

USR-IO424T-EWR User Manual

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Features

- Support 4-way Relay output.
- Support 4-way input, default is dry contact.
- Support 2-way analog input, default are voltage detection.
- Support 1-way PT100 temperature input.
- Support 8 conditional control command.
- Support Web Server to configure IO424T-EWR.
- Support various function code: 0x01, 0x02, 0x03, 0x04, 0x05, 0x06, 0x0F, 0x10.
- Support socket to connect to remote server and TCP Client.
- Support two work modes: Master mode and Slave mode. Master mode supports connecting to multiple Modbus RTU devices by RS485 cascading connection.
- Adopt Modbus RTU protocol data processing. Support Modbus TCP/RTU protocol adaptation.
- Support WAN/LAN interface.
- Support connecting to USR Cloud.
- Support FTP remote upgrade.
- Support upgrading by RS485.
- Support hardware watchdog.
- Support various LED to indicate work status.
- Support power supply over-current, over-voltage, anti-reverse connection protection.

1. Get Start

If user has any question, please submit it back to customer center: h.usriot.com.

1.1. Product introduction

USR-IO424T-EWR is network IO product which supports 4-way input/output, 2-way analog quantity detection, 1-way temperature detection and Modbus RTU/TCP protocol. Take 'Remote control' as core function and have high usability. User can easily and quickly integrate USR-IO424T-EWR into own system to realize remote control which based on Ethernet and local control which based on LAN(WiFi) and RS485.

1.2. Basic parameters

| Parameter | | Value |
|----------------------------|-------------------------|---|
| Ethernet interface | Wired WAN/LAN interface | 10/100M WAN/LAN *1 |
| WiFi | Standard | Support 802.11b/g/n |
| | Antenna | 2.4G WiFi antenna |
| | Range | 100 meters in open area |
| Hardware parameters | Data interface | Serial port: Support RS485. Baud rate: 300bps~230400bps |
| | Working voltage | DC: 12V~36V |
| | DI input | Dry contact input, just needing to short-circuit DI and COM |
| | DO output | AC 220V 5A DC 28V 5A |
| | Voltage acquisition | Range: 0V ~ 10V |
| | Current acquisition | Range: 0mA ~ 20mA |
| | Temperature detection | Range: -100℃ ~ 200℃ |
| | Working temperature | -20℃ ~ +70℃ |
| | Storage temperature | -40℃ ~ +85℃ |
| | Working humidity | 5%~95% |
| | Storage humidity | 1%~95% |
| Dimension | 123*114*28mm | |
| Software parameters | Work mode | Master mode, slave mode |
| | Configuration command | Modbus RTU |
| | Network protocol | Modbus TCP, Modbus RTU |
| | Application software | Support configuration software |
| Software function | DNS | Support |
| | Data transmission mode | Support TCP Client |
| EMC level | ESD | IEC61000-4-2, Level 4 |
| | Surge | IEC61000-4-5, Level 3 |
| | Group pulse | IEC61000-4-4, Level 3 |

Figure 1 Basic parameters

1.3. Hardware

1.3.1. Interface



Figure 2 Product interface diagram

- Antenna: WiFi antenna.
- Ethernet interface: Can be configured to LAN interface or WAN interface.
- RS485: RS485 interface.
- DO: DO1~DO4 are 4-way output and DO-COM is common interface.
- DI: Dry contact input and DI-COM is common interface.
- AI1, AI2: Analog input interface and reference ground connects to power supply negative pole. Default is voltage acquisition mode and please contact to sales personnel if user needs current acquisition mode.
- PT100: PT100 three-wire system interface.
- Power supply: DC 12~36V power supply. Low power supply will cause IO424T-EWR can't start.

1.3.2. LED

| LED | Function | Status |
|---------|------------------------------------|--|
| POWER | Indicate power status | Light after powering module |
| WORK | Indicate system running status | Blink every 0.5 second after product system running; Blink quickly during upgrading firmware process. |
| NET | Indicate network connection status | Light after connecting to remote server |
| WAN/LAN | Indicate WAN/LAN interface status | Light after connecting to network. Blink if has data interaction. |

Figure 3 LED

1.3.3. Dimension

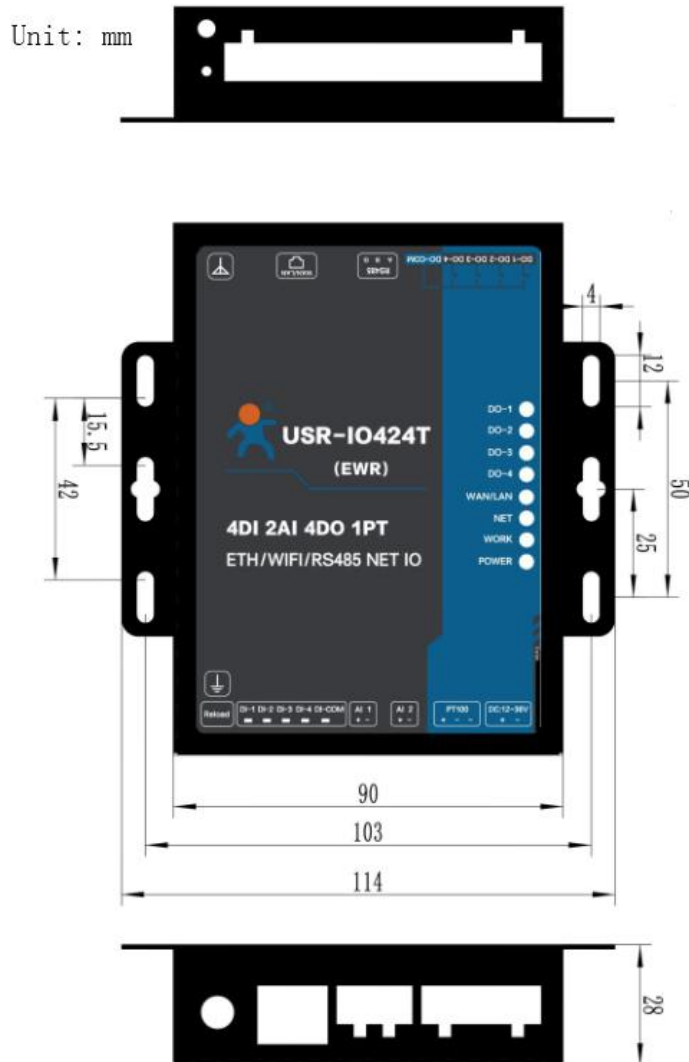


Figure 4 Dimension diagram

1.4. Test

- Connect PC to USR-IO424T-EWR by USB -> RS485 cable
- Connect IO424T-EWR's Ethernet interface to make device connect to internet
- Connect antenna to IO424T-EWR and power the IO424T-EWR
- After powering on, please wait about 15 seconds and use PC or mobile to search IO424T-EWR's WiFi network(Default SSID is USR-IO424T+last four bytes of MAC address and password is **www.usr.cn**). Then user's PC or mobile can access internet.

