

Product Name	GAOTek Smart Wireless Industrial Temperature Humidity Sensor	
Product SKU	GAOTek-IIT-141	
Product URL	https://gaotek.com/product/gaotek-smart-wireless- industrial-temperature-humidity-sensor/	

Contact us: <a href="mailto:sales@gaotek.com">sales@gaotek.com</a>

Page **1** of **165** 



# Contents

GAOTek	s Smart Wireless Industrial Temperature Humidity Sensor	
GAOTek	c Smart Wireless Industrial Temperature Humidity Sensor	6
1. Intro	oduction	6
1.1	Overview	6
1.2	Features	6
2. Get	Started	7
2.1	Installation	
2.1.1	Wall mounting	
2.1.2	DIN-Rail mounting	
2.2	Serial port	11
2.3	Power supply	
2.4	Ethernet RJ45 interface	
2.5	LED indicators	
2.6	Factory default settings	14
2.7	Quick test	14
2.7.1	Download the Software	
2.7.2	Hardware Connection	16
2.7.3	Network Configuration (Step 1)	17
2.7.4	Data Transmission test (Step 2&3)	
2.8	Reload factory settings button	
2.9 Teo	chnical support and assistance	
3. Con	nfiguration and parameter details	
3.1	Web interface (V1 version)	
3.1.1	Status	
3.1.2	IP settings	
3.1.3	Serial port settings	
3.1.4	WebSocket server	
3.1.5	Miscellaneous settings	
3.1.6	Management	
Reboo	vt	
		Page <b>2</b> of <b>165</b>



	Restore	e factory defaults	35
	Firmwa	are upgrade	35
	3.2	Web interface (V2 version)	35
	3.2.1	Status	36
	3.2.2	IP settings	38
	3.2.3	Serial port settings	40
	3.2.4	Websocket server	44
	3.2.5	MQTT gateway	44
	3.2.6	Edge computing	49
	3.2.7	Cloud service	54
	3.2.8	System setup	54
	Restart		56
	Restore	e factory de faults	56
	Firmwa	are upgrade	56
	3.3	Configuration software	57
	3.3.1	Discovering your device server	57
	3.3.2	Network setting	58
	3.3.3	Reboot the device	58
	3.3.4	Restore to factory default settings	59
	3.3.5	Open web server	
	3.4	At command	61
4.	Ope	ration modes	61
	4.1	TCP Server	62
	4.1.1	Properties	62
	4.1.2	Multihost setting	65
	4.2	TCP Client	
	4.2.1	Properties	65
	4.2.2	SSL/TLS	67
	4.2.3	Transient connection	68
	4.3	UDP Server	
	4.3.1	Properties	
		Page <b>3</b> of	



4.4	UDP Client	
4.4.1	Properties	
4.4.2	UDP multicast	
4.5	HTTP Client	
4.5.1	Properties	
4.5.2	HTTPS	
4.6	Websocket server	
5. Virt	ual COM port	
5.1	TCP Server Application with Virtual COM	
5.2	TCP Client Application with Virtual COM	
5.3	Enable RFC2217 through Virtual COM	
5.3.1	PUSR customized RFC2217 protocol	
6. Mo	dbus TCP/RTU gateway	
6.1	Ethernet masters with serial slaves	
6.2	Serial master with Ethernet slave	
6.3	Serial master with serial slaves	
6.4	Serial master via virtual COM with serial slaves	
6.5	Modbus poll with serial heartbeat packet	
7. Adv	vanced features	
7.1	Packing mechanism	
7.2	Heartbeat pack et	
7.3	Registration packet	
7.4	Socket B	
7.5	Rs485 bus detection	
7.6	Serial Printer setting	
7.7	NTP	
7.8	SNMP	
	TT gateway	
8.1	Basic settings	
8.2	Publishing a message	
8.2.1	MQTT.fx tool introduction	
	×	Page <b>4</b> of <b>165</b>



8.2.2	2.2 Transparent transmission	123
8.2.	2.3 Topic distribution	127
8.2.4	2.4 Custom node	130
8.3	Subscribe to a topic	
9. E	Edge computing	
9.1	Add Modbus slave device	
9.2	Add modbus data points	
9.2.	2.1 Register type and offset	
9.2.2	2.2 Raw data types and byte order	140
9.2.	2.3 Data points configuration	141
9.3	Export and Import configuration	144
9.4	Data report	146
9.4.	.1 Communication channel	146
9.4.2	.2 Report Method	147
9.4.	A.3 Payload-Json template	149
9.4.4	4.4 Test	
9.5	Data Query	155
9.5.	5.1 Json	
9.5.2	5.2 Modbus slave address and register mapping	157
9.5.	5.3 Modbus TCP	159
9.5.4	5.4 Modbus RTU	
10.	AWS IOT Service	
11.	PUSR Cloud service	
12.	Warranty	
13.	Contact US	
14.	Disclaimer	
15.	Revision History	

Page **5** of **165** 



# GAOTek Smart Wireless Industrial Temperature Humidity Sensor

# **1. Introduction**

### **1.1 Overview**

The USR-N5X0 Series are network-based serial device servers that connect RS-232/422/485 serial devices, such as PLC, meters, sensors, weigh scale, barcode scanner, card reader and serial printer directly to a TCP/IP network. Data coming from the Ethernet port is sent to the designated RS-232/RS-422/RS-485 port, and data received from RS-232/RS-422/RS-485 port is sent to the Ethernet port, allowing bi-directional communication. In the computer-aided manufacturing or industrial automation areas, field devices can directly connect to an Ethernet network via the USR-N5X0 Modbus gateway. In normal PCs or laptops, a virtual COM port can be created using our virtual COM software to fetch serial data from USR-N5X0 remotely over Ethernet. This extends the traditional COM ports of a PC, with access over a TCP/IP network. Through networking, you can control and monitor remote serial devices over the LAN or even over the Internet. The specific models of this series of industrial serial server are as follows. Please contact our sales for more information.

Model name	Description
USR-N510	1 RS232/485/422 to Ethernet device server
USR-N510-4	1 RS485 to Ethernet device server
USR-N520	2 RS232/485/422 to Ethernet device server
USR-N520-6	2 RS232/485 to Ethernet device server
USR-N540	4 RS232/485/422 to Ethernet device server
USR-N540-4	4 RS485 to Ethernet device server
USR-N580	8 RS485 to Ethernet device server

### Table 1 USR-N5X0 series models

### **1.2 Features**

The USR-N5X0 field-mount serial device server series share the same software platform on different available hardware components.

It provides.

Page 6 of 165



- High-performance CPU processing ability, using 32-bit Arm Cortex-M7 core CPU, up to 400MHz frequency.
- Provides remote serial access over the Internet for industrial serial devices.
- 10/100Mbps Ethernet port and support Auto MDI/MDIX
- Software selectable RS-232/422/485 3-in-1 serial port (N5X0 models)
- Rugged metal housing with IP30 protection for wall or optional DIN-Rail mount
- Built-in 15KV ESD serial port protection
- Supports a wide industrial operating temperature, -40°F-185°F.
- Baud rate: 0.6-921.6 Kbps (maximum 230.4Kbps for N520-6 model), and any baud rate setting, support None, Odd, Even, Mark, Space Parity bit (firmware V2.0.0 or later)
- Supports Hardware and Software flow control.
- Flexible serial port data framing setting, which can satisfy user's various demands for data packets segmentation.
- Versatile operation modes: TCP Server, TCP Client, UDP, HTTP client, Websocket server
- Support virtual COM, COM Port Redirector USR-VCOM (windows)
- Modbus Ethernet-to-Serial support (Modbus/TCP, Modbus/RTU) for seamless integration of serial Modbus devices
- Provides rich configuration access, including Windows configuration tool, and Web Browser
- Firmware upgrading via Web Browser and Windows configuration tool.
- Easy-to-use Windows configuration tool for auto discovery, multiple devices setting and monitoring.
- Choice of power input: AC-DC adapter (DC Jack) or DC direct (Terminal Block)
- High security via certificate verification SSL/TLS encryption for serial data transmission, HTTPS, TCPS, MQTTS (firmware V2.0.0 or later)
- Support Modbus RTU master, edge computing, Modbus gateway, MQTT gateway (firmware V2.0.0 or later)
- Support SNMP V1/V2c (firmware V2.0.0 or later)

# 2. Get Started

Since the USR-N5X0 Series is connected through a TCP/IP network, you may need to know some basic facts about networking in order to connect the server correctly. Specifications and dimensions are not provided in this manual since they may differ considerably based on the hardware purchase. Please refer to datasheet of each model for more information.



## **2.1 Installation**

You can choose whether to plug in the other peripheral ports at this point or do it later depending on the actual location of the device or level of comfort for performing such operation.

## 2.1.1 Wall mounting

The wall mounting option provides better shock and vibration resistance than the DIN-Rail vertical mount.

- Locate the installation site and place the device against the wall. Use the wall mount plates as a guide to mark the locations of the screw holes.
- Drill two holes over the two marked locations on the wall. Insert the wall sinks into the walls. Insert the screws into the wall sinks. Leave a 2 mm gap between the wall and the screw head to allow for wall mount plate insertion.
- Align the wall mount plate over the screws on the wall. Hang the device on two screws and slide it downward to lock in place, then tighten the screw to enhance stability, see the following Fig.1.

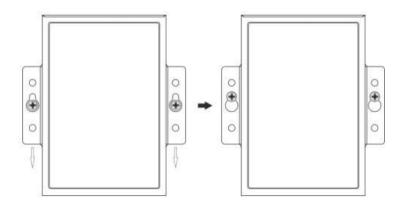


Fig.1 Wall mount installation

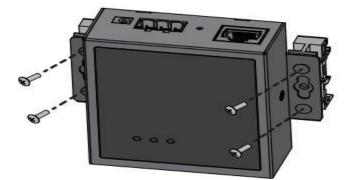
• For device disassembling please power off the device and unscrew the screw on the wall about 2mm. Lift the device upward slightly, take out the device.

### 2.1.2 DIN-Rail mounting

DIN-Rail mount kits must be purchased separately. They are not provided with the N5X0.

• If you have purchased the DIN-Rail mount kit, proceed to place the screws on the back of the device as shown in Fig.2.





### Fig.2 Fix DIN-Rail mount kit.

• Position the rear panel of the device directly in front of the DIN-Rail, making sure that the top of the DIN-Rail clip hooks over the top of the DIN-Rail, as shown in Fig.3

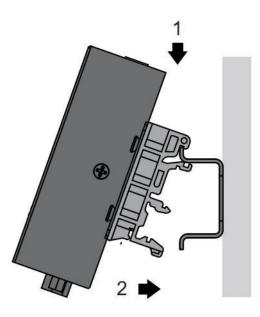


Fig.3 Install DIN-Rail mounting Kit.

• Once the DIN-Rail is seated correctly in the DIN-Rail clip, press the front of the device to rotate the device down and into the release tab on the DIN-Rail clip. If seated correctly, the bottom of the DIN-Rail should be fully inserted in the release tab.



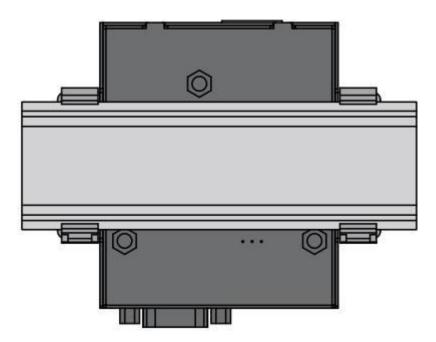


Fig.4 Correctly installed DIN-Rail Kit.

• Proceed to Fig.5 if you want to remove the device from DIN-Rail. Push down on the top of the DIN rail clip release tab with your finger. As the clip releases, lift the bottom of the device, as shown in the following illustration.

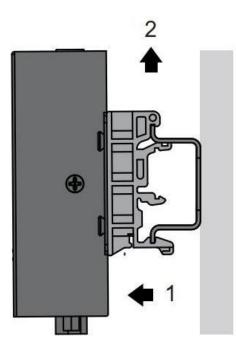


Fig.5 Remove the DIN-Rail

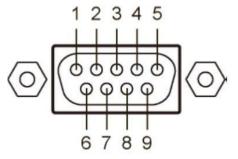
Page 10 of 165



### 2.2 Serial port

The USR-N5X0 supports the RS-232, RS-422, and RS-485 protocols, adopts DB9 male connector and is software configurable. The serial port pin assignments are given in the table.





### Fig. 6 DB9 male connector pin

### Table 2 DB9 Male Pin Assignment (N5X0 models)

Pin	RS232	RS422	RS485
1			
2	RXD	Rx+	
3	TXD	Tx-	B-
4			
5	GND	GND	GND
6			
7	RTS	Tx-	A+
8	CTS	Rx-	
9			

Page 11 of 165



The USR-N5X0-6 supports the RS-232 and RS-485 protocols and is software configurable. And RS232 adopts DB9 male connector, RS485 adopts terminal block. The DB9 pin assignment is same to table 2(RS232).



Fig.7 N520-6 serial port

The USR-N5X0-4 supports only RS-485 protocols and adopts 3-pin 5.08mm pitch industrial terminal blocks. The serial port pin assignments are shown in Fig.8



## Fig.8 N510-4 terminal block

### 2.3 Power supply

The USR-N5X0 serial device server provides 2-pin power supply input terminal blocks and DC jack. The power supply support anti-reverse protection. Power supply range: 5-36VDC.



Page 12 of 165



## Fig.9 N520 back view

Although internal grounding has been done inside, in order to help limit the effects of noise caused by electromagnetic interference (EMI) and protect your device, it is still strongly advised to ground the device properly. There is a grounding screw next to the terminal block, you should connect it to the grounding at all times.

### 2.4 Ethernet RJ45 interface

The 10Base-T/100Base-TX adaptive Ethernet RJ45 interface supports automatic MDI/MDIX connection, refer to Fig.10 below for the pin distribution of the RJ45 interface. USR-N5X0 serial servers adopt RJ45 interface with light, as shown in the picture below.

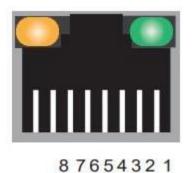


Fig.10 RJ45 with light

### Table 3 Ethernet pin assignments

Pin number	Signal name	
1	Send data+(TD+)	
2	Send data-(TD-)	
3	Receive data+(RD+)	
6	Receive data-(RD-)	
4,5,7,8	Unused	

### **2.5 LED indicators**

The USR-N5X0 serial device server provides LED indicators to monitor the device working status with a comprehensive simplified troubleshooting, the function of each LED is described in the table as below.

Page 13 of 165



### **Table 4 LED indicators**

LED name	status	description
PWR	Steady on	Power supply is normal.
PWR	Off	No power supply or abnormal power supply.
WORK	Blinking	Power is on and the device is ready. System is booted up and running
TXN	Blinking	Serial port is transmitting data
RXN	Blinking	Serial port is receiving data

### 2.6 Factory default settings

The USR-N5X0 serial device server comes with the following default settings.

Parameter	Default Values		
Username	admin		
Password	admin		
Device IP	192.168.0.7		
Subnet Mask	255.255.255.0		
Gateway IP	192.168.0.1		
COM port	115200, None,8,1		
COM operation mode	TCP server,23		
MQTT	Disable (firmware V2 version)		
Edge computing	Disable (firmware V2 version)		

#### Table 5 Default parameters

#### 2.7 Quick test

USR-N5X0 series serial server has a built-in Web server, which provides a convenient way to access and configure the serial server. Users can use Edge, Firefox, or Google browser to access it. This chapter is a quick introduction to the USR-N5X0 series of serial server products. It is recommended that users read this chapter and follow the instructions once for the system, and you will have a basic understanding of the product. For specific function details and instructions, please refer to the subsequent chapters.



### 2.7.1 Download the Software

DownloadthesettingsoftwarefromPUSR'swebsite:https://www.pusr.com/support/downloads/H7-version-set-up-software.htmlhttps://www.pusr.com/support/downloads/usr-tcp232-test-V13.html

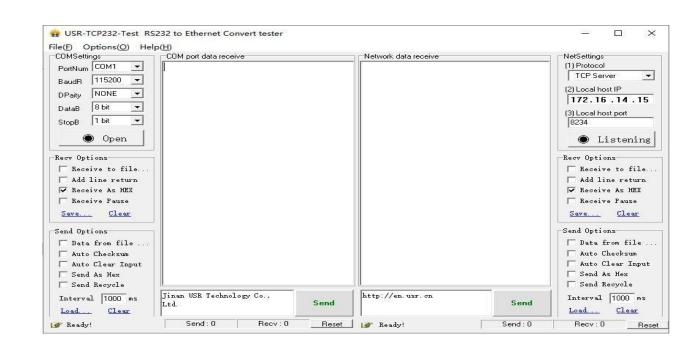
You may find it in the download section under your product page. Run the software when the installation has been completed as shown in Fig.11 and Fig.12.

It is strongly recommended for the users to set the Network Parameters through configuration tool first. Other device-specific configurations can later be carried out via user-friendly Web-Interface.

😪 Etheri	netTool				
Device	中文				
DeviceIP		DeviceName	MAC	Ver	Web
172, 16, 1	4 158	USR-N540	F4 70 OC 60 E2 CD	7208	
<					>
Basic Set					
I	P Type:	DHCP/Au	nto IP 🗸 🗸		
м	loduleSt	aticIP: 172.16.	14.158		
s	ubnetMa	sk: 255.255	5, 255, 0		
G	ateway:	172.16.	14.1		
			Save		
			Save		
		:	Search		
		<u> </u>	JSR IOT		

### **Fig.11 Windows configuration tool**

Page 15 of 165



#### Fig. 12 Test assistant

#### 2.7.2 Hardware Connection

GAOTek

For fast networking of USR-N5X0 series serial server, you need to prepare a PC, a router, a serial server, a network cable, a serial cable, and a DC12V/1A power supply. The hardware connection is shown in Fig. 13. To establish a TCP / IP network all devices must be connected to the same network either locally or via gateway connections.



#### Fig.13 Hardware connection

• Connect the power line with the N5X0 power input. If the power is properly supplied, the "PWR" LED will show a solid red color. After the system is ready, the "WORK" LED will

Page 16 of 165

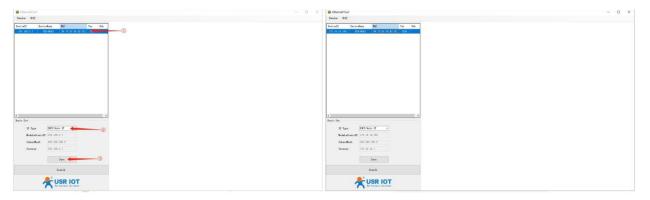


blink.

- Connect one end of the Ethernet cable to the N5X0's 10/100M Ethernet port and the other end of the cable to the same Ethernet network (same router or switch).
- Connect a serial data cable (USB to RS232 or RS485) between the N5X0 and PC.

## 2.7.3 Network Configuration (Step 1)

The Broadcast Search function is used to locate all N5X0 device servers that are connected to the same LAN as your computer. Since the Broadcast Search function searches by MAC address and not IP address, all N5X0 connected to the LAN will be located, regardless of whether they are part of the same subnet as the host. In EthernetTool, click Search to search your LAN for N5X0 device servers. When your unit appears in the search results, you can click device to select it and change the IP type to DHCH, save your change. Wait for 5s and search it again.



#### Fig.14 IP network setting

When accessing the serial server through the Web, the IP address of the serial server and the PC must be in the same network segment. After changing the IP address of the N5X0, you can access the Web page of the N5X0 series serial server through browser and perform related configuration operations on it. The username and initial password are both "admin". After, entering the username and password, click "OK" and the server will authenticate. After success, you will enter the main page of the Web server, as shown in Fig.15. The following uses firmware V2 version as an example. For details about the V1 version web page, see Section 3.1.



ISR IOT ommunication Expert of Industrial IoT			Be Honest Do Bes ⊄⊄∣Env
Status Network	Status		
Port	System		
Gateway	Model Name	USR-N540	
Cloud Service	Firmware Version	V2.0.8	
System	Туре	H7-4	
	Run Time	0day: 21hour: 15min	
	Network		
	MAC Address	F4-70-0C-60-E2-CD	
	Current IP Address	172.16.14.158	
	Preferred DNS Server	192.168.0.1	
	Alternate DNS Server	223.5.5.5	
	Port		
	Status of Port	Port1 ~	
	Conn Status A(ETH)	LISTEN	
	TX Count A(ETH)	0 bytes	
	RX Count A(ETH)	0 bytes	
	Conn Status B(ETH)	IDLE	
	TX Count B(ETH)	0 bytes	
	RX Count B(ETH)	0 bytes	
		USR IOT Technology Limited. http://www.pusr.com	

### Fig.15 The main interface of the Web server

The IP address of the PC must be modified to ensure that it is in the same local area network as the IP of the serial server if you want to connect N5X0 to PC directly via a net cable. The default IP address of serial server is: 192.168.0.7. Set the PC's IP address as: 192.168.0.X (X is any valid value from 2 to 253 except 7). The specific Windows system operation page is shown in Fig.16. you can access the Web page of the USR-N5X0 series serial server through browser as mentioned above.



## Fig.16 IP Setting of PC

nternet 协议版本 4 (TCP/	/IPv4) Properties	>
General		
	ssigned automatically if your network supports , you need to ask your network administrator ttings.	
O Obtain an IP addres	s automatically	
• Use the following IP	address:	
IP address:	192 . 168 . 0 . 100	
Subnet mask:	255 . 255 . 255 . 0	
Default gateway:	192.168.0.1	
Obtain DNS server a	address automatically	
Use the following DN	NS server addresses:	
Preferred DNS server:	192.168.0.1	
Alternate DNS server:	114 . 114 . 114 . 114	
🗌 Validate settings up	Advanced	
	OK Cance	1

### 2.7.4 Data Transmission test (Step 2&3)

You can select an operation mode in socket setting page, but for now we use default parameters to test, i.e TCP server. Now USR-TCP232-Test works as TCP client, you need configure the server IP and port, that is 172.16.14.158:23 of USR-N5X0 serial device server, the IP address of PC is 172.16.14.15. In the serial port setting module, you can configure communication parameters for the serial ports RS485 and RS232, as shown in the figure below. When configuring a serial network you need to set the following within each device-Baud rate,Parity,Stop bits,Data bits and keep serial port parameters consistent in the same network. We now configure the COM Settings to operate as required for the N5X0 devices. Go to the Port1 Settings tab for confirming values of parameters.

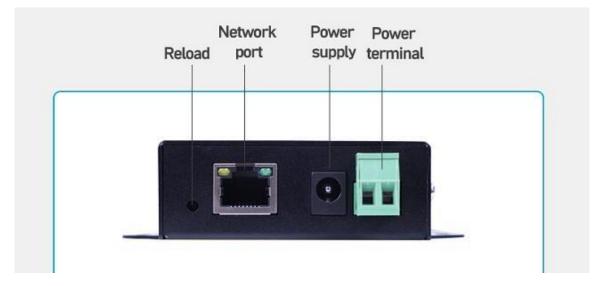


USR IOT	Be Honest Do Best 1 ⇔⊋[logida	-	5232 to Ethernet Convert tester		- 🗆 X
	TA I NUM	File(E) Options(Q) He		Network data receive	11 M 1
> Status		COMSettings PortNum COM3 •	COM pot data receive http://en.um.onhttp://en.um.onhttp://en.	Tinan USE Technology Co., Ltd. Jinan USE	NetSetlings (1) Photocol
Network     Data transmission parameter cont		processing and the second seco	usr. onhttp://en.usr. onhttp://en.usr. on	Technology Co., Ltd. Jinan WSR Technology	TCP Client +
IP Config	denne.	BaudR 115200 -		Co., Ltd Jinan USB Technology Co., Ltd.	(2) Server IP
✓ Port SETTING		DPaily NONE -			172.16.14.158
Port1 Socket		Data8 8 tik 💌			(2) Server Part
Port2		StopB 1 bit 💌			23
	19520 (600-921600)teps	🔶 Close			1 m
Port4 Data bits	a	Crose	-		💓 Disconnect
Websocket to Serial Parity	None	Recy Options	1		Reov Options
		TReceive to file			Thereive to file .
Could Service Stop bits     Southern	· ·	Add line retwn			T Add line return
Play dtl	NONE .	Receive As HEE			Escaive As HEE
UART Packet Length	0 (0-1460)tytes	T Receive Pause			T Receive Pause
UART Packet Time	0 (0-255)m	Sare Clear			Save Clear
Sanc Baudrate (RFC2217)	(N .	Send Options			Send Options
		T Data from file			🗆 Data from file
Enable Uart Heartbeat	8	T Auto Checksum			T Auto Checksum
	SeineR/aphy	T Auto Clear Input			T Auto Clear Input
		F Send As Hex		LocalHost 172.16.14.15 Port 13375	Send An Hex
		□ Send Beoyole	Jinan WE Technology Co.,	http://en.usr.on	Send Lecycle
		Interval 1000 ns	Ltd. Send	Send	Interval 1000 ms
		Lord Clear			Lord Clear
linan USR 101 Tech	tology Limited, http://www.pusr.com	tor Ready!	Send 120 Recv 80 Reset	🕼 Ready! Send: 80	Recv: 120 Resot

Fig.17 shows an example of parameters setting to test transparent transmission.

Fig.17 Transparent transmission test

### 2.8 Reload factory settings button



Press the "Reload" button (inside a small hole) on the back panel for 3-15 seconds and then release or follow the procedure in Section 3.1.6, to restore the USR-N5X0 Series Industrial Serial Device Server to the factory default settings.

Page 20 of 165



### 2.9 Technical support and assistance

Please visit the USR IoT website: <u>https://www.pusr.com</u> where you can find the latest information about the product.

Contact your distributor, sales representative, or PUSR's support center: <u>http://h.usriot.com/index.php?c=frontTicket&m=sign</u> for technical support if you need additional assistance.

Please have the following information ready before you submit a ticket:

- Product model
- Description of your peripheral attachment
- Description of your software (firmware version, application, function description.)
- A complete description of the issue and steps to reproduce.

Page 21 of 165

Based in New York City & Toronto, GAO Tek Inc. is ranked as one of the top 10 global B2B technology suppliers. GAO ships overnight within the U.S. & Canada & provides top-notch support thanks to its 4 decades of experience.



# 3. Configuration and parameter details

### 3.1 Web interface (V1 version)

Every USR-N5X0 Industrial Serial Device Server is equipped with a built-in web server in the firmware. Therefore, the device can be accessed by using a web browser for configuring by entering the device's IP address in the URL field of your web browser. An authentication will be required and you will have to enter the username (Default value is "admin") and password (Default value is "admin") for accessing the web interface as shown in Fig. 18. This approach (web interface) for configuring your device is the most user-friendly. It is the most recommended and the most common method used for USR-N5X0 Serial Device Server Series. Please go to its corresponding section for a detailed explanation.

		Q _ 🗆 X
< > C == @ 172.16.14.158		$\triangleright \oplus \mp \equiv$
	Please sign in         http://172.16.14.158         Your connection to this site is not private         Username:       admin         Password:          Stign in       Cancel	

### Fig.18 Authentication Required for Accessing Web Interface

### 3.1.1 Status

After entering the correct username and password and the authentication is successful, you will enter the main page of the Web, as shown in Fig.19. The main page can be roughly divided into three areas. The upper area displays the logo, the lower left area is the function menu area, the middle area is the main function display area, and the lower right area is the help document area. Fig.19 illustrates the status page of the web interface.



25	-IOT Experts-	Be Honest, Do Best.
urrent Status	parameter	help
ocal IP Config	Module Name: USR-N510	Run time:
ort1	Firmware Revision: V1.0.12 Current IP Address: 172.16.14.104	Run time:     run time means
	Preferred DNS Server: 192.168.0.1	the minutes since latest reboot
leb to Serial	Standby DNS Server: 223.5.5.5	• TX/RX Count:
lisc Config	MAC Address: F4-70-0C-61-1D-0E	and the second
	Run Time: Oday: 1hour: 57min	TX/RX count give us a calculation of
odule Mange	PORT Status: port1 ~	the total byte we
	Conn Status A(ETH): LISTEN	have been received or send.
	TX Count A(ETH): 0 bytes	
	RX Count A(ETH): 0 bytes Conn Status B(ETH): IDLE	
	TX Count B(ETH): 0 bytes	
	RX Count B(ETH): 0 bytes	
	-	

### Fig.19 The main interface of Web Server

The function of the device status part is to display some specific information of the current device, including module name, firmware version, IP address, DNS, MAC address, running time and serial port status.

### **Table 6 Status List**

Page 23 of 165



Parameter Item	Description		
Module name	The name of the serial server, which can be customized by the user on the "Miscellaneous settings" page.		
Firmware Version	The current software version of the serial server.		
IP Address	The IP address of the serial server.		
MAC Address	The MAC address of the serial server.		
Running time	Total time after the device start work. It will starts from 0 after reboot.		
Port Status	<ul> <li>The working status of checked serial port.</li> <li>Select the serial port currently to be displayed</li> <li>1. Conn Status A(ETH): connection status of socket A.</li> <li>IDLE : Initialization status</li> <li>LISTEN : When the module works as TCP Server, it is listening for connection access CONNECTING : Works as TCP client, the module is establishing a connection to the TCP Server</li> <li>CONNECTED : Works as TCP server, the TCP connection to TCP server, the TCP connection to TCP server of the module has been established</li> <li>CONNECTED (n) : Number of TCP clients connected to the module.</li> <li>ERROR : The module is abnormally disconnected</li> <li>Tx Count A(ETH): To count how many bytes be send to internet.</li> <li>Rx Count A(ETH): To count how many bytes received from internet.</li> </ul>		

Page 24 of 165



## 3.1.2 IP settings

You must assign a valid IP address to the USR-N5X0 before it will work in your network environment. The IP address must be unique within the network. If the device is connected to the Internet and should connect to other servers over the Internet to get some services such as Network Time Protocol (NTP) server, you will need to configure the DNS server in order to be able to resolve the host name of the NTP server. The detailed description of the configuration parameters on this interface is shown in table 7.

