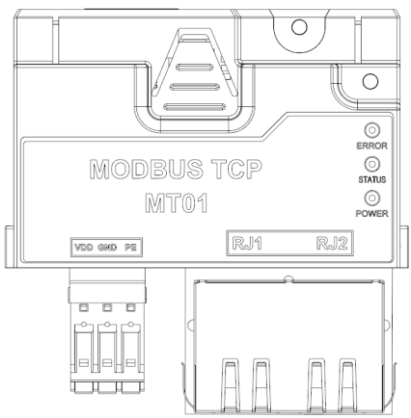
# Operation Guide of Modbus TCP

## 1.Summary

The MT01 card is a Modbus TCP fieldbus option card. This card is installed on our company's frequency converter to improve communication efficiency and facilitate the implementation of networked functions for the frequency converter. The frequency converter is controlled by the master station as a slave station. The MT01 card is suitable for our full power range products in this series.

Please read this guide carefully before using this product.




Features:

- The bus communication rate reaches 100Mbit/s, the communication cycle is short.
- Flexible networking topology, MT01 supports all types of topologies: chain, bus, tree or star, etc, where MT01 functions as the Modbus TCP server and the master station as the client.
- The option card is directly installed on the option card slot, no external power supply is required, and the installation is convenient.

## 2.MT01 Installation

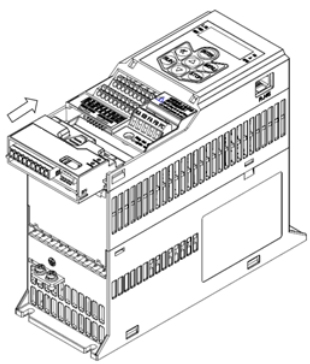
Installation steps：

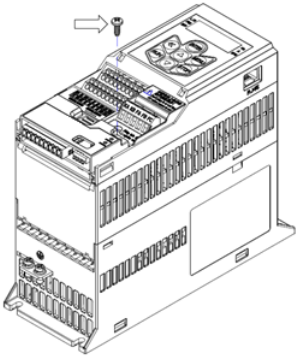
1) Check the option card accessory package contains: Modbus TCP card,pluggable terminal *1, screw *1, manual；

2) Install the option card as shown below：

Step 1. Push the option card along the bottom rail into the bottom of the CU. Then terminals of the option card are inserted into the bottom of the CU terminal, and the two screw holes are aligned;

Step 2. as the picture shows, align the screws with the screw holes to fix the CU and the Modbus TCP card.