Note: If user uses USR-IO424T-EWR firstly and can't access internet with correct connection, it maybe the following reason: LAN interface network segment is same as USR-IO424T-EWR's LAN interface network segment. The solution is: Enter USR-IO424T-EWR's Web Server(Default IP address is 192.168.10.1) and modify LAN interface IP address to other network segment, then restart device.

1.4.1. Control by serial

Power IO424T-EWR and connect IO424T-EWR's RS485 interface to PC. Run setup software **USR-IO V1.0.28.exe** and choose IO424T-EWR. Choose correct COM and configure correct serial port parameters as follow(Default settings is 9600, None, 8, 1):

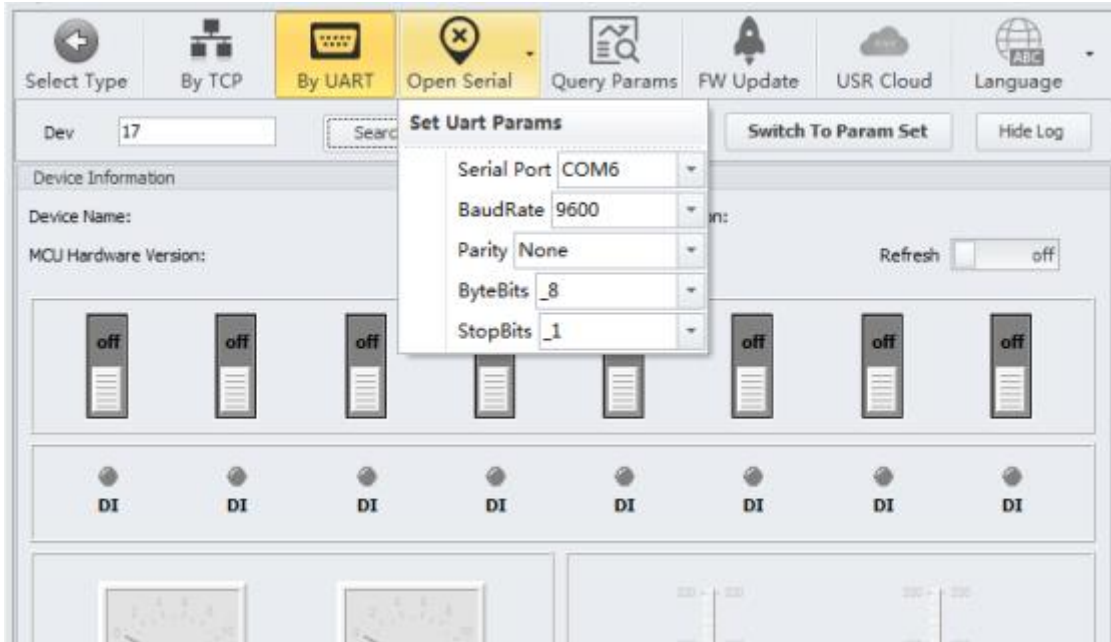


Figure 5 Open serial

After opening serial port, click 'Search' to search IO network controller and click '停止' to stop searching after finding IO network controller. Then choose IO network controller that user wants to configure.

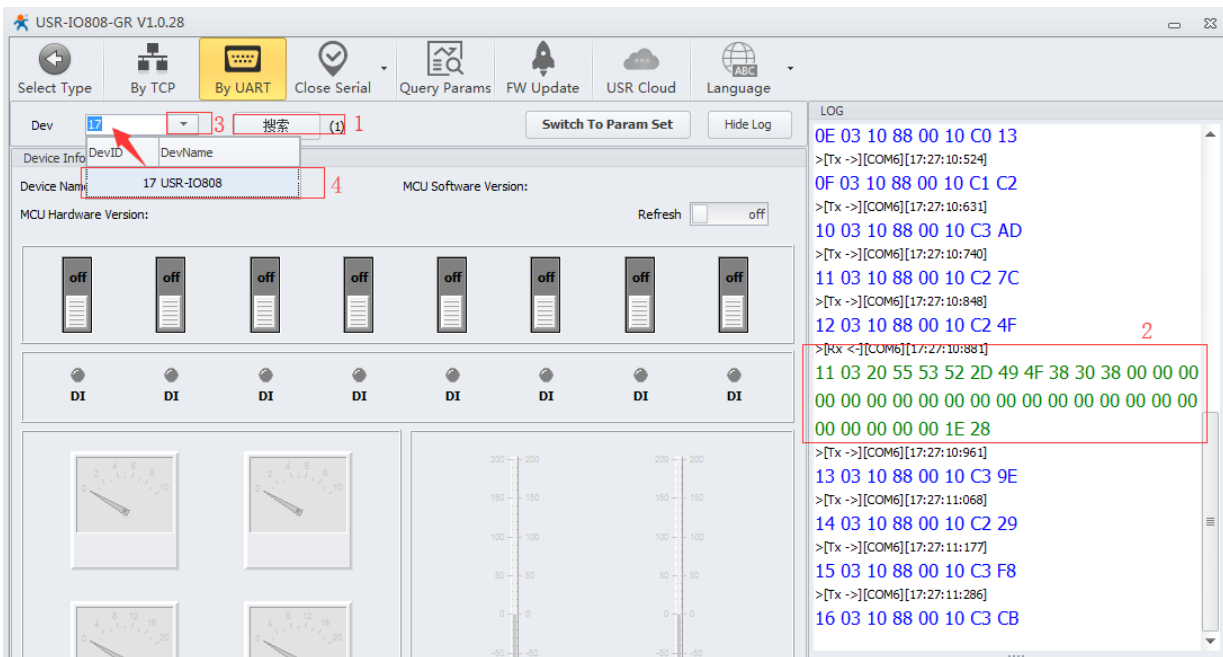


Figure 6 Search IO network controller

Then user can control devices.

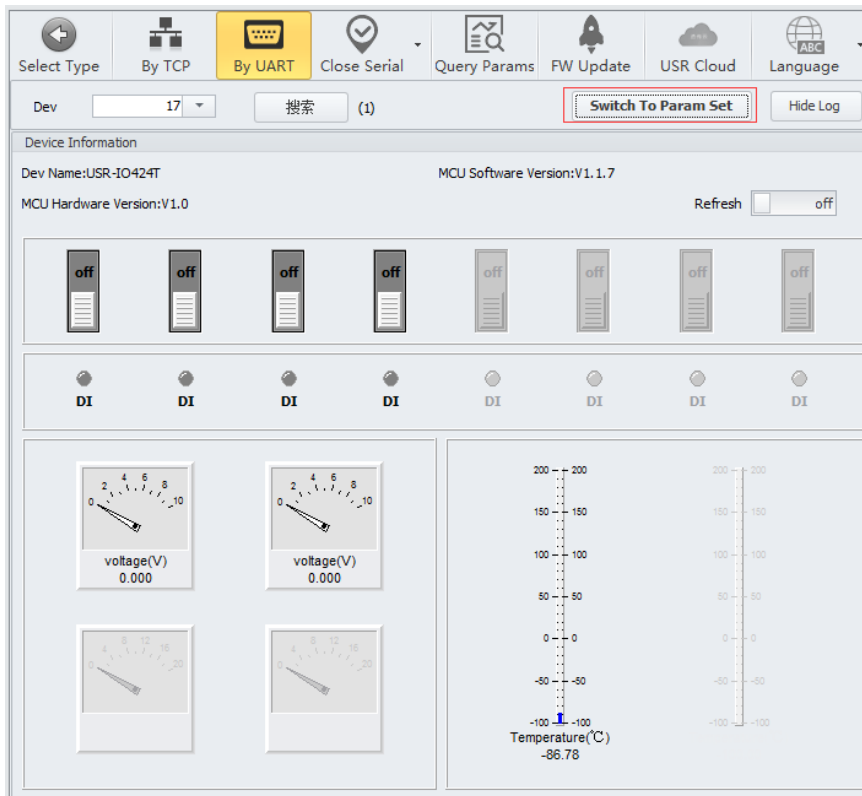


Figure 7 Control devices

User can also click ‘Switch To Param Set’ on above figure to enter IO424T-EWR configuration page.