Version:V1.0.12 Ty	ype:H7-4					虫之
₹ ¶	USR IOT -IOT Experts-					Be Honest, Do Best!
Current Status			parame	eter		help
Local IP Config	IP Type:	DHCF	P/AutoIP •			• IP type:
Port1	DNS type:	Auto				StaticIP or DHCP
Web to Serial	Static IP:	192	168	0	7	StaticIP
and the second	Submask:	255	255	255	0	Module's static ip • Submask
Misc Config	Gateway:	102	168	0	1	usually
Module Mange	Dns Server:		114	114	114	255.255.255.0  • Gateway
	Spare Dns Server:		5	5	5	Usually router's ip address
			Save C	ancel		
Copyright © Jinan	USR IOT Technology Limited. A	ll Right	s Reserve	d		website: <u>www.usriot.com</u>

Fig.20 Network Settings Web Page



#### **Parameter Item** Description Network protocol Click the drop-down menu to select the IP Address Setting mode: Static or DHCP. If you choose DHCP, the rest of the options will be greyed out or disabled. DNS type Click the drop-down menu to select the DNS mode: auto or manual. If you choose auto, the DNS options will be greyed out or disabled. IP address is a 32-bit address assigned to Ip address devices connected to the Internet. The IP address consists of two fields: the network number field (Net-id) and host number field (host-id). In order to facilitate the management of IP addresses, IP addresses are divided into five categories: Class A, B, and C addresses are unicast addresses, Class D addresses are multicast addresses. Class E addresses are reserved addresses for future special purposes. The IP addresses currently in large numbers belong to three types of addresses: A, B and C. Subnet mask The mask is a 32-bit number corresponding to an IP address. Some of these numbers are 1, and the others are 0. The mask can divide the IP address into two parts: the subnet address and the host address. The part of the IP address corresponding to the 1 bit in the mask is the subnet address, and the other bits are the host address. The mask for class A addresses is 255.0.0.0, the mask for class B addresses is 255.255.0.0, the mask for class C addresses is 255.255.255.0 The default gateway in the host is usually Default gateway called the default route. The default route (Default route) is the route chosen by the router when no other route exists for the destination address in the IP packet. All packets whose destination is not in the router's routing table will use the default route.

### **Table 7 Network Settings List**

Page 26 of 165

GROTek

The IP address of the DNS server. DNS
Server part is where you can specify the IP
Address of your Preferred DNS (Domain
Name Server) and Alternate DNS. When the
device uses a static IP address, the user is
required to fill in this item, 8.8.8.8(Google)
will be a good choice. If a specific DNS
server is not used, the default gateway IP
address is generally sufficient

After finishing the network settings configuration, please click the Save button to save all changes that have been made. Finally, the web browser will be redirected to the Reboot page as shown in Fig.21. All modified parameters take effect after device restart.

Version:V1.0.12 Ty	pe:H7-4		中文
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	USR IOT -IOT Experts-	Be Hone	st, Do Best!
Current Status	Reboot/Reset		help
Local IP Config	Restart Module	Restart Module	Reboot:
Port1			Click to make your config take
Web to Serial			effect
Misc Config			
Module Mange			
Copyright © Jinan	USR IOT Technology Limited. All Rights Reserved		website: <u>www.usriot.com</u>

Fig.21 Reboot web page

Page 27 of 165



### 3.1.3 Serial port settings

The serial port module includes serial port parameter configuration, network parameter configuration. The main function of the serial device server is to carry out two-way transparent transmission of standard serial bus data (RS-232, RS-485, RS-422) and standard Ethernet data supporting TCP/IP protocol to solve common serial equipment Networking problems on the Internet. The Port configuration page can configure the parameters of the serial port and socket, as shown in Fig.22.

Version:V1.0.12 Typ	USR IOT -IOT Experts-	Be Hone	±± est, Do Best!
Current Status		Parameter	Help
Local IP Config Port1 Web to Serial Misc Config Module Mange	Baud Rate: Data bit: Parity: Stop bit: Flow ctrl: UART Packet Time: UART Packet Length: Sync Baudrate(RF2217 Similar): Enable Uart Heartbeat Packet:	8 ▼ bit None ▼ 1 ▼ bit NONE ▼ 0 (0~255)ms 0 (0~1460)chars	<ul> <li>Local Port 1~65535. when TCP Client, set this to 0 means use random local port</li> <li>Remote Port 1~65535</li> <li>Packet time/length default 0/0, means automatic packet</li> </ul>
	Work Mode: TCP Server MAX Sockets: Local Port Number: PRINT: Modbus Poll: Modbus TCP Exception: Enable Net Heartbeat Packet: Registry Type:	Response Timeout: 200 (10~9999)ms None  Vocation Connect With  Parameters	mechanism; you can modify it as a none-zero value

### Fig.22 Serial port configuration page

Details on work mode connectivity protocols and its settings of N5X0 series are given in Chapter 4 Operation modes, this section will only focus on the part of parameter description. The description of the configuration parameters on this interface is shown in table 8 and table 9.

### Table 8 Serial settings

Page 28 of 165



Parameter Item	Description
Baud rate	This sets the port's data transfer speed. Choices are from 600—921600. Set this to match the baud rate setting of the connected device. Default is 115200.
Data bits	This sets the port's data transfer speed. Choices are from 600—921600. Set this to match the baud rate setting of the connected device. Default is 115200.
Parity bits	This bit checks the integrity of the transmitted data. Choices are: None, Odd, Even. Set this to match the parity setting of the connected device. Default is None (which is the default for the majority of serial devices).
Stop bits	This indicates that a character has been transmitted. Set this to match the stop bit setting of the connected device. Choices are: 1 and 2. Default is 1 (which is the default for the majority of serial devices).
Flow control	This allows you to choose how the data flow will be controlled. Choices are: (No Flow Control), RTS/CTS (Hardware Flow Control), or Xon/Xoff (Software Flow Control). Set this to match the flow control setting of the connected device. Default is None. If Xon/Xoff is selected, the Xon and Xoff characters are 0x11 for Xon and 0x13 for Xoff. Note that these are hexadecimal numbers of ASCII characters
Serial mode (N5X0 models)	Click the drop-down menu to select the type of serial interface for the port. Choices are RS-232, RS-422, RS-485 (2 Wire).
Packing time	Click the option to sent pack immediately by interval.
Packing length	Click the option to sent pack immediately by size.

**Table 9 Operating modes settings** 

Page 29 of 165



Parameter Item	Description
Work mode	USR-N5X0 series supports 5 different operation Modes which are TCP Server, TCP Client, and UDP,HTTP
	client and websocket. The operation Mode describes the role of the device and the connection
	between the device and other remote devices in the network which would like to communicate
	with serial device on N5X0's COM port.
Maximum socket no.(TCP	This option specifies the maximum number of remote devices/clients (with maximum of 16 clients, except
server only)	N580 with 8) that can be connected to the serial device on this COM port.
Local port	This option specifies the port number that the TCP/UDP server should listen to. It is also used by the
	remote TCP/UDP client to connect to the TCP/UDP server. The default local port is 23.
	You can enterdifferent port numbers in this option.
Remoter server addr.	Please specify the IP address of the TCP/UDP server program on the remote host in this field. This should
	match the IP settings of the TCP/UDP server program.
Remote port	Please specify the port number of the TCP/UDP server program on the remote host in this
	field. Once
	again, this should match the IP setting of the TCP/UDP server program.
Timeout	The default is disable. If you want to keep connection continually, you can disable it. Data idle
reconnection(TCP/U	Time is the
DP client)	time period for which the device waits for data. If the USR-N5X0 Series does not receive data duringestablished idle time(timeout), the USR-N5X0 Series will disconnect temporarily. When the data comes
	in, it will reconnect automatically. Users do not need to reconnect.
Modbus polling	This option is selected when multiple modbus maters from Ethernet are polling the same serial port.
	Each serial port supports up to 16 simultaneous TCP connections allowing hosts to
	simultaneously transmit/receive data to/from the same serial port,USR-N5X0 Series
	processes the data in the orderarrived. The serial device server determines the end of the
	serial acknowledgement through a response timeout.
Modbus exception	This option is used to enable modbus exception checking. If selected, error messages (TCP
	exception
	codes) are generated if a problem (such as a message timeout) should occur during Modbus

Page **30** of **165** 



	operations.
Socket B	Socket B supports 2 different operation Modes which are TCP Client, and UDP client, this socket is closed by default.

The configuration will save to flash memory after clicking Save button. All configurations take effect after a system reboot.

### 3.1.4 WebSocket server

This function is that the serial server acts as a WebSocket server, and transparently transmits the data received by the serial to the webpage in hexadecimal or ascii format. The WebSocket server can also send data to the serial device at any time.

Version:V1.0.12 Typ	e:H7-4	史文
₹ C	USR IOT Be H	lonest, Do Best!
Current Status	parameter	help 🄶
Local IP Config	Websocket connection: 0	web to serial
Port1	Receive hex data	this page use websocket to
Web to Serial	Prompt ×	transmit data between webpage
Misc Config	connect success!	and uart
Module Mange		
	ОК	
	send ascii data send hex data clear	
Copyright © Jinan U	SR IOT Technology Limited. All Rights Reserved	website: <u>www.usriot.com</u>

### Fig.23 WebSocket Server

Page 31 of 165



## 3.1.5 Miscellaneous settings

This configuration tab includes several system level settings, such as device name, websocket, system log, username and password. Most of these settings are optional.

Version:V1.0.12 Ty	pe:H7-4	史主
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	USR IOT -IOT Experts-	Be Honest, Do Best!
Current Status	parameter	help
Local IP Config	Module Name: USR-N51	• Module Name
Port1	Websocket Port: 6432	max length is 32
Web to Serial	Websocket Direction : UART1	Websocket Port
Misc Config	Webserver Port: 80 User Name: admin	default 6432 • Websocket
Module Mange	Pass Word: admin	Direction default UART1
	Uart Cache: Uart Cache: Cancel	(60~65535) (60~65535) (60~65535) (60~65535) (60~65535) (60~65535) (60~65535) (60~65535) (60~65535) (60~65535) (70~65735) (70~667) (70~67) (70
Copyright © Jinan	USR IOT Technology Limited. All Rights Reserved	website: <u>www.usriot.com</u>

Fig.24 Miscellaneous settings

Page 32 of 165



Parameter Item	Description	
Module name	The name of the device, up to 32 characters, can't be null	
Websocket port	Websocket server listen port NO. Range 1-65535	
Websocket direction	Click the drop-down menu to select websocket mapping direction: UART or Log.	
Webserver port	Web server listen port NO. Range 1-65535	
User name	The user name of web console and can be modified. up to 16 characters, can't be NULL	
Password	The password of web console and can be modified. up to 16 characters, can't be NULL	
UART cache	Click the option to enable serial buffer. By default, N5X0 will empty its serial buffer when a new TCP	
	connection is established. This means that the TCP application will not receive buffered serial	
	data during a TCP link breakage. To keep the serial data when there is no TCP connection and	
	send out the buffered serial data immediately after a TCP connection is established, you can	
	disable this option.	
Reset timeout	This function is used for the serial device server without any data transmission or reception	
	for a long	
	time, and the serial server automatically restarts. If the restart time is set between 0 and 59	
	seconds, this function does not take effect. Only when the time is set to be greater than or equal to 60 seconds, the	
	restart function of the device without data will take effect.	

### Table 10 Miscellaneous settings

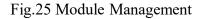
Page **33** of **165** 



## 3.1.6 Management

This page can perform some system operations on the N5X0 series serial server, including restarting, restoring factory configuration, and upgrading. It is recommended that users use it with caution. Improper operation may damage the serial server.

Version:V1.0.12 Typ	ie:H7-4	中文
<del>ا</del>	USR IOT -10T Experts-	Be Honest, Do Best!
Current Status	Firmware upgrade	help
Local IP Config	Firmware file: Please select firmware file Select the file Flash	ng the firmware
Port1	Restore factory	upgrade: Flash the device's
Web to Serial	Restore factory Restore fa	firmware to the version you
Misc Config	Restart	uploaded  Restore factory:
Module Mange	Restart Module Restart Mo	Restore your
		factory and restart • Restart: Click to make your config take effect
Copyright © Jinan U	JSR IOT Technology Limited. All Rights Reserved	website: <u>www.usriot.com</u>



#### Reboot

This function is used to restart the USR-N5X0 series serial server by software. Before the serial server is completely restarted, the device does not work and cannot forward any data packets. This restart is different from the hardware reset of power-on restart, but the serial server system software is reset, just like the "warm restart" of the windows operating system. Once a new setting is changed, you can use the Save function to accept the changes. You will need to reset the device to

Page 34 of 165



save the settings to flash memory. Click on "restart module" Button, the page pops up a prompt box, click "yes".

### **Restore factory defaults**

This function is used to restore the USR N5X0 serial server to the factory settings and automatically restart the serial server at the same time. Before the serial server restarts successfully, the serial server does not work and cannot forward any data packets. This function is to restore the factory default configuration value once the user sets the wrong parameter and causes the serial port server to work abnormally. Click the "Restore factory" button, and a prompt box will pop up on the page. Click "yes".

#### **Firmware upgrade**

USR IoT continually upgrades its firmware to add new features and optimize performance. Please contact the sales to obtain the latest version of the firmware. Before upgrading the firmware, please make sure that the device has a reliable power source that will not be powered off or restarted during the firmware upgrading process (please be patient as this whole process might take up to 1 -2 minutes). Copy the new firmware file to your local computer. Note that the firmware file is a binary file with ".bin" extension. Before updating the firmware, make sure that your host's Network domain is as same as the serial device server. Next, click "Select the file" button as shown in Figure to find and choose the new firmware file. Then, click "Flashing the firmware" button to start the firmware upgrade process. The program will show the upload status. Please wait until the uploading process is finished (the amount of time varies depending on the equipment used). Finally, the device will then proceed to restart itself. In most cases, you might require to reconfigure your device. Please refer to "USR-N5X0 firmware upgrade from V1 to V2 version user guide" for detail if you want to use V2 firmware function.

#### 3.2 Web interface (V2 version)

Every USR-N5X0 Industrial Serial Device Server is equipped with a built-in web server in the firmware. Therefore, the device can be accessed by using a web browser for configuring by entering the device's IP address in the URL field of your web browser. An authentication will be required and you will have to enter the username (Default value is "admin") and password (Default value is "admin") for accessing the web interface as shown in Fig. 26. This approach (web interface) for configuring your device is the most user-friendly. It is the most recommended and the most common method used for USR-N5X0 Serial Device Server Series. Please go to its corresponding section for a detailed explanation.

Please sign in		
Diana sina ia		Q _ > G
Diagon sign in		Þ G
Please sign in		
Prease sign in       http://172.16.14.158       Your connection to this site is not private       Username:       admin       Password:		
	Your connection to this site is not private Username admin Password:	Your connection to this site is not private Username: admin Password: •••••

#### Fig.26 Authentication Required for accessing web Interface.

#### 3.2.1 Status

After entering the correct user name and password and the authentication is successful, you will enter the main page of the Web, as shown in Fig.27.

R IOT munication Expert of Industrial IoT			Be Honest Do Best 中文   Engli
atus etwork	Status		
ut.	System		
ateway	Model Name	USR-N540	
Service	Firmware Version	V2.0.8	
	Туре	H7-4	
	Run Time	0day: 2hour: 7min	
	Network		
	MAC Address	F4-70-0C-60-E2-CD	
	Current IP Address	172.16.14.158	
	Preferred DNS Server	192.168.0.1	
	Alternate DNS Server	223.5.5	
	Port		
	Status of Port	Port1 v	
	Conn Status A(ETH)	USTEN	
	TX Count A(ETH)	0 bytes	
	RX Count A(ETH)	0 bytes	
	Conn Status B(ETH)	IDLE	
	TX Count B(ETH)	0 bytes	
	RX Count B(ETH)	0 bytes	

Fig.27 Overview Web page of USR-N5X0 (V2 Version)

The function of the device status part is to display some specific information of the current device, including system, network, serial port, mqtt gateway and Edge computing status.

#### Table 11 Overview status list

Parameter Item	Description
Model name	The name of the serial server, which can be customized by the user on the "Miscellaneous settings" page.

Page 36 of 165



Firmware version	The current software version of the serial server.
Туре	The current hardware version of the serial
	server.
Running time	Total time after the device start work. It will
	starts from 0 after reboot.
MAC address	The MAC address of the serial server.
IP address	The IP address of the serial server.
Port Status	The working status of checked serial port.
	Select the serial port currently to be displayed
	Conn Status A(ETH): connection status of
	socket A.
	IDLE : Initialization status
	LISTEN : When the module works as TCP
	Server, it is listening for connection access
	CONNECTING : Works as TCP client, the
	module is establishing a connection to the
	TCP Server
	CONNECTED : Works as TCP server, the
	TCP connection to TCP server of the module
	has been established
	CONNECTED (n) : Number of TCP
	clients connected to the module
	ERROR : The module is abnormally
	disconnected
	Tx Count A(ETH): To count how many bytes
	be send to internet.
	Rx Count A(ETH): To count how many bytes
	received from internet
MQTT	Whether MQTT is enable.
Connection status	Connection status of MQTT.
	CONNECTING : the module is establishing
	a MQTT connection to the MQTT broker
	CONNECTED : the MQTT connection to
	MQTT broker has been established
	ERROR : The module is abnormally
	disconnected.
Edge computing	Whether edge computing is enable.
Edge computing Connection status	Connection status of Edge computing.
Connection status	CONNECTING : the module is establishing
	_
	a socket or mqtt connection

Page **37** of **165** 



CONNECTED : the socket or mqtt connection has been established ERROR : The module is abnormally disconnected

### 3.2.2 IP settings

You must assign a valid IP address to the USR-N5X0 before it will work in your network environment. The IP address must be unique within the network. If the device is connected to the Internet and should connect to other servers over the Internet to get some services such as Network Time Protocol (NTP) server, you will need to configure the DNS server in order to be able to resolve the host name of the NTP server. The detailed description of the configuration parameters on this interface is shown in table 12.

★USRIOT × +			Q _ 8 ×
C 88 A Not secure 172.16.14.158			rod o d f =
Communication Expert of Industrial IoT			Be Honest Do Best ! ⊄⊄[frejfeh
Status     Overview     Vetwork     IP Config     Port     Port     Port2     Port3     Port4     Websocket to Serial     Sateway     Cloud Service     System	PCONFIGURATION IC CONFIGURATION Method of IP Obtaining IP Address Subnet mask Gateway Preferred DNS Server Atternate DNS Server	DHCP/AutoIP   Auto  T72 16 14 158  255 255 255 0  172 16 141  114 114 114  223 5 5 5  nan USR I/OT Technology Limited.	the function of the func

Fig.28 Network web page



#### **Parameter Item** Description Network protocol Click the drop-down menu to select the IP Address Setting mode: Static or DHCP. If you choose DHCP, the rest of the options will be greyed out or disabled. DNS type Click the drop-down menu to select the DNS mode: auto or manual. If you choose auto, the DNS options will be greyed out or disabled. IP address is a 32-bit address assigned to **IP** address devices connected to the Internet. The IP address consists of two fields: the network number field (Net-id) and host number field (host-id). In order to facilitate the management of IP addresses, IP addresses are divided into five categories: Class A, B, and C addresses are unicast addresses, Class D addresses are multicast addresses. Class E addresses are reserved addresses for future special purposes. The IP addresses currently in large numbers belong to three types of addresses: A,B,C. Subnet mask The mask is a 32-bit number corresponding to an IP address. Some of these numbers are 1, and the others are 0. The mask can divide the IP address into two parts: the subnet address and the host address. The part of the IP address corresponding to the 1 bit in the mask is the subnet address, and the other bits are the host address. The mask for class A addresses is 255.0.0.0, the mask for class B addresses is 255.255.0.0, the mask for class C addresses is 255.255.255.0. The default gateway in the host is usually Gateway called the default route. The default route (Default route) is the route chosen by the router when no other route exists for the destination address in the IP packet. All packets whose destination is not in the router's routing table will use the default route.

### Table 12 Network configuration list

Page 39 of 165

GRDTek

DNS	The IP address of the DNS server. DNS
	Server part is where you can specify the IP
	Address of your Preferred DNS (Domain
	Name Server) and Alternate DNS. When the
	device uses a static IP address, the user is
	required to fill in this item, 8.8.8.8(Google)
	will be a good choice. If a specific DNS
	server is not used, the default gateway IP
	address is generally sufficient.

The configuration will save to flash memory after clicking Save button. All configurations take effect after a system reboot.

### **3.2.3** Serial port settings

The serial port module includes serial port parameter configuration, network parameter configuration. The main function of the serial device server is to carry out two-way transparent transmission of standard serial bus data (RS-232, RS-485, RS-422) and standard Ethernet data supporting TCP/IP protocol to solve common serial equipment Networking problems on the Internet. The Port configuration page can configure the parameters of the serial port and socket, as shown in Fig.29. Details on work mode connectivity protocols and its settings of N5X0 series are given in Chapter 4 Operation modes, this section will only focus on the part of parameter description. The description of the configuration parameters on this interface is shown in table 13 and table 14. Fig.29 Serial port configuration web page

★ UseNot         ×         +           <         >         C         88         ▲ Not secure         172.16.14.158	C ≤ 0	
USR IOT Communication Expert of Industrial IoT	Be Honest Do B. 무것	est!  English
Status     Overview     Overview     Vent     IP Config     Fort     Port     Port     Port     Config     Socket     Port	onfiguration	
Port2 Baud rate Port3 Data bits Port4 Data Websocket to Serial Party	s 8 v bit	
S Gateway     Stop bits     Cloud Service     Flow ctrl     System     UART Packet Length	d NONE ~	
UART Packet Time Sync Baudrate(RFC2217) Enable Uart Heartbeat	) ON ~	
	SurveB.Apply	
	Jinan USR IOT Technology Limited. http://www.pusr.com	

Table 13 Serial settings list

Page 40 of 165



**Parameter Item** 

Parameter Item	Description
Baud rate	This sets the port's data transfer speed. Choices are from 600—921600. Set this to match the baud rate setting of the connected device. Default is 115200.
Data bits	This sets the number of bits used to transmit one character of data. Choices are: 7 and 8. Set this to match the data bit setting of the connected device. Default is 8 (which is the default for the majority of serial devices).
Parity bits	This bit checks the integrity of the transmitted data. Choices are: None, Odd, Even, Space, Mark. Set this to match the parity setting of the connected device. Default is None (which is the default for the majority of serial devices).
Stop bits	This indicates that a character has been transmitted. Set this to match the stop bit setting of the connected device. Choices are: 1 and 2. Default is 1 (which is the default for the majority of serial devices).
Flow control	This allows you to choose how the data flow will be controlled. Choices are: (No Flow Control), RTS/CTS (Hardware Flow Control), or Xon/Xoff (Software Flow Control). Set this to match the flow control setting of the connected device. Default is None. If Xon/Xoff is selected, the Xon and Xoff characters are 0x11 for Xon and 0x13 for Xoff. Note that these are hexadecimal numbers of ASCII characters (i.e., $0x11 = `1`$ and $0x13 = `3`$ )
Serial mode (N5X0 models)	Click the drop-down menu to select the type of serial interface for the port. Choices are RS-232, RS-422, RS-485 (2 Wire).
Packing time	Click the option to sent pack immediately by interval
Packing length	Click the option to sent pack immediately by size.

Description

The configuration will save to flash memory after clicking Save button. All configurations take effect after a system reboot.

Page 41 of 165



★USRIOT X +	9 _ <i>6</i> ×
K > C 88 A Not secure 172.16.14.158	長 (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)
Communication Expert of Industrial IoT	Be Honest Do Best ! ++⊅[fanjiah
System PRINT Modbus Poll Enable Net Heartbeat Registration Packet Type SSL protocol SSCKET B Operating Mode	TCP Cleat     None       192.168.0.201       0       1883       0
	inan USR IOT Technology Limited. http://www.pusr.com

Fig.30 Socket configuration web page

# Table 14 Operation modes settings list

Parameter Item	Description
Work mode	USR-N5X0 series supports 5 different operation Modes which are TCP Server, TCP Client, and UDP, HTTP client and websocket. The operation Mode describes the role of the device and the connection between the device and other remote devices in the network which would like to communicate with serial device on N5X0's COM port.
Maximum socket no. (TCP Server only)	This option specifies the maximum number of remote devices/clients (with maximum of 16 clients, except N580 with 8) that can be connected to the serial device on this COM port.
Local port	This option specifies the port number that the TCP/UDP server should listen to. It is also used by the remote TCP/UDP client to connect to the TCP/UDP server. The default

Page 42 of 165



	local port is 23. You can enter different port
Remoter server addr.	numbers in this option. Please specify the IP address of the TCP/UDP server program on the remote host in this field. This should match the IP settings of the TCP/UDP server program.
Remote port	Please specify the IP address of the TCP/UDP server program on the remote host in this field. This should match the IP settings of the TCP/UDP server program
Timeout reconnection (TCP/UDP client)	The default is disable. If you want to keep connection continually, you can disable it. Data idle Time is the time period for which the device waits for data. If the USR-N5X0 Series does not receive data during established idle time(timeout), the USR- N5X0 Series will disconnect temporarily. When the data comes in, it will reconnect automatically. Users do need to reconnect.
Modbus polling	This option is selected when multiple modbus maters from Ethernet are polling the same serial port. Each serial port supports up to 16 simultaneous TCP connections allowing hosts to simultaneously transmit/receive data to/from the same serial port,USR-N5X0 Series processes the data in the order arrived. The serial device server determines the end of the serial acknowledgement through a response timeout.
Response timeout	If the Modbus device does not receive a response within the time specified here, the communication times out. Valid settings are from 10 – 9999ms.
Modbus exception	This option is used to enable modbus exception checking. If selected, error messages (TCP exception codes) are generated if a problem (such as a message timeout) should occur during Modbus operations.
SSL protocol	Choose TLS/SSL data encryption protocol version
Socket B	Socket B supports 2 different operation Modes which are TCP Client, and UDP client, this socket is closed by default

Page **43** of **165** 



The configuration will save to flash memory after clicking Save button. All configurations take effect after a system reboot.

### 3.2.4 Websocket server

This function is that the serial server acts as a WebSocket server, and transparently transmits the data received by the serial to the webpage in hexadecimal or ascii format. The WebSocket server can also send data to the serial device at any time.

🛠 USR IOT X +		۹ _ D ×
C 88 A Not secure 172.16.14.158		$\triangleright$ $\otimes$ $\neq$ $\equiv$
Communication Expert of Industrial IoT	172.16.14.158 says connect success!	
> Status	Websocket to Serial	
> Network		
✓ Port	this page use websocket to transmit data between webpage and uart Websocket connection:0	
Port1		
Port2	Receive hex data	
Port3		
Port4		
Websocket to Serial		
> Gateway		
> Cloud Service		
> System		
	send ascii data send hex data clear	

Fig.31 Websocket server

### 3.2.5 MQTT gateway

If you enable MQTT Broker as your northbound connection, the N5X0 will be configured as MQTT Client. In Client mode, you can setup MQTT broker basic settings, general topic settings, TLS secure transmission, last will message, and advanced settings.

Page 44 of 165



★ USR IOT         ×         +            >         C         BB         ▲ Not secure         172.16.14.158			Q _ G X Q _ G X
Communication Expert of Industrial IoT			Be Honest Do Best ! 中文∣English
> Status > Network > Port		SSL, clean sesion and QOS, supports connecting to the third-party MQIT servecit supports up to 16 publish topics and 16 subscribe topics, hich can bind each topic to a different setial port.	Î
Port1 Port2	Basic configuration Publish	Subscribe	
Port3 Port4 Websocket to Serial	Enable MQTT MQTT Version	Enable ~ MQTF3.1.1 ~	
✓ Gateway MQTT Gateway Edge Computing	Client ID Server Address (IP)	123456 broker emps io	
Cloud Service     System	Local/Remote Port NO. Keepalvie Interval	0 (0-65535) 1883 (1-65535) 60 (0-65535)s	
	Reconnecting time Without Data Reconnection Interval	0 (0-65535)s 1 (1-65535)s	
	Clean up session User Credentials		
	Enable last will SSL protocol	Disable v None v	
		SmidApply	
	Jii	an USR IOT Technology Limited. http://www.pusr.com	

# Fig. 32 MQTT connection profiles

# Table 15 MQTT basic setting

Parameter Item	Description
Enable	Turns MQTT gateway on or off.
Version	Select the mqtt protocol version V3.1 and V3.1.1 are supported.
Client ID	The client ID defined the identifier of the N5X0 Gateway. The IDs of the various MQTT clients have to be unique for the respective MQTT Broker. If two MQTT clients are using an identical ID, the connections of theses clients to the MQTT Broker are disconnected. For an individual client, there is no way to find out whether a specific client ID is already used by another client or not.
Server address	IP address or hostname of an MQTT broker.
Remote port	Port number of the MQTT broker.
Keep alive interval	The Keep Alive is a time interval measured in seconds. It is the maximum time interval that the broker permits between when a client

Page 45 of 165



	finish sending one MQTT packet and starts to send the next.
Re-connection time	Automatic reconnection when there are not data flow in the MQTT session in the setting time. If the time is set 0, this function does not take effect.
Interval	Automatic reconnection interval after a fail network connection.
Clean session	Valid only for Qos1 and Qos2. When the clean session is checked, the client does not want a persistent session. If the client disconnects for any reason, all information and messages that are queued from a previous persistent session are lost. When the clean session is unchecked, the broker creates a persistent session for the client. All information and messages are preserved until the next time that the client requests a clean session.
Username	Username for authentication to the MQTT broker.
Password	Password for authentication to the MQTT broker.
Last will	The last will message is part of the Last Will and Testament (LWT) feature of MQTT. The will message notifies other clients when a client disconnects ungracefully.
SSL/TLS	If you use a TLS connection, click the SSL/TLS tab, select Enable SSL/TLS, and then set the Protocol parameter to TLSv1.2.

