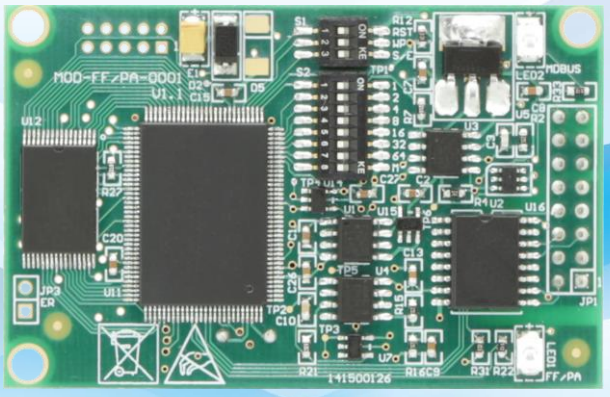
中科博微
MICROCYBER

# M0313

# Modbus to FF built-in module

## User Manual




沈阳中科博微科技股份有限公司

## Caution

1. Please don’t take off/install module at random.
2. Please check if the power of module meets the power qequest in the User Manual.

## Version：

V2.0

## Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described.Since variance cannot be precluded entirely,we cannot guarantee full consistency.However,the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

# Company Introduction

Microcyber Corporation. established as a high-tech enterprise by the Shenyang Institute of Automation Chinese Academy of Sciences, mainly engages in advanced industrial control systems, equipments, instruments and chips for industrial process automation control solutions in the research, development, production and application. Microcyber undertakes a number of national scientific and technical key task and “863” project, and has Liaoning Province networked control systems engineering research center. The company successfully developed the FF H1 fieldbus protocol stack which is number one to be approved internationally in China, and the Industrial Ethernet Protocol(HSE) which is number one to be approved in China, and the domestic first fieldbus instrument which has a function of national-level intrinsically safe explosion--proof and safety barrier. Also Microcyber participated in the drafting of the domestic first Ethernet-based industrial automation protocol standards (Ethernet for Plant Automation, EPA). As a result, serial products are composed of configuration, control software, embedded software, control system, instrument chip to the OEM board, and make Microcyber be an industrial automation products provider in full range, and also further Microcyber’s leading position in the field of fieldbus technology.

Microcyber is the FF member, the HART member and the Profibus National Organization (PNO) member.

Microcyber passes the Authentication of ISO 9001 Quality System, and has an outstanding innovative R&D team, plentiful practical experiences of design of the Automatic engineering, a leading product series, a huge market network, a strict quality management system and an excellent enterprise culture. All these further a solid foundation of entrepreneurship and sustainable development for Microcyber.

Microcyber Inc. is looking forward to the long-term smooth and close cooperation with you.

# Table of Contents

# Section 1 Summary

Modbus-FF built-in module realizes the conversion function from MODBUS Protocol to Foundation Fieldbus F1 Protocol.It is one of the Microcyber M-serise modules,which have features of same size,same interface,easy to upgrade and easy to configure.It is an ideal choice for user to develop fieldbus devices.As Modbus master station,M0313 Modbus to FF module communicates with Modbus-RTU device via TTL interface,and it can convert the data of Modbus-RTU device to FF device variable output.M0313 Modbus to FF module is shown in Figure Figure 1.1:

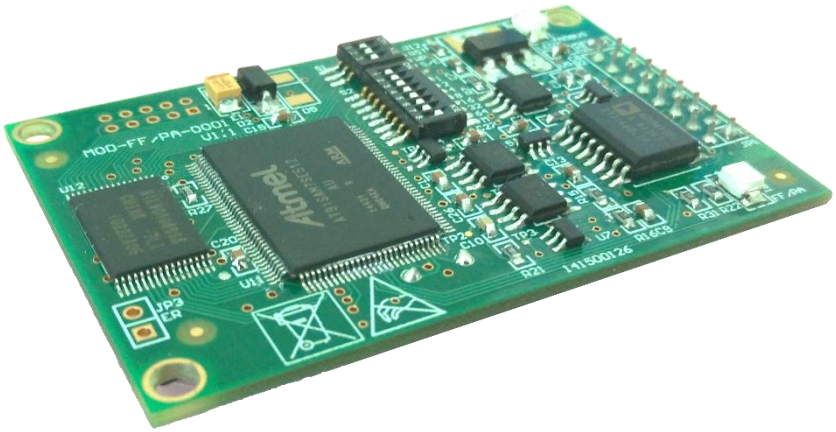


Figure 1.1 M0313 Modbus to FF Built-in Module

## 1.1.1 Features

## 1.1.2 Same Size

The Microcyber M series built-in modules have the same size: 65mm（length）*42mm（width）。

## 1.1.3 Same Interface

The connector of Microcyber M series built-in modules is 2.54 pitch 16 pin, function of them are compatible.

## 1.1.4 Easy to Upgrade

Please replace the different kind of Micrcyber M series modules to realize the different protocols of devices.