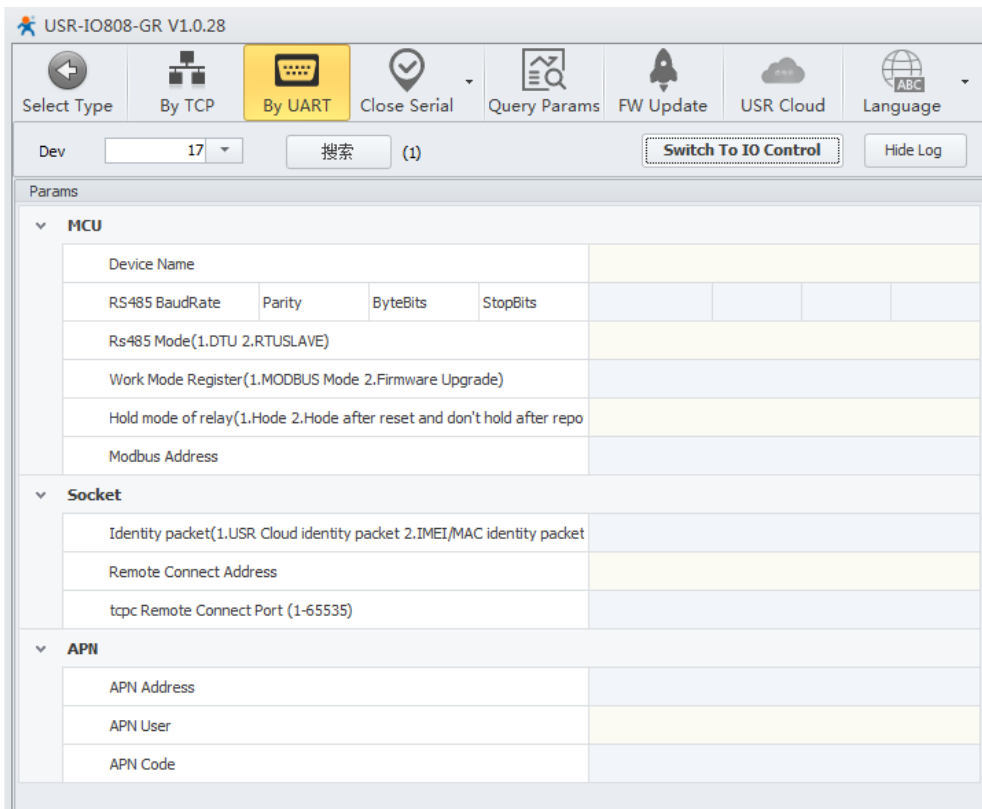


Figure 8 Configuration page

1.4.2. Web Server

The initial parameter of USR-IO424T-EWR to enter Web Server as follow:

| Work mode | Network data transparent transmission |
|--------------------------|---------------------------------------|
| Username | admin |
| Password | admin |
| LAN interface IP address | 192.168.10.1 |

Figure 9 Initial parameter of USR-IO424T-EWR to enter Web Server

Type 192.168.10.1 into browser address bar and log in with username and password(Both are admin). Then user can query and configure parameters of USR-IO424T-EWR by Web Server.

1.4.3. Control by USR Cloud

User can type <http://console.usr.cn/> into browser address bar to enter USR Cloud web page and login with username and password. Then user can add device as follow:

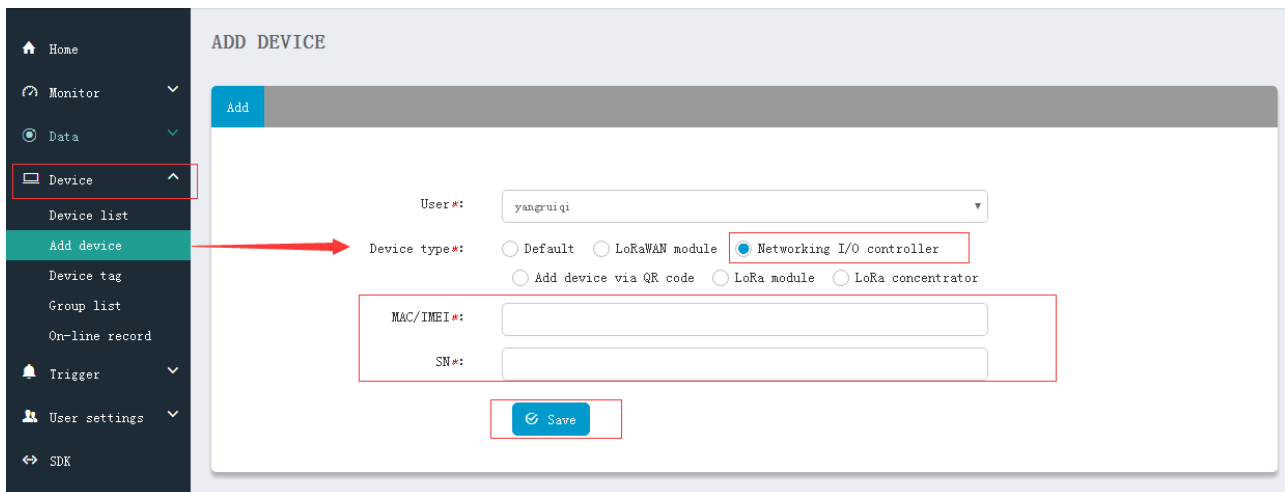


Figure 10 Add IO424T-EWR

Choose 'Networking I/O controller' as 'Device type', write IMEI and SN on IO424T-EWR's label and click 'Save' to add IO424T-EWR.

After adding IO424T-EWR, power IO424T-EWR and wait LED 'NET' light which means IO424T-EWR connects to USR Cloud. Then user can remotely look over, record and control IO424T-EWR status in real time through USR Cloud(Monitor->Data list).