Page **46** of **165** 



USR IOT Communication Expert of Industr	al loT	e Honest Do Best ⊄oc∣Englisi
Communication Expert of Hoducat     Status     Network:     Port     Port1     Port2     Port4     Websocker to Serial     Websocker to Serial     Codus Service     Codus Service     System	by the set of the set	e Honest Do Best Φα [Inglia
	Jinan USR IOT Technology Limited. http://www.pusr.com	

Fig.33 Topic to publish



impl da	Description
topic r receiving to the name. by {" gatewn allowed way, d top Qos(0 payloa public topic t	Asparent transmission, just as its name lies, the gateway does not process any ata, forward the data directly. Topic ution, in this mode users should define a name when configuring the topic. After ing serial port data, the device pushes it the associated topics based on the topic . Topic name and payload are separated y comma. For example, topic name, "message": "Hello from USR-N510 ray"} as serial data. Different topics are ed to have the same topic name. In this lata is pushed to all topics with the same pic name. Custom mode, add topic, 0,1,2), retain(ON,OFF) message before ad. After receiving the serial data, N510 ishes the payload of the corresponding o cloud according to rules. This method e used to publish any topic at any time.

Page 47 of 165



	For example, awsiot/test,0,ON,{"message": "Hello from USR-N510 gateway"} as serial data.
TOPIC string	An MQTT topic is a UTF-8 string that the broker uses to filter messages for each connected client. To receive messages, the client must subscribe to the topic. A topic can have one or more topic levels. Each topic level is separated by a slash
Binding port	The MQTT topic is bound to the serial port number of the device. Any data from the COM Port1 of the gateway will send to all the TOPIC it bindings to.
Qos	QoS 0: at most once. In this case, the client publishes a message to the broker only once. QoS 1: at least once. In this case, when a client publishes a message to the broker, the client expects the broker to acknowledge whether or not a client has received the message. If the publisher does not receive acknowledgement from the broker within a preset time interval, it will republish the message again and again until acknowledgment is received. QoS 2: exactly once. The MQTT protocol uses the confirmation of confirmations to ensure that a message is delivered exactly once.
Retained message	By setting the Retain flag the MQTT Broker is instructed to save the most recent data value for the topic. Data values without Retain flag are only transferred from the MQTT Broker to those MQTT Subscribers that are registered at the broker and have subscribed to the appropriate topic in the moment when sending the data to the broker.

Page 48 of 165



Communication Expert of Industrial IoT		3e Honest Do Best! 中文∣English
Communication Expert of Inductivial tot  Status  Network  Port1 Port2 Port3 Port4 Websocket to Serial  Cateway Edge Computing Cloud Service System	MQTT Gateway         MQTT Gateway function supports SSL, clean session and QOS, supports connecting to the third-party MQTT serveril supports up to 16 publish topics and 16 subscribe topics, supports port mapping function, which can bind each topic to a different serial port.         Basic configuration       Publish       Subscribe         Subscribe topic1	Φ2   Ingloh
	Jinan USR IOT Technology Limited. http://www.pusr.com	

Fig.34 Topic to subscribe

# Table 17 Subscribe message setting

Parameter Item	Description
Transmission modes	The data printed to the serial port can be set whether to carry the topic.
Topic string	Same to Table 16.
Binding port	Same to Table 16.
Qos	Same to Table 16.

# 3.2.6 Edge computing

The N5X0 supports southbound fieldbus protocols of Modbus RTU protocols. It also supports northbound MQTT/ Cloud protocols of MQTT Broker, TCP/UDP/HTTP in socket, AWS IOT, and Alibaba Cloud IoT Platform. The N5X0 fulfills a different role on each of its sides. Each role is determined by your devices' settings. Therefore, set the role of each of your devices correctly.



USR IOT Communication Expert of Indu	nia lot	Be Honest Do Best ! ⊄⊄∣English
Status Network Port Port Port2 Port3 Port4 Websocket to Serial Gateway NGTT Gateway	Edge Computing Gateway         Incluing edge excluisiion, edge computing, edge reporting and other functions, supports Modbus RTU to Jon, Modbus RTU to Modbus TCP and other general industrial protocol conversion.         SETTING         Edge Computing       Data Acquisition         Data Acquisition       Data Query and Report         Enable Edge Computing       Enable         Very       Next	
Edge Computing Cloud Service System	Jinan USR 10T Technology Limited. http://www.pusr.com	

# Fig.35 Edge computing enabled

Communication Expert of Industr	Tolk	Be Honest Do Best ! 中文∣English
<ul> <li>&gt; Status</li> <li>&gt; Network</li> <li>Port1</li> <li>Port2</li> <li>Port3</li> <li>Port4</li> <li>Websocket to Serial</li> <li>Cateway</li> <li>Edge Computing</li> <li>&gt; Cloud Service</li> <li>&gt; System</li> </ul>	Edge Computing Gateway         Including edge acquisition, edge computing, edge reporting and other functions, supports Modbus RTU to Joon, Modbus RTU to M	
	Save Next	

Fig.36 Modbus slaves and datapoints configuration

Page 50 of 165



#### **Parameter Item** Description Device name The Modbus slave device identifier, which is unique for the current gateway. The device name must be less than 30 characters in length, and can contain letters, digits, underscores (). Which serial port the modbus slave device COM port connected to. Select an option from the dropdown list. Slave address Slave ID. Each slave in a network is assigned a unique identifier ranging from 1 to 255. When the master requests data from a slave, the first byte it sends is the Slave ID. When set to 0, the slave will respond to requests addressed to any ID. Polling interval The interval at which data is collected. Modbus is a communications protocol with half-duplex transmission. Gateways send requests to collect data from devices. Therefore, you must specify the data collection interval. The unit is millisecond. If 60 milliseconds is required to collect the data of each property, the total time required to collect the data of all properties is calculated as follows: Total required time = Time required to collect the data of each property $(60 \text{ ms}) \times \text{Number of properties for the slave}$ device. This function is usually combined with Modbus address mapping register mapping to realize a single modbus command query in data query. This function is used when the register Merger collection address of many data points are sequential.

# Table 18 Modbus RTU poll configuration

Page 51 of 165



Parameter Item	Description
Data point name	Identifier of the data point, which must be unique for the gateway. The name must be 1 to 30 characters in length and can contain letters, digits, and underscores (_).
Modbus function code	The Modbus RTU master supports the following Modbus functions: 1 Read Coils, 2 Read Discrete Inputs,3 Read Multiple Holding Registers, 4 read input registers.
Register address	The address of the register from which data will be read.
Data type	Defines how read data will be stored. See table 26.
Response timeout	If the Modbus device does not receive a response within the time specified here, the communication times out. Valid settings are from $10-65535$ ms.
Data report	The trigger of reporting data. Valid values: On Change: The report is triggered if the collected data changes. You can use a tolerance to only log the data point if the value changes more than X amount. Interval: Collect the variable data at the poll interval and report the data at the specified report interval. Timer: Collect the variable data at the poll interval and report the data at the regular time.
Register address mapping	This function is usually combined with modbus address mapping to realize a single modbus command query in data query.
Formula	Modbus register store only whole numbers. For this reason a scale factor often needs to be applied. For example a modbus register with a temperature value may read as 723 and a multiplier of 0.1 need to be applied to get the correct value of 72.3 in the SCADA system,the formula is %s*0.1. If the data type is a Float then the multiplier is not needed. This computation supports +, -, * and / operators.

# Table 19 Data point(node) configuration

Page 52 of 165



Communication Expert of Industrial IoT				Be Honest Do Best ! ⊄⊄∣English
	Edge Computing Gateway			î
> Status > Network	Including edge acquisition, edge or protocol conversion.	computing, edge reporting and o	other functions, supports Modbus RTU to Json, Modbus RTU to Modbus TCP and other general industrial	
∽ Port				-
Port1	SETTING			
Port2	Edge Computing Data Acc	Quisition Data Query and	Report	
Port3				
Port4	Socket type	MQTT ~	•	
Websocket to Serial	Data Query			
∽ Gateway				
MQTT Gateway	Data Query	Disable		
Edge Computing	Data Report of nodes			
> Cloud Service	Reporting method	Enable		
> System				
	Report Topic	/UploadTopic		
	QOS	Q0S0 ~		
	Periodic reporting			
	Reporting interval	5	(1-36000)s	
	Reporting on regular	(Start NTP first)		
	Failure Padding			
	Quotation Mark			
	Json template	("Current"."node0101","Voltage"." node0102")	(<2048 bytes)	
	л	nan USR IOT Technology Li	mited. http://www.pusr.com	

# Fig.37 Transport channel and formatting

### Table 20 Data Quert and report

Parameter Item	Description
Communication channel	Select the channel in the socket type. You can choose TCP/UDP or HTTP in socket A of each serial port, or MQTT you have added.
Data Query	Query type. You can choose Modbus RTU, Modbus TCP or JSON. Users can send the right format query command from remote modbus master or MQTT publisher to the N5X0 gateway. The data is retrieved from the device's cache of corresponding modbus instructions.
Data report	<ul> <li>The trigger of reporting data. Valid values:</li> <li>On Change: The report is triggered if the collected data changes. You can use a tolerance to only log the data point if the value changes more than X amount.</li> <li>Interval: Collect the variable data at the poll interval and report the data at the specified report interval. Timer: Collect the variable</li> </ul>

Page 53 of 165



	data at the poll interval and report the data at the regular time.
Failure padding	Exception handling. Any data point did not get the response in response timeout will be filled with this string as key value into the template.
Quotation mark	Numeric values are quoted. It does not affect a string.
Json template	The payload format. Users can custom which data points should report to the server.

# 3.2.7 Cloud service

Please refer to "USR-N5X0 Quick Start Guide with AWS IoT" for detail.

Please refer to "USR-N5X0 Quick Start Guide with PUSR cloud" for detail.

### 3.2.8 System setup

This system setting tab includes several system level settings, such as device name, web socket, system log, username and password. Most of these settings are optional.

USR IOT Communication Expert of Industrial IoT				Be Honest Do Best! 中文   English
> Status	SYSTEM SETTING			^
> Status > Network	Set System Parametes	Set System Parametes		
<ul> <li>Port</li> </ul>	SETTING			
Port1	SETTING			
Port2	System Setting			
Port3				
Port4	Model Name	USR-N540		
Websocket to Serial	Websocket Port	6432	(1~65535)	
✓ Gateway	Websocket Direction	UART1	Y	
MQTT Gateway	Webserver Port	80	(0~65535)	
Edge Computing	User Name	admin		
✓ Cloud Service	User Name	admin		
USR Cloud	Pass Word		8	
Alibaba Cloud	Uart Cache	OFF	~	
AWS IoT	Restarting Without Data	0	(0/60-65535)s	
✓ System	SNMP	OFF	~ 0	
System Setting				
Management	Teinet	OFF	~ <b>0</b>	
	NTP	OFF	× 0	
	485 Anti-Collision	OFF	~ Ø	
	Log Export	Export		
				~
	1	nan USR IOT Technology	Limited. http://www.pusr.com	

Fig.38 System settings

Page 54 of 165



# Table 21 System settings list

#### **Parameter Item**

### Description

Module name	The name of the device, up to 32 characters, can't be null
Websocket port	Websocket server listen port NO. Range 1- 6553
Websocket direction	direction Click the drop-down menu to select websocket mapping direction: UART or Log.
Webserver port	Web server listen port NO. Range 1-65535
Username	The user name of web console and can be modified. up to 16 characters, can't be NUL
Password	The password of web console and can be modified. up to 16 characters, can't be NUL
UART cache	Click the option to enable serial buffer. By default, N5X0 will empty its serial buffer when a new TCP connection is established. This means that the TCP application will not receive buffered serial data during a TCP link breakage. To keep the serial data when there is no TCP connection and send out the buffered serial data immediately after a TCP connection is established, you can disable this option.
Restarting without data	This function is used for the serial device server without any data transmission or reception for a long time, and the serial server automatically restarts. If the restart time is set between 0 and 59 seconds, this function does not take effect. Only when the time is set to be greater than or equal to 60 seconds, the restart function of the device without data will take effect.

The configuration will save to flash memory after clicking Save button. All configurations take effect after a system reboot. In management page users can perform some system operations on the N5X0 series serial server, including restarting, restoring factory configuration, and upgrading. It is recommended that users use it with caution. Improper operation may damage the serial server.



USR IOT Communication Expert of Industrial IoT		Be Honest Do Best! ⊄¢ English
> Status > Network	Management	_
✓ Port	Firmware upgrade/Reset/Restart	
Port1	Firmware upgrade	
Port2	Firmware file: Select firmware file Select the file Flashing the firmware	
Port3 Port4	Reset	
Websocket to Serial		
<ul> <li>Gateway</li> </ul>	Reset 📓 Restore factory defaults	
MQTT Gateway	Restart	
Edge Computing	Restart: 週 Restart	
✓ Cloud Service	Nestert: all nestert	
USR Cloud		
Alibaba Cloud		
AWS IoT		
System System		
Management		
	Jinan USR IOT Technology Limited. http://www.pusr.com	

Fig.39 Module Management

# Restart

This function is used to restart the USR-N5X0 series serial server by software. Before the serial server is completely restarted, the device does not work and cannot forward any data packets. This restart is different from the hardware reset of power-on restart, but the serial server system software is reset, just like the "warm restart" of the windows operating system. Once a new setting is changed, you can use the Save function to accept the changes. You will need to reset the device to save the settings to flash memory. Click on "restart" Button, the page pops up a prompt box, click "OK".

# **Restore factory defaults**

This function is used to restore the USR N5X0 serial server to the factory settings and automatically restart the serial server at the same time. Before the serial server restarts successfully, the serial server does not work and cannot forward any data packets. This function is to restore the factory default configuration value once the user sets the wrong parameter and causes the serial port server to work abnormally. Click the "Restore factory defaults" button, and a prompt box will pop up on the page. Click "OK".

### **Firmware upgrade**

USR IoT continually upgrades its firmware to add new features and optimize performance. Please contact the sales to obtain the latest version of the firmware. Before upgrading the firmware, please make sure that the device has a reliable power source that will not be powered off or restarted during the firmware upgrading process (please be patient as this whole process might take up to 1

Page 56 of 165



-2 minutes). Copy the new firmware file to your local computer. Note that the firmware file is a binary file with ".bin" extension. Before updating the firmware, make sure that your host's Network domain is as same as the serial device server. Next, click "Select the file" button as shown in Figure to find and choose the new firmware file. Then, click "Flashing the firmware" button to start the firmware upgrade process. After the progress bar in the page is read, the serial server software upgrade is completed. Please wait until the uploading process is finished (the amount of time varies depending on the equipment used). Finally, the device will then proceed to restart itself. In most cases, you might require to re-configure your device.

# 3.3 Configuration software

### 3.3.1 Discovering your device server

After you start EthernetTool software, if the USR-N5X0 Serial Device Server is already connected to the same gateway as your PC, the device can be accessed via broadcast packets. Users can search all the USR-N5X0 Series device servers on the network and show them on the Serial Device Server List Area of the utility. Please select the right Ethernet adapter if you did not see any serial device server.

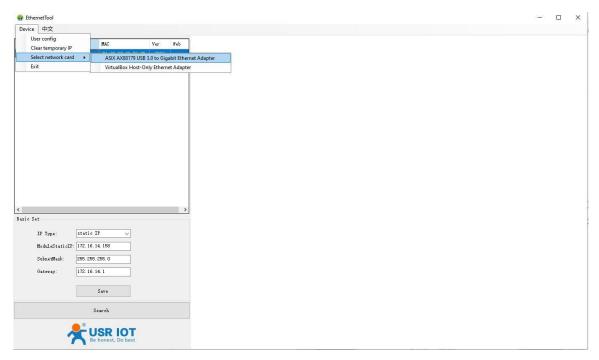


Fig.40 Searching serial device server

Page 57 of 165



# 3.3.2 Network setting

Sometime the USR-N5X0 device might not be in the same subnet as your PC, therefore, you will have to use this utility to locate it in your environment. To configure each device, first click to select the desired device (default IP:192.168.0.7) in the list of configuration utility, and then change the IP address to avoid any IP address conflict with other hosts on your LAN, save your change.

	EthernetTool					3 <u>1</u> 3
2 16.14.150 UCR-H0540 P4 70.00 60 12°CD 7000	evice 中文					
12       13       10       14       15       12       10       12       12       10       12       12       10       12       12       10       12       10       12       10       12       10       12       10       12       10       12       10       12       10       12       10       12       10       14       10 <td< th=""><th>viceIP Device</th><th>Man e MAC</th><th>Ver We</th><th>eb</th><th></th><th></th></td<>	viceIP Device	Man e MAC	Ver We	eb		
aic Set       IP Type:     DHCF/Auto IP ~       ModuleStatidP:     172.10.14.150       SubnedMask:     255.255.0       Gateray:     172.16.14.1		Contraction of the second s	177.010			
sis Set IF Type: DHCF/Auto IP ↓ HodulaStatiIF: 172.10.14.158 SubnedBask: 255.255.0 Gateray: 172.10.14.1 Save						
sis Set IF Type: DHCF/Auto IP ↓ HodulaStatiIF: 172.10.14.158 SubnedBask: 255.255.0 Gateray: 172.10.14.1 Save						
sis Set IF Type: DHCF/Auto IP ↓ HodulaStatiIF: 172.10.14.158 SubnedBask: 255.255.0 Gateray: 172.10.14.1 Save						
aic Set       IP Type:     DHCF/Auto IP ~       ModuleStatidP:     172.10.14.150       SubnedMask:     255.255.0       Gateray:     172.16.14.1						
uid Set IP Type: DHCF/Auto IP ↓ RobulStatioF: 172.10.14.150 SubnetMask: 255.255.00 Gateray: 172.16.14.1 Seve						
ario Set IP Type: DECF/Auto IP Nodul Stati CIP: 172.16.14.150 SubnetHask: 255.255.255.0 Gateway: 172.16.14.1 Save						
uid Set IP Type: DHCF/Auto IP ↓ RobulStatioF: 172.10.14.150 SubnetMask: 255.255.00 Gateray: 172.16.14.1 Seve						
ario Set IP Type: DECF/Auto IP Nodul Stati CIP: 172.16.14.150 SubnetHask: 255.255.255.0 Gateway: 172.16.14.1 Save						
szis Szt I? Type: DECT/Auto I?  AndulaStaticI?: 172.16.14.150 SubmetMask: 205.255.255.0 Gateway: 172.16.14.1 Sure						
ario Set IP Type: DECF/Auto IP Nodul Stati CIP: 172.16.14.150 SubnetHask: 255.255.255.0 Gateway: 172.16.14.1 Save						
azic Set           IP Type:         DRCP/Auto IP ~           RodulsStaticP:         172.16.14.150           SubnetHask:         255.255.05.0           Gateway:         172.16.14.1						
uid Set IP Type: DHCF/Auto IP ↓ RobulStatioF: 172.10.14.150 SubnetMask: 255.255.00 Gateray: 172.16.14.1 Seve						
azic Set           IP Type:         DRCP/Auto IP ~           RodulsStaticP:         172.16.14.150           SubnetHask:         255.255.05.0           Gateway:         172.16.14.1						
IP         Type:         DBCC/Auto IP           Robul&StatiofF:         172.16.14.156           SubneHMask:         255.255.256.0           Gateway:         172.16.14.1						
RedulsStatiofF:     172.16.14.158       SubnetMask:     255.255.05.0       Gateray:     172.16.14.1				3		
SubnetHask:         255, 255, 0           Gateway:         172, 16, 14, 1           Save	sic Set	DUTP (Auto TP		<u>,</u>		
Gatevey: 172.16.14.1 Save	sic Set IP Type:			<u>,</u>		
Sere	sic Set IP Type: ModuleStaticIP:	172. 16. 14. 158		*		
	sic Set IP Type: ModuleStaticIP: SubnetMask:	172. 16. 14. 158 255. 255. 255. 0				
	sic Set IP Type: ModuleStaticIP: SubnetMask:	172. 16. 14. 158 255. 255. 255. 0				
Search	sic Set IP Type: ModuleStaticIP: SubnetMask:	172. 16. 14. 158       255. 255. 255. 0       172. 16. 14. 1				
	sic Set IP Type: ModuleStaticIP: SubnetMask:	172. 16. 14. 158       255. 255. 255. 0       172. 16. 14. 1		<u>د</u>		
	sic Set IP Type: ModuleStaticIP: SubnetMask:	172. 16. 14. 158 255. 255. 255. 0 172. 16. 14. 1 Save				
	sic Set IP Type: ModuleStaticIP: SubnetMask:	172. 16. 14. 158 255. 255. 255. 0 172. 16. 14. 1 Save	,			

# Fig.41 Changing network settings

# **3.3.3** Reboot the device

This function is available to allow you to reset the serial device server. The function disconnects both the ethernet and serial connections. The function also allows the serial device server to save new configuration settings to flash memory. To reset the device:

- 1. Right-click a desired device to display the settings menu.
- 2. Select Reboot.

Press the Reboot button and the system will give a reset response.

Page 58 of 165



😭 Ether	netTool				
Device	中文				
DeviceI	- 1	eviceName	MAC	Ver	¥eb
172.16	122	USR-N540	F4 70 0C 60 E2	Rebo	
					nal web co
					re Factory
				Upgra	ade
<					>
Basic Se	t				
	IP Type:	DHCP/A	ito IP 🗸		
		icIP: 172.16			
	SubnetMas	: 255.255	5. 255. 0		
	Gateway:	172.16	14.1		
			Save		
			e 1		
			Search		
		<u> </u>			
		A	JSR IOT e honest, Do best		

### Fig. 42 Reboot the device

# 3.3.4 Restore to factory default settings

The configuration utility provides the function to restore the serial device server to factory default settings. If you really want to restore the serial device sever to factory default settings, please click restore factory button to continue.

Page 59 of 165

会 EthernetTool Device 中文		
DeriesIP DeviceSane 202 Ver 172.16.14.150 USR-9540 74 m.ore.co.strans in proce Reboot External web config Restore Factory Upgrade	e e b	
Basic Set         DHCF/Auto IP         ✓           ModuleStaticIP:         172:16.14.155         ✓           SubnedIesk:         255.255.0         ○           Gateway:         172:16.14.1         ✓		
Save		

### Fig.43 Restore factory defaults

### 3.3.5 Open web server

GAO

Users can visit the web server of serial device server conveniently with configuration tool. Select the device you want to visit and right click, then click External web config ,you will open the web server with default browser such as Google Chrome.

EthernetTo								
Device 中文								
eviceIP 172 16 14 158		NAC	Ver V.	eb				
72.10.14.150	Re	poot						
		ernal web config						
		tore Factory grade						
				>				
		_		>				
	e: statio IP	~		>				
sic Set IP Typ	Landard	×	_	>				
sic Set IP Typ Module	StaticIP:	×		>				
isio Set IP Typ Module Subnet	StaticIP:	×		>				
Module	StaticIP:	×		>				
sio Set IP Typ Module Subnet	StaticIP:	×		>				
sio Set IP Typ Module Subnet	StaticIP:	~ ~		>				
sic Set IP Typ Module Subnet	StaticIP:	ave		2				

#### Fig.44 Open webpage in browser

#### 3.4 At command

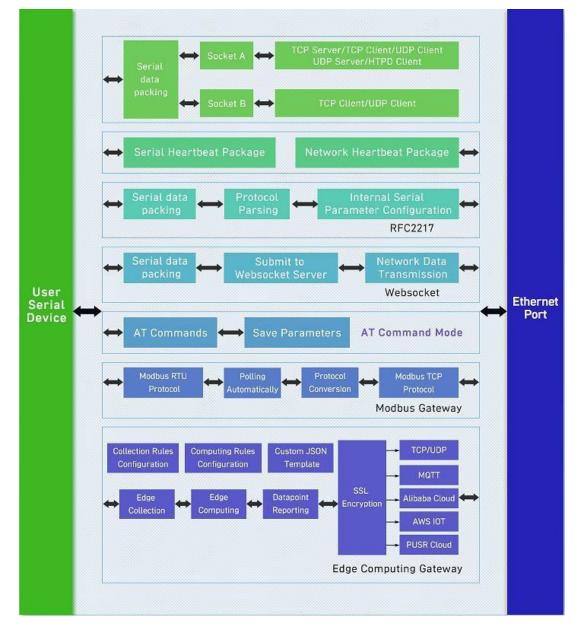
GAD Tel

In order to reduce the length of this document, we have organized this section into a special document. Please refer to "USR Cortex M7 series serial to Ethernet device server AT command manual" for detail.

# 4. Operation modes

The USR-N5X0 Series provides various operations: TCP Server/ Client mode, UDP mode, HTTP mode and Websocket mode. The main difference between the TCP and UDP protocols is that TCP guarantees delivery of data by requiring the recipient to send an acknowledgement to the sender. UDP does not require this type of verification, making it possible to offer speedier delivery. UDP also allows unicast or multicast of data to only one IP or groups of IP addresses. Detailed descriptions of each operation are provided in following sections. After choosing the proper operation mode in this chapter, refer to Chapter 3 for detailed configuration parameter definitions. Because the V2 firmware contains all the function of V1 firmware, we describe the configuration in V2 firmware as illustration in this chapter, users of V1 version can refer to it for reference.







# 4.1 TCP Server

### 4.1.1 Properties

In TCP server mode, the TCP connection is initiated from the host to the USR-N5X0 Series device server. This operation mode supports a maximum of 16 (except 8 for N580) simultaneous connections for each serial port on an device server from a single or multiple hosts. After the connection is established between the serial device server and the remote host computer (remote

Page 62 of 165



TCP client), data can be transmitted in both directions. The COM port on the device will forward requests from all remote connected hosts (Ethernet) to the serial device immediately and reply to all remote connected hosts once it receives data from the serial device(RS-232/RS-422/RS-485). The default operation mode of USR-N5X0 is the TCP Server mode. Fig.46 shows an example of configuration setting for TCP Server working mode under the Port1 socket tab. You can configure other serial ports in the same way. There are additional connection settings that can be configured as shown in Fig.46.

Communication Expert of Industrial IoT	Be Honest Do Best! 中文 English
Status Network Port Port Port3 Port4 Websocker to Serial Occur and Service System Version Service System Courd Service Service Model	
Jinan USR IOT Technology Limited. http://www.pusr.com	

Fig.46 TCP server work mode

Please follow the following steps to configure connection settings of the work mode for PORT1 port.

1. Click on the "Port1" tab on the menu frame on the left side of Web UI to go to Port1 page as shown in Fig.46.

2. For Serial Settings on the Port configuration page, please go to Section 3.2.3.

3. Click on the Socket tab in this page, select TCP Server in the working mode options. The local ports of different serial ports must be different. After receiving network data, the device determines which serial port the data is sent to based on the local port. For example, the default port number of the first serial port (Port1) is 23, the default port number of the second serial port (PORT2) is 26, and so on.

4. After finishing configuring the working Mode, please scroll down to the bottom of the page and click on "Save & Apply" button to save all the changes that you have made. All configurations

Page 63 of 165



take effect after a system reboot. Fig.47 shows an example of test in this mode. By selecting the TCP Server work mode, a TCP client program on a remote host computer should be prepared to connect to USR-N5X0. Server IP is IP address of USR-N5X0, server port is local port of USR-N5X0. In this case, IP address of USR-N5X0 is 172.16.14.12.

COMSettings	COM port data receive	Network data receive	NetSettings
PortNum COM3  PortNum COM3  BaudR 115200  DataB 8 bit  StopB 1 bit  Close Close Cov Options Receive to file  Add line return Receive As HEX Receive Pause Save Clear Clear Cend Options Data from file Auto Checksum Auto Clear Input	http://en.usr.onhttp://en.usr.onhttp://en. usr.onhttp://en.usr.on	Jinan USR Technology Co., Ltd Jinan USR Technology Co., Ltd Jinan USR Technology Co., Ltd.	(1) Protocol TCP Client (2) Server IP 172.16.14.12 (2) Server Port 23 (2) Server Port 23 (2) Disconnect Receive to file. Add line return Receive As HEX Receive Pause Save Clear Send Options Data from file Auto Checksum Auto Clear Input
🥅 Send As Hex 🥅 Send Recycle		LocalHost 172.16.14.15 Port 9228	└── Send As Hex └── Send Recycle
Interval 1000 ms Load Clear	Jinan USR Technology Co., Ltd. Send	http://en.usr.on Send	Interval 1000 ms Load Clear

Fig.47 Host initiating TCP connection

Page 64 of 165



# 4.1.2 Multihost setting

USR IOT Communication Expert of Industrial	Bi for	e Honest Do Best! 中文   English
Communication Expert of Industrial     Status     Network     Vort     Port     Port2     Port3     Port4     Websocket to Serial     Gateway     Cloud Service     System	Local Port Number 23 (-65535) PRINT OFF Modbus Poll @ Response Timeout 200_(10-9999)ms Enable Net Heartiset	42   English
	Jinan USR IOT Technology Limited. http://www.pusr.com	

### Fig.48 Maximum socket connection

Maximum connection is usually used when the user needs to receive data from different hosts simultaneously. The factory default allows 8 connection at a time. This option specifies the maximum number of remote devices/clients (with maximum of 16 clients) that can be connected to the serial device on this COM port. And users can define the behavior when the connection established exceed the maximum. Kick: when the connection exceeds the maximum number, actively kick out the oldest connection(first in first kick out). Keep: when the connection exceeds the maximum number, keep the old connection and reject new connections.

