USR-M511 User Manual

File Version: V1.0.4.2
# Contents

USR-M511 User Manual .......................................................................................................................... 1

Features .................................................................................................................................................. 3

1. Get Start ............................................................................................................................................. 4
   1.1. Application Diagram .................................................................................................................. 4
   1.2. Hardware Design .......................................................................................................................... 5
      1.2.1. Hardware Dimensions ........................................................................................................... 5
      1.2.2. LED Indicator ....................................................................................................................... 6
      1.2.3. DB9 Pin definition ............................................................................................................... 6
      1.2.4. DB9 Pinboard ....................................................................................................................... 6

2. Product Functions ............................................................................................................................... 8
   2.1. Basic Functions ........................................................................................................................... 8
      2.1.1. Static IP/DHCP .................................................................................................................... 8
      2.1.2. Hardware Restore default settings ....................................................................................... 9
      2.1.3. Upgrade Firmware Version ............................................................................................... 9
   2.2. Serial port ...................................................................................................................................... 10
      2.2.1. Serial Port Basic Parameter .............................................................................................. 10
      2.2.2. Serial Package Methods .................................................................................................. 11
      2.2.3. Baud Rate Synchronization ............................................................................................. 11
   2.3. Modbus protocol transmission .................................................................................................... 11
      2.3.1. Modbus Master .................................................................................................................. 11
      2.3.2. Modbus Slave ..................................................................................................................... 12
   2.4. Modbus Slave management ......................................................................................................... 14
      2.4.1. Modbus data monitoring .................................................................................................... 14
      2.4.2. Modbus data management ............................................................................................... 15
   2.5. Features .......................................................................................................................................... 16
      2.5.1. Network Identity Packet Function ..................................................................................... 16

3. Parameter Setting .................................................................................................................................. 17
   3.1. Web Server Configuration .......................................................................................................... 17
   3.2. AT Command ................................................................................................................................ 17
      3.2.1. Serial AT Command .......................................................................................................... 17
      3.2.2. Network AT Command .................................................................................................... 18

4. Contact Us ........................................................................................................................................... 19

5. Disclaimer .......................................................................................................................................... 19

6. Update History ..................................................................................................................................... 19
Features

- Support Modbus_RTU_Master, Modbus_RTU_Slave, Modbus_ASCII_Master, Modbus_ASCII_Slave work modes.
- Support Modbus Master Prefetch function.
- Support 8 Modbus Slave automatic query by commands.
- Support Modbus web server management function.
- 10/100Mbps Ethernet interface, support Auto-MDI/MDIX.
- Baud rate support 600bps~230.4K bps; Support None, Odd, Even, Mark, Space.
- Support Static IP/DHCP.
- Support keep-alive.
- Support RS232/RS485/RS422.
- Support hardware Reboot.
1. Get Start

Product link:

Industrial Modbus Gateway, Modbus RTU/ASCII to Modbus TCP
USR-M511 is Modbus gateways that query Modbus RTU/ASCII slave and display data in internal webpage. It also supports reply the querying from Modbus TCP Master. USR-M511 provides a flexible method to control and monitor your Modbus RTU/ASCII devices.

- Support RS232/RS485 or RS422
- Ethernet accessory
- Internal webpage to control and monitor
- Auto query Modbus RTU/ASCII Slave device

If you have any question, please submit it back to customer center: http://h.usriot.com

1.1. Application Diagram

Figure 1 Download Page

Figure 2 Application diagram
1.2. Hardware Design

1.2.1. Hardware Dimensions

Figure 3 Hardware dimensions
1.2.2. LED Indicator

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWR</td>
<td>On: Power on</td>
</tr>
<tr>
<td></td>
<td>Off: Power off</td>
</tr>
<tr>
<td>WORK</td>
<td>On: Working</td>
</tr>
<tr>
<td></td>
<td>Off: Not working</td>
</tr>
<tr>
<td>TX</td>
<td>On: Sending data to serial</td>
</tr>
<tr>
<td></td>
<td>Off: No data sending to serial</td>
</tr>
<tr>
<td>RX</td>
<td>On: Receiving data from serial</td>
</tr>
<tr>
<td></td>
<td>Off: No data receiving from serial</td>
</tr>
</tbody>
</table>

Figure 4 Hardware Indicator

1.2.3. DB9 Pin definition

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>RS232</th>
<th>RS422</th>
<th>RS485</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>RXD</td>
<td>RX+</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>TXD</td>
<td>TX-</td>
<td>B-</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>GND</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>RTS</td>
<td>TX+</td>
<td>A+</td>
</tr>
<tr>
<td>8</td>
<td>CTS</td>
<td>RX-</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 5 DB9 Pin definition

1.2.4. DB9 Pinboard

We provide DB9 pinboard for user to use terminal connection.
<table>
<thead>
<tr>
<th>Type</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS232</td>
<td>TX</td>
<td>RX</td>
<td></td>
<td></td>
<td>GND</td>
</tr>
<tr>
<td>RS485</td>
<td>A+</td>
<td>B-</td>
<td></td>
<td></td>
<td>GND</td>
</tr>
<tr>
<td>RS422</td>
<td>T+</td>
<td>T-</td>
<td>R+</td>
<td>R-</td>
<td>GND</td>
</tr>
</tbody>
</table>

Figure 6 DB9 pinboard
2. Product Functions

This chapter introduces the functions of USR-M511 as the following diagram shown, you can get an overall knowledge of it.