2. Product function

USR-IO424T-EWR functional diagram as follow:

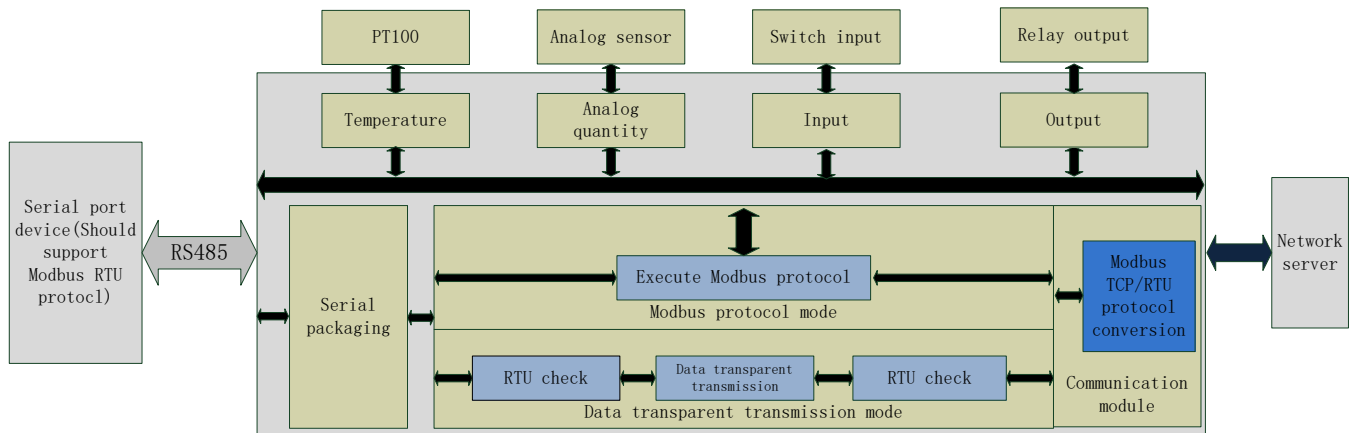


Figure 11 Functional diagram

2.1. DI input

2.1.1. Electrical level detection

- Register address range: 32~35(0x0020~0x0023)
- Supported function code: 02(Read discrete input), 03(Read holding register)
- Connection: Default is dry contact input. Short-circuit DI and COM will change input status. If user needs wet contact input can contact to our sales personnel
- Electrical level detection: Default status is 0, after short-circuiting DI and COM, status will be 1. Detection method: 02 function code of Modbus protocol.

Example:

Detect input of the first way, send: 11 02 00 20 00 01 BA 90

Short-circuiting will return: 11 02 01 01 64 88

No short-circuiting will return: 11 02 01 00 A5 48

2.1.2. Buttons detection

- Register address range: 48~51(0x0030~0x0033)
- Supported function code: 03(Read holding register), 04(Read input register)
- Connection: Default is dry contact input. Short-circuit DI and COM will change input status. If user needs wet contact input can contact to our sales personnel
- Electrical level detection: Default status is 0000, after short-circuiting DI and COM and then releasing, status will be FF00. Detection method: Read button register value by 03 function code of Modbus protocol. After reading once button register, status will recover to 0000; after executing conditional control, status will also recover to 0000.

Example:

Detect the first way button, send: 11 03 00 30 00 01 86 95

No button will return: 11 03 02 00 00 79 87

Have button will return: 11 03 02 FF 00 38 77

2.1.3. Pulse counting

- Register address range: 64~67(0x0040~0x0043)
- Supported function code: 03(Read holding register), 04(Read input register)
- Connection: Default is dry contact input. Short-circuit DI and COM will change input status. If user needs wet contact input can contact to our sales personnel
- Pulse counting: Default status is 0, short-circuit DI and COM and then release will count 1. Detection method: Read pulse counting register value by 03 function code of Modbus protocol. Maximum value of pulse counting is 65535 and it will restart counting after exceeding 65535. Can't reset count to 0 and restart product won't save count.
- **Note:** Pulse counting won't filter input waveform and all pulse in the range of detection will be recorded. So input waveform should keep stable to ensure accurate count.

Example:

Detect count of the first way, send: 11 03 00 40 00 01 87 4E

Return: 11 03 02 00 00 79 87

2.2. DO output

- Register address range: 00~03(0x0000~0x0003)
- Supported function code: 01(Read coil), 05(Write single coil), 0F(Write multiple coil)
- Connection: DO output is Relay passive output and 4-way will use one COM together. Relay close will connect DO with COM.

Take the first way Relay control as example:

Query: 11 01 00 00 00 04 3F 59

Control to close: 11 05 00 00 FF 00 8E AA

Control to disconnect: 11 05 00 00 00 00 CF 5A

2.3. AI input

- Register address range: 88~89(0x0058~0x0059, voltage acquisition data), 96~97(0x0060~0x0061, current acquisition data)
- Supported function code: 03(Read holding register), 04(Read input register)
- Connection: Analog detection adopts public reference ground method to connect(signal + connects to +, signal - connects to - and reference ground short-circuit to power ground). Voltage detection range: 0 ~ 10V; current detection range: 0 ~ 20mA.

Take the first way voltage detection as example:

Query: 11 03 00 58 00 01 07 49

Return: 11 03 02 10 00 74 47

Return data: 0x1000, it's 4096 mV

Note: Analog detection is voltage detection and current detection, default is voltage detection and please ignore current register value. If user needs to do 0~20mA current detection, please contact to our sales personnel

2.4. Temperature detection

- Register address range: 80(0x0050, temperature acquisition data)
- Supported function code: 03(Read holding register), 04(Read input register)
- Connection: Input signal of temperature detection is PT100 signal and connection adopts three-wire system. Single wire connects to + and two interlinked wires connect to two -.
- Temperature calculation formula: Actual temperature=(Return value-10000)/100

Example:

Query: 11 04 00 50 00 01 33 4B

Return: 11 04 02 06 92 FA FE

Return data: 0x0692, it's 1682 and actual temperature=(1682-10000)/100=-83.18°C

2.5. Analog self-calibration

USR-IO424T-EWR supports analog self-calibration(Include two-way voltage value and one-way temperature value calibration).

- Temperature 1 self-calibration register address: 0x00B7~0x00B8
- Voltage 1 self-calibration register address: 0x00C7~0x00C8
- Voltage 2 self-calibration register address: 0x00C9~0x00CA

Every analog self-calibration will occupy two register address. For example, 0x00B7 and 0x00B8 are temperature self-calibration register address. Factory default value of two register address both are 10000, prior register address value represents K and last register address value represents B.

Calculation formula of temperature self-calibration: Temperature output value=(K/10000)*original temperature output value+(B-10000)/100

Calculation formula of voltage self-calibration: Voltage output value=(K/10000)*original voltage output value+(B-10000)*10

2.6. Work mode

Default work mode of USR-IO424T-EWR is slave mode. IO424T-EWR will be slave both on network side and RS485 side and IO424T-EWR will discard data if IO424T-EWR receives data not for IO424T-EWR local address.