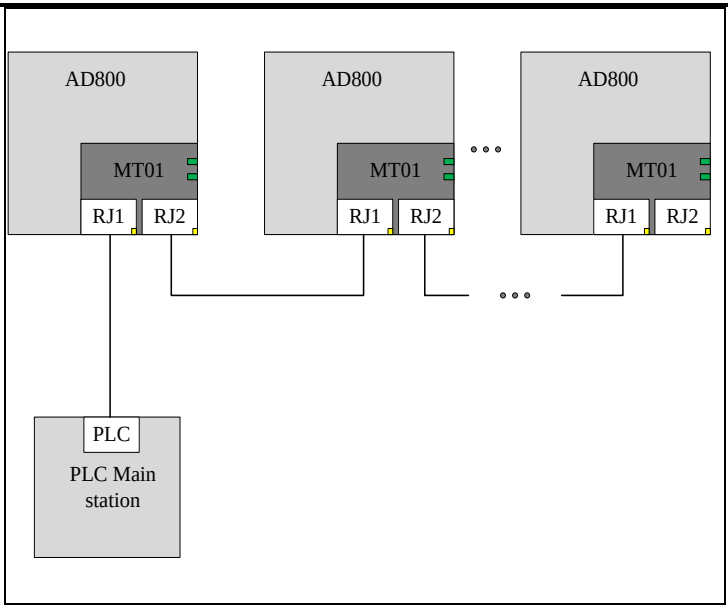




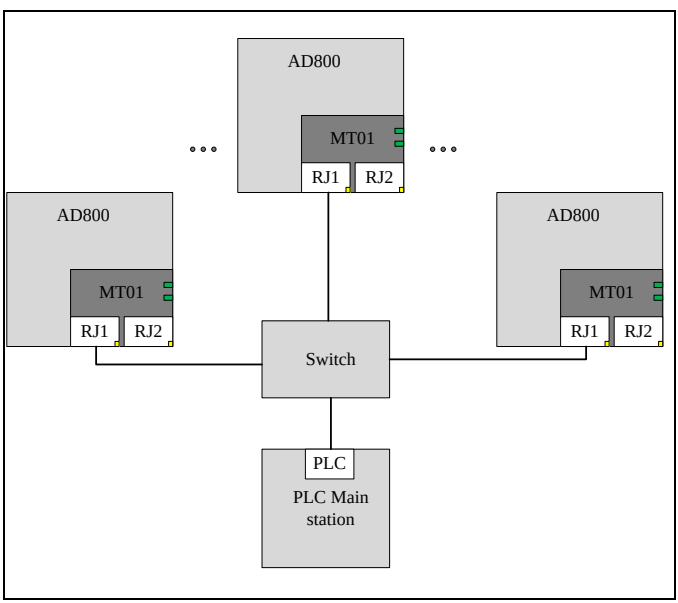
## 3.Electrical Connections

The MT01 module uses a standard Ethernet RJ45 socket to connect to the MODBUS TCP master station, and its pin signal definition is the same as the standard Ethernet pin, cross-wire and straight-wire are both available.

1) Chain network electrical connection

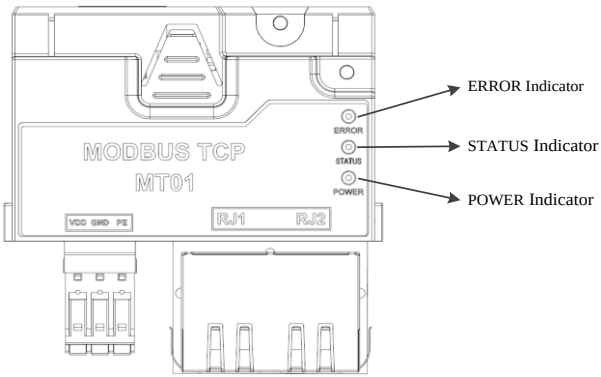



2) Star network electrical connection



# 4 .Status Indicator Description

MT01 expansion card can track bus communication failures through 2 status indicators. The diagnosis failure description is shown in the following table:




| Indicator light | Color | Status description |
|---|---|---|
| ERROR | Red light is always on | ModbusTCP communication error |
| | Red light is flashing | Internal fault |
| | Red light is off | Communication is normal |
| **STATUS** | Green light is always on | Communication messages in progress |
| | Green light is flahing | Communication messages in progress |
| | Gtenn light is off | No communication message transmission |
| POWER | Green light is always on | The expansion card is powered on normally |
| | Green light is off | The power supply of the expansion card is abnormal or the inverter is not powered on |
| **Interface** | **Terminals or signals** | **Explanation** |
| ModbusTCP Communication interface | RJ1 | Communication interface1 |
| | RJ2 | Communication interface2 |
| Independent power supply interface | VDD | Translation: External 24V power supply, 24V+/5%;<br>When the frequency converter is powered off, it can be powered by this port to ensure that MT01 does not lose connectivity |
| | GND | Power ground |
| | PE | Ground |

## 5.Related Parameters

| Parameter Number | Parameter Name | Comments |
|---|---|---|
| 1001 | IP Address[0] | IP address.<br>E.g,192.168.0.1 set the following parameters：<br>1001: 192，1002: 168，<br>1003: 0，1004:1 |
| 1002 | IP Address[1] | |
| 1003 | IP Address[2] | |
| 1004 | IP Address[3] | |
| 1005 | IP Address Mask[0] | IP address mask.<br>E.g,255.255.255.0 set the following parameters：<br>1005：255，1006：255，<br>1007：255，1008：0 |
| 1006 | IP Address Mask[1] | |
| 1007 | IP Address Mask[2] | |
| 1008 | IP Address Mask[3] | |
| 1009 | Gateway address[0] | Gateway address.<br>E.g,192.168.0.241 set the following parameters：<br>1009：192，1010：168，<br>1011：0，1012：241 |
| 1010 | Gateway address[1] | |
| 1011 | Gateway address[2] | |
| 1012 | Gateway address[3] | |

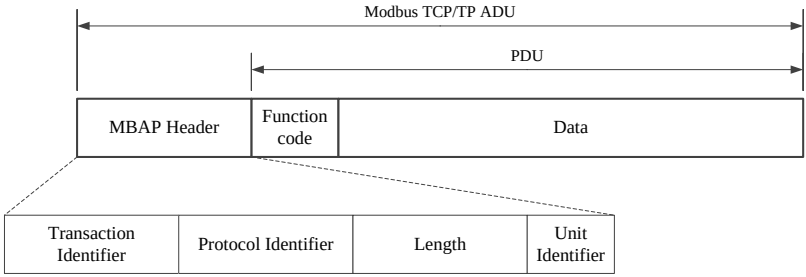
## 6.Technical Specifications

| Type | Specifications |
|---|---|
| Communication connector | RJ45 × 2 |
| Network standard | IEEE 802.3/802.3u |
| Physical layer | 10Base-T/100Base-TX |
| Cable Type | Category 5e shielding 100M |
| Protocol | Modbus TCP |
| Maximum number of clients | 6 |
| Port | 502 |