### 4.2 TCP Client

### 4.2.1 Properties

When the working mode of this device is TCP Client, the remote device must work in TCP Server mode, and its IP address and port number must be configured, which can be configured in the corresponding options of the network connection. The local port number can be ignored and no configuration is required. USR-N5X0 supports SSL (TLS v1.0 or v1.2) data encryption in this operating mode. Fig.49 shows an example of configuration setting for TCP Client working mode under the Port1 socket page. You can configure other serial ports in the same way. There are additional connection settings that can be configured as shown in Fig.49.

Page 65 of 165



Communication Expert of Industrial IoT	Be Honest Do Best ! ⊄⊄∣English
Conversionation Expect al Material balance          > Status         > Network:         > Port         Port1         Port2         Port3         Port4         Websocker to Serial         > Gateway:         > Could Service         > System         Reconnection paries Threcod Biolog (1c-6555)         Reconnection paries Threcod Biolog (1c-9999)ns         Exable Net HeartBeat:         Registration Recker Type         Registration Recker Type         Stateway:         Could Service         > System         Reconnection paries Threcod Biolog (1c-9999)ns         Reconnection paries Threcod Biolog (1c-9999)ns         Exable Net HeartBeat:         Registration Recker Type         Registration Recker Type         Operating Mode         Nete	42 [ English
SimeAnpely Jinan USR IOT Technology Limited. http://www.pusr.com	,

Fig.49 TCP client work mode

Please follow the following steps to configure connection settings of the work mode for PORT1 port. 1. Click on the "Port1" tab on the menu frame on the left side of Web UI to go to Port1 page as shown in Fig.49.

2. For Serial Settings on the Port configuration page, please go to Section 3.2.3.

3. Click on the Socket tab in this page, select TCP Client in the working mode options. Please specify the Destination IP address and port number of the TCP server program on the remote host. This should match the IP settings of the TCP server program. The default local port number is 0, N5X0 will assign a random TCP Port.

4. After finishing configuring the working Mode, please scroll down to the bottom of the page and click on "Save & Apply" button to save all the changes that you have made. All configurations take effect after a system reboot. Fig.50 shows an example of test in this mode. By selecting the TCP Client operation mode, a TCP server program on a remote host computer should be prepared to accept a connection request from the device. In this case, Host IP address is 172.16.14.15.

COMSettings	COM port data receive	Network data receive	NetSettings
PortNum COM3  PortNum COM3  BaudR 115200  DataB 8 bit  DataB 8 bit  StopB 1 bit  Close Recov Options Receive to file Add line return Receive As HEX Receive Pause Save Clear Send Options Data from file Auto Checksum Auto Checksum Auto Clear Input Send As Hex	http://en.usr.onhttp://en.usr.onhttp://en. usr.onhttp://en.usr.onhttp://en.usr.onhttp ://en.usr.on	<pre>[Receive from 172.16.14.12 : 1180] : Jinan USR Technology Co., Ltd. Jinan USR Technology Co., Ltd. Jinan USR Technology Co., Ltd.</pre>	(1) Protocol TCP Server (2) Local host IP 172.16.14.15 (3) Local host port 8000 Poisconnec Receive to file. Add line return Receive As HEX Receive Pause Save Clear Send Options Data from file . Auto Checksum Auto Clear Input Send As Hex
└── Send Recycle Interval 1000 ms	Jinan USR Technology Co., Ltd. Send	Peers: 172.16.14.12:1180   http://en.usr.on Send	☐ Send Recycle Interval 1000 ms

### Fig.50 N5X0 initiating TCP connection

### 4.2.2 **SSL/TLS**

GADTek

If SSL certificate authentication is enabled on the remote server, user need to configure SSL encryption parameters on N5X0. User can select TLS1.0 or TLS1.2 version protocol. User can select None certificate Authentication, server certificate authentication and bidirectional certificate authentication.



	中文   English
<ul> <li>Status</li> <li>Status</li> <li>Network:</li> <li>Port</li> <li>Port3</li> <li>Port4</li> <li>Websocket to Serial</li> <li>Stateway</li> <li>Cloud Service</li> <li>System</li> </ul> System State To Prime	tis⊻ Inginh
Operating Mode None Save&Atpoly	v

Fig.51 SSL/TLS encryption

# 4.2.3 Transient connection

This connection, called transitory due to its short-lived nature. If the serial port or network port receives none data within the setting time, the connection will be automatically disconnected. The serial device servers used to send serial device back to control room or a cloud application need to open a remote connection before they can transfer the serial data. If a large number of serial devices are connected to the same network, the connection will require many resources in the control room or cloud application. To handle these large numbers of remote connections properly, serial device servers should support flexible connection control. The best way to do this is to open a connection only when serial data is received from a device. When the transmission is completed, the serial device server should immediately close the connection. Without support for flexible connection control, you would need to spend extra time handling connections at the central site or cloud application. TCP transient connection is used primarily to save server resources. Fig.52 shows an example of configuration setting for transient connection in TCP Client working mode under the socket page.

Page 68 of 165



USR IOT Communication Expert of Industrial IoT		Be Honest Do Best 中文 Engli
	UART TO ETH	
✓ Status	Data transmission parameter configuration	
Overview		
> Network	SETTING	
✓ Port	Port Socket	
Port1		
Port2	SOCKET A	
Port3	Working Made TCP Client ~ Shart Connection ~	
Port4		
Websocket to Serial	Remote Server Addr 172.16.14.15	
> Gateway	Local/Remote Port Number 0 8000 (1-65535)	
> Cloud Service	Reconnection period 0 (0~99999)s	
> System	Duration of short connection 3 (3-255)s	
	PRINT OFF ~	
	Modbus Poll Response Timeout 200 (10-9999)ms	
	Enable Net Heartbeat	
	Registration Packet Type None v Location Once connecting v	
	SSL protocol Disable V None V	
	SSL protocol Disable Vione	
	SOCKET B	
	Operating Mode None ~	
	Save&Apply	
	Jinan USR IOT Technology Limited. http://www.pusr.com	🥰 e 🦏 🎍 🗉 1

**Fig.52** Transient connection

# 4.3 UDP Server

### 4.3.1 Properties

User Datagram Protocol (UDP) is a faster and more efficient transport protocol than TCP but it is a connectionless transport protocol, it does not guarantee the delivery of network datagram. In UDP mode, you can unicast or multicast data from the serial device to one or multiple host computers, and the serial device can also receive data from one or multiple host computers. Please beware that even though UDP provides better efficiency in terms of response time and resource usage, it does not guarantee data delivery. It is recommended to utilize UDP only with cyclic polling protocols where each request is repeated and independent, such as Modbus Protocol. When the working mode of the device is UDP server, the remote device must also work in UDP mode. You only need to specify the Local Port that USR-N5X0 should listen to. In UDP server mode, serial port data is always sent to the last peer UDP device (IP and port) that communicates with the USR-N5X0, and the USR-N5X0 can record the IP and port number only after the peer UDP device sends data to the USR-N5X0 first. Fig.53 shows an example of configuration setting for UDP Server mode under the Port1 socket page. You can configure other serial ports in the same way.

Page 69 of 165



USR IOT Communication Expert of Industrial IoT		Be Honest Do Best! 中文   English
Network     Port     Port2	UART TO ETH Data transmission parameter configuration SETTING Port Socked	
Websocket to Serial Gateway Cloud Service System	SOCKET A Working Mode UGP Server  None Remote Server Addr 172 16 14 15 Local/Remote Port Number 900 20108 (1-65535) PRINT OFF  Enable Net Heartbeat Registration Packet Type None  Location Once connecting	
	SOCKET B Operating Mode None Save&Apply Jinan USR 10T Technology Limited. http://www.pusr.com	

### Fig.53 UDP server work mode

Please follow the following steps to configure connection settings of the operation mode for PORT1 port.

1. Click on the "Port1" tab on the menu frame on the left side of Web UI to go to Port1 page as shown in Fig.53.

2. For Serial Settings on the Port configuration page, please go to Section 3.2.3.

3. Click on the Socket tab in this page, select UDP Server in the working mode options.

4. Local Port specifies the local port number for UDP server mode on N5X0 which it will be listening to and it can be any number between 1 and 65535. The local ports of different serial ports must be different. After receiving network data, the device determines which serial port the data is sent to based on the local port.

5. After finishing configuring the working Mode, please scroll down to the bottom of the page and click on "Save & Apply" button to save all the changes that you have made. All configurations take effect after a system reboot. Serial port data is firstly sent to the preset destination IP/domain name and Destination port. After receiving a UDP packet, the system updates the destination IP address and port number, and sends the data back to the latest IP address and port number. In this case, IP address of USR-N5X0 is 172.16.14.12, host IP address is 172.16.14.15.

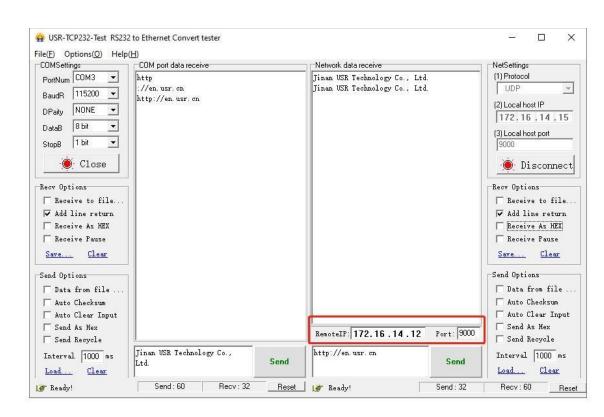


Fig.54 UDP transmission test

### 4.4 UDP Client

GAOTek

### 4.4.1 Properties

When the working mode of the device is UDP client, the remote device must also work in UDP mode. N5X0 supports remote IP address and port verification. After verification is enabled(OFF), the N5X0 only communicates with the destination port of the destination IP address. If the data is not from this channel, the N5X0 will discard the data. If verification is disabled(ON), N5X0 does not filter the data of the destination IP address and destination port. Fig.55 shows an example of configuration setting for UDP Client mode under the Port1 socket page. You can configure other serial ports in the same way.

Page 71 of 165



Communication Expert of Industrial IoT		Be Honest Do Best ! ⊄¢∣English
Status     Network     Port     Port     Port2     Port3     Port4     Websocket to Serial     Sateway     Colud Service     System	LART TO ETH   Data transmission parameter configuration     SETTING     Pot     SOCKET A     Working Mode     UDP Not Check Remote PORT     OFF     PINT     None     Enable Net Heartbast     Registration Packet Type     None     CockET D     Operating Mode     Image: Cocation     Image: Cocation	
	Jinan USR IOT Technology Limited. http://www.puss.com	

Fig.55 UDP client work mode

Please follow the following steps to configure connection settings of the UDP client mode for PORT1 port.

1. Click on the "Port1" tab on the menu frame on the left side of Web UI to go to Port1 page as shown in Fig.55.

2. For Serial Settings on the Port configuration page, please go to Section 3.2.3.

3. Click on the Socket tab in this page, select UDP Client in the working mode options.

4. Please specify the Destination IP address and port number of the UDP program on the remote host. Local Port specifies the local port number which socket A will be listening to and it can be any number between 1 and 65535. The local ports of different serial ports must be different. After receiving network data, the device determines which serial port the data is sent to based on the local port. Note that typically the port number that is larger than 1024 is recommended to avoid conflicting with the well-known port numbers. You should match this setting with the remote UDP program. Note that this number is usually called destination port in the remote UDP program.

5. After finishing configuring the working Mode, please scroll down to the bottom of the page and click on "Save & Apply" button to save all the changes that you have made. All configurations take effect after a system reboot. Fig.56 shows an example of test in this mode. In this case, IP address of USR-N5X0 is 172.16.14.12, host IP address is 172.16.14.15.



COMSettings	COM port data receive	Network data receive	NetSettings
PortNum COM3  BaudR 115200  Daity NONE  DataB 8 bit  DataB 8 bit  Close Close Recev Options Receive to file Add line return Receive As HEX Receive Pause Save Clear Send Options Data from file Auto Checksum Auto Clear Input	http://en.usr.on http://en.usr.on http://en.usr.on	Jinan USR Technology Co., Ltd. Jinan USR Technology Co., Ltd. Jinan USR Technology Co., Ltd.	(1) Protocol UDP (2) Local host IP 172.16.14.15 (3) Local host pot 20108 Disconnect Receive to file Add line return Receive As HEX Receive Pause Save Clear Send Options Data from file Auto Checksum Auto Chez Input
🥅 Send As Hex 🥅 Send Recycle		RemoteIP: 172.16.14.12 Port: 90	000 Send As Hex Send Recycle
Interval 1000 ms Load Clear	Jinan USR Technology Co., Ltd. Send	http://en.usr.on Send	Interval 1000 ms Load Clear

### Fig.56 UDP Client test

## 4.4.2 UDP multicast

UDP also allows multicasting of data to groups of IP addresses. A multicast is a packet sent by one host to multiple hosts. In multicast mode, each host that belongs to a specific multicast group will receive multicast packets for that group. For a host to be configured as a multicast receiver over the Internet, the must inform the routers on its LAN. The Internet Group Management Protocol (IGMP) is used to communicate group membership information between hosts and routers on a LAN. The USR-N5X0 Series supports IGMP version 2.

Page 73 of 165



Communication Expert of Industrial IoT		Be Honest Do Best ! ⊄r≿∣English
Status Network  Port Port1 Port2 Port3 Port4	UART TO ETH Data transmission parameter configuration SETTING Fort Socket SOCKET A	
Websocket to Serial Gateway Cloud Service System	Working Mode       UDP Client          ✓ Multicast          Remote Server Addr       239.1.1.1         Local/Remote Port Number       9000       20108         PRINT       OFF           Enable Net Heartbeat           Registration Packet Type       None	
	SOCKET 8 Operating Mode None Sizero6Apply Jinan USR JOT Technology Limited. http://www.pusr.com	

## Fig.57 USR-5X0 #1UDP multicast setting

USR IOT Communication Expert of Industrial IoT	B	e Honest Do Best! 中文∣English
Status     Network     Port     Port     Port2     LOG     Gateway     Cloud Service     System	LART TO ETH   Data transmission parameter configuration     SETTINE   Tot ordet     SOCKET A     Working Mode UDP Client with Multicast   UDP Client with Multicast   Vorking Mode UDP Client with Multicast   Vorking Mode UDP Client with Multicast   Filmt OFF   Remote Server Add 20108 0000 (1-65533)   Filmt OFF   Registration Packet Type None with Location Once connecting     SOCKET B     Operating Mode None     SavedApply	u tra Londino.
	Jinan USR IOT Technology Limited. http://www.pusr.com	

Fig.58 USR-N5X0 #2 UDP multicast setting

Page 74 of 165



Fig.59 shows an example of test in this mode with two N5X0s

	Uart Assistant	₩ - □ ×	•	Uart Assistant	₩ - □ ×
COM Configs Channel COM10 HU- Badrole (15200 - Paritybis) NONE - Databis & - Stopbis 1 - Flowcht NONE - Flowcht NONE - Close - Recv Options C ASCII C HEX - Auto Linefeed - Hide Received Data - Save Recv to File Auto Scroll Clear - Auto Append Bytes - Auto Append Bytes	Detalog           [2022-07-19 10:44:33.675]# RECV ASCII)           MEXID device 1 UDP multicart           [2022-07-19 10:44:39.777]# SEMD ASCII)           MEXID device 2 UDP multicart           Deta Send           1. DCD • 2.RXD • 3.TXD • 4.DTE • 5.000 •	UortAssist V5.0.2 @ A	COM Configs Channel COM3 #US + Boudtate (115000 - Partybits NONE × Databits © × Stopbits © × Stopbits © × Flowcht NONE × © Close Recv Options © ASCII C HEX Flow None × Cose Recv Options © ASCII C HEX Save Recv to File AutoScrall Clear Send Options © ASCII C HEX FLUSE Scope Chars() C Auto Append Bytes	Data log           [2022-07-19 10:44:33.597]# SEND ASCII>           PSK0 device 1 UUP multicast           [2022-07-19 10:44:39.691]# RECV ASCII>           NEX0 device 2 UUP multicast           SEX0 device 2 UUP multicast           Data Send 1.0CD 0 2.RXD 0 3.TXD 0 4.DTR 0 5.GK	UartAssist V5.0.2 A
☐ Send from File ☐ Cycle 1000 ms <u>Shortcut Mistory</u>	NSX0 device 2 UDP multicast	Send	☐ Send from File ☐ Cycle 1000 ms <u>Shortcut History</u>	NSX0 device 1 UDP multicast	Send
🞯 Readyl	1/1 RX:28	TX:27 Reset	🞯 Readyl	1/1 RX:27	TX:28 Reset

Fig.59 UDP multicast transmission test

# 4.5 HTTP Client

# 4.5.1 Properties

When the operation mode of this device is Httpd Client, users need to specify the remote httpd server's address, port, method and other parameters. The device will submit the serially received data to the httpd server in the form of GET or POST. At the same time, the data sent by the httpd server can be transparently transmitted to the serial port. Fig.60 shows an example of configuration setting for HTTP Client working mode under the Port1 socket page. You can configure other serial ports in the same way.



Communication Expert of Industrial IoT		Be Honest Do Best! 中文∣English
Status     Data transmission parameter cc	onfiguration	
Network     Port     SETTING		
Port1 Port2		_
Port3 SOCKET A		•
Websocket to Serial Working Mode Gateway Httpd method		
Cloud Service     Httpd URL(<101byte)     System		
Httpd Header(<181byte)		
Remote Server Addr Local/Remote Port Number		
Server Response Time		
PRINT Enable Net Heartbeat		
Registration Packet Type	None v Location Once connecting v	
SSL protocol SOCKET 8	4 Disable v None v	
	Jinan USR IOT Technology Limited. http://www.pusr.com	_

Fig.60 HTTP client mode

Please follow the following steps to configure connection settings of the work mode for PORT1 port. 1. Click on the "Port1" tab on the menu frame on the left side of Web UI to go to Port1 page as shown in Fig.60.

2. For Serial Settings on the Port configuration page, please go to section 3.2.3.

3. Click on the Socket tab in this page, select Httpd Client in the working mode options.

4. The HTTPD method needs to fill in the correct URL path, and select the GET or POST method as needed.

5. Fill in the HTTPD request header as needed.

6. Fill in the HTTPD address, that is, the address of the HTTP server, which can be an IP address or a domain name (the ability to connect to foreign countries is required).

7. Fill in the HTTPD port number. The default local port number is 0, N5X0 will assign a random TCP Port.

8. After finishing configuring the working Mode, please scroll down to the bottom of the page and click on "Save & Apply" button to save all the changes that you have made. All configurations take effect after a system reboot.



## 4.5.2 HTTPS

If SSL certificate authentication is enabled on the remote server, user need to configure SSL encryption parameters on N5X0. User can select TLS1.0 or TLS1.2 version protocol. User can select None certificate Authentication, server certificate authentication and bidirectional certificate authentication.

Section Communication Expert of Industrial IoT		Be Honest Do Best ! 中文∣English
Status     Fort     Socket     Socket     Socket     Socket     Socket		
Port1 Working Mode	Httpd Client v None v	
Port2 Httpd method Port3	GET V Remove Httpd Header 🗹	
Port4 Httpd URL(<101byte)	/1.php?	
Websocket to Serial Httpd Header(<181byte)	User_Agent: Mozilla/4.0	
> Gateway	*	
Cloud Service     Remote Server Addr	192.168.0.201	
> System Local/Remote Port Number	0 80 (1~65535)	
Server Response Time	10 (3~255)s	
PRINT	OFF ~	
Enable Net Heartbeat		
Registration Packet Type	None   Location Once connecting	
SSL protocol	TLS1.2 Verify all v	
Upload Server CA	Server Root CA Choose file Upload	
	Uploaded certificate: null	
Upload Client CA	Client CA Choose file Upload Uploaded certificate: null	
Upload Client Private Key	Client Private Key Choose file Upload Uploaded certificate: null	

Fig.61 SSL/TLS encryption

## 4.6 Websocket server

When the operation mode of this device is WebSocket server, the user needs to specify the main parameters such as listening port, forwarding direction. This function is that the serial server acts as a WebSocket server, and transparently transmits the data received by the serial to the WebSocket client in hexadecimal format. The WebSocket server can also forward data to the serial device at any time.

1. Click on the "system setting" tab on the menu frame on the left side of Web UI to go to system setting page as shown in Fig.62.

- 2. Fill in the WebSocket server listening port number, default 6432.
- 3. Select UART1 in websocket direction.
- 4. For Serial Settings on the Port configuration page, please go to section 3.2.3.

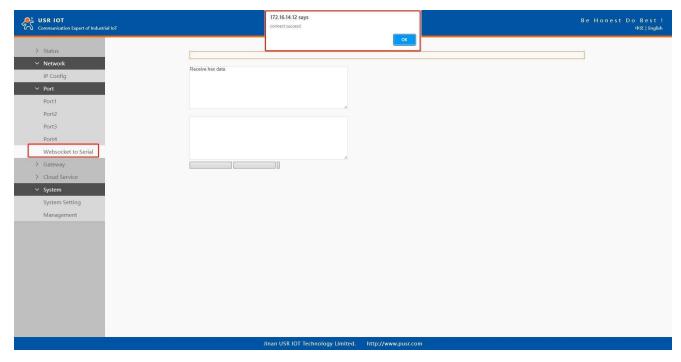
Page 77 of 165



Communication Expert of Industrial Ic	əī	8	e Honest Do Best! 中文∣English
Status  Network  P Config  Port  Port  Port3	SYSTEM SETTING Set System Parametes SETTING System Setting Model Name	e USR-N540	Â
Port4 Websocket to Serial > Gateway	Websocket Port Websocket Direction	t 6432 (1-65535)	
Cloud Service     System     System Setting	User Name	e admin	
Management	Pass Word Uart Cache Restarting Without Data	0 0FF: •	
	SNMP		
	NTP 485 Anti-Collision		
	Log Export	Jinan USR IOT Technology Limited. http://www.pusr.com	

## Fig.62 Websocket server setting

5. Click on the websocket to serial tab, browser will connect to the websocket server of N5X0 automatically.



## Fig.63 Browser as websocket client to connect N5X0

Page 78 of 165



## Fig.64 shows an example of test in this mode

Communication Expert of Industr	nnial⊳7 Be Honest Do	Best! 中文 English
<ul> <li>&gt; Status</li> <li>Network</li> <li>IP Config</li> <li>Port</li> <li>Port2</li> <li>Port3</li> <li>Port4</li> <li>Websocket to Serial</li> <li>&gt; Gateway</li> <li>&gt; Cloud Service</li> <li>&gt; System</li> <li>System Setting Management</li> </ul>	Websocket to Serial         Unred-Achilated         Websocket to transmit data between webpage and uart         Unred-Achilated         Out of the top 20 both 50/2 bot	
	Jinan USR IOT Technology Limited. http://www.pusr.com	

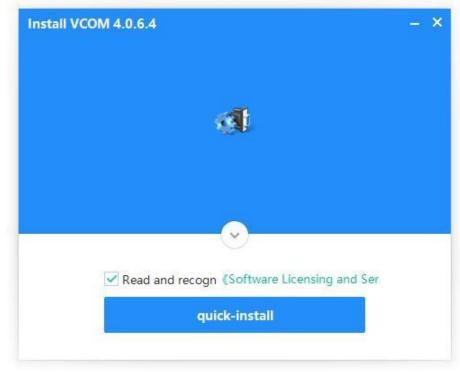
Fig.64 Data transmission test

Page **79** of **165** 



# 5. Virtual COM port

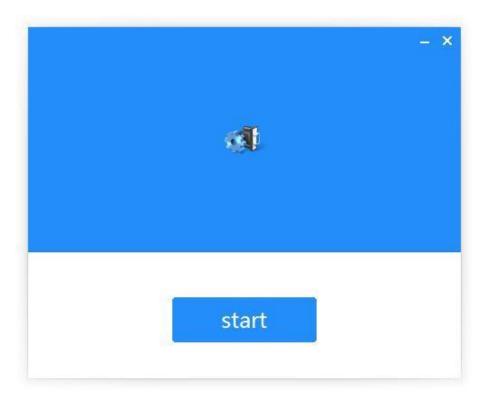
Traditional SCADA and data collection systems rely on serial ports (RS-232/422/485) to collect data from various kinds of instruments. Virtual COM ports on host computer allows remote access of serial devices over TCP/IP network that works like local native COM ports. Since USR-N5X0 serial device servers enable network operation of instruments equipped with an RS-232/422/485 communication port, your SCADA and data collection system will be able to access all instruments connected to a standard TCP/IP network, regardless of whether the instruments are used locally or at a remote site. To enable Virtual COM on host computer, you will require a VCOM software to emulate the COM port. For Windows operating system, a software utility called VCOM is supported by PUSR to be used for this purpose. This function is useful with devices such POS terminals, Bar Code Readers, Serial printers, etc. since it allows you to use software that was written for pure serial communication applications. Download the software from PUSR's website: <u>https://www.pusr.com/support/downloads/VCOM\_Setup\_exe.html</u> Execute the VCOM program, click quick-install to install program files in the default directory, or select an alternative location. The Installing window reports the progress of the installation.



# Fig.65 Install wizard 1

Page 80 of 165



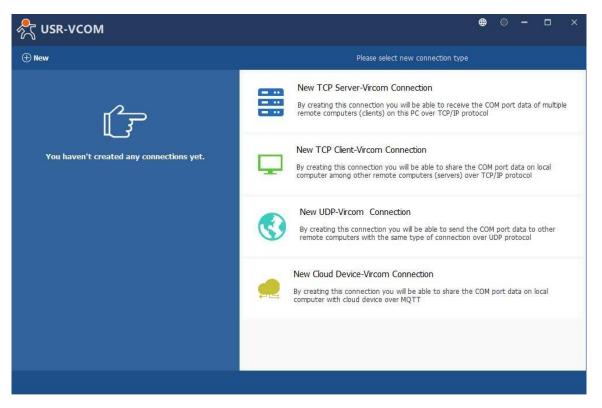


# Fig.66 Install wizard 2

Once the installation of the package is finished a start screen display. Click start to conclude the process and launch the VCOM software.

Page 81 of 165



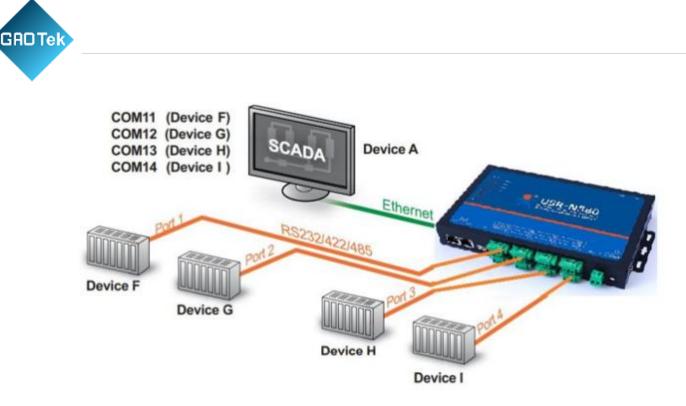


#### Fig.67 VCOM overview

#### 5.1 TCP Server Application with Virtual COM

Virtual COM on host computer allows remote access of serial devices over TCP/IP networks through Serial/IP Virtual COM ports that work like local native COM ports. Fig.68 is an example of Virtual COM application diagram. There are traditionally only two Physical COM ports (COM 1 and COM 2) on the personal computer (PC) while there can be several Virtual COM ports such as COM 11, 12, 13, and so on. This section will provide the procedure to enable Virtual COM (VCOM) on Windows based PC. Please follow the steps described here to configure your Virtual COM application.

Page 82 of 165

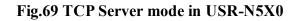


## Fig.68 Diagram of virtual COM Application over TCP/IP Network

1. If the serial device server is running in TCP Server Mode (recommended), the VCOM utility on the host computer should be configured as the TCP client connecting to the serial device server. The characteristic of this mode is that the IP address of the host can be changed (usually automatically assigned by the router), and the IP address of the serial server must be fixed.