2.6.1. Master mode

Master mode data flow diagram and connecting to network diagram as follows:

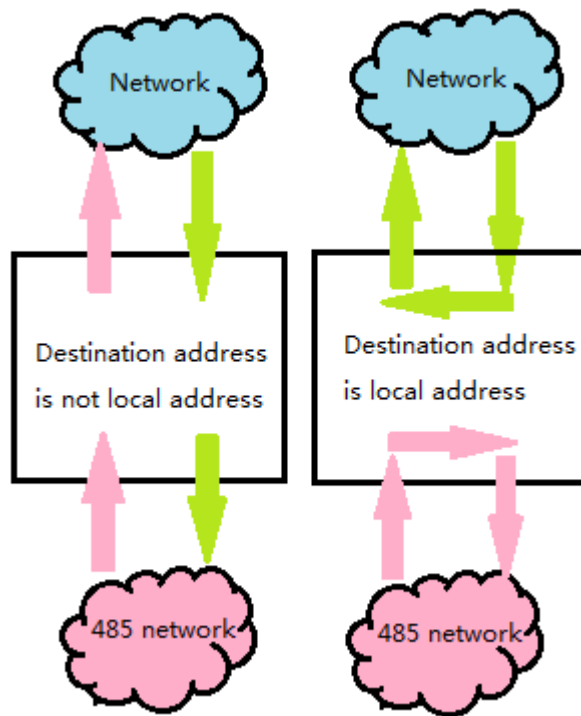


Figure 12 Master mode data flow

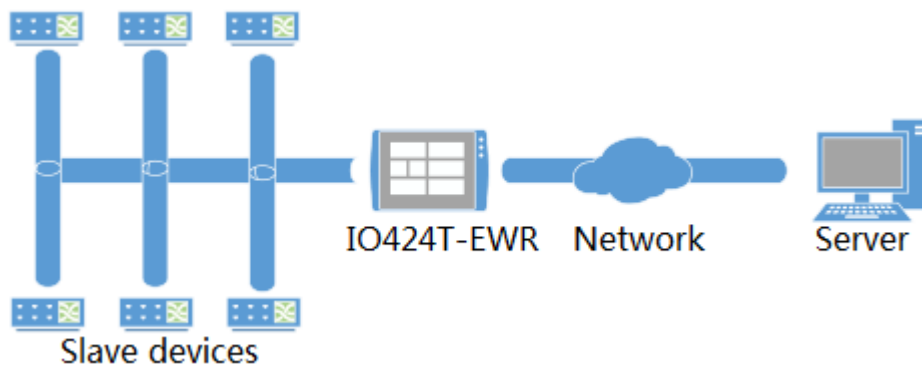


Figure 13 Connecting to network in Master mode

In master mode, server can communicate to network IO product IO424T-EWR and Modbus devices which connect to IO424T-EWR's RS485 interface. RS485 side can also transmit data to IO424T-EWR directly.

User can configure IO424T-EWR to Master mode by setup software as follow(Configure RS485 mode to 1.DTU):

| Params | | | | | | | |
|---|--------|----------|----------|------|---------------|---|---|
| ▼ MCU | | | | | | | |
| Device Name | | | | | USR-IO808 | | |
| RS485 BaudRate | Parity | ByteBits | StopBits | 9600 | NONE | 8 | 1 |
| Rs485 Mode(1.DTU 2.RTUSLAVE) | | | | | 1 | | |
| Work Mode Register(1.MODBUS Mode 2.Firmware Upgrade) | | | | | 1 | | |
| Hold mode of relay(1.Hold 2.Hold after reset and don't hold after repo) | | | | | 2 | | |
| Modbus Address | | | | | 17 | | |
| ▼ Socket | | | | | | | |
| Identity packet(1.USR Cloud identity packet 2.IMEI/MAC identity packet) | | | | | 2 | | |
| Remote Connect Address | | | | | 118.190.93.90 | | |
| tcp Remote Connect Port (1-65535) | | | | | 8235 | | |
| ▼ API | | | | | | | |
| APN Address | | | | | CMNET | | |
| APN User | | | | | | | |
| APN Code | | | | | | | |

Figure 14 Configure IO424T-EWR to Master mode

2.6.2. Slave mode

Slave mode data flow diagram and connecting to network diagram as follows:

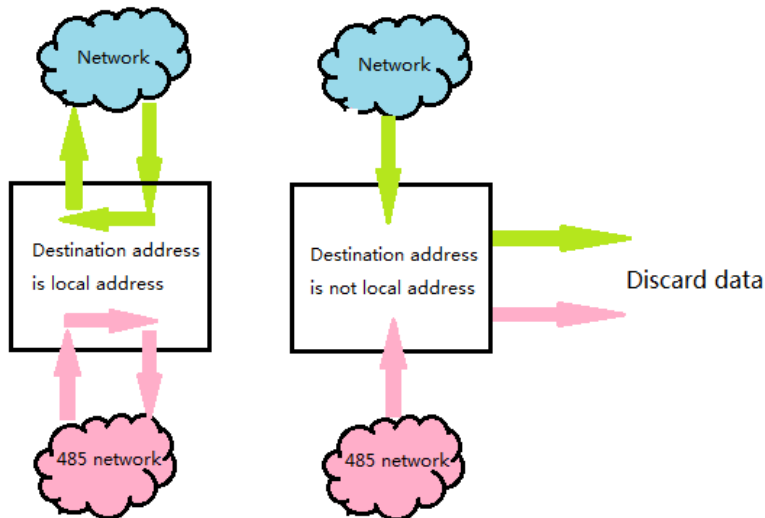


Figure 15 Slave mode data flow



Figure 16 Connecting to network in Slave mode

In this mode, IO424T-EWR can communicate to network server and Modbus devices on RS485 network. But network server can't communicate to Modbus devices on RS485 network.

User can configure IO424T-EWR to slave mode by setup software as follow(Configure RS485 mode to 2.RTUSLAVE):

| Params | | | | | | | |
|---|--------|----------|----------|---------------|------|---|---|
| ▼ MCU | | | | | | | |
| Device Name | | | | USR-IO808 | | | |
| RS485 BaudRate | Parity | ByteBits | StopBits | 9600 | NONE | 8 | 1 |
| Rs485 Mode(1.DTU 2.RTUSLAVE) | | | | 2 | | | |
| Work Mode Register(1.MODBUS Mode 2.Firmware Upgrade) | | | | 1 | | | |
| Hold mode of relay(1.Hode 2.Hode after reset and don't hold after repo) | | | | 2 | | | |
| Modbus Address | | | | 17 | | | |
| ▼ Socket | | | | | | | |
| Identity packet(1.USR Cloud identity packet 2.IMEI/MAC identity packet) | | | | 2 | | | |
| Remote Connect Address | | | | 118.190.93.90 | | | |
| tcp: Remote Connect Port (1-65535) | | | | 8235 | | | |
| ▼ APN | | | | | | | |
| APN Address | | | | CMNET | | | |
| APN User | | | | | | | |
| APN Code | | | | | | | |

Figure 17 Configure IO424T-EWR to Slave mode

2.7. Upgrade firmware

User can refer to FAQ <<[Upgrading firmware method of USR-IO424T-EWR_V1.0.0](#)>>.