![Product Functions Diagram]

Figure 7 Product Functions diagram

2.1. Basic Functions

2.1.1. Static IP/DHCP

There are two ways for module to get IP address: Static IP and DHCP.

Static IP: Default setting of module is Static IP and default IP is 192.168.0.7. When user set module in Static IP mode, user need set IP, subnet mask and gateway and must pay attention to the relation among IP, subnet mask and gateway.

DHCP: Module in DHCP mode can dynamically get IP, Gateway, and DNS server address from Gateway Host. When user connect directly to PC, module can’t be set in DHCP mode. Because common computer does not have the ability to assign IP addresses.
User can change Static IP/DHCP by web server. Setting diagram as follow:

![Figure 8 Static IP/DHCP](image)

**2.1.2. Hardware Restore default settings**

User can press Reload over 5s and less than 15s then release to restore default settings.

**2.1.3. Upgrade Firmware Version**

User can contact to salespersons for needed firmware version and upgrade by setup software through Ethernet port. Setup software download link: [http://www.usriot.com/USR-tcp232-m4k3-setup-software](http://www.usriot.com/USR-tcp232-m4k3-setup-software). User can upgrade as follows:
2.2. Serial port

2.2.1. Serial Port Basic Parameter

Serial port basic parameters as follow:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Default</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baud rate</td>
<td>115200</td>
<td>600~230400bps</td>
</tr>
<tr>
<td>Data bits</td>
<td>8</td>
<td>5~8</td>
</tr>
<tr>
<td>Parity</td>
<td>None</td>
<td>None, Odd, Even, Mark, Space</td>
</tr>
<tr>
<td>Stop bits</td>
<td>1</td>
<td>1~2</td>
</tr>
<tr>
<td>Flow control</td>
<td>None</td>
<td>No flow control.</td>
</tr>
</tbody>
</table>

HardWare: Hardware flow control(RTS/CTS).
Xon/Xoff: Software flow control.

User can change serial port parameters by web server as follow:

![Serial port parameters configuration](image_url)
2.2.2. Serial Package Methods

For network speed is faster than serial, Module will put serial data in buffer before sending it to network. The data will be sent to Network as Package. There are 2 ways to end the package and send package to network - Time Trigger Mode and Length Trigger Mode.

- Time Trigger Mode: Default package time is 4 bytes sending interval and use can set between 0~65535.
- Length Trigger Mode: Default package length is 1460 and user can set between 0~1460.

2.2.3. Baud Rate Synchronization

When module works with USR devices or software, serial parameter will change dynamically according to network protocol. Customer can modify serial parameter by sending data conformed to specific protocol via network. It is temporary, when restart DTU, the parameters back to original parameters.

2.3. Modbus protocol transmission

Work mode: Modbus_RTU_Master, Modbus_ASCII_Master, Modbus_RTU_Slave, Modbus_ASCII_Slave. Work mode can be defined according to the serial port device of M511 and Modbus protocol. For example, serial port device is Modbus Master and Modbus protocol is ASCII protocol, work mode is Modbus_ASCII_Master.

2.3.1. Modbus Master

Modbus Master mode means serial port device connected to M511 is Modbus Master.

1. M511 work in Modbus Master mode allow at most 32 Modbus Masters connect through RS485/RS422 to achieve RS485/RS422 multiple Masters Polling function. But speed of RS485/RS422 interface will be a little slow because of the limitation of RS485/RS422 baud rate.
2. When M511 work in Modbus Master mode can query information of different Modbus slaves by sending query command with ID of specific Modbus slave. M511 allow at most 8 target server.
3. Modbus work in Modbus Master mode can apply to four applications: One Master to one Slave; one Master to multiple Slaves; multiple Masters to one Slave; multiple Masters to multiple Slaves.

Application diagram as follows:

![Modbus Master Diagram]

**Figure 12 One Master to one Slave**

User can change Modbus Master mode parameters by web server as follow:
Figure 13 Modbus Master mode configuration

A. Work Mode: Four types work modes.
B. Enable Modbus Over TCP/IP: Open this function, M511 will work in transparent transmission and don’t proceed protocol conversion. If network side protocol is Modbus RTU/ASCII, this function must be used. If network side protocol is Modbus TCP, this function can’t be opened.
C. Remote Server AddrA: Modbus Slave address, can be domain name.
D. Remote Port NumberA: Default port is 502 and often keep default value.
E. Slave ID Range: All querying command will be sent to this Slave in this range.
F. Enable SocketB: Enable socket B to set salve 2 parameters.
G. Timeout Reconnection: No data transmission over this time, M511 will automatically disconnect and reconnect remote Slave.
H. Modbus Timeout: Modbus response time which must be accordant with serial port Modbus Master.

2.3.2. Modbus Slave

Modbus Slave mode means serial port device connected to M511 is Modbus Slave.