Communication Expert of Industr	Be	Honest Do Best! 中文   English
Communication Expert of Industr  Status  Network:  Port1  Port2  Port3  Port4  Websocker to Serial  Gateway:  Cloud Service  System	abd UART TO ETH Data transmission parameter configuration SETTINC Port Sostet SOCKET A Working Mode TOP Savier IN None INFORMATION KICK I	ΦΩ   Ingliah
	Jinan USR IOT Technology Limited. http://www.pusr.com	





💦 USR-VCOM	⊕ ⊘ − □	×
① New	Please select new connection type	
<u></u> ∏ <sup>2</sup> ₹	New TCP Server-Vircom Connection By creating this connection you will be able to receive the COM port data of multip remote computers (clients) on this PC over TCP/IP protocol	le
You haven't created any connections yet.	New TCP Client-Vircom Connection By creating this connection you will be able to share the COM port data on local computer among other remote computers (servers) over TCP/IP protocol	
	New UDP-Vircom Connection By creating this connection you will be able to send the COM port data to other remote computers with the same type of connection over UDP protocol	
	New Cloud Device-Vircom Connection By creating this connection you will be able to share the COM port data on local computer with cloud device over MQTT	

## Fig.70 New Virtual COM connection

2. Select one COM port as the Virtual COM port before proceeding as shown in Fig.71. Note that if a COM port number is used by other application or your operating system, you can not select it.

Page 84 of 165



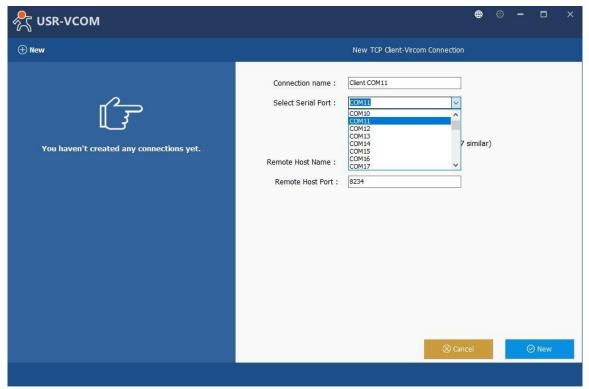
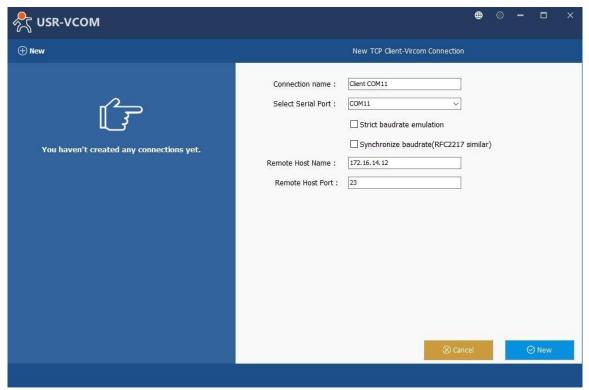


Fig.71 Select one COM port

3. After selecting the virtual COM ports, please enter the IP Address of the serial device server with the specified Port Number. The Port Number here is the Local Listening Port for the serial device server which is specified in the Local Port field of Fig.72

Page 85 of 165





## Fig.72 Virtual COM port mapping

4. Click new to add the Virtual COM11. Click client COM11 on the left side of VCOM panel to check the status. If status become connected, the process is completed.

💦 USR-VCOM	• •	A Device Manager      Elle Action View Help	- 🗆 ×
① New		te action yew help	
Clonet CON11 CON11 (Lioped — bytes:0) Echer 172:16:16:12:22 Connected bytes:0 Con12 CON12 Con12 C	COM port information Port name : COM11 Port status : deed Port parameters : Bytes received : 0 Opened by : Network information Type : TCP Client P : 172.16.14.12 Port : 23 Status : Connected Bytes received : 0	V     USR-Genderation       >     Settlerise       >     Monitors       >     Potable Derices       >     Potable Derices	

Fig.73 Virtual COM11 status

Page 86 of 165



## 5.2 TCP Client Application with Virtual COM

1. If the serial device server is running in TCP Client Mode, the VCOM utility on the host computer should be configured as the TCP server waiting for a serial device server to connect to the host computer. The feature of this mode is that the IP address of the computer cannot be changed, but the IP address of the serial device server can be changed (which can be automatically assigned by the router).

Communication Expert of Industrial IoT	- <b>B</b>	e Honest Do Best! 中文∣English
	figuration	
Gateway Working Mode     Cloud Service Remote Server Addr     System Loca/Remote Port Number     Reconnection period		
PRINT Modbus Poll Enable Net Heartbeat Registration Packet Type SSL protocol	OFF         ~           Response Timeout 200         (10-9999)ms           Image: Second Se	
SOCKET 8 Operating Mode	None SansAlppy Inan USR IOT Technology Limited. http://www.pusr.com	

Fig.74 TCP client mode in USR-N5X0

Page 87 of 165



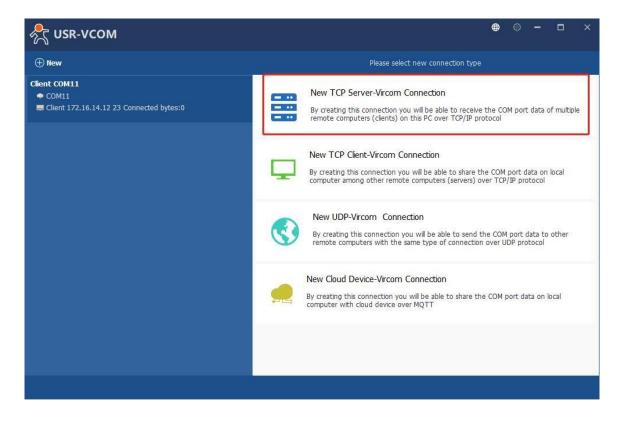


Fig.75 New Virtual COM connection

- 2. Select one COM port as the Virtual COM port before proceeding as shown in Fig.76. Note that if a COM port number is used by other application or your operating system, you can not select it.
- 3. After selecting the virtual COM ports, please enter the specified Port Number. This Port Number is the Destination Port of the serial device server.

Page 88 of 165



nter state with the second state of the second		(	<b>•</b> •			×
⊕ New		New TCP Server-Vircom Connection				
Client COM11 COM11 Client 172.16.14.12 23 Connected bytes:0	Connection name : Select Serial Port : TCP port :	Server COM12 COM12 Strict baudrate emulation Synchronize baudrate(RFC2217 sim Keep-alive 20108	ular)			
		🛞 Cancel		Ø	New	

## Fig.76 Virtual COM port mapping

4. Click new to add the Virtual COM12. Click client COM12 on the left side of VCOM panel to check the status. If status become connected, the process is completed.

💦 USR-VCOM	🛛 🗢 🗆 🗢	🛃 Device Manager	– 🗆 ×
N .		Elle Action View Help	
① New	Info of TCP Server connection : Server COM12		
Clonit CON11	COM port information Fort same : COM12 Fort status : closed Port parameters : Bytes received : 0 Opened by :	✓         USR-Clerkturken           >         €         Aufories           >         Extensis            >         Blatteries            >         Extensis            >         Extensis            >         Extensis            >         Computer            >         Display adapters            >         Timmare	
	Network information Type : TCP Server Port : 28108 Status : Connected(1) Bytes received : 0	<ul> <li>&gt; We Human Interface Devices</li> <li>&gt; We Human Interface Devices</li> <li>&gt; We how the second of the pointing devices</li> <li>&gt; We how the adapters</li> <li>&gt; Pointable Devices</li> <li>&gt; Pointable Devices</li> <li>&gt; Pointable Devices</li> </ul>	
	🖾 Dafa Montor 🔗 Delet Count	EITINA Viral Sein Peet (COM12) US8 Service (COM3) Common Viral Sein Peet (COM3) Printees Pri	

Fig.77 Virtual COM12 Status

Page 89 of 165



## 5.3 Enable RFC2217 through Virtual COM

Enabling this function allows users to use customized RFC2217 commands on the network to dynamically modify the serial port's baud rate, data bits, stop bits, and parity bits. This function is only allowed when the working mode is TCP Server and TCP Client. Note that this protocol is used to change the serial port parameters of USR-N5X0.

Communication Expert of Industri	l loT			Be Honest Do Best! 中文 English
> Status > Network <b>&gt; Port</b>	UART TO ETH Data transmission parameter confi	iguration		
Port1 Port2 LOG	SETTING Fort Socket			
> Gateway > Cloud Service	Baud rate Data bits	115200	(600-230400)bps	
> System	Parity	None 1	•	
	Serial Mode Current Serial Mode	DIP Switch	• •	
	Flow ctrl	NONE	~	
	UART Packet Time		(0-1460)types (0-255)ms	
	Sync Baudrate(RFC2217) Enable Uart Heartbeat		v	
			Save&Apply	
	Ji	nan USR IOT Technolog	gy Limited. http://www.pusr.com	

Fig.78 RFC2217 enabled

Page 90 of 165



💦 USR-VCOM			<b>#</b>	٢	-		×
+ New		New TCP Client-Vircom Connection					
Client COM11 ◆ COM11 closed bytes:0 ■ Client 172.16.14.12 23 Connected bytes:0	Connection name : Select Serial Port :	Client COM1	]				
Client COM12 COM12 closed bytes:0 Client 172.16.14.12 26 Connected bytes:0		☐ Strict baudrate emulation ✓ Synchronize baudrate(RFC2217	similar)	1			
Client COM13 COM13 closed bytes:0 Client 172.16.14.12 29 Connected bytes:0	Remote Host Name : Remote Host Port :	172.16.14.34       23		1			
Client COM14		S Cano	tel		Ø	New	

Fig.79 enable RFC2217 in VCOM

When we change serial parameters in Virtual COM port 1, we can see these parameters have took effect in serial port of USR-N5X0.

	Uart Assistant	₩ <u>-</u> □×	• / (	Uart Assistant	₩ - □ ×
COM Configs Channel COM1 #EL # Baudrel® 9500 # Paritybits EVEN # Databits 8 # Stoobits 1 # Flowetal NONE # Recv Options C ASCII C HEX # Log Display Mode C Auto Linefeed F Hide Received Data Save Recv to File AutoScroll Clear	Data log           [2022-07-08 17:57:10.669]# Decive has been inserted           [2022-07-08 17:57:10.669]# Decive has been inserted           [2022-07-08 17:57:10.669]# SEND ASCH10           http://www.emsoft.eml1           [2022-07-08 17:57:10.668]# SEND ASCH10           http://www.emsoft.eml1           [2022-07-08 17:57:10.668]# SEND ASCH10           http://www.emsoft.eml1           [2022-07-08 17:57:20.046]# BECV ASCH10           http://www.emsoft.eml2           <           [2022-07-08 17:57:20.910]# HECV ASCH10           http://www.emsoft.em22		IDM Configs Channel COMID #L v Baudrale 39500 v Paritvibis EVEN v Databàs 8 v Storbis 1 v Flowctri NONE v Close Lecv Dpions ALUG Linefeed ALUG Linefeed Hide Received Data Save Recv to File Auto Scroll Clear	Dealog [2022-07-08 17:57:11.076]# BECV ASCII> http://www.emsoft.call [2022-07-08 17:57:13.631]# BECV ASCII> http://www.emsoft.call [2022-07-08 17:57:18.963]# BECV ASCII> http://www.emsoft.call [2022-07-08 17:57:18.960]# SERD ASCII> http://www.emsoft.cal2 [2022-07-08 17:57:20.823]# SERD ASCII> http://www.emsoft.cal2	UartAssist V5.0.2 🗇 🗘
Send Options C ASCII C HEX U se Escape Chars() Auto Append Bytes Send tom File Cycle 1000 ms <u>Shorteut Kistory</u>	Data Send         1. ncn ●         2. nxn ●         3. nxn ●         4. nnn ●         5. Gm ●           http://www.cmsoft.cn11	6. ISR • F Clear L Clear Send	ASCII C HEX     Use Escape Chars()     Auto Append Bytes     Send from File     Cycle [1000 ms     Shortcut <u>History</u>	Data Send         1. DCD ●         2. 8XD ●         3. TXD ●         4_DTE ●         5. GW           http://www.cmsott.cn22	• 6.ISR • F Clear & Clear Send
🐨 Readyl	2/4 RX:44	TX:88	Readyl	3/2 RX:88	TX:44 Reset

Fig.80 Synchronizing serial port parameters

Page 91 of 165



# 5.3.1 PUSR customized RFC2217 protocol

Name	Header	Baud rate	Serial parameter definition	Sum check
Length(bytes)	3	3	1	1
Description	Fixed	Big endian, e.g. 600 (00 02 58)	Data bits/stop bits/ parity bits setting. As shown in the table 23 below	Check sum of 4 bytes of baud rate and serial parameter definition, retain the least significant byte
115200,N,8,1	55AA55	01C200	03	C6
9600,N,8,1	55AA55	002580	03	A8

## **Table 22 Com Port Control Commands**

### **Table 23 Serial Parameter definition**

<b>Bit Position</b>	Function	Value	Description
1:0	Data bits	10	7 Data bits
		11	8 Data bits
2	Stop bits	0	1 Stop bits
	_	1	2 Stop bits
3	Parity bit enable	0	Disable the parity bit
		1	Enable the parity bit
5:4	Parity bit type	00	ODD
		01	EVEN
		10	Mark
		11	Space
7:6	undefinition	00	Please write 0

Page 92 of 165



# 6. Modbus TCP/RTU gateway

Modbus is one of the most popular automation protocols in the world, supporting traditional RS-232/422/485 devices and recently developed Ethernet devices. Many industrial devices, such as PLCs, DCSs, HMIs, instruments, and meters, use Modbus as their communication standard. In industrial applications, the most common protocol conversion is Modbus RTU to Modbus TCP conversion, and it is usually required when legacy devices such as meters, mostly using Modbus RTU, need to be integrated with SCADA systems, mostly using Modbus TCP. Most modern PLCs and host computers support Modbus TCP over Ethernet. In order to access discrete Modbus RTU devices for data collection and control, they can rely on the N5X0 Modbus gateway. When connecting up Modbus devices via an RS485 network they should be daisy chained together, and a dual twisted pair cable are recommended. The connections should be kept the same throughout the network: positive to positive, and negative to negative. These may sometimes be labelled up as A and B. When wiring Modbus serial devices there is a limit of 32 per network, the master device takes up an address on the network. The maximum length of the serial network cannot exceed 1200m regardless of boosters and repeaters.

## 6.1 Ethernet masters with serial slaves

When the host computer or PLC is Modbus TCP Master, the Modbus TCP function must be enabled, the remote device must work in Modbus RTU Slave mode. The N5X0(TCP Server mode) supports Modbus TCP with up to 16 simultaneous connections. The serial interface supports both RS-232 and RS-422/485, selectable through software. Each serial port can be connected to one RS-232 or RS-422 serial device, or to 32 RS-485 serial devices. When connected with more than one RS485 devices, please refer to section 7.5 for bus collision direction.

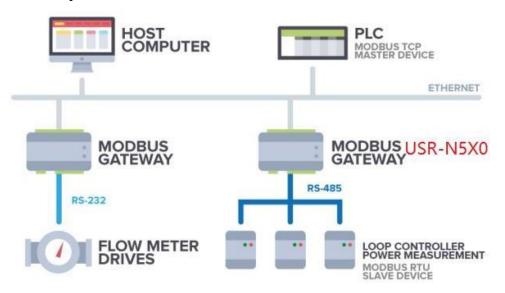


Fig.81 Ethernet masters with multiple serial slaves

Page 93 of 165



The device supports multiple hosts to query data from the slave in q&A mode. Please select modbus polling function as shown in Fig.82. When USR-N5X0 Series serial device server does not receive a response from the serial port after a response timeout, the device replies with an acknowledgement and then processes the next host request. When you need to use long frame data frequently or have high data transmission requirements, please adjust the baud rate and lengthen the sending interval appropriately to prevent the slow serial port from causing messy codes or packet loss.

USR IOT Communication Expert of Industrial IoT		Be Honest Do Best! 中文   English
Status Network  Port Port1 Port2 Port3 Port4 Websocket to Serial  Gateway Cloud Service System	LART TO ETH Data transmission parameter configuration  SETTING  Ref  SockEF A  Vorking Mode  TCP Server  Vorking Mode  TCP Server  Vorking Mode  SockEF  Vorking Mode  None  Vorking Mode  SockEF  Vorking Mode  Vorking Mode  SockEF  Vorking Mode  Vor	
	Jinan USR IOT Technology Limited. http://www.pusr.com	

#### Fig.82 Modbus TCP master settings

Open the Modbus Poll and Modbus Slave software, go to "Connect" -> "Connect", and the connection parameters are configured as follows, in this case, IP address of USR-N5X0 is 172.16.14.12. Fig.83 Modbus emulator settings

□         File         Edit         Connection         Setup         Functions         Display         View         Window         Help	I Modeus Save - (Modevel) - □ × P File Edit Connection Setup Display View Window Help - □ # # D 알 및 중 [□ ] 변 요   ♥ ♥
No connection Alian O Alian O Alian O Alian O S Alian O Alian Alian O Alian O Alian	D = 1: F = 03 Connection Setup X Connection Setup X Connection Setup X Connection Setup X Connection Setup X Connection Setup X Setup Setup
For Help, press F1. [172.16.14.13]: 502	For Help, press F1. [172.16.14.15]: 502

#### Page 94 of 165



## 6.2 Serial master with Ethernet slave

Many HMI (Human Machine Interface) systems use a serial interface to connect to a discrete DCS (Data Control System). However, many DCSs are now Ethernet-based and operate as a Modbus TCP server device. The N5X0 Modbus gateway can link a serial-based HMI to distributed DCSs over an Ethernet network. When the host computer or HMI is Modbus RTU Master, if the remote device work in Modbus TCP Slave mode, the Modbus function must be enabled. The N5X0(TCP Client mode) supports only one Modbus TCP slave.

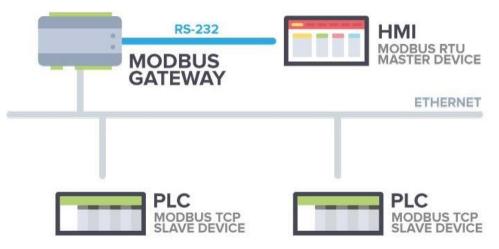


Fig.84 Serial master with one Ethernet slave

## Fig.85 Modbus TCP slave settings

Communication Expert of Industrial IoT		Be Honest Do Best! 中文   English
Status     Network     Port     Port     Port2     Port3     SocKET A	ter configuration	
	Addr 172:16:14:15 nber 0 502 (1-65535) eriod 0 (0-99999)s RINT OFF ~ ~ Poll Response Timeout 200 (10-9999)ms evicen 121	
SSL pro SOCKET B Operating 1		I

Page 95 of 165



Open the Modbus Poll and Modbus Slave software, go to "Connect" -> "Connect", and the connection parameters are configured as follows, in this case, IP address of USR-N5X0 is 172.16.14.12, host IP address is 172.16.14.15.

😘 Medbus Pell - [Mepell1] - 🗆 🗙	2 Modius Slave - [Misslave1] ×
📴 File Edit Connection Setup Functions Display View Window Help	🔁 File Edit Connection Setup Display View Window Help
D 📽 🖬 🗃 🗶 🛅 🖳 05 06 15 16 17 22 23 TC 🖗 🦹 🚧	
Tx = 8: Err = 0: ID = 1: F = 03: SR = 1000ms No connection	ID = 1: F = 03
Addar         Connection Step         X           0         0         0         0         0           2         0         0         0         0         0           3         0         0         0         0         0         0           4         0	Atter     ODDO       0     0       1     0       2     0       3     0       4     0       5     114       6     0       7     0       8     0       9     0       100 Sead Serings       110 Sering Serings       110 Sering Serings       110 Serings       111 Serings  <
For Help, press F1. Port 3: 115200-8-N-1	For Help, press F1. [172.16.14.15]: 502

## Fig.86 Modbus emulator settings

## 6.3 Serial master with serial slaves

When the HMI is Modbus RTU Master, all N5x0 must enable or disable ModbusTCP function at the same time, the remote device must work in Modbus RTU Slave mode. The N5X0 supports up to 16 simultaneous TCP connections.

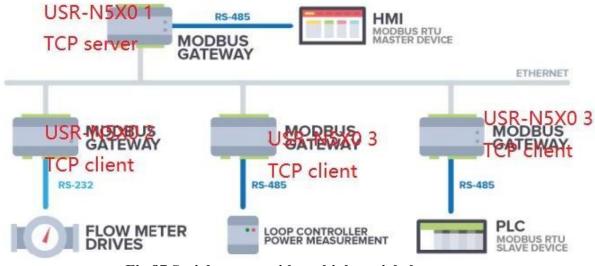


Fig.87 Serial master with multiple serial slaves

If there are more than one serial masters in RS485 network, users should select modbus poll function and configure response timeout in Fig.88. please refer to section 7.5 for bus collision detection.

Page 96 of 165



Communication Expert of Industrial IoT	Be Honest Do Best! 中文   English
	_
Websocket to Senal  Cloud Service Cloud Service System  Working Mode TCP Server  Maximum Sockets supported  Maximum Sockets supported  Maximum Sockets supported  Kock  Cocal Port Number  Socket  Response  Timeout 200 (10-9999)ms  Enable Net Heartbeat  Socket  So	
Derating Mode None	

## Fig.88 Modbus RTU masters settings

Star IOT Communication Expert of Industrial IoT	Be Honest Do Best ! ⊕≎   Ingliah
Status     UART TO ETH     Data transmission paramete     Data transmission paramete	r configuration
✓ Port     SETTING     Port1	
Port2 Socket	
Sateway     Cloud Service     Working Ma	
> System Remote Server A	
Reconnection per	iod 0 (0-9999)s INT OFF ~
Modbus Enable Net Heartb	Poli Response Timeout 200 (10-9999)ms
Registration Packet T	
SOCKET B	
Operating Mr	Sawadapay
	Jinan USR IOT Technology Limited. http://www.pusr.com

Fig.89 Modbus RTU slave settings

Page 97 of 165



협월 Modbus Poll - [Mbpoll1]	- 🗆 X	Modbus Slave - [Mbslave1]	- 🗆 X
📴 File Edit Connection Setup Functions Display View Window Help	- 6" ×	File Edit Connection Setup Display Vie	w Window Help # ×
🗅 🗃 🗑 🗙 🛅 🙁 🚊 🕮 05 06 15 16 17 22 23 TC 🖻 🤋 🎌	these study units	□ ☞ 🖬 🗇 🗔 🗏 ≜ 📍 🕅	
Tx: = 47. Err. = 27: ID = 1: F = 03: SR = 1000ms           Alias         000000           Alias         000000           Connection         Connection           Edita         000000           Send Starge         Mode           Send Starge         Mode           Send Starge         Mode           T12200 Baa         Person           Resp         Data bis           T00         Mode Path v	17U O ASCII scrae Timest 2 Between Poli- [fed] Vol4	D         B         B         E         E         E         Yet           D         1         F         0	Connection Setup Connection Set Set Set Det Set Set Set Det DSR Set Set Set Set Set Set Set Set Set Set
For Help, press F1.	Port 3: 115200-8-N-1	For Help, press F1.	[172.16.14.15]: 502

Fig.90 Modbus emulator settings

## 6.4 Serial master via virtual COM with serial slaves

When the host computer is Modbus RTU master, if we use VCOM, the Modbus TCP function must be disabled, the remote device must work in Modbus RTU Slave mode.

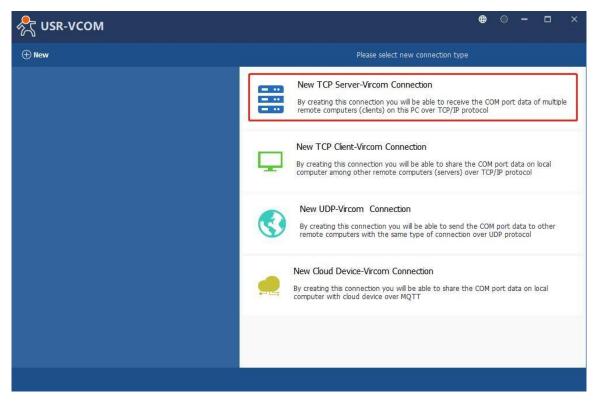


Fig.91 New virtual COM port mapping

Page 98 of 165



New TC Connection name : Select Serial Port :	CP Server-Vircom Connection          Server COM16         COM16
	COM16 V Strict baudrate emulation Synchronize baudrate(RFC2217 similar)
	C Keep-alive
TCP port :	

# Fig.92 Mapping a virtual COM port

● New       Info of TCP Server COM16         ● COM16       ● Ort name : COM16         ● Dott status : closed       ● Port parameters :         Bytes received : 0       ● Opend by :         ● Network information       Type : TCP Server         Port : 20108       Status : Listen         Bytes received : 0       ●	💦 USR-VCOM	
COM16 E Server 20108  Cont port monitored  Port name : COM16 Port status : closed Port parameters : Bytes received : 0 Opened by :  Network information  Type : TCP Server Port : 20108 Status : Listen Bytes received : 0		Info of TCP Server connection : Server COM16
Data Monitor Delete	🗭 COM16	Port name       : COM16         Port status       : closed         Port parameters       :         Bytes received       : 0         Opened by       :         Network information       :         Type       : TCP Server         Port       : 20108         Status       : Listen

Fig.93 Virtual COM port mapping details

Page 99 of 165



USR IOT Communication Expert of Industrial IoT		Be Honest Do Best ! #v≿∣English
VSR IOT Communication Toppert of Industrial IoT Overview V Network IP Config V Port Port1 Port2 Port3 Port4 Websocket to Serial Stateway Cloud Service V System System Setting Management	VART TO ETH   Data transmission parameter configuration     SETTINE   Port Socket   Vorking Mode TCP Client None   Vorking Mode TCP Client None	
	Save&Apply Jinan USR IOT Technology Limited. http://www.pusr.com	v

#### Fig.94 Serial device settings

Tx = 441: Err = 120: ID = 1: F = 03: S	05 06 15 16 17 22 23   TC 🖭   🧣 🏘	- D × - Ø.8	D 📽 🖬 🚳 🗔 🗏 🏛 🤻 😵 ID = 1: F = 03	y View Window Help	- C X - # X
No concetton           0         0000           0         0000           1         0           2         0           3         0           3         14           6         0           7         0           8         0           9         0	Connection Strap		Access         00000           0         1         0           2         0         0           3         0         0           5         0         0           7         0         0           8         0         0	Connection Setup     X       Said Pol     OX       Said Setings     Canool       USB Seel Pel (CMU)     Canool       ISSOB In     Mode       ISSOB In     Pile Contol       ISSoB In     Image Canool       ISSoB In     Pile Contol       ISSoB In     Image Canool       Image Canool     Image Canool <td></td>	
For Help, press F1.	Port 3: 115200	-8-N-1	For Help, press F1.	Port 10: 115200-8-6	41

## Fig.95 Modbus emulator settings (Serial master and serial slave)

#### 6.5 Modbus poll with serial heartbeat packet

When the N5X0 is Modbus RTU Master, the serial device work in Modbus RTU Slave mode, the ModbusTCP function must be disabled. N5X0 works in TCP server mode, it supports up to 16 TCP connections.

Page 100 of 165



Communication Expert of Industrial IoT		Be Honest Do Best! 中文   English
Status Cverview Network Port Port2 Port3 Port4 Websocket to Serial Gateway Cloud Service System	URIT TO ETH   Data transmission parameter configuration     SETTING     To configuration     SOCKET A     Modius Poli     PRINT   OFF   Modius Poli   Response Timeout 200   (10-9999)ms     Enable Net Heartbeat     SOCKET A     Operating Mode     None     Standard Mode     Standard Mode	
	Jinan USR IOT Technology Limited. http://www.pusr.com	

## Fig.96 Modbus RTU master settings

USR IOT Communication Expert of Industrial IoT			Be Honest Do Best ! ⊄¢∣English
Status     UART TO ETH     Overview     Data transmission	n parameter configuration		
Network     Port     SETTING Port1			
Port2 Port3	Baud rate 115200	(600~921600)bps	
Port4 Websocket to Serial > Gateway	Data bits 8 Parity None	v bit	
Suteway     Cloud Service     System	Stop bits 1 Flow ctrl NONE		
	Packet Length 0	(0~1460)bytes (0~255)ms	
Sync Baud	rate(RFC2217) ON	v v	
	art Heartbeat		
	Beat Time 1	(1-65535)»	
	Jinan USR IOT Techno	Save&Apply Dlogy Limited. http://www.pusr.com	

Fig.97 Serial heartbeat packet as modbus command

Page 101 of 165



COMSettings	COM port data receive	Network data receive		NetSettings
PortNum COM10 -		[Receive from 172.16.14.12 :	23]: ^	(1) Protocol
Luna la		01 03 14 00 00 00 00 00 00 00	2202220272	TCP Client
		00 00 00 00 00 00 00 00 00 00 00	5000 5700	(2) Server IP
DPaity NONE -		01 03 14 00 00 00 00 00 00 00 00	22022232	172.16.14.12
DataB 8 bit 💌		00 00 00 00 00 00 00 00 00 00 00 00 00	500015750	
			3303784778	(2) Server Port
StopB 1 bit		01 03 14 00 00 00 00 00 00 00 00		23
🖲 Open		00 00 00 00 00 00 00 00 00 00 00	97 8F	🔘 Disconnect
		01 03 14 00 00 00 00 00 00 00		Disconnect
Recv Options		00 00 00 00 00 00 00 00 00 00 00		Recv Options
Receive to file				Receive to file.
Add line return				Add line return
₩ Receive As HEX		00 00 00 00 00 00 00 00 00 00 00	2.2.2.2.2.2.2.	Receive As HEX
Receive Pause		01 03 14 00 00 00 00 00 00 00	00 00 0E	Receive Pause
		00 00 00 00 00 00 00 00 00 00 00	5.5.5.7.7.5	
<u>Save</u> <u>Clear</u>		01 03 14 00 00 00 00 00 00 00	33-373-77	<u>Save</u> <u>Clear</u>
Send Options				Send Options
🖵 Data from file		01 03 14 00 00 00 00 00 00 00 00		Data from file
🥅 Auto Checksum		00 00 00 00 00 00 00 00 00 00 00	97 8F	🔲 Auto Checksum
🥅 Auto Clear Input		01 03 14 00 00 00 00 00 00 00	00 00 0E 🗸	🗌 Auto Clear Input
🥅 Send As Hex		LocalHost 172.16.14.15	Port 4723	🔲 Send As Hex
🥅 Send Recycle		100000001 172.10.14.15	1011	🔲 🔲 Send Recycle
Interval 1000 ms	Jinan USR Technology Co.,	http://en.usr.cn		Interval 1000 ms
Load Clear	Ltd. S	end	Send	Load Clear

Fig.98 Modbus response transparently transmission

Page 102 of 165



# 7. Advanced features

## 7.1 Packing mechanism

Serial to Network Packet Delimiter: Packet delimiter is a way of packing data in the serial communication. It is designed to keep packets intact. USR-N5X0 provides two types of delimiter: Time Delimiter, Maximum Bytes Delimiter. Note that the following delimiters (time, length) when they are selected are programmed in the OR logic. Meaning that if any of the two conditions were met, the device would transmit the serial data in its buffer over the network.