2.8. Network

2.8.1. Ethernet interface

USR-IO424T-EWR's Ethernet interface supports switching between WAN interface and LAN interface. By modifying value of corresponding register, USR-IO424T-EWR can realize WAN/LAN switch. User can configure by setup software as follow:

| ▼ WAN/LAN | |
|------------------------------|---------------|
| Wan/lan(1.WAN 2.LAN) | 1 |
| WAN-ipmode(1. DHCP 2.STATIC) | 1 |
| WAN-IP | 192.168.0.7 |
| WAN-netmask | 255.255.255.0 |
| WAN-gateway | 192.168.0.1 |
| Lan-ip | 192.168.10.1 |
| Lan-netmask | 255.255.255.0 |
| dns1 | 8.8.8.8 |

Figure 18 WAN/LAN switch

2.8.2. WiFi


USR-IO424T-EWR supports WiFi function and AP/STA two WiFi modes,

AP mode:

1. Set WiFi mode to 1(AP mode) and AP'SSID/AP's password, then restart device.
2. After restarting successfully, use PC or mobile to search IO424T-EWR and connect.

STA mode:

1. Set WiFi mode to 2(STA mode) and SSID/password of the target AP which user wants to connect IO424T-EWR to, then restart device.
2. After restarting successfully, IO424T-EWR will connect to target AP automatically.



| WiFi | |
|-------------------------|-----------------|
| username | admin |
| password | admin |
| wifi ap/sta(1.AP 2.STA) | 1 |
| wifi ssid | USR-IO424T-446C |
| wifi pwd | www.usr.cn |

Figure 19 WiFi mode

2.9. Serial port

2.9.1. Basic parameters

| Parameter | Range |
|-----------|-----------------|
| Baud rate | 300~230400 |
| Data bits | 7, 8 |
| Stop bits | 1, 2 |
| Parity | NONE, EVEN, ODD |

Figure 20 Serial port basic parameters

2.9.2. Configuration method

Serial port parameters occupy two registers. Length of protocol is 4 bytes and specific protocol content as follow(All examples are in HEX format):

| Name | Baud rate | Parameter bit |
|-------------------------------|--|---|
| Number of bytes | 3 | 1 |
| Description | Three bytes represent a baud rate value and high-order in the former | Refer to Figure 22 Serial port parameter bit |
| Example 1(115200, None, 8, 1) | 01 C2 00 | 03 |
| Example 2(9600, None, 8, 1) | 00 25 80 | 03 |

Figure 21 Serial port parameters protocol

| Bit number | Representation | Value | Description |
|------------|----------------|-------|------------------|
| 1:0 | Data bits | 10 | 7 bits data bits |
| | | 11 | 8 bits data bits |
| 2 | Stop bits | 0 | 1 bit stop bits |
| | | 1 | 2 bits stop bits |
| 5:4:3 | Parity | 000 | None |
| | | 001 | ODD |
| | | 011 | EVEN |
| 7:6 | No definition | 00 | Please write 0 |

Figure 22 Serial port parameter bit

2.10. Features

2.10.1. Relay output status hold

User can configure whether hold Relay output status: After restarting IO424T-EWR or powering on IO424T-EWR again, hold the Relay output status or reset to disconnect status.

- Register address: 182(0x00B6)
- Parameter values: 1(0x0001):All Relays hold status after restarting or powering off. 2(0x0002):All relays hold status after restarting and don't hold status after powering off.3(0x0003):All relays don't hold status after restarting or powering off.
- Supported function code: 0x03, 0x04, 0x06, 0x10

Configuration will take effect after restarting.

2.10.2. Conditional control

Conditional control function supports user configuring the conditions to trigger IO changes. It can make using IO424T-EWR more flexibly and extend application scenario. User only needs to modify conditional control function register parameters according to the instructions , it will realize corresponding function.

Conditional control function has 32 registers and 8 conditional control commands(Every command occupies 4 registers). Registers distribution as follow:

| Storage content | Input register | Output register | Output action | Condition | Threshold | Reserved |
|-----------------|------------------|-----------------|--|-----------|--|---|
| Length | 1 byte | 1 byte | 1 byte | 1 byte | 2 bytes | 2 bytes |
| Address | Range: 16~109 | Range: 1~16 | 1: Disconnect 2: Close 3: Reversal | 1 ~ 255 | 'Compared register values'/The first two bytes of time-stamp | Reserved/ Last two bytes of time-stamp |

Figure 23 Conditional control function register

- Output action(Relay output)
 - 1: Disconnect

- 2: Close
- 3: Reversal
- Condition
 - 1: Forward direction output follow
 - 2: Backward direction output follow
 - 3: Greater than or equal to
 - 4: Less than or equal to
 - 255: Button action
- Control mode
 - Switching value control: DI input control DO output directly
 - Semaphore control: DI button semaphore control DO. Press button once, DO act once(Execute action in rising edge of releasing button).

Detailed explanation:

1. Forward direction output follow

Enable forward direction output follow: Set condition register to 1, input register is corresponding to one way register address of 4-way input and output register is corresponding to one way register address of 4-way output.

For example, if configure as 0x20 0x00 0x01 0x01 0x00 0x00 0x00 0x00, it represents status of DO1 will follow status of DI1 which means DO1 will close if DI1 close and DO1 will disconnect if DI1 disconnect.

2. Backward direction output follow

Enable backward direction output follow: Set condition register to 2, input register is corresponding to one way register address of 4-way input and output register is corresponding to one way register address of 4-way output.

For example, if configure as 0x20 0x00 0x01 0x02 0x00 0x00 0x00 0x00, it represents status of DO1 will be opposite as status of DI1 which means DO1 will close if DI1 disconnect and DO1 will disconnect if DI1 close.

3. Button control

Enable button control: Set condition register to 255, input register is DI button register and output register is DO output register. Action can be 1(disconnect), 2(close), 3(reversal), threshold register and reserved register can't work.

For example, if configure as 0x30 0x00 0x03 0xFF 0x00 0x00 0x00 0x00, it represents detecting DI1 button once will reverse status of DO1 once.

4. Greater than or equal to

Condition of greater than or equal to action is 03. Input register are voltage register, current register and temperature register; output register is DO output register. Action can be 1(disconnect), 2(close), 3(reversal). Threshold register is comparison value and program will compare acquisition results of input register with comparison value. Reserved register can't work.

For example, if configure as 0x50 0x00 0x01 0x03 0x3A 0x98 0x00 0x00, it represents: 0x50 is the first way temperature acquisition and 0X3A98 represents 15000(50°C). This condition represents disconnecting the first

way DO output when the first way temperature acquisition result is greater than 50°C.

5. Less than or equal to

Condition of less than or equal to action is 04. Input register are voltage register, current register and temperature register; output register is DO output register. Action can be 1(disconnect), 2(close), 3(reversal). Threshold register is comparison value and program will compare acquisition results of input register with comparison value. Reserved register can't work.

For example, if configure as 0x50 0x00 0x01 0x04 0x3A 0x98 0x00 0x00, it represents: 0x50 is the first way temperature acquisition and 0X3A98 represents 15000(50°C). This condition represents disconnecting the first way DO output when the first way temperature acquisition result is less than or equal to 50°C.