## 1.1.5 Easy to configure

Please use the special tool provided by Microcyber Corporation for configuration,it is easy to operate .

## 1.2 Product Development Process

**First step： Hardware design**

We can redesign hardware schematic diagram and PCB diagram of the original users' products according to the module size and interface pin definition. If taking M-series products compatibility, we need to refer to all the M-series module interface pin definition and then design the hardware.

**Second step： Software design**

Besides the definition of the interface with the module, all other Software needs not to be modified. The Modbus-RTU protocol communication is adopted between the module and the user's products.

**Third step： Module configuration**

According to the users' requirement, we use the Modbus configuration tool to carry out necessary factory set for the module. After configuration, module will communicate with user's product with this mode.

**Fourth step： Serial port communication**

Preliminary debugging of the serial data communication between the user's product and the module interface.

**Fiveth step: Customized development of DD file(Optional)**

The user can choose custom parameters name,this step need to be customized developed.

**Sixth step： Installation, configuration and debugging**

It is recommended to use NI equipment to build a debug experiment system for the detection of FF communication, and product operation. Using the experimental system to connect user developed product and realize design function.

END

## 1.3 Outer Size Diagram

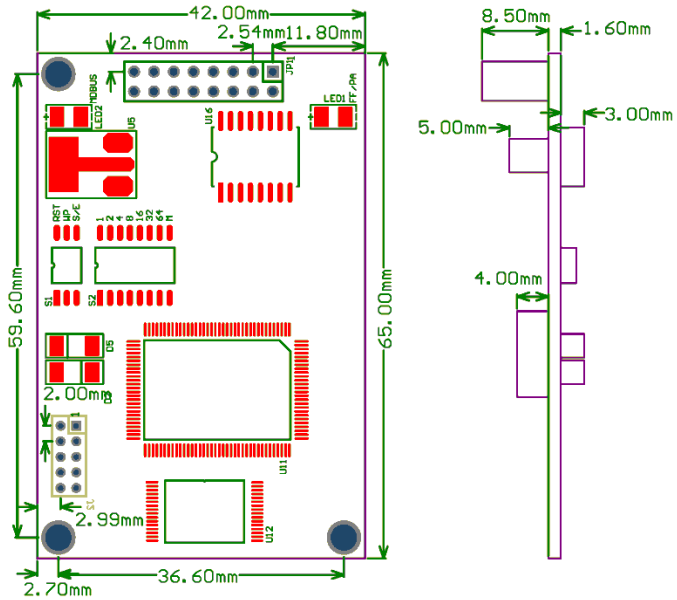



Figure 1.2Outer size of built-in module(Unit：mm)

## 1.4 Structure Diagram

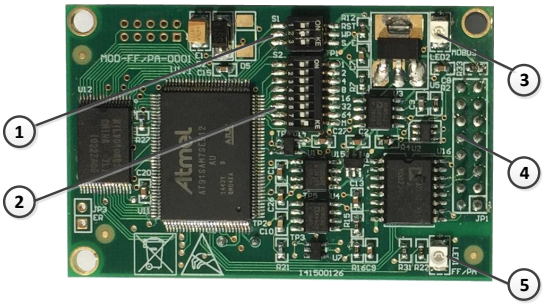



Figure 1.3 Whole structure of built-in module

| | | | | | |
|---|---|---|---|---|---|
| 1 | DIP switch S1 | 2 | DIP switch S2 | 3 | LED2 Modbus communication light |
| 4 | Communication interface | 5 | LED1 FF communication light | | |

# Section 2. Installation

## 2.1 External Interface

M0313 Modbus to FF built-in modul's terminal distribution and meaning is shown as figure 2.1:

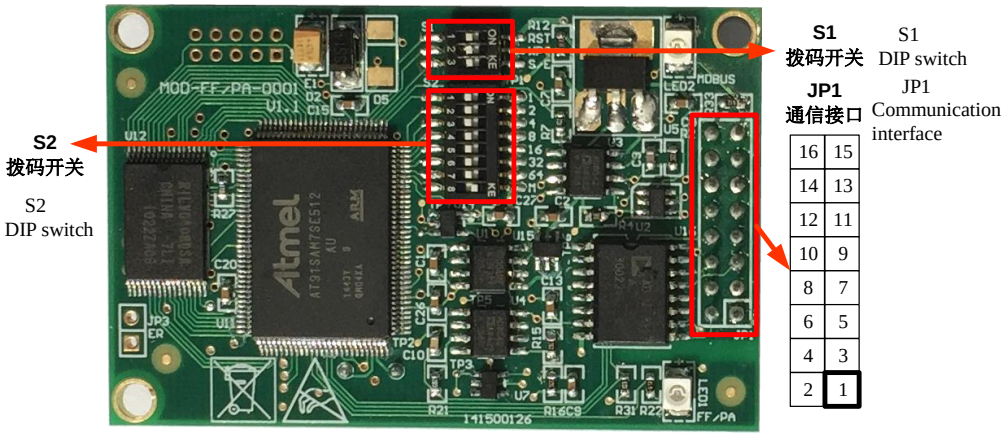



Figure 2.1 M0313 Modbus to FF built-in modul's terminal distribution and meaning

### 2.1.1 Communication interface JP1

JP1 Communication interfac's meaning is shown as below:

| Pin | I/O | Name | Description | Pin | I/O | Name | Description |
|---|---|---|---|---|---|---|---|
| 1 | I | VCC_IS | The signal isolation power supply, provided by baseboard | 2 | I | GND_IS | The signal isolated power ground, provided by baseboard. |
| 3 | I | /RES | CPU Reset, low active | 4 | I/O | NC | Reserved |
| 5 | O | TXD | CPU TXD | 6 | O | RTS-485 | RS-485 control port* |
| 7 | I/O | NC | Reserved | 8 | I | RXD | CPU RXD |
| 9 | O | NC | Reserved | 10 | I/O | Status | Communication indicating light |
| 11 | I/O | BUS+ | Bus Power Supply+ | 12 | I/O | BUS- | Bus Power Supply- |
| 13 | I/O | NC | Reserved | 14 | I/O | NC | Reserved |
| 15 | I/O | NC | Reserved | 16 | I/O | NC | Reserved |

*：It is used for coonection with RS-485 communication chip.

### 2.1.2 Configuration of DIP Switch

There is a 3-position DIP switch S1 and a 8-position DIP switch S2 for M0313 Modbus to FF built-in module, shown as figure Figure 2.1

The description fo DIP switch S1 is shown as below:

| No | Name | Description |
|---|---|---|
| 1 | RST | Reset, reset device data to factory original.Power off the device at first, and made the switch at ON,and then power on the device,the device shall be reseted to factory original. |
| 2 | WP | Writhe protection, all the write operation for FF communication module shall be refused,which avoid data modification at random. |

| | | |
|---|---|---|
| 3 | S/E | Simulation switch,used for “simulation function”. |

The description fo DIP switch S2 is shown as below:

| No | Name | Description |
|---|---|---|
| 1 | 1 | Standing off |
| 2 | 2 | Standing off |
| 3 | 4 | Standing off |
| 4 | 8 | Standing off |
| 5 | 16 | Standing off |
| 6 | 32 | Standing off |
| 7 | 64 | Standing off |
| 8 | M | Set the work mode, configuration mode(ON)and normal work mode(OFF) |

## 2.2 Installation of Module

There are three Φ3 location hole in the module.The module can be fixedly installed in the user’s board with three hexagonal prism.

# Section 3. Working Principle

M0313 Modbus to FF built-in module is a module supporting Modbus and FF protocol.As FF device,it can communicate with Modbus devices,read Modbus data to FF device by simply configuration,and transfer data to control system through FF bus.System Wiring Diagramof Modbus to FF built-in module is shown in Figure 3.1:

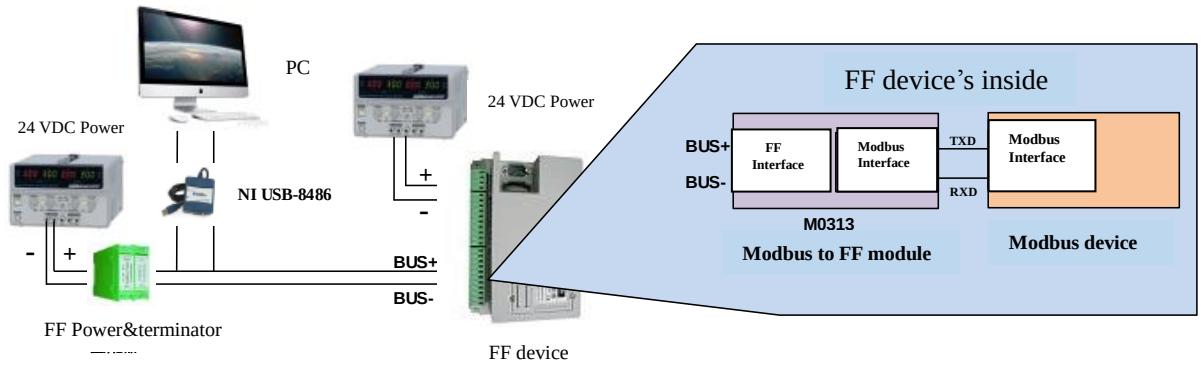



Figure 3.1 System Wiring Diagram of M0313 Modbus to FF built-in module

M0313 Modbus to FF built-in module support 1 Modbus slave device,8 groups of analog input outputand discreter input output parameters,totally 32 channels provided.It configures Modbus device's data into transducer block's parameters via Modbus register,and provides data support for FF system via channels betweenvariables and AI,AO,DI and DO function blocks.Principle Diagram for Modbus to FF built-in module is shown in Figure3.2:

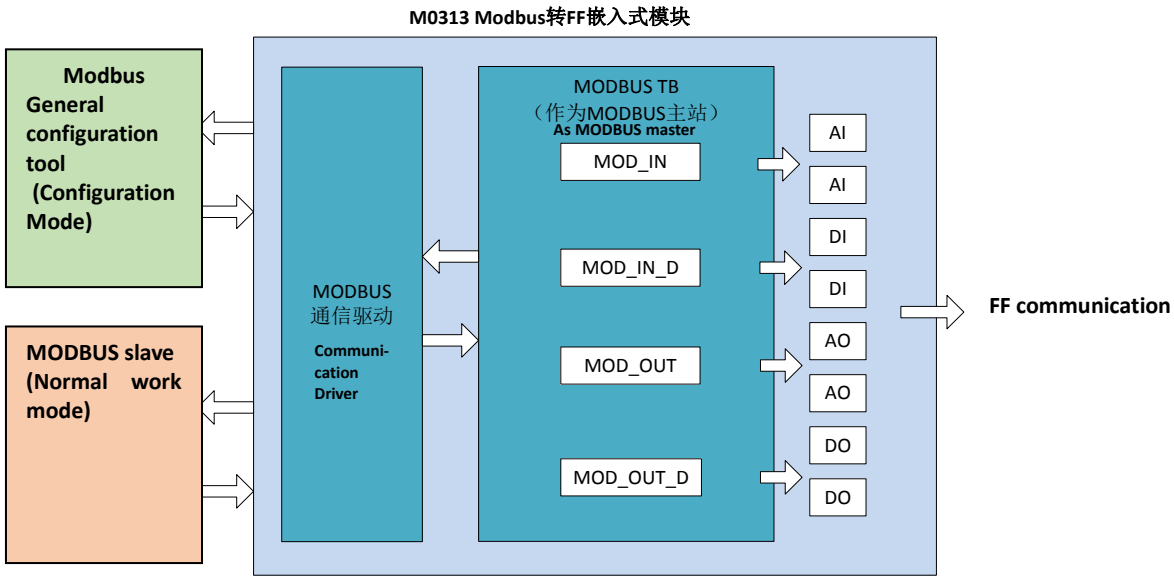



Figure 3.2 M0313 Principle Diagram for Modbus to FF built-in module

# Section 4. Configuration of module

## 4.1 Topologic connection

FF device support many net topologies shown as Figure 4.1. The bus connection of FF instrument is shown in Figure 4.2,in order to ensure the bus signal quality ,the terminal matching resistances should be connected to the 2 ends of the bus.The bus maximum length is 1900m,with a repeater,the legth can be extended to 10 kilometers.