1. M511 work in Modbus Slave mode allow at most 32 Modbus Slaves connect through RS485/RS422 to achieve RS485/RS422 multiple Masters Polling function. But speed of RS485/RS422 interface will be a little slow because of the limitation of RS485/RS422 baud rate.
2. M511 work in Modbus Slave mode support 16 Masters querying Slave information.
3. M511 work in Modbus Slave will default open Memory Function to solve the problem that Modbus Masters in
network side query Modbus Slaves too slow. When open this function, M511 will automatically update the stored data from serial port Modbus Slaves and reply stored data to network side Modbus Masters directly.

4. Modbus work in Modbus Slave mode can apply to four applications: One Master to one Slave; one Master to multiple Slaves; multiple Masters to one Slave; multiple Masters to multiple Slaves.

Application diagram as follows:

User can change Modbus Slave mode parameters by web server as follow:

A. Work mode: Four types work modes.

B. Enable Modbus Over TCP/IP: Open this function, M511 will work in transparent transmission and don’t proceed protocol conversion. If network side protocol is Modbus RTU/ASCII, this function must be used. If network side protocol is Modbus TCP, this function can’t be opened.

C. Enable Memory Function: When open this function, M511 will automatically update the stored data from serial port Modbus Slaves and reply stored data to network side Modbus Masters directly.
D. Local Port Number: Default is 502 and don’t need change.

E. Timeout Reconnection: No data transmission over this time, M511 will automatically disconnect and reconnect remote Slave.

F. Modbus Timeout: Modbus response time which must be accordant with serial port Modbus Master.

### 2.4. Modbus Slave management

M511 support Modbus management based on Websocket. So user need use browser which can support Websocket as follow:

<table>
<thead>
<tr>
<th>Browser</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chrome</td>
<td>Version 4+</td>
</tr>
<tr>
<td>Firefox</td>
<td>Version 4+</td>
</tr>
<tr>
<td>Internet Explorer</td>
<td>Version 10+</td>
</tr>
<tr>
<td>Opera</td>
<td>Version 10+</td>
</tr>
<tr>
<td>Safari</td>
<td>Version 5+</td>
</tr>
</tbody>
</table>

**Figure 16 Browser version**

#### 2.4.1. Modbus data monitoring

User need disable Modbus Over TCP/IP function to use Modbus data monitoring function.

1. Open Modbus Manage and configure the Modbus Slave ID/address by web server as follow:

2. Save and refresh the Modbus Manage, configure Slave mark to monitor conveniently. (mark only support Chinese characters, letter and number).

**Figure 17 Modbus data monitoring function configuration**
2.4.2. Modbus data management

M511 support Modbus data management function to query Slave information through Modbus Management web-page. When user open Modbus data management function, M511 will disable querying commands from Modbus Master to Modbus Slave (close protocol conversion function).

User can configure Modbus data management as follow:

(3) Refresh Modbus Management and query the data. Web server will update data value without refreshing.
2.5. Features

2.5.1. Network Identity Packet Function

M511 work in Modbus Master mode can send identity packet to Slave. Identity packet can be user editable data or MAC address. Identity packet will be sent when connection is established. Application diagram as follow:

![Identity Packet application diagram](image)

*Figure 20 Identity Packet application diagram*
3. Parameter Setting

There are two ways to configure USR-M511. They are web server configuration and AT command configuration.

3.1. Web Server Configuration

User can connect PC to M511 through LAN port and enter web server to configure.

Web server default parameters as follow:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Default settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web server IP address</td>
<td>192.168.0.7</td>
</tr>
<tr>
<td>User name</td>
<td>admin</td>
</tr>
<tr>
<td>Password</td>
<td>admin</td>
</tr>
</tbody>
</table>

*Figure 21 Web server default parameters*

After firstly connecting PC to M511, user can open browser and enter default IP 192.168.0.7 into address bar, then log in user name and password, user will enter into web server. Web server screenshot as follow:

*Figure 22 Web Server*

3.2. AT Command

We have specific user manual for AT commands.
3.2.1. Serial AT Command

In transparent mode, user can enter AT command mode, then user can send AT command to module. For entering AT command mode, please refer to this FAQ: [http://www.usriot.com/enter-serial-command-mode/](http://www.usriot.com/enter-serial-command-mode/).

3.2.2. Network AT Command

Network AT command is to send a search keyword by broadcast, then set the parameters in a single broadcast way. Default keyword is **WWW.USR.CN** and default port number is 48899. User can enter Network AT command as follow:

![Network AT Command](image)

**Figure 23 Network AT Command**
4. Contact Us

Company: Jinan USR IOT Technology Limited
Address: Floor 11, Building 1, No. 1166 Xlnluo Street, Gaoxin District, Jinan, Shandong, 250101, China
Web: www.usriot.com
Support: h.usriot.com
Email: sales@usr.cn
Tel: 86-531-88826739/86-531-55507297

5. Disclaimer

This document provides the information of USR-M511 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

2017-09-06 V1.0.4.1 Established
2018-08-10 V1.0.4.2 Remove Modbus Master mode "Offset" function.