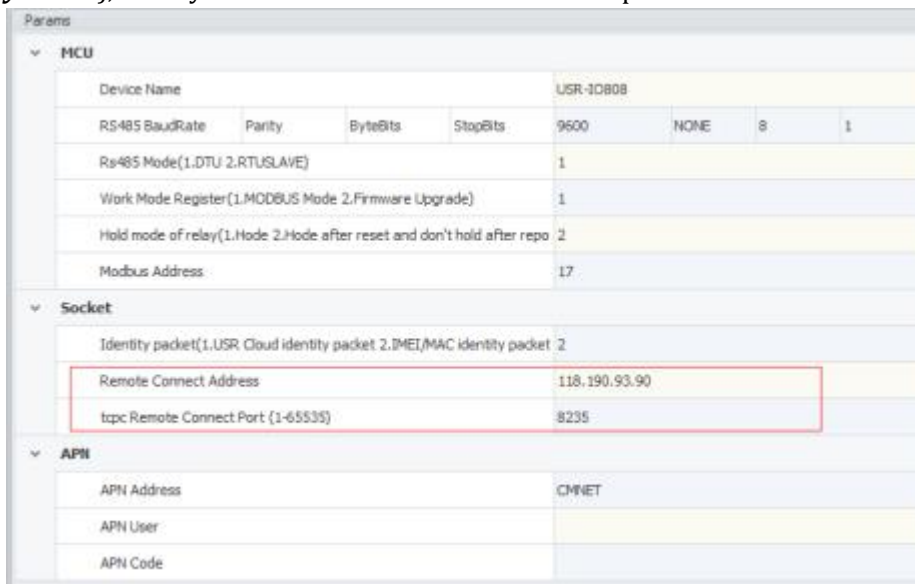
Note:

Input register is 0 means close this conditional control and execute button action once will clear button register. If multiple conditions will lead to paradoxical result, program will execute two results quickly. If forward direction output follow and backward direction output follow lead to paradoxical result, disconnecting and closing will revolve.

2.10.3. Connect to remote server

User can modify related register parameters of remote server to realize IO424T-EWR connecting to remote server. Procedure as follow:

1. Power the IO424T-EWR and connect IO424T-EWR's RS485 interface to PC. Run setup software(User can refer to **1.4.1.Control by serial**), modify remote server address and remote port as follow:



| Params | | | | | | | |
|--|---------------|----------|----------|------|------|---|---|
| MCU | | | | | | | |
| Device Name | USR-IO808 | | | | | | |
| RS485 BaudRate | Parity | ByteBits | StopBits | 9600 | NONE | 8 | 1 |
| Rs485 Mode(1.DTU 2.RTUSLAVE) | 1 | | | | | | |
| Work Mode Register(1.MODBUS Mode 2.Firmware Upgrade) | 1 | | | | | | |
| Hold mode of relay(1.Hold 2.Hold after reset and don't hold after repo | 2 | | | | | | |
| Modbus Address | 17 | | | | | | |
| Socket | | | | | | | |
| Identity packet(1.USR Cloud identity packet 2.IMEI/MAC identity packet | 2 | | | | | | |
| Remote Connect Address | 118.190.93.90 | | | | | | |
| tcp: Remote Connect Port (1-65535) | 8235 | | | | | | |
| APN | | | | | | | |
| APN Address | CMNET | | | | | | |
| APN User | | | | | | | |
| APN Code | | | | | | | |

Figure 24 Configure remote server parameters

2. Restart IO424T-EWR to make configuration take effect.

3. Login remote server and open the port.

4. Wait IO424T-EWR LED 'NET' light which means IO424T-EWR connect to remote server successfully, Then user can transmit Modbus TCP/RTU command from server side to control IO424T-EWR and receive response from IO424T-EWR.

2.10.4. Reset to default by hardware

User can reset to default settings by pressing Reload button. After powering on, press Reload button 3 seconds to 15 seconds, then release it, IO424T-EWR will reset to default settings. Less than 3 seconds or more than 15 seconds will be considered as misoperation and don't handle it.

3. Modbus

3.1. Modbus frame

Modbus RTU:

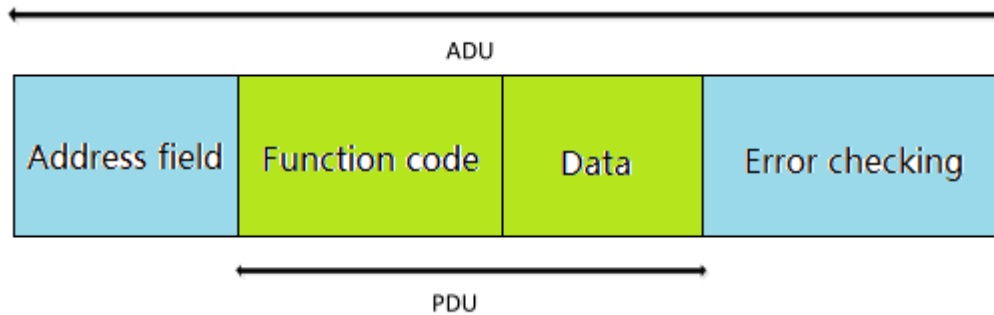


Figure 25 Modbus RTU frame

USR-IO424T-EWR data format conform to general Modbus frame format. IO424T-EWR can analyse Modbus RTU protocol and execute related operations.

Modbus TCP:

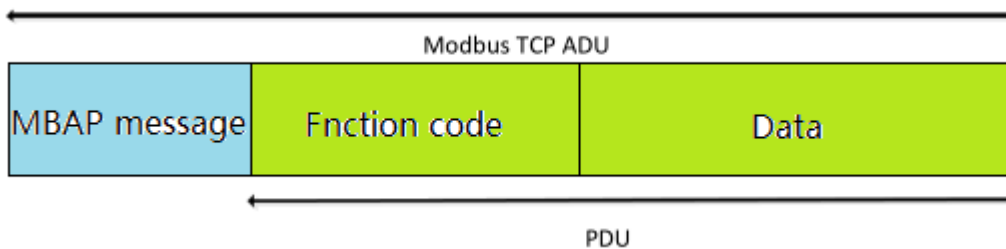


Figure 26 Modbus TCP frame

USR-IO424T-EWR can analyse received network Modbus TCP protocol data and transfer to Modbus RTU protocol to do data processing. IO424T-EWR can also be used in Master mode and transfer Modbus RTU protocol to Modbus TCP protocol and transmit to server.