Communication Expert of Indust	rial IoT			Be Honest Do Best ! ⊄⊄∣English
USR IOT         Communication Expert of Indust         > Status         > Network:         ✓ Port         Port3         Port4         Websocket to Serial         > Cloud Service         > System	UART TO ETH Data transmission parameter cont SETTING Port Socket Data bits Parity Stop bits Flow ctrl UART Packet Length	115200 8 None 1 NONE 0 0 0 ON V	(0-1460)bytes (0-255)ms	
	ii.	nan USR IOT Technology Lir	nited. http://www.pusr.com	

Fig.99 Data packing mechanism

Packet time: USR-N5X0 will transmit the serial data in its buffer when the specified time interval has reached and no more serial data comes in. The default value is calculated automatically based on the baud rate. If the automatic value results in chopped data, the timeout could be increased manually by specifying a larger value in the text box above. Note that the maximum interval is 255 milliseconds. This option is disabled by default. The optimal "Interval timeout" depends on the application, but it must be at least larger than one-character interval within the specified baud rate. For example, assuming that the serial port is set to 1200 bps, 8 data bits, 1 stop bit, and no parity. In this case, the total number of bits needed to send a character is 10 bits (included 1 start bit), and the time required to transfer one character is (10 (bits)/1200 (bits/s))\*1000 (ms/s) = 8.3 ms. Therefore, you should set the "Interval timeout" to be larger than 8.3 ms. Rounding 8.3 ms to the next integer would give you 9 ms. Which can be set as your interval timeout. Packet length: USR-N5X0 will transmit the serial data in its buffer when the specified length in the unit of bytes has reached. If you would like USR-N5X0 to queue the data until it reaches a specific length, the

#### Page 103 of 165



data length can be configured for 1 to 1460 bytes. If the data length (in bytes) matches the configured value, the data will be forced out. Set to 0 if you do not need to limit the length.

## 7.2 Heartbeat packet

Network heartbeat packet: The serial device server sends a heartbeat packet regularly to notify the server that it is active and maintains a normal network connection with the server. This function is only allowed when the working mode is UDP and TCP Client. Serial heartbeat packet: The serial device server notifies the serial device it is active via packet, and this packet can also be used to actively capture sensor data. Heartbeat packet only works in no data traffic in the setting direction. There are no data coming from serial port or internet in heartbeat interval.

ISR IOT ommunication Expert of Industrial IoT					Be Honest Do Be 中文
Status	UART TO ETH				
Status Network	Data transmission parameter con	figuration			
Port	SETTING				
Port1	Port Socket				
Port2	POR				
Port3	Baud rate	115200	(600-921600)bps		
Port4	Data bits	8	~ bit		
Websocket to Serial					
Gateway Cloud Service	Parity	None	~		
Lioud Service System	Stop bits	1	~		
ystem	Flow ctrl	XON/XOFF	~		
	UART Packet Length	0	(0~1460)bytes		
	UART Packet Time	0	(0~255)ms		
	Sync Baudrate(RFC2217)	ON	~		
	Enable Uart Heartbeat				
	Uart Heartbeat Packet	www.usr.cn			
		HEX 🗆 ASCII 🗹			
	Beat Time	30	(1~65535)s		
	Dear Inte	30	Save&Ap	aly	
		inan USR IOT Technol	ogy Limited. http://ww		

Fig.100 Serial heartbeat packets

Page 104 of 165



USR IOT Communication Expert of Industrial IoT		Be Honest Do Best! 中文   English
Status     Vaction     Network     IP Config     Port     Port     Port     Port     Port2     Port3     Port4     Websocket to Serial     Gateway     Cloud Service     System     Ports     System     Port     Port     Reconnection period     PRINT	Infiguration	
	Jinan USR IOT Technology Limited. http://www.pusr.com	Ŷ

Fig.101 Network heartbeat packets

## 7.3 Registration packet

This function is only allowed when the working mode is UDP and TCP Client. The content of the registration packet can be up to 40 bytes long. Users can choose to display this content in hexadecimal format or ASCII format. Once connected: The registration packet is only sent once when the network connection is established; Prefix of DATA: The registration packet is filled in front of the serial port data every time the serial port sends data to the network.

Page 105 of 165



Communication Expert of Industrial IoT		Be Honest Do Best! 中文 English
> Status	Data transmission parameter configuration	î
V Network	SETTING	
✓ Port Port1	Port Socket	_
Port2	SOCKET A	-
Port3	Working Mode TCP Client V None V	
Port4 Websocket to Serial	Remote Server Addr 192.168.0.201	
> Gateway	Local/Remote Port Number 9000 20108 (1–65535)	
> Cloud Service	Reconnection period 0 (0~99999)s	
> System	PRINT OFF ~	
	Modbus Poll CResponse Timeout 200 (10-9999)ms	
	Enable Net Heartbeat	
	Registration Packet Type User Defined v Location Once connecting v	
	User defined Packet User User User Cloud MAC address	
	SSL protocol Disable v None v	
	SOCKET 8	
	Operating Mode None ~	
	SavasKitredv	,
	Jinan USR IOT Technology Limited. http://www.pusr.com	

## Fig.102 Registration packet type

Communication Expert of Industrial IoT		Be Honest Do Best ! 中文∣English
> Status Data transmission parameter o	onfiguration	^
✓ Network SETTING		í – I
IP Config		· · · · · ·
✓ Port Port Socket		
Port1		2 C C C C C C C C C C C C C C C C C C C
Port2 SOCKET A		
Port3 Working Mode	TCP Client V None V	
Port4 Remote Server Add	192.168.0.201	
Websocket to Serial Local/Remote Port Numbe	9000 20108 (1~65535)	
> Gateway		
> Cloud Service Reconnection period	1 0 (0~99999)s	
> System PRINT	OFF v	
Modbus Pol	Response Timeout 200 (10~9999)ms	
Enable Net Heartbea		
Registration Packet Type	User Defined   Location Once connecting   Once connecting	
User defined Packe		
	HEX 🗆 ASCII 🗹	
SSL protoco	I Disable V None V	
SOCKET B		
Operating Mode	None ~	
	Save&Anniv	v
	Jinan USR IOT Technology Limited. http://www.pusr.com	

Fig.103 Registration packet method

Page 106 of 165



## 7.4 Socket B

Socket B supports TCP Client and UDP Client. Socket B and Socket A share the registration packet and heartbeat packet. When Socket B initiates a connection, it uses a random local port number to connect to the target server.

Communication Expert of Industrial IoT		Be Honest Do Bi 中文
<ul> <li>&gt; Status</li> <li>~ Network</li> </ul>	Port Sodet	
IP Config	SOCKET A	
✓ Port Port1	Working Mode TCP Client V None V	
Port2	Remote Server Addr 192.168.0.201	
Port3	Local/Remote Port Number 9000 20108 (1–65535)	
Port4	Reconnection period 0 (0-99999)s	
Websocket to Serial	PRINT OFF	
> Gateway	PRINT OPP 0	
> Cloud Service	Modbus Poll CResponse Timeout 200 (10~9999)ms	
> System	Enable Net Heartbeat	
	Registration Packet Type None v Location Once connecting v	
	SSL protocol Disable v None v	
	SOCKET B	
	Operating Mode TCPClient ~	
	Remote Server Addr UDPClient	
	I CP-Client	
	Remote Port No. 20105 (1~65535)	
	SanväßAppty	
	Jinan USR IOT Technology Limited. http://www.pusr.com	

Fig.104 Socket B operating mode

## 7.5 Rs485 bus detection

If RS485 bus is in the receiving state, N5X0 can not output data to serial port to achieve the 485 bus anti-conflict function. Idle time: the interval time when N5X0 is allowed to send data to RS485 bus after the receiver is idle. The value ranges from 0 to 65535 (ms). Default value: 10. This parameter is mandatory.

Page 107 of 165



Star LOT Communication Expert of Industrial IoT		Be Honest Do Best ! 中文 English
> Status System Setting		^
> Network		
> Port Model Name	USR-N540	
> Gateway Websocket Port	8080 (1~65535)	
Cloud Service     Websocket Direction	UART1 ~	
∽ System		
System Setting Webserver Port	80 (0~65535)	
Management User Name	admin	
Pass Word		
Uart Cache	OFF ~	
Restarting Without Data	0 (0/60-65535)s	
SNMP	OFF v 0	
Teinet	OFF v	
NTP	OFF v	
485 Anti-Collision	ON V	
485-idle Time	10 (0~2500)ms	
Log Export	Export	
	Save&Apply	
		v
jan ja	Jinan USR IOT Technology Limited. http://www.pusr.com	

Fig.105 RS485 bus detection

## 7.6 Serial Printer setting

Serial device servers transform any serial device into an Ethernet-capable device that can be used in a network. These servers allow serial devices such as a printer, control mechanisms or control systems to be used in a network without relying on the serial port of a computer for connectivity. This way, any serial device can be connected to the network and the internet and accessed from anywhere. Sharing a printer among coworkers in the same physical office can be implemented with a simple serial server that does not need to offer security or authorization capabilities. The serial device server, N5X0, features a Serial Printer option which functions in similar fashion to the Serial Printer option in the (COM) Ports dialog box. This option allows the associated TCP port to be identified as a serial printer connection. The connection does not consume a user license, is restricted to output only, and filters out the end-of-document marker correctly. In this case, IP address of USR-N5X0 is 172.16.14.12.

Page 108 of 165



USR IOT Communication Expert of Industrial IoT		Be Honest Do Best! 中文   English
<ul> <li>Status</li> <li>Status</li> <li>Network</li> <li>Port1</li> <li>Port2</li> <li>Port3</li> <li>Port4</li> <li>Websocket to Serial</li> <li>Gateway</li> <li>Cloud Service</li> <li>System</li> </ul>	UART TO ETH         Data transmission parameter configuration         SETTINS         Port       Socket         Socket A         Working Mode       Image: Compare the set of	
	Jinan USR IOT Technology Limited. http://www.pusr.com	

### Fig.106 Serial printer option

Soon Brother DCP-7180DN Printer (扫描)				Welcome to the Add Standard TCP/IP Printer Port Wizard
rint to the following port(s). Documents will print to the first free hecked port.	Printer Ports		×	This wizard helps you add a port for a network printer.
Port         Description         Printer           COM9         Serial Port			nnel	Before continuing be sure that: 1. The device is turned on. 2. The network is connected and configured.
Add Port 1 Delete Port Configure Po	t	2		To continue, click Next.

### Fig.107 Serial Printer setting wizard

Page 109 of 165



Add Standard TCP/IP Printer Port Wiza	rd	10000
Add port For which device do you want to ad	dd a port?	
Enter the Printer Name or IP ad	dress, and a port name for the desired device.	
Printer Name or IP <u>A</u> ddress:	172.16.14.12	
Port Name:	172.16.14.12	
	< <u>B</u> ack <u>N</u> ext >	Cancel

Fig.108 Serial printer setting wizard 1

Page 110 of 165

ditional port information required The device could not be identified.	
The device could not be identified.	
e device is not found on the network. Be sure that:	
The device is turned on.	
The network is connected.	
The device is properly configured.	
The address on the previous page is correct.	
you think the address is not correct, click Back to return to the previous page. Then corr	
dress and perform another search on the network. If you are sure the address is correct vice type below.	t, select t
Device Type	
	-
© Standard Generic Network Card	<u> </u>
C Custom Settings	

GRDTek

Fig.109 Serial printer setting wizard 1

Page 111 of 165



Add Standard TCP/IP Printer Po	Ort Wizard Completing the Add Standard TCP/IP Printer Port Wizard You have selected a port with the following characteristics.		
	SNMP: Protocol: Device: Port Name: Adapter Type:	No RAW, Port 9100 172.16.14.12 172.16.14.12 Generic Network Card	
	To complete this wiz	zard, click Finish.	

Fig.110 Serial printer setting wizard 1

### 7.7 NTP

If device is connected to the internet or to a local NTP server, the Date/time can be set automatically by enable NTP function. If this option is chosen, the default value "cn.ntp.org.cn" should be shown in the NTP server field. User can select a proper Time Zone from the dropdown box. If the N5X0 device is connected to the Internet and should connect to other servers over the Internet to get NTP server, you will need to configure the DNS server in order to be able to resolve the host name of the NTP server.



USR 10T Communication Expert of Industrial IoT	Be Honest Do Best ! ⊕⊉ jogiù
> Status	^ ^
Network     Model Name     Port	USR-N540
> Gateway Websocket Port	8080 (1~65535)
Cloud Service Websocket Direction	UART1 ~
✓ System Webserver Port	80 (0-65535)
System Setting Management User Name	admin
Pass Word	
Uart Cache	OFF v
Restarting Without Data	0 (0/60–65535)s
SNMP	OFF 🗸 🖉
Telnet	0FF • • •
NTP	0N • 0
NTP Server Address	cn.ntp.org.cn
NTP Timezone Setting	UTC+8 v
485 Anti-Collision	OFF 🗸 💿
Log Export	Export
	Save&Apply
	Jinan USR IOT Technology Limited. http://www.pusr.com

Fig.111 NTP settings

#### **7.8 SNMP**

The Simple Network Management Protocol (SNMP) is used by network management software to monitor devices in a network, to retrieve network status information of the devices, and to configure network parameters of the devices. To make the device's information available for public viewing/editing, you can enable the SNMP function by checking the Enable box. The supported SNMP Version:v1/v2c.The default SNMP Community Strings (or passphrases) is "admin".

Page 113 of 165



USR 10T Communication Expert of Industrial IoT		Be Honest Do Best! 中文∣English
Status     SYSTEM SETTING     Set System Parametes     Gateway.     Cloud Service     System Setting		- -
System     System Setting     Model Name	USRA640	-
Management Websocket Port	8680 (1-65535)	
Websocket Direction Webserver Port	UART1 ~ 80 (0-65535)	
User Name	admin	
Pass Word Uart Cache	₩₩ # OFF •	
Restarting Without Data SNMP	0 (0/60-65535)*	
Teinet	OFF · · · ·	
NTP 485 Anti-Collision		
Log Export	Egent	

## Fig.112 Enable SNMP agent

## Table 24 PUSR OLD List

Item	OID	
IP address	.1.3.6.1.2.1.4.20.1.1.172.16.14.12	
Subnet mask	.1.3.6.1.2.1.4.20.1.1.172.16.14.12	
Preferred DNS	.1.3.6.1.2.1.12.5.0	
Alternate DNS	.1.3.6.1.2.1.12.6.0	
Gateway	.1.3.6.1.2.1.4.21.1.1.172.16.14.12	
Running time	.1.3.6.1.2.1.1.3.0	
Port1	.1.3.6.1.2.1.13.1.0	
Port2	.1.3.6.1.2.1.13.2.0	
	•••	
Port8	.1.3.6.1.2.1.13.8.0	
Firmware version	.1.3.6.1.2.1.12.1.0	
Hardware version	.1.3.6.1.2.1.12.2.0	

#### Page 114 of 165



Paessler SNMP Test	er - 20.2.4	×
Eile Help		
1. Set SNMP Settin	gs	3. Run Test
Local IP:	172.16.14.15	Start T Repeat every 5 24 seconds
Device IP/Port:	172.16.14.12 161 16 v4 C v6	
SNMP Version:	SIMP v2c ·	Paesiar SVMP Tester - 30.2 4. Computername: USR-GAPIC-MAD Interface: 172.36.14.15 2022/7721 187:23 (149) 1 0 1 0 1 1 1 7 1 1 5 1.6.14.12
Community:	admin	3022/1721 315-52:26 (3) and ): 5040-1/2 0222/1721 315-52:26 (4) +ea): Sominier foots
Authentications	C MDS C SHA	Scanning Standard Interfaces 02/21/27 JSS2 Part Scan: Start Scan
Plazaword	*****	2022/772 IIIS5228 Hotel: 172.16.14.12 2022/772 IIIS5228 Community: admin
Excryption:	IF DES C AES	02/27/12 18:522 85/04 / Vesion: V1 02/27/27 18:522 85/04 / Vesion: V1
v3 Encryption Key:		002/7/72 INSE28 Foreks2: No 2027/72 INSE28 Solve (bet No
Context:		2022/727 18-52:36 GPT[ODIVa]E 1.3.6.1.2.1.1.0 D222/727 18-52: 66 GPT[ODIVa]E 1.3.6.1.2.1.1.0
Timeout:	2 24	3022/7/27 3552:28 Dokequet() 0) Infl Session 2022/7/27 3552:28 Dokequet() 0) Infl Session 2022/7/27 355:28 Dokequet() 0) Infl Session (Sen Original Control (Sen Original Contro
Advanced Settings		022//72 18:52:20 Bolepart () Session Open () Session () Sensi ()
Force 32-bi	☐ "Slow" Tweak	2022/77 18-15-20 Bolkepart () estion: fierd Dras 2022/77 18-15-20 Bolkepart () estion: fierd Dras
F Single Get	☐ Signed ☐ Use GetNext	2022/7/27 18:52:28 DaRequett 0) SynchResponse/74260837 Done: Status=0
Hide SNMP Dataty	pe from Walk	2022/727 ISS.22 Dokesaref (0) Ampooref (0) A
Read As:	String .	022/7/2 35:52:6 @T[OD09i]: 1.5.1.2.1.2.10 0227/27 35:52:8 @T[OD09i]: 1.7.1
		022/7/27 18:52:28 Deskepate(1) for these Texts. 14:15:61. Treneout: 2000000, Version: 2
2. Select Request T	Abs	022/7/23 18:12:18 DeRequet () Section Gen 022/7/23 18:12:10 DeRequet () Section Sectio
C Read Device Uptim	e	2022/07 18:22:00 (Head of Carlos and Carlos
C 32-bit Traffic Coun	1.5	2027/72 18:52:8 Defease() Spindhespore(?H8076) Zone: Stata=0 2027/72 18:52:8 Defease() Spindhespore(?H8076) Zone: Stata=0
C 64-bit Traffic Coun	iter: 1 2	2027/77 INS-228 GET[5] (59): 13.6.1.2.1.2.1.0 2027/77 INS-228 ETE(54): 13.6.1.2.1.2.1.0
Scan Interfaces		2022/77 15:52:20 GET NET' 1.55.1.2.1.1.1.1.6 2022/77 15:52:20 GET NET' 1.55.1.2.1.1.1.1.6
C Custom OED:	.1.3.6.1.2.1.12.1.0	2022/17/21 18-12:28 Dedeesated [0] HT is that 7.12.54 [1] Tensor: 2000000, Version: 2
	.1.3.6.1.2.1.13.1.0	2022/77/19:528 Deebaard 0 Seturn Seture (August 2000) (Health 2000) (Hea
C Scan OIDLIB:	<u>i</u>	
C Scan Script:	<u>2</u>	022/7/73 18:15:28 DoRequet[ 0] Syndregorener[245]049[ start 2027/73 18:15:28 DoRequet[ 0] Syndregorener[245]049[ start
C Multiget Test:	1 24	2022/72/18/52/28 064espet(0).Response(0) *#*(16X).UNPSRA11.3.6.1.2.1.3.1.1.1.6[1.3.6.1.2.1.3.1.1.1.6]
		2022/72/18:55:28 (Holt In Vol available 2022/72/18:55:28 (Filter II.16:1.1.1.2.1.1.2
		2022/72 18:5228 GET BULKTODIVel(1:1.3.6.1.2.1.2.2.1.2 2022/72 18:5228 Defecue(1) (1) In it Session
		2022/7/27 18:52:28 DoRequest 0 Int: Host: 172.16.14.12:161. Timeout: 200000. Version: 2
		3022/1/17 III:51:28 Dollequett () Elemion: Open 3022/1/17 III:51:28 Dollequett () Elemion: Sard Request 3022/27/17 IS:25:28 Dollequett () Elemion: Sard Doll
		2022/727 18-532 Brokesut 0) Synthegeone (246076) Start 2022/727 18-532 Brokesut 0) Synthegeone (246076) Done (341a-0
		022/77 18:52:8 Defequent() #spore() # "0" [Ast_LAUSES] 13:6.12.12.2.12[13:6.12.12.2.12] 222/77 18:52:8 Defequent() Ast_LAUSES] 13:6.12.12.2.12[13:6.12.12.2.12]
		2022/7/27 18:52:28 Description: e0
		022/727 J855287 Edition; 2022/727 J85528 edit(D0xva)[1.1.5.6.1.2.1.2.2.1.10.1
		2022/727 18:55:20 GET[CD1094]; fry 1 2022/727 18:55:20 GET[CD1094]; fry 1
		2022/7/27 18/52:28 DoReguest [0] Init: Host: 172.16.14.12:161, Timeout: 2000000, Version: 2
		Silve Log to File Clear Log
		IT Log Raw Packets (not for Scan Interfaces and Walk)

Fig.113 SNMP test

# 8. MQTT gateway

Although the MQTT protocol has been around for nearly three decades, the design of the protocol makes it ideal for IIoT (Industrial Internet of Things) applications, the latest trend in automation engineering. This is particularly true for applications that stress "active notification," in which devices provide data only when needed, as opposed to "passive notification," in which devices are polled at regular intervals. MQTT's broker/client design eliminates the need for all devices in the system to be online at the same time. The clients (i.e., "devices" or "things") communicate directly with the broker, which plays the role of middleman to pass messages back and forth between clients.

### 8.1 Basic settings

When configuring the Broker information, Client ID, Host, and Port are already filled in by default. You can also modify it by yourself based on the actual Broker information. We will use Free Public MQTT Server provided by EMQX Cloud as the MQTT server address for quick testing.



SR IOT mmunication Expert of Industrial IoT		
Status	MQTT Gateway	
Network Port	MQIT Gateway function supports SSL, clean session and QOS, supports connecting to the third-party MQIT servecit supports up to 16 publish supports port mapping function, which can bind each topic to a different serial port.	i topics and 16 subscribe topics,
ateway QTT Gateway	Basic configuration Publish Subscribe	
dge Computing	Enable MQTT Enable ~	
loud Service ISR Cloud	MQTT Version MQTT-3.1.1 ~	
ibaba Cloud VS IoT	Client ID d664f1e143664ec29ed7aa8e3b8	
tem	Server Address (IP)         broker empc.lo           Local/Remote Port NO.         18899         (0~65535)         1883         (1~65535)	
	Keepalvie Interval 60 (0-65535)s	
	Reconnecting time Without Data 0 (0-65535)s	
	Reconnection Interval 10 (1-65535)s Clean up session	
	User Credentials	
	Enable last will	
	SSL protocol Disable ~ None ~	
	Save&Apply	

#### Fig.114 MQTT broker setting

If your broker has enabled user authentication, you can fill in the information of Username and Password in the configuration item.

Sommunication Expert of Industrial IoT		Be Honest Do Best ! 中文 English
Status     Network     Publis     Port	h Subscribe	_
Cateway MQTT Gateway MQTT Gateway	Enable v MQTT-3.1.1 v	i
Edge Computing Client ID Cloud Service Server Address (IP)	4664419143666ec239a67 aale 300 brokar enegc is	
USR Cloud Local/Remote Port NO. Alibaba Cloud AWS IoT Keepalvie Interval	18899 (0-65535) 1883 (1-65535) 60 (0-65535)s	
> System Reconnecting time Without Data	0 (0-65535)s 10 (1-65535)s	
Clean up session User Credentials		
Username Password	emqx_name 123456	
Enable last will SSL protocol	Diable V None V	
	SweitApply	
л	inan USR IOT Technology Limited. http://www.pusr.com	v

Fig.115 User Credential

Page 116 of 165



When you need to enable SSL/TLS authentication, you need to set the SSL/TLS configuration item. The two versions,TLS 1.0 and TLS 1.2 are provided. If SSL/TLS is selected, certificate configuration can be performed. If it is a one-way connection, you only need to select your CA File. If it is a two-way authentication, you also need to select to configure Client Certificate File and Client key file. Click the choose file button on the far right to select the certificates you have generated.

- Uploads a Certificate Authority (CA) file. A Certificate Authority (CA) is an entity that issues digital certificates. A digital certificate certifies the ownership of a public key by the named subject of the certificate.
- Uploads a client certificate (cert) file. A certificate file is a type of digital certificate that is used by client systems to make authenticated requests to a remote server.

USR IOT Communication Expert of Industrial IoT			Be Honest Do Best! 中文   English
> Status	Client ID	d6d4f1e143664ec29ad7aa8e3b8	
> Network	Server Address (IP)	broker.emqx.io	
> Port	Local/Remote Port NO.	18899 (0~65535) 1883 (1~65535)	
✓ Gateway			
MQTT Gateway	Keepalvie Interval	60 (0~65535)s	
Edge Computing	Reconnecting time Without Data	0 (0~65535)s	
✓ Cloud Service	Reconnection Interval	10 (1~65535)s	
USR Cloud	Clean up session		
Alibaba Cloud			
AWS IOT	User Credentials		
> System	Username	emqx_name	
	Password	123456	
	Enable last will		
	SSL protocol	TLS1.2 Verify All	
	Upload Server CA	Server Root CA Choose file Upload	
		Uploaded certificate: null	
	Upload Client CA	Client CA	
		Uploaded certificate: null	
	Upload Client Private Key	Client Private Key Choose file Upload Uploaded certificate: null	
		Save&Apply	
		inan USR 10T Technology Limited. http://www.pusr.com	

• Uploads a private key file.

You can configure KeepAlive, Clean Session, Auto Reconnect, MQTT Version, etc



の Granuarication Expert of Industrial IoT		Be Honest Do Best! 中文   English
MQTT Gateway		^
> Status MQTT Gateway function	pports SSL, clean session and QOS, supports connecting to the third-party MQTT server. It supports up to 16 publish topics and 16 subscribe topics,	
> Network supports port mapping f	nction, which can bind each topic to a different serial port.	
> Port		
✓ Gateway Basic configuration	Publish Subscribe	_
MQTT Gateway		
Edge Computing Enable	IQTT Enable ~	
✓ Cloud Service MQTT \	rsion MQTT-3.1.1 V	
USR Cloud	nt ID d6d4f1e143664ec29ad7aa8e3b8	
Alibaba Cloud	nt ID db0411e143bb4ec29a0/aa8e308	
AWS IoT Server Addr	s (IP) broker.emqx.lo	
> System Local/Remote Po	NO. 18899 (0~65535) 1883 (1~65535)	
Keepalvie I	erval 60 (0~65535)s	
Reconnecting time Without	Data 0 (0~65535)s	
Reconnection I	erval 10 (1~65535)s	
Clean up s	ssion	
User Cred	thats	
Enable I	t will	
SSL pr	tocol Disable ~ None ~	
	Save&Apply	
	our court ppy	
	Jinan USR IOT Technology Limited. http://www.pusr.com	V

**Fig.117 Advanced configuration** 

You can configure the Will Message. The values of Last-Will-QoS and Last-Will-Retain are filled with 0 and False by default. When you enter the values of Last-Will-Topic and Last-Will-Payload, you can complete the configuration of Will Message.

Communication Expert of Industri	ial toT		Be Honest Do Best ! ⊄≎[logida
> Status	Enable MQTT	Enable ~	A
> Network	MQTT Version	MQTT-3.1.1 ~	
> Port	Client ID	d6d4f1e143664ec29ad7aa8e3b8	
✓ Gateway	Server Address (IP)	broker.emgx.io	
MQTT Gateway			
Edge Computing <ul> <li>Cloud Service</li> </ul>	Local/Remote Port NO.	18899 (0~65535) 1883	(1~65535)
USR Cloud	Keepalvie Interval	60 (0~65535)s	
Alibaba Cloud	Reconnecting time Without Data	0 (0~65535)s	
AWS IoT	Reconnection Interval	10 (1~65535)s	
> System	Clean up session		
	User Credentials		
	Enable last will		
	Topic of will	hvill	
	Will Message	offine	
	QOS	QOS0 ~	
	Retained	0	
	SSL protocol	Disable ~	None
			Save&Apply
		inan USR IOT Technology Lin	nited. http://www.pusr.com
	4	nan osk for fermiology rif	meet mappinentparton

Page 118 of 165



### Fig.118 Last will message

After finishing configuring the basic settings, please scroll down to the bottom of the page and click on "Save & Apply" button to save all the changes that you have made. All configurations take effect after a system reboot. In this case we only finish the follow parameters setting.