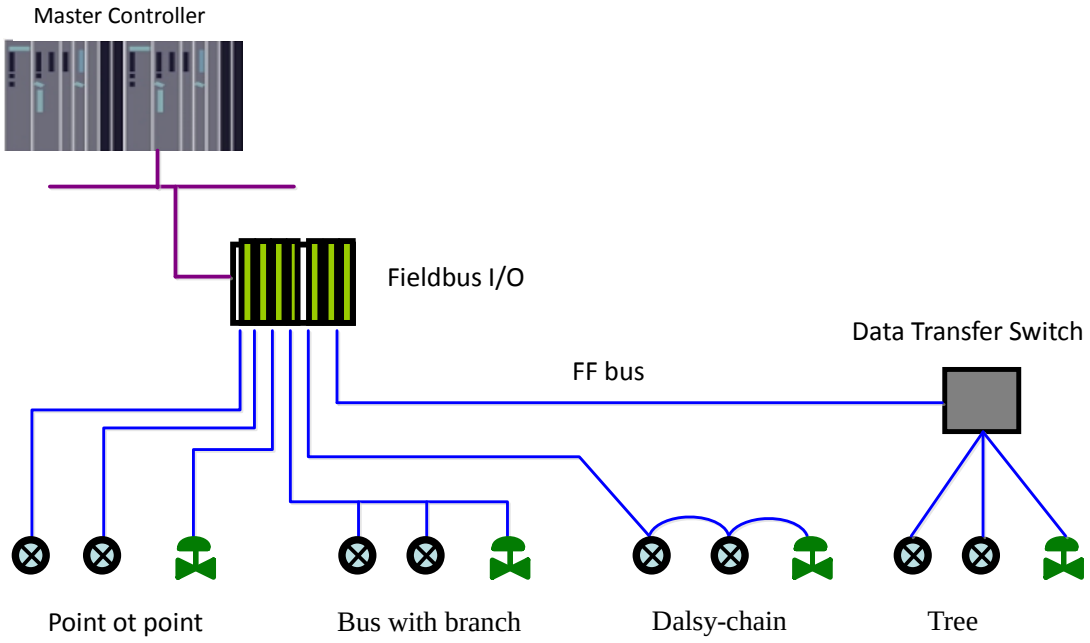



Figure 4.1 Topology of FF Bus

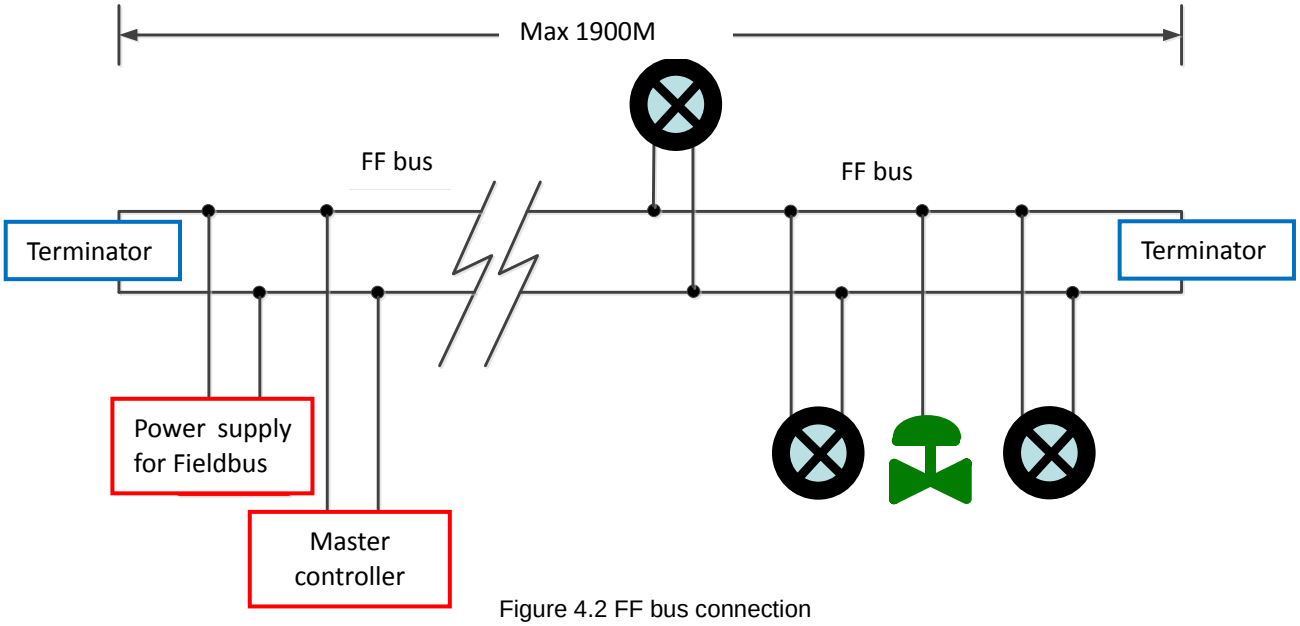



Figure 4.2 FF bus connection

## 4.2 Introduction for Function

Default configuration of Modbus to FF built-in module has 1 RES function block,4 for each AI,AO,DI,DO,PID function block and Modbus transducer block(Modbus_TB)complying to FF specifications.AI,AO,DI,DO respectively supports 8 channels(CHANNEL),channel is corresponding to analot/discrete input and output parameters of Modbus transducer block.

| Function Block name | Description |
|---|---|
| Resource (RES) | Resource block is used to describe the device identity in the field,such as device name,manufacture,serial number.There is no input or output parameter in the resource block.Generally,there is noly one resource block for each device. |
| Modbus_TB(MTB) | Configure Modbus communication parameters via transducer block, such as baud rate, stop bit, communication overtime, etc., Modbus communication configuration parameter. |
| Analog Input (AI) | Analog input function block is used to achieve transducer block input data and transfer to other function blocks, has the function of range conversion, square root, cut mantissa, etc. |
| Analog Output (AO) | Analog output function block is used to transfer output data to transducer block, then to operate physical device. |
| Discrete Input (DI) | Discrete input function block, achieve transducer block input data and transfer to other functions blocks. |
| Discrete Output (DO) | Discrete output function block is used to transfer discrete output data to transducer block, then to operate physical device. |
| Proportional Integral Derivative（PID） | PID function block has the function of PID control and setting point adjustment, process value(PV) filtering and alarm, output tracking, etc. |

## 4.3 Parameter Specification for ModbusTransducer Block

Including NI-Configurator software as an example of how to configure Modbus transducer block.Shown as Figure 4.3, the MODBUS transducer block provides 8 couples of Analog input output and 8 couples of digital input output parameters,which are process parameters,user can choose the configuration for at least 1 analog input and 1 digital input. In addition, the MODBUS transducer block also provide 10 couples of 32-bit floating points,10 couples of 16-bit floating points and 10 couples of 8-bit floating points,1 couple of 32-bit string parameter,can be used for configuration parameter.All above parameters configured by Modbus general configuration tool,but not FF configuration software.

Note: The eighth position M of DIP switch S2 should be in “OFF”state,i.e. under normal work mode.