3.2. Register distribution

USR-IO424T-EWR register instructions:

1. Register base address is 0x0000.
2. In following register distribution table, MCU parameters and communication module parameters must operate together.
3. Setup software USR-IO adopts UTF-8 coded format.
4. Register store HEX format data.

| Register address | Register content | Parameter description | Applicable function code |
|-------------------|---------------------|---|--------------------------|
| Device I/O | | | |
| 0x0000~0x0003 | Switch value output | 0xFF00 means ON, 0x0000 means OFF; 1 means ON, 0 means OFF | 0x01, 0x05, 0x0F |

| | | | |
|----------------------|--|---|------------------------|
| 0x0020~0x0023 | Switch value input | 1 means ON, 0 means OFF | 0x02 |
| 0x0030~0x0033 | Button input | Button detection. Reset to 0 after reading once | 0x03, 0x04 |
| 0x0040~0x0043 | Pulse counting | Count range: 0~65535. Reset to 0 after reaching maximum | 0x03, 0x04, 0x06, 0x10 |
| 0x0050 | Temperature detection | PT100 temperature detection, range: -100~200℃ | 0x03, 0x04 |
| 0x0058 | Voltage 1 detection | 0-10V voltage detection | 0x03, 0x04 |
| 0x0059 | Voltage 2 detection | 0-10V voltage detection | 0x03, 0x04 |
| MCU parameter | | | |
| 0x0068~0x0069 | Time-stamp | Current time-stamp | 0x03, 0x04 |
| 0x006A~0x006C | Year, month, day, hour, minute, second | The format of 'year, month, day, hour, minute, second' is Bcd code. Such as [0x18,0x01,0x01,0x08,0x24,0x56] represents 2018-1-1 8:24:56 | 0x03, 0x04, 0x10 |
| 0x006D | Week | 0x0001-0x0007 represents Monday to Sunday | 0x03, 0x04 |
| 0x008E~0x0091 | Conditional control command 1 | Refer to 2.10.2. Conditional control | 0x03, 0x04, 0x10 |
| 0x0092~0x0095 | Conditional control command 2 | | |
| 0x0096~0x0099 | Conditional control command 3 | | |
| 0x009A~0x009D | Conditional control command 4 | | |
| 0x009E~0x00A1 | Conditional control command 5 | | |
| 0x00A2~0x00A5 | Conditional control command 6 | | |
| 0x00A6~0x00A9 | Conditional control command 7 | | |
| 0x00AA~0x00AD | Conditional control command 8 | | |
| 0x00AE~0x00AF | RS485 interface | Refer to 2.9.2. Configuration method | 0x03, 0x04, 0x10 |
| 0x00B0 | RS485 mode | Master mode(0x0001) Slave mode(0x0002) | 0x03, 0x04, 0x06, 0x10 |
| 0x00B1 | Modbus address | Slave address(0x0001~0x00FD) | 0x03, 0x04, 0x06, 0x10 |
| 0x00B2 | Work mode | Modbus mode(0x0001) Firmware upgrade(0x0002) | 0x03, 0x04, 0x06, 0x10 |

| | | | |
|--|-----------------------------------|---|------------------------|
| 0x00B3 | Global parameters configuration | Default(0x0000), restart(0x0001), reset to user default settings(0x0002), reset to USR default settings(0x5555), save current settings as user default settings(0xAAAA) | 0x03, 0x04, 0x06, 0x10 |
| 0x00B4 | MCU software version | For example, 0x0112 means version V1.1.2 | 0x03, 0x04 |
| 0x00B5 | MCU hardware version | For example, 0x0110 means version V1.1 | 0x03, 0x04 |
| 0x00B6 | Relay status after restarting | All relays hold status after restarting or powering off(0x0001); All relays hold status after restarting and don't hold status after powering off(0x0002) All relays don't hold status after restarting or powering off(0x0003) | 0x03, 0x04, 0x06, 0x10 |
| 0x00B7~0x00B8 | Temperature self-calibration | Device temperature self-calibration interface | 0x03, 0x04, 0x06, 0x10 |
| 0x00C7~0x00C8 | Voltage 1 self-calibration | Device voltage 1 self-calibration interface | 0x03, 0x04, 0x06, 0x10 |
| 0x00C9~0x00CA | Voltage 2 self-calibration | Device voltage 2 self-calibration interface | 0x03, 0x04, 0x06, 0x10 |
| Communication module parameters | | | |
| 0x1021 | WiFi mode | AP(1)/STA(2) | 0x03, 0x04, 0x06, 0x10 |
| 0x1022~0x1031 | AP mode SSID | Character string format | 0x03, 0x04, 0x10 |
| 0x1032~0x1041 | AP mode password | Character string format | 0x03, 0x04, 0x10 |
| 0x1042 | WAN/LAN switch | WAN(1)/LAN(2) | 0x03, 0x04, 0x06, 0x10 |
| 0x1043 | Remote connection identity packet | USR Cloud(1)/MAC(2)/User editable(3)/Disable(4) | 0x03, 0x04, 0x06, 0x10 |
| 0x1044~0x1045 | LAN interface IP | 0xC0A80007 represents 192.168.0.7 | 0x03, 0x04, 0x10 |
| 0x104A | WAN interface IP mode | DHCP(1)/Static IP(2) | 0x03, 0x04, 0x06, 0x10 |
| 0x104B~0x104C | WAN interface IP | 0xC0A80007 represents 192.168.0.7 | 0x03, 0x04, 0x10 |
| 0x104D~0x104E | WAN interface mask | 0xC0A80007 represents 192.168.0.7 | 0x03, 0x04, 0x10 |
| 0x104F~0x1050 | WAN interface gateway | 0xC0A80007 represents 192.168.0.7 | 0x03, 0x04, 0x10 |
| 0x1051~0x1052 | DNS1 | 0xC0A80007 represents | 0x03, 0x04, 0x10 |

| | | 192.168.0.7 | |
|---------------|--------------------------------------|---|------------------------|
| 0x1055~0x1074 | TCP Client remote server address | Remote server address | 0x03, 0x04, 0x10 |
| 0x1075 | TCP Client remote port | Remote server port | 0x03, 0x04, 0x06, 0x10 |
| 0x1076 | TCP Server/UDP Server listening port | LAN listening port | 0x03, 0x04, 0x06, 0x10 |
| 0x1078~0x107F | Username | Character string format | 0x03, 0x04, 0x10 |
| 0x1080~0x1087 | Password | Character string format | 0x03, 0x04, 0x10 |
| 0x1088~0x1097 | Device name | Character string format | 0x03, 0x04, 0x10 |
| 0x1098 | Device software version | For example, 0x0112 means version V1.1.2 | 0x03, 0x04 |
| 0x1099 | Device hardware version | For example, 0x0110 means version V1.1 | 0x03, 0x04 |
| 0x109A~0x10A9 | Target AP's SSID in STA mode | Character string format | 0x03, 0x04, 0x10 |
| 0x10AA~0x10B9 | Target AP's password in STA mode | Character string format | 0x03, 0x04, 0x10 |
| 0x10BA~0x10CD | User editable identity packet | Character string format | 0x03, 0x04, 0x10 |
| 0x10CE | Identity packet sending method | Send identity packet after establishing connection(1)/Send before every data package(2)/Both way(3) | 0x03, 0x04, 0x06, 0x10 |

Figure 27 Register distribution

4. Contact Us

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5. Disclaimer

This document provides the information of USR-IO424T-EWR products, it hasn't been granted any intellectual property license by forbidding speak or other ways either explicitly or implicitly. Except the duty declared in sales terms and conditions, we don't take any other responsibilities. We don't warrant the products sales and use explicitly or implicitly, including particular purpose merchant-ability and marketability, the tort liability of any other patent right, copyright, intellectual property right. We may modify specification and description at any time without prior notice.

6. Update History

2018-05-28 V1.0.3.01 established based on Chinese version V1.0.3.

FCC STATEMENT :

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

Warning: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help.

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.