USR IOT Communication Expert of Industrial IoT		Be Honest Do Best! 中文   English
MQTT Gateway		^
	orts SSL, clean session and QOS, supports connecting to the third-party MQTT server. It supports up to 16 publish topics and 16 subscribe topics,	
	on, which can bind each topic to a different serial port.	
> Port		
	blish Subscribe	
MQTT Gateway		
Edge Computing Enable MC	T Enable ~	
Cloud Service     MQTT Versi	m MQTT-3.1.1 ~	
USR Cloud Client	D d6d4f1e143664ec29ad7aa8e3b8	
Alībaba Cloud		
AWS IOT Server Address (	P) broker.emqx.ia	
> System Local/Remote Port N	D. 18899 (0~65535) 1883 (1~65535)	
Keepalvie Inter	al 60 (0-65535)s	
Reconnecting time Without D	ta 0 (0-65535)s	
Reconnection Inter	al 10 (1~65535)s	
Clean up sessi	vn 🗌	
User Credenti	ls 🗌	
Enable last v		
SSL proto	ol Disable ~ None ~	
	Save&Apply	
		9
	Jinan USR IOT Technology Limited. http://www.pusr.com	

Fig.119 EMQX broker connection

To view the status of the device, choose Status>Overview, the device is in the CONNECTED state, the connection to IoT Hub is successful, and publishing and subscribing operations can be performed.

Page 119 of 165



SR IOT ommunication Expert of Industrial IoT			Be Honest Do Best ⊄⊄∣Engl
	Network		
Status	MAC Address	F4-70-0C-60-E2-CD	
Overview	Current IP Address	172.16.14.12	
Network	Preferred DNS Server	192.168.0.1	
Port Gateway	Alternate DNS Server	223.5.5	
MQTT Gateway	Port		
Edge Computing	Status of Port	Port1 ~	
Cloud Service System	Conn Status A(ETH)	LISTEN	
System	TX Count A(ETH)	0 bytes	
	RX Count A(ETH)	0 bytes	
	Conn Status B(ETH)	IDLE	
	TX Count B(ETH)	0 bytes	
	RX Count B(ETH)	0 bytes	
	MQTT Gateway		
	Enable MQTT	ENABLE	
	Conn Status MQTT	CONNECTED	
	Edge Computing		
	Enable Edge Computing	DISABLE	
	tions II	SR IOT Technology Limited. http://www.pusr.com	

### Fig.120 MQTT connection status

#### 8.2 Publishing a message

#### 8.2.1 MQTT.fx tool introduction

MQTT.fx is a mainstream MQTT desktop client. Compatible with Windows, macOS, and Linux, it can quickly verify whether it is possible to connect to IoT Hub and publish or subscribe to messages. MQTT.fx in this article refers to version 1.7.1 without special instructions. The main page is shown in the figure below. The top part is the MQTT Broker connection address bar and its connection configuration. The following function Tabs include Publish column, Subscribe column, Scripts column, Broker Status column, Log column for log information control.



😨 MQTT.fx - 1.7.1	– 🗆 X
File Extras Help	
EMQX  Connect Disconnect	•
Publish Subscribe Scripts Broker Status Log	
>> /testTopic/1   Publish	QoS0 QoS1 QoS2 Retained Cov

#### Fig.121 MQTT.fx main page

First, the MQTT client and Broker need to establish a connection to communicate. Click the configuration icon on the right side of the input box in the connection address bar to enter the specific connection configuration. Select the Profile Type as MQTTBroker. Fill in broker.emqx.io for Broker Address and 1883 for Broker Port, as shown in the figure below.

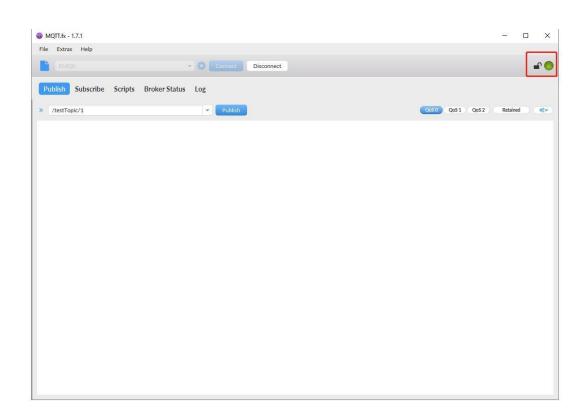
Page 121 of 165

3	EMQX	Connect Disconnect		
Pub	Edit Connection Profiles			- 0 ×
	AWSIOT			
	EMQX M2M Eclipse	Profile Name	EMQX	
	New Profile	Profile Type	MQTT Broker	
	Thingsboard		(3)	
	cloudmatt	MQTT Broker Profile Settings	U U	
	mqtt onenet connect	Broker Address	broker.emqx.io	
		Broker Port	1883	
		Client ID	8045a78e6f4b49c59160b6c52ec95444	Generate
		Keep Alive Interval Clean Session Auto Reconnect Maxi Inflight MQTT Version	<ul> <li>✓</li> </ul>	
			Clear Subscription History	

GADTek

**Fig.122** Connection Profiles

Click OK to confirm the configuration, return to the main interface, and click Connect. It can be seen that the indicator on the right side turns to green, indicating that the current connection is successful, as shown in the following figure.



#### Fig.123 Successful connection

#### 8.2.2 Transparent transmission

GAOTek

In the Publish field, select Publish topic1, enter the topic, bind to the Port1, select Qos 0, uncheck retained message. We use the /PubTopic1 as an example to describe the process. After finishing configuring the Publish topic1, please scroll down to the bottom of the page and click on "Save & Apply" button to save all the changes that you have made. All configurations take effect after a system reboot.

Page 123 of 165



USR IOT Communication Expert of Industrial IoT		Be Honest Do Best! 中文 English
	tion supports SSL, clean session and QOS, supports connecting to the third-party MQTT servecit supports up to 16 publish topics and 16 subscribe to ing function, which can bind each topic to a different serial port.	pics,
MQTT Gateway Basic configuration Edge Computing	Publish Subscribe	
Cloud Service     Cu     System	stom mode Disable ~ @	
	Transmission Mode Transparent transmission C	
	Binding port  Part 1,  Part 1  Part 2  Part 3  Part 4  Part 4	
	QOS QOS8 v	
Pu	Sinna Apply	
	Jinan USR IOT Technology Limited. http://www.pusr.com	

### Fig.124 Add publish topic

Click to enter the Subscribe Tab to enter /PubTopic1 in the topic box. Then, select a QoS level, click the Subscribe button, and the list of subscribed topics will appear on the left. The current number of subscribed topics is 0, as shown in the following figure:

Page 124 of 165

WQTT.fx - 1.7.1		- 0
File Extras Help		
EMQX	Connect Disconnect	
Publish Subscribe Scri	pts Broker <mark>S</mark> tatus Log	
/PubTopic1	Subscribe	QoS0 QoS1 QoS2 Autoscroll
/PubTopic1	Ump Messages Mute Unsubscribe	
Topics Collector (0)	Scan Stop (a)*	
Topics Collector (0)	Scan Stop of	DUB Retained
Topics Collector (0)	Scan Stop @(+)	DUB Retaine
Topics Collector (0)	Scan Stop @	(DUB) (Retaine
Topics Collector (0)	San Stop of	DUB Retaine
Topics Collector (0)	Scan Stop O(*	DUB Retaine
Topics Collector (0)	Scan Stop of *	(DUB) (Retaine

GADTek

## Fig.125 Subscribe to the N5X0 topic

Launch serial debug assistant on PC, and open COM port with the N5X0's serial default settings as below:

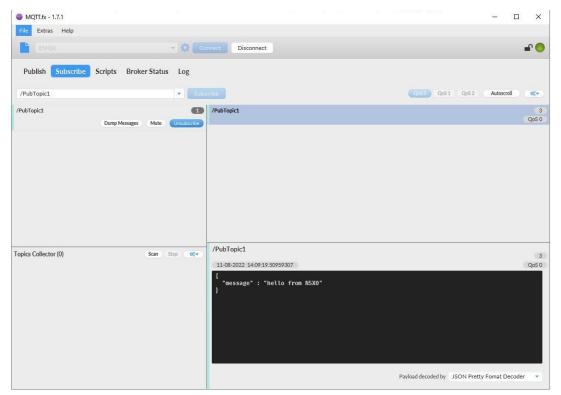
Page 125 of 165



COM3,115200,None,8,One - Serial Debug Assistant	×
🗚 🗗 ? 😅	<u>ي</u>
Serial Port : COM3 Baud Rate : 115200 Data Bits : Parity : None Close serial port Close serial p	
Send settings. Send a file Extension cmd HEX Send Sending scripts A ADD8 ("message": "hello from N5X0") Timing send 1.0 sec Q	
Line break Idn (CRLD Send : 87 Rece	ive : 0 Reset count

#### Fig.126 Serial debug assistant setting

Click send button. On the MQTT.fx page, you will receive a message from the cloud that was sent from the N5X0. For Payload decoded by select "JSON Pretty Format Decoder" to show the message. Fig.127 Receive message from N5X0



#### Page 126 of 165



### 8.2.3 Topic distribution

In the Publish field, select Publish topic2, enter the topic, topic name, bind to the Port1, select Qos 0, uncheck retained message. We use the /PubTopic2 as an example to describe the process. After finishing configuring the Publish topic2, please scroll down to the bottom of the page and click on "Save & Apply" button to save all the changes that you have made. All configurations take effect after a system reboot.

USR IOT Communication Expert of Industri	loT		
✓ Status	Basic configuration Publish Subscribe		
Overview			
✓ Network	Custom mode Disable	~ 0	
IP Config	Publish topic1 🔽		
> Port			
∽ Gateway	Transmission Mode	Transparent transmission	~ @
MQTT Gateway	Topic String	/PubTopic1	
Edge Computing	Binding port	Port 1,	
<ul> <li>Cloud Service</li> </ul>	QOS		~
USR Cloud			
Alibaba Cloud	Retained message		
AWS IoT	Publish topic2		
> System			
	Transmission Mode	Topic distribution	~ @
	Topic String	/PubTopic2	
	Topic name	test	
	Binding port	Port 1,	
	QOS		~
	Retained message		
	Publish topic3		
	Jinan USR IOT Te	echnology Limited.	ttp://www

### Fig.128 Topic distribution mode

Click to enter the Subscribe Tab to enter /PubTopic2 in the topic box. Then, select a QoS level, click the Subscribe button, and the list of subscribed topics will appear on the left. The current number of subscribed topics is 0, as shown in the following figure:

Page 127 of 165

MQTT.fx - 1.7.1		- 0
File Extras Help		
EMQX	- 🎆 Connect Disconnect	-
Publish Subscribe Script	ts Broker Status Log	
/PubTopic2	Subscribe	QoSD QoS1 QoS2 Autoscroll
/PubTopic1	mp Messages Mute Unsubscribe	
/PubTopic2 Dur	0 mp Messages Mute Unsubscribe	
opics Collector (0)	Scan Stop COv	
opics Collector (0)	Scan Stop 00×	
opics Collector (0)	Scan Stop Cox	
opics Collector (0)	Scan Stop @v	
opics Collector (0)	Scan Stop OC+	

GADTek

## Fig.129 Subscribe to the N5X0 topic

Launch serial debug assistant on PC, and open COM port with the N5X0's serial default settings as below:

		1000	
🗚 🗹 ? 😅			
Serial Port : 🕄 COM3 🗸			
Baud Rate : 🦼 115200 🗸			
Data Bits : 8 🗸			
Parity : 🚺 None 🗸			
Stop Bits : One 💛			
Close serial port			
Receiving settings. Receive and save to file			
HEX display			
Pause receiving display			
Auto break frame ? 20			
Receive scripts 🔊 Add Timesta 🗸			
Save data Empty data			
Save data Empty data			
Send settings.			
Send settings.	test,{"message":"hello from N5X0"}		
Send settings. Send a file HEX Send	test,{"message":"hello from N5X0"}		

GADTek

Enter the correct serial data format test, {"message":"hello from N5X0"}, Click send button. On the MQTT.fx page, you will receive a message from the cloud that was sent from the N5X0.

MQTT.fx - 1.7.1					
File Extras Help					
EMQX		• •	Disconnect		•
Publish Subscr	ribe Scripts Broker S	Status Log			
/PubTopic2		Sub:	scribe	QoSU QoS1 QoS2 Autoscroll	
/PubTopic1		2	/PubTopic1		6
	Dump Messages	Mute Unsubscribe	/PubTopic1		
/PubTopic2	Dump Messages	Mute Unsubscribe			0
	Dunip Messages	Mute	/PubTopic2		
Topics Collector (0)	S	Scan Stop o3.∞	/PubTopic2		
Topics Collector (0)	S	ican Stop o\$▼	11-08-2022 14:46:11.53171819		6
Topics Collector (0)	S	ican Stop o§▼			0
Topics Collector (0)	S	ican Stop 😋	11-08-2022 14:46:11.53171819		6
Topics Collector (0)	S	īcan Stop <b>oč</b> ≁	11-08-2022 14:46:11.53171819		0
Topics Collector (0)	2	Scan Stop otvr	11-08-2022 14:46:11.53171819		0
Topics Collector (0)	2	Scan Stop o≬v	11-08-2022 14:46:11.53171819		¢

Fig.131 Receive message from N5X0

#### 8.2.4 Custom node

GADTek

In the Publish field, select Custom mode, bind to the Port1. Click on "Save & Apply" button to save all the changes that you have made. All configurations take effect after a system reboot.



貁	USR IOT Communication Expert of Industri	ныт	ie Honest Do Best! 中文∣English
3	Communication Equat of Industri Status Network Port Gateway MQTT Gateway Edge Computing Cloud Service System	MQTT Gateway       MQTT Gateway         MQTT Gateway       Lean assion and QOS, supports connecting to the third-party MQTT served: supports up to 16 publish toptca and 16 subscribe toptca, supports connecting to the third-party MQTT served: supports up to 16 publish toptca and 16 subscribe toptca, supports connecting to the third-party MQTT served: supports up to 16 publish toptca and 16 subscribe toptca, supports connecting to the third-party MQTT served: supports up to 16 publish toptca and 16 subscribe toptca, supports connecting to the third-party MQTT served: supports up to 16 publish toptca and 16 subscribe toptca, supports connecting to the third-party MQTT served: supports up to 16 publish toptca and 16 subscribe toptca, supports connecting to the third-party MQTT served: supports up to 16 publish toptca and 16 subscribe toptca, supports connecting to 16 publish toptca and 16 subscribe toptca, supports connecting to 16 publish toptca and 16 subscribe toptca, supports connecting to 16 publish toptca and 16 subscribe toptca, supports connecting to 16 publish toptca and 16 subscribe toptca, supports connecting to 16 publish toptca and 16 subscribe toptca, supports connecting to 16 publish toptca and 16 subscribe toptca, supports connecting to 16 publish toptca and 16 subscribe toptca, support and 16 subscribe toptca, support and 16 subscribe toptca, support and 16 support and 16 subscribe toptca, support and 16 support and 16 subscribe toptca, support and 16 suport and 16 sup	
		Jinan USR IOT Technology Limited. http://www.pusr.com	

#### Fig.132 Custom node

Click to enter the Subscribe Tab to enter /PubTopic3 in the topic box. Then, select a QoS level, click the Subscribe button, and the list of subscribed topics will appear on the left. The current number of subscribed topics is 0, as shown in the following figure:

Page 131 of 165

WQTT.fx - 1.7.1					- 0
File Extras Help					
EMQX		👻 🏟 Conne	ct Disconnect		
Publish Subscribe	Scripts Broker Sta	tus Log			
/PubTopic3		👻 Subscrib	ie -	Q050 Q051 C	QoS 2 Autoscroll
/PubTopic1			PubTopic1		
/PubTopic2	Dump Messages Mut		PubTopic1		
/PubTopic3	Dump Messages Mut	e Unsubscribe /	PubTopic2		
	Dump Messages Mut	e Unsubscribe			
Topics Collector (0)	Scan	Stop OS-			

**GRO Tek** 

### Fig.133 Subscribe to the N5X0 topic

Launch serial debug assistant on PC, and open COM Port with the N5X0's serial default settings as below:

Page 132 of 165

🗚 🗠 ? 😳	<b>*</b>			Ę
Baud Rate : 🤳 🗌	COM3 ~ 115200 ~ 8 ~ None ~			
Stop Bits :	One 🗸			
Close serial p	port			
Save data				
Send settings.	Extension cmd			
HEX Send	ADD8 V	<pre>/PubTopic3,0,ON,{"message":"hello from N5X0"}</pre>		

GADTek

Enter the correct serial data format /PubTopic3,0,ON,{"message":"hello from N5X0"},Click send button. On the MQTT.fx page, you will receive a message from the cloud that was sent from the N5X0.

MQTT.fx - 1.7.1				<u>1000</u>
File Extras Help				
EMQX		• 🔅 🖸	Disconnect	
Publish Subscrib	e Scripts Broker Stat	us Log		
/PubTopic3		👻 Subs	cribe	Qo51 Qo51 Qo52 Autoscroll
/PubTopic1		2	/PubTopic1	
/PubTopic2	Dump Messages Mute	Unsubscribe	/PubTopic1	
	Dump Messages Mute	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	/PubTopic2	
/PubTopic3	Dump Messages Mute	Unsubscribe	/РиbТоріс3	
		, i	/PubTopic3	
Topics Collector (0)	Scan	Stop OS-	11-08-2022 15:08:04.54484701	
			{"message":"hello from N5X0"}	
		l		J

Fig.135 Receive message from N5X0

### 8.3 Subscribe to a topic

GADTe

In the Subscribe field, select Subscribe topic1, enter the topic, bind to the Port1, select Qos 0. We use the /SubTopic1 as an example to describe the process. After finishing configuring the Subscribe topic1, please scroll down to the bottom of the page and click on "Save & Apply" button to save all the changes that you have made. All configurations take effect after a system reboot.



Communication Expert of Industrial IoT		Be Honest Do Best! 中文   English
	MQTT Gateway	^
✓ Status Overview	MQTT Gateway function supports SSL, clean session and QOS, supports connecting to the third-party MQTT server. It supports up to 16 publish topics and 16 subscribe to	pics,
<ul> <li>Vetwork</li> </ul>	supports port mapping function, which can bind each topic to a different serial port.	
IP Config		
> Port	Basic configuration Publish Subscribe	_
✓ Gateway	Subscribe topic1 🛛	
MQTT Gateway		
Edge Computing	Transmission Mode Without Topic	
✓ Cloud Service	Topic String /SubTapic1	
USR Cloud	Binding port Port 1,	
Alibaba Cloud		
AWS IoT	QOS QOSI ~	
> System	Subscribe topic2 🛛 🖂	
	Transmission Mode With Topic	
	Topic String /SubTopic2	
	Delimiter .	
	Binding port Part 1,	
	Q05 Q050 ~	
	Subscribe topic3	
	Save UCR FOT Taskes Loss Links of the Annual Save Annual	
	Jinan USR IOT Technology Limited. http://www.pusr.com	

### Fig.136 Add subscribe topic

Click to enter the Publish Tab to enter /SubTopic1 in the topic box, and enter the message of "hello world" in the message input box, select a QoS level, and click Publish to publish the message, as shown in the following figure:



MQTT.fx - 1.7.1				×
File Extras Help				
EMQX	• 🔅 Connect Di	isconnect		•••
Publish Subscribe Scrip	pts Broker Status Log			
> /SubTopic1	▼ Publish		QoS0 QoS1 QoS2 Retained	(0)v
("message":"hello")				

### Fig.137 Publish message to N5X0

Click Publish to send the messages and return to the serial debug assistant. We can find that the serial port has received the message, as shown in the following figure:

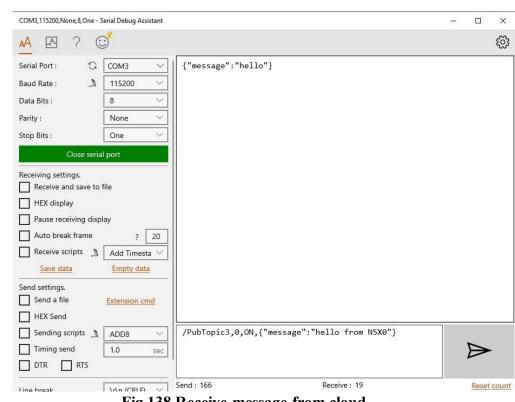


Fig.138 Receive message from cloud

# 9. Edge computing

GADTek

The USR-N5X0 supports Modbus RTU Master for retrieving field site data from serial meters. After collecting data, users can convert serial data to MQTT json format data, allowing users to get field site data. This two-in-one design reduces system complexity and the amount of space required in the network topology, as well as overall installation time. In addition, you can extend the useful life of legacy devices by connecting them to Ethernet and accessing the devices using a preferred protocol,TCP/UDP, HTTP, MQTT. First, users need to enable edge computing function.

Page 137 of 165



Communication Expert of Industri	list	Be Honest Do Best! 中文   English
<ul> <li>Status</li> <li>Network:</li> <li>Port1</li> <li>Port2</li> <li>Port4</li> <li>LOG</li> <li>Gateway</li> <li>Edge Computing</li> <li>Cloud Service</li> <li>System</li> </ul>	Edge Computing Gateway   Including edge expluiblion, edge computing, edge reporting and other functions, supports Modbus RTU to Joon, Modbus RTU to Modbus TCP and other general industrial potocol conversion.   SETINC   Edge Computing   Data Accudation   Data Courry and Report   Enable Edge Computing   Enable Edge Computing	
	Jinan USR IOT Technology Limited. http://www.pusr.com	

## Fig.139 Enable Edge computing

#### 9.1 Add Modbus slave device

Communication Expert of Industrial IoT	Be Honest Do Bes 中文[64
<ul> <li>&gt; Status</li> <li>&gt; Network</li> <li>&gt; Port</li> <li>&gt; Gateway</li> <li>MQTT Gateway</li> </ul>	Edge Computing Gateway Including edge acquisition, edge computing, edge reporting and other functions, supports Modbus RTU to Json, Modbus RTU to Modbus TCP and other general industrial protocol conversion. SETTING
Edge Computing Cloud Service USR Cloud Alibaba Cloud AWS JoT V System	Edge Computing     Data Acquisition     Data Query and Report       Select edge computing profile     Choose file     Export.       No.     Name!i     Port!i       Slave addr!i     Operations
System Setting Management	1       divideo11       Port1       1       mode/011       40001       wint15       Edit       Delete         2       rede/0102       40002       wint16       Edit       Delete
	Save
	Jinan USR IOT Technology Limited. http://www.pusr.com

#### Fig.140 Add a slave device

Page 138 of 165



Status	Edge Computing Gateway		_				
Network							
Port	Including edge acquisition, edge computing, protocol conversion.	edge reporting and other functi	ons, supports Modbus RI	U to Json, Modbus KIU to	Modbus ICP and	other general industrial	
Gateway							1
MQTT Gateway	SETTING						
Edge Computing	Edge Computing Data Acquisition	Data Query and Report					
Cloud Service							
System	Select edge computing profile Choose t	*Device name	sensor1	0			
						last: 126 nodes@	i.
		*Port	1	~			
	No. Nameți Portți	*Slave Address	1	(1~255)	11 Data	type <sup>1</sup> Operations	
	1 device01 Port1 1	*Polling interval	100	(10~65535)ms	uint16	Edit Delete	
		Show advanced settings	D		uint16	Edit Delete	
	Add						
		Enable Address mapping			odes		
		Merge collection			lodes		
		1	Save Cancel				
			Save Next				

#### Fig.141 Polling slave device configuration

In the slave property, enter the device name, bind to the Port1, enter the slave address and polling interval, enable merge collection function, the description of the configuration parameters on this interface is shown in table 18. We use the temperature and humidity sensor1 as an example to describe the process. After finishing configuring the slave device, please scroll down to the bottom of the page and click on "Save" button to save all the changes that you have made. All configurations take effect after a system reboot.

#### 9.2 Add modbus data points

#### 9.2.1 Register type and offset

#### Table 25 Typical register tables

Register Type	Address range	Description
Coil points	00001-09999	Read, function code 0x1, bool values.
Discrete inputs	10001-19999	Read, function code 0x2, bool values.
Input registers	30001-39999	Read only, function code 0x4, int,uint,float values
Holding registers	40001-49999	Read only, function code 0x3, int,uint,float values

#### Page 139 of 165



The Modbus register addressing starts with register 0, but some device manufacturers start with the number 1 in the device documentation. In this case, the number minus 1 should give the correct register address. Offsets can be represented in different ways. Sometimes as Hex values and sometime the offset will also contain the register type. For example Offsets in the Holding Register range might start with a 4 such as 411001, in the SCADA this would be entered as 11001.

### 9.2.2 Raw data types and byte order

A standard Modbus Holding Register or Input Register is a 16 bit (2 Byte) value. Often this is not enough so different equipment will utilize multiple modbus registers to hold a larger value. Here is a list of Data Types supported in the N5X0 gateway.

Туре	Function code	<b>Objects count</b>	Note
Bool	1-2	1+	Bool
int8	3-4	1+	Integer 8 bit
uint8	3-4	1+	Unsigned integer 8 bit
int16 uint 16	3-4 3-4	1 1	Integer 16 bit. Big- endian.high byte first. Unsigned integer 16 bit-endian.
int32(ABCD)	3-4	1	Integer 32 bit. Big- endian
int32(CDAB)	3-4	2	Integer 32 bit. Little- Endian byte swap
uint32(ABCD)	3-4	2	Unsigned integer 32 bit. Big-endian.
uint32(CDAB)	3-4	2	Unsigned integer 32 bit. Little-endian byte swap.
float32(ABCD)	3-4	2	Float 32 bit. Big- endian.
float32(CDAB)	3-4	2	Float 32 bit. Little- endian byte swap.
float64	3-4	4	Float 64 bit.

## Table 26 Data Types

Page 140 of 165



Note that these could be referred to in different ways. for example a 4 Byte Signed Integer might be referred to as a 32 bit Integer in equipment documentation. For binary values we also need to know what "bit" of the register to look at for the binary value. For this reason a single 16 bit modbus register could represent up to 16 individual binary data points. Sometimes the Data Type is inferred by listing the number of registers. For example 2 registers might mean a 4 byte value.

### 9.2.3 Data points configuration

First select the slave device, click add nodes to add a data point, click edit to configure the data point, click delete to delete a data point.

USR IOT Communication Expert of Industrial IoT	Be Honest Do Be: <del>¶2</del> ∣5	
<ul> <li>Status</li> <li>Status</li> <li>Networki</li> <li>Port</li> <li>Gateway</li> <li>Edge Computing</li> <li>Cloud Service</li> <li>System</li> </ul>		
	Jinan USR IOT Technology Limited. http://www.pusr.com	v

Fig.142 Add modbus data point

Page 141 of 165



Communication Expert of Industrial IoT	Be H	lonest Do 中
> Status	Edge Computing Gateway	
> Network > Port	Including edge acquisition, edge computing, edge reporting and other functions, supports Modbus RTU to Json, Modbus RTU to Modbus TCP and other general industrial protocol conversion.	
∽ Gateway	SETTING	
MQTT Gateway Edge Computing	Edge Computing Data Acquisition Data Query and Report	
<ul> <li>Cloud Service</li> </ul>	Select edge computing profile Choose Node name temperature1	
> System	Seeks eage computing prome Choose a *Function code 03 ✓ last: 126 nodes ●	
	No. Name1 Port11 *Register address 0 (0-65534) 11 Data type11 Operations	
	*Data type uint16 v 1 sensor1 Port1 it Delete	
	*Timeout 200 (10~65335)ms uint16 Edit Delete	
	Add Reporting on change	
	Show advanced settings 🖉 nodes	
	Calculation formula =%s/10	
	Save Canod	
	Save Next	
	Jinan USR IOT Technology Limited. http://www.pusr.com	

Fig.143 Data point configuration

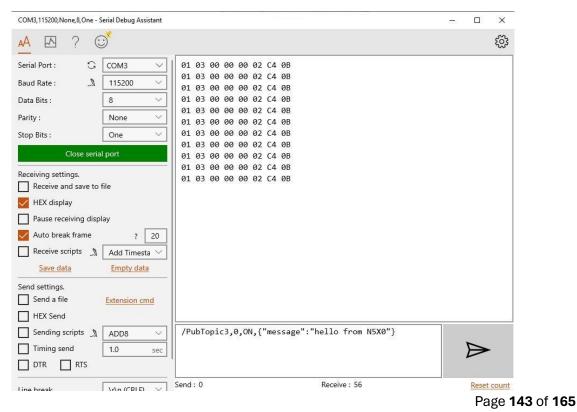
In the data point property, enter the node name, select modbus function code, enter the register address and response timeout, select the right data type, input the calculation formula, the description of the configuration parameters on this interface is shown in table 19. We use the temperature and humidity data points as an example to describe the process. After finishing configuring the data points, please scroll down to the bottom of the page and click on "Save" button to save all the changes that you have made. All configurations take effect after a system reboot.