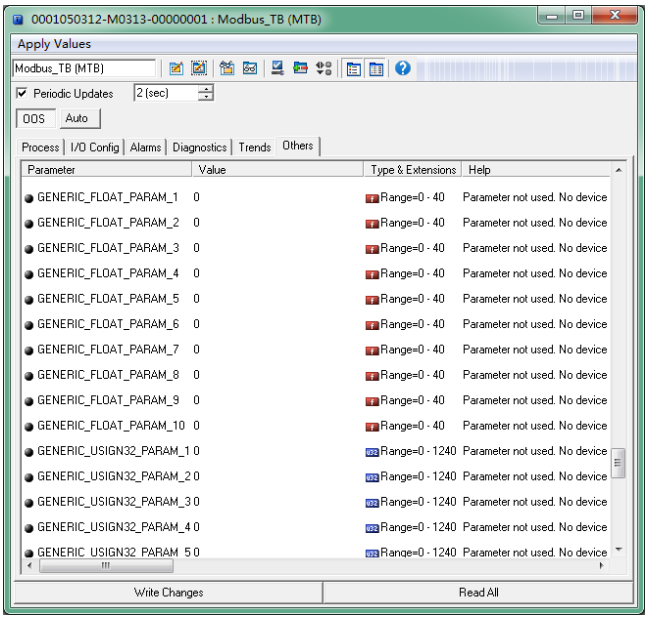



图 4.3 Modbus 变换块

### 4.3.1 BAD_STATUS Parameter Description

If the communication failed, the related bit will be set as 1, otherwise, it will be 0.

| BIT | PARAMETER | BIT | PARAMETER | BIT | PARAMETER | BIT | PARAMETER |
|---|---|---|---|---|---|---|---|
| **0** | MOD_IN1 | 8 | MOD_OUT1 | 16 | MOD_IN_D1 | 24 | MOD_OUT_D 1 |
| **1** | MOD_IN2 | 9 | MOD_ OUT 2 | 17 | MOD_IN_D 2 | 25 | MOD_ OUT_D 2 |
| **2** | MOD_IN3 | 10 | MOD_ OUT 3 | 18 | MOD_IN_D 3 | 26 | MOD_ OUT_D 3 |
| **3** | MOD_IN4 | 11 | MOD_ OUT 4 | 19 | MOD_IN_D 4 | 27 | MOD_ OUT_D 4 |
| **4** | MOD_IN5 | 12 | MOD_ OUT 5 | 20 | MOD_IN_D 5 | 28 | MOD_ OUT_D 5 |
| **5** | MOD_IN6 | 13 | MOD_ OUT 6 | 21 | MOD_IN_D 6 | 29 | MOD_ OUT_D 6 |
| **6** | MOD_IN7 | 14 | MOD_ OUT 7 | 22 | MOD_IN_D 7 | 30 | MOD_ OUT_D 7 |
| **7** | MOD_IN8 | 15 | MOD_ OUT 8 | 23 | MOD_IN_D 8 | 31 | MOD_ OUT_D 8 |

### 4.3.2 ERR_LOOK_RESULT Parameter Description

ERR_LOOK_RESULT, data inquiry function for input output parameter negative response. User is able to inquiry about every input output response value, reading ERR_LOOK_RESULT parameter will receive the communication response data of this parameter.(Please using Modbus general configuration tool to inquiry parameters). ERR_LOOK_RESULT, 0 means there is no failure. 0x01 – 0x0B is standard negative data, and 0xFF means slave station communication is in failure.

| Value | Parameter Description | Value | Parameter Description |
|---|---|---|---|
| **0x00** | OK | 0x06 | Slave Device Busy |
| **0x01** | Illegal Function | 0x08 | Memory Parity Error |
| **0x02** | Illegal Data Address | 0x0A | Gateway Path Unavailable |
| **0x03** | Illegal Data Value | 0x0B | Gateway Target Device Failed To Response |
| **0x04** | Slave Device Failure | 0xFE | Function Code Mismatch |
| **0x05** | Acknowledge | 0xFF | Commmunication Failure |

## 4.4 Communication Parameter for Modbus Transducer Block

The user is able to configure the Modbus communication parameter, such as common parameter, analog input,analog output, digital input,digital output, floating point data, data USIGN32, data USIGN16, data USIGN8 and data Octet etc.