## 7.Protocol Description

**7.1.Protocol Format**

ModbusTCP frame format of MT01 is shown as the figure below:




**Specification:**

| Field | | Length | Description |
|---|---|---|---|
| MBAP Header | Transaction Identifier | 2 | Identification of a MODBUS Request / Response transaction. |
| | Protocol Identifier | 2 | 0 = MODBUS protocol |
| | Length | 2 | Number of following bytes |
| | Unit Identifier | 1 | Identification of a remote slave connected on a serial line or on other buses. |
| Function code | | 1 | Modbus function code |
| Data | | 2*N | Frequency Converter Parameter Address, Number of Parameters, and Parameter Values, etc. |

**7.2.Function Code**

| Function code | Description | Meaning |
|---|---|---|
| 0x03 | Read Holding Registers | Read drive functional parameters and running status parameters |
| 0x06 | Preset Single Register | Over-write individual drive functional parameters |
| 0x10 | Preset Multiple Registers | Over-write multiple Registers |

**7.3.Register Address Definition**

All the following register addresses are started from 0.

7.3.1.The Rules of Register Address of the Parameter Number

The parameters can be mapping to Modbus TCP register address. The read and write characteristics and ranges of frequency converter parameters still follow the instructions provided in the frequency converter manual.The rules of register address of the parameter number are shown below:

**Register address = Parameter number – 1**

**For example:**

The register address of P0-30 is 30 - 1 = 29 (0x001D)

The register address of P9-11 is 911 - 1 = 910(0x038E)

**Attention:**

Parameters Group 8 and 9 are Read-only.

The Drive don't support write or read multiple parameters at a time.

7.3.2.Other Register Addresses Specification

In addition to parameter is mapped to Modbus registers, there are some additional registers within the drive which can be used to control the drive, monitor the drive's status.

| Register address | Specification | R/W |
|---|---|---|
| 9999 | Control command | W |
| 10000 | Frequency command（0~Fmax, unit 0.01Hz） | W |

7.3.3.Register 9999 specification

| Bit | Specification |
|---|---|
| Bit 7~0(run/stop control etc.) | 0x00: No function (Keep the original state unchanged)<br>0x01: Run forward<br>0x02: Reverse<br>0x03: Jog<br>0x04: Jog reverse<br>0x05: Stop<br>0x06: Coast<br>0x07: Reset<br>0x08: Clear command (Clearn all running and stopping instructions) |
| Bit 11~8(Preset value select) | 0000B:P0-30(Preset Value 0)<br>0001B: P0-31(Preset Value1)<br>…<br>1111B: P0-45(Preset Value 15) |
| Bit 13~12(Ramp time select) | 00B: Ramp 1<br>01B: Ramp 2<br>10B: Ramp 3<br>11B: Ramp 4 |
| Bit 14 | Reserved |
| Bit 15 | 1B: Enable Bit8~13 function<br><br>0B: Disable Bit8~13 function |

7.3.4.Communication ratio values

The Communication data is expressed by hexadecimal in actual application and there is no radix point in hexadecimal. For example, if you want to set P5-08 = 61.5, 61.5 can be magnified by 10 times into 615. So hex 0x0267 (615) can be used to express 61.5.

A non-integer can be timed by a multiple to get an integer and the integer can be called communication ratio values.

The communication ratio values are referred to the radix point of the setting range of default value in the functional parameter list. If there are radix point n, then the communication ratio value m is 10^n.

7.3.5.Error message

There may be errors in the communication process, for example, some parameters are read-only, but the PC/PLC sends a written directive, the

drive will return an error message.

Error message data frame format is shown as the figure below:


Error message function code = requirements function code + 0x80

| Error code | Specification |
|---|---|
| 0x01 | Function code error, the drive does not support this kind of function code. |
| 0x02 | The register address is invalid. |
| 0x03 | The value exceeds the upper limit of the parameter. |
| 0x04 | Operation error. |

# 8.Fault Description And Disposal

| Type | ERR0R | STATUS | POWER | Corresponding measures |
|---|---|---|---|---|
| 1 | Red light flashing slowly | X | X | Internal fault |
| 2 | Red light is always on | X | X | ModbusTCP communication abnormality |
| 3 | X | Green light flashing | X | ModbusTCP communication is normal |
| 4 | X | X | Green light on | MT01 power supply is normal. |
| 5 | X | X | Green light off | MT01 power supply is abnormal or not powered on |