USR IOT Communication Expert of Industri	Tali	3e Honest Do Best! ⊄⊄∣English
<ul> <li>Status</li> <li>Network</li> <li>Port</li> <li>Gateway</li> <li>Edge Computing</li> <li>Cloud Service</li> <li>System</li> </ul>	Edge Computing Gateway   Including edge scapabilition, edge computing, edge reporting and other functions, supports Modebus RTU to Modebus TCP and other general industrial protocol conversion.   SETURE   Edge Computing   Bate Acquisition   Choose Bill   Choose Bill   Choose Bill   Conversion	
	Jinan USR IOT Technology Limited. http://www.pusr.com	

Fig.144 Sensor register reading

After the correct slave and data points configuration, the modbus polling command will print on the corresponding serial port regularly, as shown in Fig.145





### Fig.145 Modbus polling command

#### 9.3 Export and Import configuration

There are three main reasons for using the Import and Export functions.

- Applying the same configuration to multiple units. The Import/Export configuration function is a convenient way to apply the same settings to units located in different sites. You can export the configuration as a file and then import the configuration file onto other units at any time.
- Backing up configurations for system recovery. The export function allows you to export configuration files that can be imported onto other gateways to restore malfunctioning systems within minutes.
- Troubleshooting. Exported configuration files can help administrators to identify system problems that provide useful information for Technical Service Team when maintenance visits are requested. The export function saves all the configuration settings and parameters of the data acquisition in a \*.csv file. To begin, click the Export button.

USR IOT Communication Expert of Industri	A lot	Be Honest Do Best! 中文 English
<ul> <li>&gt; Status</li> <li>&gt; Network</li> <li>&gt; Port</li> <li>&gt; Gateway</li> <li>&gt; Cloud Service</li> <li>&gt; System</li> </ul>	Edge Computing Gateway         Including edge acquilition, edge computing, edge reporting and other functions, supports Modbus RTU to Json, Modbus RTU to Modbus TCP and other general industrial protocol conversion.         SETTINE         Edge Computing       Data Acquisition         Data Acquisition       Data Query and Report         Sident edge computing profile       Choose Riv         No.       Name11         Port1       Sident edder computing         Add Inters       No.         Not Interset       1         Mathem       List 126 nodes         Add Interset       1	
	Saw Next Jinan USR IOT Technology Umited. http://www.pusr.com	

Fig.146 Export the configuration file

Page 144 of 165



evice nume	B Port-number	C Slave-addrez=	D Polling-interval	Happed-address	Herge-collection	G	H Node-nane	Function-code	Register-Address	K Data-type	Response-Tineou+	M Reporting-on-change	N Variation range	Mapped-address	Form
ensor1	1	1	10	O N/A	ON		temperaturel	r diotron code		0 uint16	200	OFF		N/A	=%s/
nsor1	1	1	10	O N/A	ON		huni di tv1			1 uint16	200	OFF		N/A	
				2 10 11			A day of the			1 annite				10.15	
							2								
									-						
											-				
	edge-Ef														
								-							
							-								
							-						-		
															_
											- C - (				

Fig.147 Configuration file

Once the file is saved, it can be imported into your target unit to duplicate the same settings. Select the target unit first and click the choose file button to import. Select the file you want to import, and then click the open button. The data points setting will display on the webpage. After finishing importing the configuration file, please scroll down to the bottom of the page and click on "Save" button to save all the changes that you have made. All configurations take effect after a reboot.

Page 145 of 165



Communication Expert of Industrial IoT	Be Honest Do Best ! Ф∑∣бодій
Convenciation Equat of Industrial IoT  Status Network: Port  Gateway Edge Computing Cloud Service System	<pre>tidge Computing Gateway Including edge acquidition, edge reporting and other functions, supports Modous RTU to Joon, Modous RTU to Modous TCP and other general industrial induced computing. edge reporting and other functions, supports Modous RTU to Joon, Modous RTU to Modous TCP and other general industrial induced computing. Edge Computing Edg</pre>
	Jinan USR IOT Technology Limited. http://www.pusr.com

### Fig.148 Import the configuration file

## 9.4 Data report

## 9.4.1 Communication channel

Users can select TCP/UDP/HTTP in socketA of each serial port, MQTT Gateway, or AWS IOT service as the communication channel. When select MQTT or AWS IOT channel, user need configure the MQTT broker parameters in MQTT Gateway tab or Cloud service tab at first, and setting the report topic in the Fig.149.



Communication Expert of Industrial IoT		Be Honest Do Best! 中文 English
> Status	Edge Computing Gateway	Ŷ
> Network	Including edge acquisition, edge computing, edge reporting and other functions, supports Modbus RTU to Json, Modbus RTU to Modbus TCP and other general industrial protocol conversion.	
✓ Port Port1	SETTING	
Port2	Edge Computing Data Acquisition Data Query and Report	
Port3 Port4	Socket type MOTT v 🖉	· · · · · ·
LOG	Data Query Alfaba cloud Avis lot	
V Gateway MQTT Gateway	Societ1 Data Query Societ2 Societ4	
Edge Computing	Data Report of nodes	
> Cloud Service	Reporting method Enable	e
> System	Report Topic //UploadTopic	
	QOS QOS0 ~	
	Periodic reporting 🛛	
	Reporting Interval 5 (1~36000)s	
	Reporting on regular Start N7P find	
	Failure Padding	
	Quotation Mark	
	Json template ("memorranus" "tempt" "humid ("temperature" tempt" "humid ("could by test)	
	Jinan USR IOT Technology Limited. http://www.pusr.com	

## Fig.149 Communication channel set

## 9.4.2 Report Method

There are three ways to report the data acquired to the communication channel: on change, interval, timer. The description of the configuration parameters on this interface is shown in table 20. After finishing parameter setting, please click on "save" button to save all the changes that you have made. All configurations take effect after a system reboot.

Page 147 of 165



USR IOT Communication Expert of Industrial IoT		Be Honest Do Best! 中文   English
Status Network Port Gateway Edge Computing	Edge Computing Gateway Including edge acquidition, edge computing, edge reporting and other functions, supports Modbus RTU to Json, Modbus RTU to Modbus TCP and other general industrial protocol conversion. SETTING Edge Computing Oata Acquisition Data Query and Report	
Cloud Service     System	Select edge computing profile Choose 1 *Function code 03 ~ ^ *Register address 0 (0-65534) last: 124 nodes	o
	No.         Name11         Port11         "Data type         unit16         ss11         Data type11         Operations           1         sensor1         Part1         1         Timeout         200         (10-65335)ms         unit16         Edit         Delete	
	2 sensor2 Port2 1 Variation range 1 Unit16 Edit Delete	
	Enable Address mapping  Calculation formula =%s/10  Save Cancel	
	Saw Not	
	Jinan USR IOT Technology Limited. http://www.pusr.com	×

#### Fig.150 Report on change

Communication Expert of Industrial IoT		Be Honest Do Best ! 中文∣English
	protocol conversion.	^
> Status		
> Network	SETTING	_
✓ Port	Edge Computing Data Acquisition Data Query and Report	
Port1		
Port2	Socket type Socket1 v 2	
Port3	Data Query	-
Port4		-
LOG	Data Query Disable ~	
✓ Gateway	Data Report of nodes	
MQTT Gateway	Reporting method Enable	
Edge Computing		
> Cloud Service	Periodic reporting 🕑	
> System	Reporting interval 5 (1~36000)s	
	Reporting on regular 🖂 (Start NTP first)	
	Regular time Reporting every minute v Provide Reporting every minute v	
	Failure Padding Kaporing avery caritier Failure Fadding Kaporing avery caritier Regoring at Keeping at Textual time	
	Quotation Mark	
	Json template ("tensort": "temp": "temp y"mem" tensort "temp": "temp ("tensort") ("tenso	
	(y	
	Jinan USR IOT Technology Limited. http://www.pusr.com	

## Fig.151 Interval and timer report

Page 148 of 165



# 9.4.3 Payload-Json template

A JSON object contains zero, one, or more key-value pairs, also called properties. The object is surrounded by curly braces {}. Every key-value pair is separated by a comma. The order of the key-value pair is irrelevant. A JSON array contains zero, one, or more ordered elements, separated by a comma. The JSON array is surrounded by square brackets []. A key-value pair consists of a key and a value, separated by a colon (:). The key is a string, which identifies the key-value pair. The value can be any of the following data types: string(surrounded by quotation marks (" ")),number,float,array(JSON array),object(JSON object (can be nested)),boolean(true or false),empty.

```
Example 1
{
"sensor1": {
"temperature": "temperature1",
"humidity": "humidity1",
"user define": "bedroom"
},
"sensor2": {
"temperature": "temperature2",
"humidity": "humidity2",
"user define": "living room"
},
"time": "sys net time"
}
Example 2
{
"service":[{
"sensor1": {
"temperature": "temperature1",
"humidity": "humidity1",
```

Page 149 of 165



```
"user_define": "bedroom"
},
"sensor2": {
"temperature": "temperature2",
"humidity": "humidity2",
"user_define": "living room"
},
"event_time": "sys_net_time"
}],
"device_id":"sys_mac"
}
```

We can use a tool to compact it. Below is a free online tool: https://jsonformatter.org/. Paste the message in the column on the left and then, click Minify JSON. It will show a compact JSON format message in the column on the right. Click Copy to Clipboard.

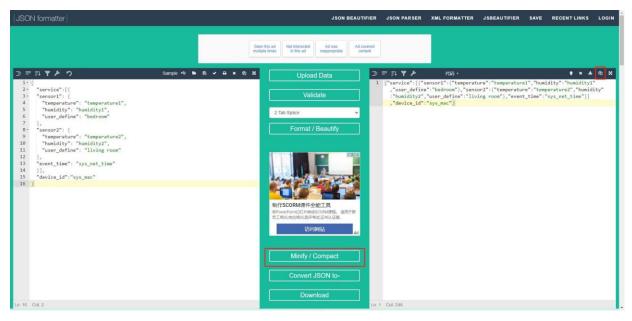


Fig.152 Json Formatter

Paste the message in the Json template on the page and click on "Save&Apply" button to save all the changes that you have made. All configurations take effect after reboot.

Page 150 of 165



USR IOT Communication Expert of Industrial IoT		Be Honest Do Best! 中文   English
> Status		<u>^</u>
	quisition Data Query and Report	2
> Port		
✓ Gateway Socket type	MQTT - O	
MQTT Gateway Data Query		
Edge Computing Data Query	Disable ~	
Cloud Service     Data Report of nodes		
/ system		
Reporting method	Enable ~	
Report Topic	/UploadTopic	
QOS	QOS0 ~	
Periodic reporting		
Reporting Interval	5 (1~36000)s	
Reporting on regular	Gaset NTP Ford	
Failure Padding		
Quotation Mark		
Json template	100 <sup>™</sup> <sup>10</sup> 0001, (inst <sup>™</sup> 1948, pdf, 1) − tet T <sup>™</sup> denkes 16 <sup>™</sup> 1948 mac(1) − 0 (<2049 bytes)	
	Save&Apply	
	inan USR IOT Technology Limited. http://www.pusr.com	

#### Fig.153 Json template setting

There are three type data point, user define, system, and register value in a Json template.

→ System data points

The system data points defined by N5X0 gateway is shown in table 2.

#### Table 27 System data points

System data points	Description
Sys_sn	SN number
Sys mac	MAC address
Sys_hard_ver	Hardware version
Sys_soft_ver	Software version
Sys_dev_name	Product name
Sys net time	GMT time
Sys_unix_time	Unix time
Sys_ip	Local IP address
Sys_dev_name	Product running time

→ Modbus register value data points.

The node name configured in the section 9.2.3 is register value data points.

Page 151 of 165



### → User define

In addition to the above two types of data points, users can also define your own data points. Such as "user\_define": "living room."

#### 9.4.4 Test

We now use modbus slave software to simulate two modbus slave device. The connection and and parameters settings are show in Fig.155. Two USB to RS485 converters are connecting PC with serial Port 1 and 2 of N540 gateway. We use MQTT.fx to connect to the same broker and subscribe the report topic of N540, we can see the message transmitted at the specified interval.

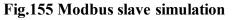
Communication Expert of Industrial IoT	B	e Honest Do Best! 中文 English
Status     Network     Port     Po	meter configuration	
Port4 LOG > Gateway > Cloud Service > System	aud rate 115200 (600-921600)bps Data bits 8 bit Party None - Stop bits 1 - Flow ctrl NONE -	
UART P Sync Baudratt	t Lengti       0       (0-1460)bytes         ket Time       0       (0-255)ms         iFC2217)       ON       •         eastbeat	
	Jinan USR IOT Technology Limited. http://www.pusr.com	

**Fig.154 Serial Port Parameters** 

Page 152 of 165



Image: State - Mbslave1       File     Edit       Connection     Setup       Display     Image: Setup       Image: Setup     Image: Setup       <	ew Window Help	- 🗆 X	Image: State - Mbslave1       File     Edit       Connection     Setup       Display     V       Image: State - St	iew Window Help	- 🗆 X
Altacionet           10         =1: F = 03           No connection         00000           0         223           1         67           2         3           4         6           7         9	Connection Setup X Connection Setup DI Setup Fort Setup Fort Setup Setup Connect Setup Setup Connect None Party Stop Bar TCP/P Setup TCP/P		D         http://doi.org/10.00000000000000000000000000000000000	Connection Stup Connection Stup Senial Year Senial Year USS SERIAL CTAP (DNACO USS SERIAL C	
For Help, press F1.	Port	3: 115200-8-N-1	For Help, press F1.	Port 20: 115200-8-N-1	



Communication Expert of Industrial IoT	Be Honest Do B 4文	est!  English
Status     Network     Port     Gateway     Edge Computing     Cloud Service     System	Edge Computing Gateway         Including edge acquisition, edge reporting and other functions, supports Modbus RTU to Json, Modbus RTU to Modbus TCP and other general industrial protocol conversion.         SETTING         Edge Computing Data Acquisition       Data Query and Report         Select edge computing profile       Choose file	
	No.       Name!       Port!       Slave addr!       Operations         1       sensor!       Port!       1       Edit       Delete         2       humidity2       40001       uint16       Edit       Delete	
	Save Next Jinan USR IOT Technology Limited. http://www.pusr.com	

Fig.156 Data Acquisition setting

Page 153 of 165



USR IOT Communication Expert of Industrial IoT		Be Honest Do Best ! ⊄⊄∣English
> Status		Î.
	Acquisition Data Query and Report	2
✓ Port		
Port1 Socket typ	MQTT V	
Port2 Data Query		
Port3 Data Quer	/ Disable ~	
Port4 LOG Data Report of nodes		
MOTT Gateway		
Report Topi Edge Computing	c /UploadTopic	
✓ Cloud Service	5 QOS0 ~	
USR Cloud Periodic reportin		
Alibaba Cloud Reporting interva	4 5 (1~36000)s	
AWS IoT Reporting on regula	Gast MTP first	
> System Failure Paddin		
Quotation Mar		
Json templat	Caencol:(Exemont) Chemperature "temperature t", ~ Tomiddy: "homishity" user_de ≪ @ (<2048 bytes)	
	Save&Apply	
		,
	Jinan USR IOT Technology Limited. http://www.pusr.com	

# Fig.157 Data report setting

🕲 MQTT.fx - 1.7.1				- 0	X
File Extras Help					
EMQX	- 🔅 💿	Disconnect			<b>•</b> •
Publish Subscribe	Scripts Broker Status Log				
/UploadTopic	▼ Subs	ribe	QoS0 QoS1 QoS2	Autoscroll	0(*
/UploadTopic	7	/UploadTopic		Retained	3 QoS 0
	Dump Messages Mute Unsubscribe	/UploadTopic			4 QoS 0
		/UploadTopic			5 QoS 0
		/UploadTopic			6 QoS 0
		/UploadTopic			7 QoS 0
		/UploadTopic			8 QoS 0
		/UploadTopic			9 QoS 0
Topics Collector (0)	Scan Stop of	/UploadTopic			9
		<pre>15-08-2022 15:20:50:55259461 {     "service" : [ {         "sensor1" : {         "temperature" : 27.3,         "numidity" : 67,         "user_define" : "bedroom"     },         "temperature" : 27.3,         "humidity" : 68,         "user_define" : "living room"     },         "user_define" : "living room" }, </pre>			QoS 0
			Payload decoded by JSON Prett	y Fomat Decod	der 💌

Fig.158 Data reported

Page 154 of 165



## 9.5 Data Query

There are three methods to actively query the data collected through the serial port from the communication channel: Json format, Modbus TCP, Modbus RTU. Firstly, user need enable the data query function.

#### 9.5.1 Json

When select MQTT or AWS IOT channel, user need configure the MQTT broker parameters in MQTT Gateway tab or Cloud service tab at first, select Json query type and setting the query topic in the Fig.159. The report topic is same as described in section 9.4.1.

Communication Expert of Industrial IoT					Be Honest Do Best! 中文 English
> Status > Network > Port <b>- Gateway</b>	Edge Computing Gateway Including edge acquisition, edge of protocol conversion.	omputing, edge report	ing and other funct	tions, supports Modbus RTU to Json, Modbus RTU to Modbus TCP and other general industrial	
MQTT Gateway Edge Computing > Cloud Service > System	Edge Computing Data Acq	uisition Data Qu	ery and Report		-
	Data Query Data Query	Enable	×		•
	Query type Query Topic QOS	Json /QueryTopic QOS0	~		
	Report Topic QOS Data Report of nodes	/UploadTopic QOS0	v		.
	Reporting method	Disable	*	SanolApply	
	Jii	nan USR IOT Techn	ology Limited.	http://www.pusr.com	v

# Fig.159 Json Query Type

The Json content need conform to template described in section 9.4.3.

Page 155 of 165



MQTLfx - 1.7.1				×
File Extras Help				
EMQX Connect Disconnect			1	•
Publish Subscribe Scripts Broker Status Log				
» /QueryTopic   Publish Q050 Q05	051 Qo52	Retained		0°*
['temperature': 'temperature1','humidity1']				

Fig.160 Json Query message

Page 156 of 165

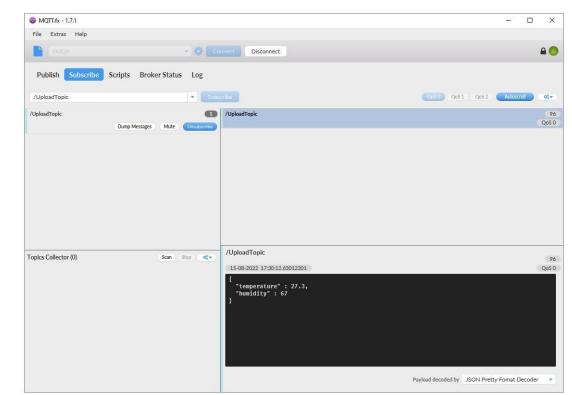


Fig. 161 Json response message

### 9.5.2 Modbus slave address and register mapping

GADTek

This function is very useful in data query and only used in modbus TCP/RTU query type. When user select Modbus TCP/RTU query type to get data, the N5X0 gateway will be confused if there are the same slave address in different serial port or same register address in different slave devices. All slave devices and registers on a gateway are planned and managed in a unified manner. For example, user can map slave address 1 in Port1 to slave 1 in N5X0 gateway, map slave address 1 in Port2 to slave 2 in N5X0 gateway.

Page 157 of 165



Communication Expert of Industrial IoT								e Honest Do Best ! 中文 English
> Status > Network	Edge Computing Gateway							Î
> Port ~ Gateway	Including edge acquisition, edge computing, edge rep protocol conversion.	eporting and other functions,	supports Modbus RTU to Jsor	, Modbus RTU to Mi	odbus TCP	and other gen	eral industrial	
MQTT Gateway	SETTING							
Edge Computing Cloud Service	Edge Computing Data Acquisition Data	ta Query and Report						
> System	Select edge computing profile Choose I	*Device name s	sensor1	0			last: 124 nodes	
	Torrest	*Port	1 ~					
	No. Nameți Portți	Slave Address		(1~255)		Data type†i	Operations	
	1 sensor1 Port1 1	*Polling interval 1	100	(10~65535)ms	3	int16	Edit Delete	
	2 sensor2 Port2 1 Si	Show advanced settings 🛛 🖃			2	Jint 16	Edit Delete	
	En	nable Address mapping 🛛 🖓						
	Add	*Map Slave address 1		(1~255)	odes			
		Merge collection						
		Sav	Cancel					
		Sav	e Next					
	Jinan USR IOT Tec	chnology Limited. ht	tp://www.pusr.com					

## Fig.162 Slave address mapping

Communication Expert of Industrial IoT		Be Honest Do Best! 中文   English
Status     Network     Network     Port     Gateway     MQTT Gateway     Edge Computing     Cloud Service	Computing Data Acquisition Data Query and Report     tedge computing profile Choose "Device name sensor2          "Port 2          Vert 2	+2   fnglish
	Save Cancel Save Next Jinan USR IOT Technology Limited. http://www.pusr.com	

Fig.163 Slave address mapping

Page 158 of 165



## 9.5.3 Modbus TCP

When select socket channel, user need configure the socket A parameters in PORT tab at first, then select Modbus TCP query type. We use slave address mapping here for illustration.

Communication Expect of Industrial IoT	Be Honest Do Best ! 中文∣English
Status Network: Port: Conducting Gateway Edge Computing Gateway Edge Computing Cloud Service USR Cloud Atbaba Cloud AWS ioT System System Data Query Enable Query type Modum TCP Modum TCP ServitApery ServitApery	ФФ   English
Jinan USR IOT Technology Limited. http://www.pusr.com	

Fig.164 Modbus TCP query type

Page 159 of 165



<ul> <li>&gt; stats</li> <li>&gt; ketwoik</li> <li>&gt; Port</li> <li>Port3</li> <li>Port3</li> <li>Port3</li> <li>Port3</li> <li>Port4</li> <li>Port3</li> <li>Port5</li> <li>Port5</li> <li>Port4</li> <li>Port5</li> <li>Port5</li> <li>Port6</li> <li>Port6</li> <li>Port6</li> <li>Port6</li> <li>Port7</li> <li>Port6</li> <li>Port7</li> <li>Port7</li></ul>	USR IOT Communication Expert of Indus	hal lot
LOG         SOCKET A         Working Mode       TCP Server         MQTT Gateway         Edge Computing         Cloud Service         USR Cloud         Alibaba Cloud         Alibaba Cloud         AVS IoT         Enable Net Heartbeat         SockET B         Operating Mode         Operating Mode	Network     Port     Port1     Port2	Data transmission parameter configuration SETTING
USR Cloud     PRINT     OFF       Alibaba Cloud     Modous Poli     Response Timeout 200     (10-9999)ms       AWS IoT     Enable Net Heartbeat	LOG Y Gateway MQTT Gateway	Working Mode     TCP Server     None       Maximum Sockets supported     8     Exceeding Maximum
Operating Mode None ~	USR Cloud Alibaba Cloud AWS IoT	Modbus Poll  Response Timeout 200 (10-9999)ms Enable Net Heartbeat
		Operating Mode None ~

Fig.165 A socket parameters setting

해 Modbus Poll - Mbpoll1 File Edit Connection Setup Funct	ons Disnlav View Window Heln		12	×
	L 05 06 15 16 17 22 23 TC 🖂 🔋 🎗			
$\begin{tabular}{ c c c c c } \hline \hline$		OK     OK     Cancel     Mode     @RTU ASCI     Response Timeout     200 [Ims]     Delay Betveen Polis     500 [Ims]     @IPv4     OIPv6		
For Help, press F1.		[172.16.14.12]: 9100		0.

Fig.166 Modbus TCP simulator

Page 160 of 165



លា Modbus Poll - Mbpoll2																1 <u>111</u>		×
<u>File Edit Connection S</u>					17.		~											
		几   05 06 15	6 17	22 23	3   ТС	변	8	₩?										
💬 Mbpoll1																		
Tx = 11: Err = 0 ID = 1	1: F = 03:	SR = 1000ms																
Alias	00000																	
0	27																	
	67																	
2	Mbpol			٦														×
3 4	Tx = 12:	Err = 0: ID = 2:	F = 03	B: SR	= 10	00m	S											
5		Alias	00000	12														
6		Alias	00000	8														
7			68															
8			08															_
9	3	– 🔝 Communica	tion Tra	fic													>	×
	4	Exit	Stop		С	lear		Sa	ave		Co	ру		Log	Stop on Error	Time sta	mp	
p	5	Tx:1393-D5	E8 0	0 00	00	06	02	03	00	00	00	02	-	1	J			~
	6	Rx:1394-D5									1B	00	44					
	7	Tx:1395-D5	E9 0	0 00	00	06	01	03	00	00	00	02						
	8	Rx:1396-D5											43					
		Tx:1397-D5																
	9	Rx:1398-D5											44					
	2004.0	Tx:1399-D5																
	h	Rx:1400-D5											43					
	Nº	Tx:1401-D5 Rx:1402-D5												1				2

Fig. 167 Modbus TCP response

# 9.5.4 Modbus RTU

When select socket channel, user need configure the socket A parameters in PORT tab at first, then select Modbus RTU query type. We use slave address mapping here for illustration.



Fig.168 Build a virtual COM10



USR IOT Communication Expert of Indu	8 esial lot	e Honest Do Best ! ⊄x† English
Status     Status     Status     Network     Port     Port1     Port2     Port4     LOG     Gateway     Cloud Service     System	ndul std Edge Computing Gateway Including dage acquilition, edge computing, edge reporting and other functions, supports Motibus RTU to Joon, Motibus RTU to Motibus TCP and other general industrial protocol conversion. SETTINC Edge Computing Data Acquilition Cate Gaery and Report Data Query Type Sociant Data Query Type ModausRTU Data Query Type ModausRTU Data Query Type ModausRTU Data Query Type ModausRTU Seme&Agety	
	Jinan USR IOT Technology Limited. http://www.pusr.com	

# Fig.169 Modbus RTU Query Type

Image: Connection       05       06       15       16       17       22       23       TC       Image: Connection         Alias       00000       27       57       1       105       06       105       106       105       106       105       106       105       106       105       106       1	Cancel
--	--------

Fig.170 Modbus RTU Simulator

Page 162 of 165



e Edit Connectio	etup Functions Display View Window Help	
) 📽 🖬 🚭 🗙	三 直  几   05 06 15 16 17 22 23   TC 回  💡 🕅	
Mbpoll1		
	= 1: F = 03: SR = 1000ms	
x - 1255. EII - C	- 1. F = 03. BR = 1000ms	
Alias	00000	
	27	
1		
	67	
8	D Mbpoll2	•
8	Tx = 1238: Err = 1; ID = 2: F = 03: SR = 1000ms	
	The standardship with the standard burner include standard standardship	
5	Alias 00000	
5	0 27	
7	1 68	
3		
	Communication Traffic	×
	3	
	4 Exit Stop Clear Save Copy Log Stop on Error Time stamp	د
	5 Tx:154-02 03 00 00 02 C4 38	^
	6 Rx:155-02 03 04 00 1B 00 44 B9 07	
	7 Tx:156-01 03 00 00 02 C4 0B	
	Rx:157-01 03 04 00 1B 00 43 CB C5	
	9 Rx:159-02 03 04 00 1B 00 44 B9 07	
	Tx:160-01 03 00 00 02 C4 0B	
	Rx:161-01 03 04 00 1B 00 43 CB C5	

Fig.171 Modbus RTU response

Page 163 of 165



# **10. AWS IOT Service**

In order to reduce the length of this document, we have organized this section into a special document. Please refer to "USR-N5X0 Quick Start Guide with AWS IoT" for detail.

# 11. PUSR Cloud service

In order to reduce the length of this document, we have organized this section into a special document. Please refer to "USR-N5X0 Quick Start Guide with PUSR cloud" for detail.

# 12. Warranty

# 13. Contact US

Jinan USR IOT Technology Limited

Address: Floor 12 and 13, CEIBS Alumni Industrial Building, No. 3 Road of Maolingshan, Lixia District, Jinan, Shandong, China

Official website: https://www.pusr.com

Official shop: <u>https://shop.usriot.com</u>

Technical support: http://h.usriot.com/

Email: sales@usriot.com

Tel: +86-531-88826739

Fax: +86-531-88826739-808

# 14. Disclaimer

The information in this document provided in connection with Jinan USR IoT technology ltd. and/or its affiliates' products. No license, express or implied, by estoppel or otherwise, to any intellectual property right is granted by this document or in connection with the sale of USR IoT products. EXCEPT AS SET FORTH IN THE TERMS AND CONDITIONS AS SPECIFIED IN THE LICENSE AGREEMENT FOR THIS PRODUCT, USR IoT AND/OR ITS AFFILIATES ASSUME NO LIABILITY WHATSOEVER AND DISCLAIMS ANY EXPRESS, IMPLIED OR STATUTORY WARRANTY RELATING TO ITS PRODUCTS INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT. IN NO EVENT SHALL USR IoT AND/OR ITS AFFILIATES BE LIABLE FOR ANY DIRECT, INDIRECT, CONSEQUENTIAL, PUNITIVE, SPECIAL OR INCIDENTAL DAMAGES (INCLUDING, WITHOUT)

Page 164 of 165



LIMITATION, DAMAGES FOR LOSS OF PROFITS, BUSINESS INTERRUPTION OR LOSS OF INFORMATION) ARISING OUT OF THE USE OR INABILITY TO USE THIS DOCUMENT, EVEN IF USR IOT AND/OR ITS AFFILIATES HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. USR IOT and/or its affiliates make no representations or warranties with respect to the accuracy or completeness of the contents of this document and reserves the right to make changes to specifications and product descriptions at any time without notice. USR IoT and/or its affiliates do not make any commitment to update the information contained in this document.

# 15. Revision History

Version	Date	Author	Description		
1.0.0	2022.7.30	Dean,Gao	Initial		

Page 165 of 165