Modbus configuration tool for common patameter is shown as Figure 4.4,more details please see the Appendix 3,

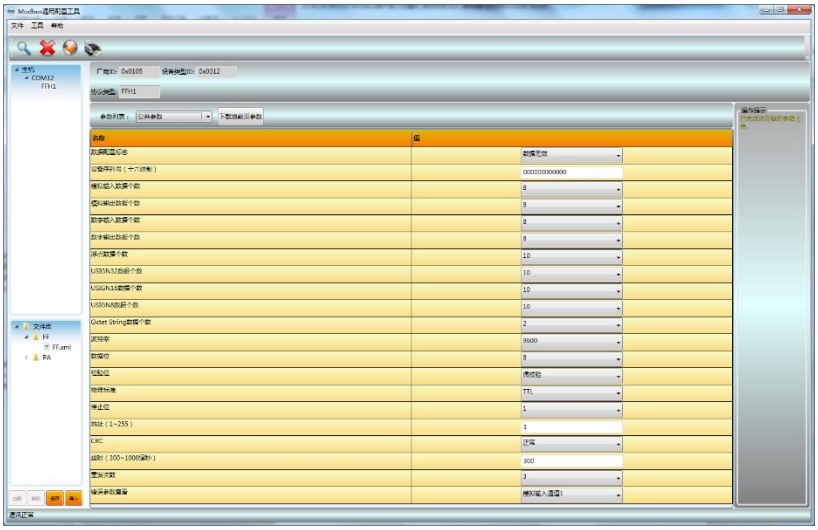


Figure 4.4 Modbus Modbus configuration tool

In addition to the common parameter, all the data can be configured as read-write, data format, register address and function code,users can flexibly configure as required.Due to the different parameter type support different Modbus function code,so the selection of corresponding data format is needed after choosing the function code,not aptional data format is automatically set to gray by software,user selection is not allowed,shown as Figure 4.5:

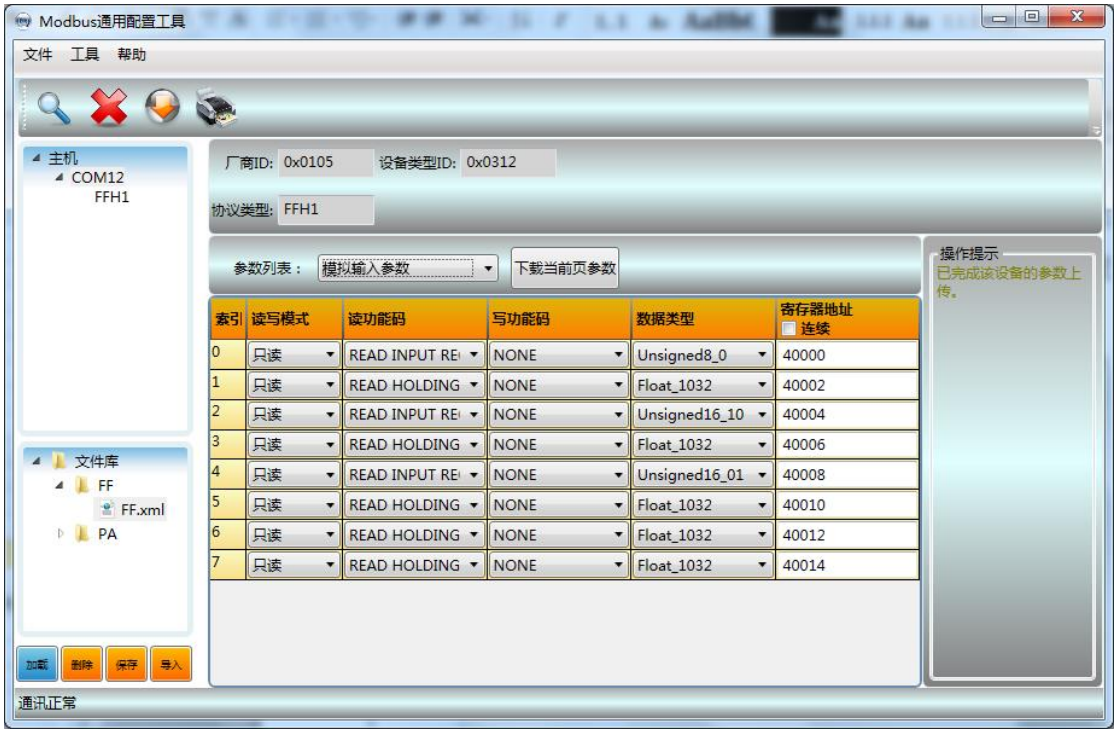



Figure 4.5 Parameter Configuration

Both separately download parameter in data interface and together download via Download button are available after configuration.

Note:For more detailed applying method of Modbus general configuration tool,please refer to software help file. Note: The eighth position M of DIP switch S2 should be in “ON” state,i.e. under configuration mode.

## 4.5 Example for configuration of Modbus Slave station

Communication parameter of User’s Modbus slave station is shown as below:

| NO. | Parameter | Value |
|---|---|---|
| **1** | **Baud Rate** | 9600 bps |
| **2** | **Data Bits** | 8 |
| **3** | **Parity** | Even-parity Check |
| **4** | **Physical Standard** | TTL |
| **5** | **Stop Bits** | 1 |
| **6** | **Address** | 1 |
| **7** | **CRC** | Normal |
| **8** | **Timeout** | 300ms |
| **9** | **Number of Retry** | 3 |

User’s Modbus slave station support function code 03(Read Holding Registers)and function code 16(Preset Multiple Registers),the register of device parameter is allocated as shown below:

| Register Address（decimalism） | Data Format | Registers Definition |
|---|---|---|
| 4112 | Float Inverse | Representation of instantaneous flow float |
| 4114 | Float Inverse | Representation of instantaneous velocity float |
| 4116 | Float Inverse | Representation of flow percentage float representation(the battery powered type is preserved) |
| 4118 | Float Inverse | Representation Fluid conductance ratio float |
| 4120 | Long Inverse | Integer part of positive accumulation value |
| 4122 | Float Inverse | Decimal part of positive accumulation value |
| 4124 | Long Inverse | Integer part of negative accumulation value negative |
| 4126 | Float Inverse | Decimal part of negative accumulation value |
| 4128 | Unsigned short | Unit of instantaneous flow |
| 4129 | Unsigned short | Unit of accumulation total quantity |

Step 1.

Please check if the eighth position M of DIP switch S2 is in “ON” state.If not,please switch it to “ON” state.

Step 2.

Open the Modbus general configuration tool software, set up the serial port, and scan the equipment online,as shown below:

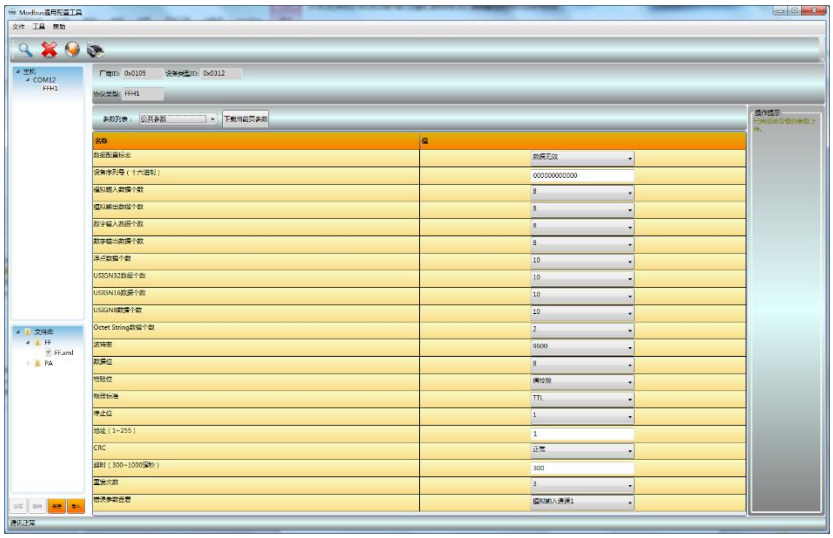


Figure 4.5 Scanning equipment

Step 3.

Set parameter in the public parameter table according to the parameter of users Modbus slave station,as shown below:

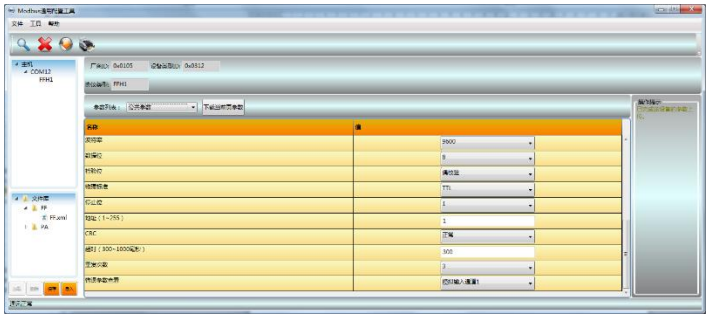


Figure 4.6 Configuration of communication parameter

Step 4.

Modify public parameter according to the users device parameter list,the analog input data is 8,USIGN16 parameter is 2,the others is 0,as shown below:

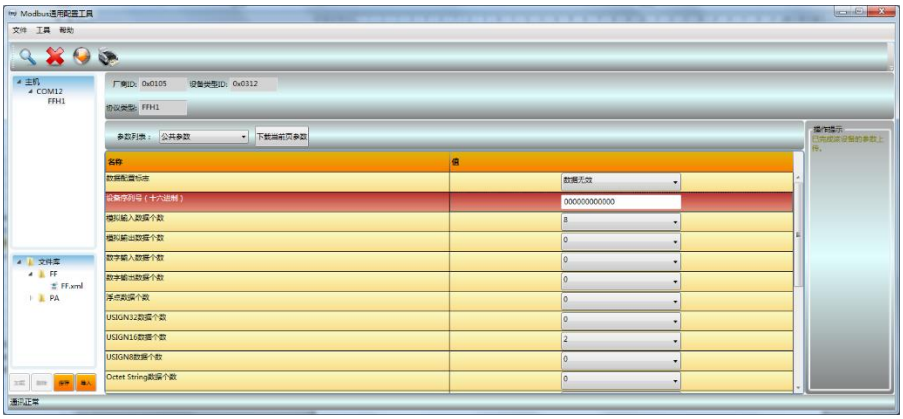
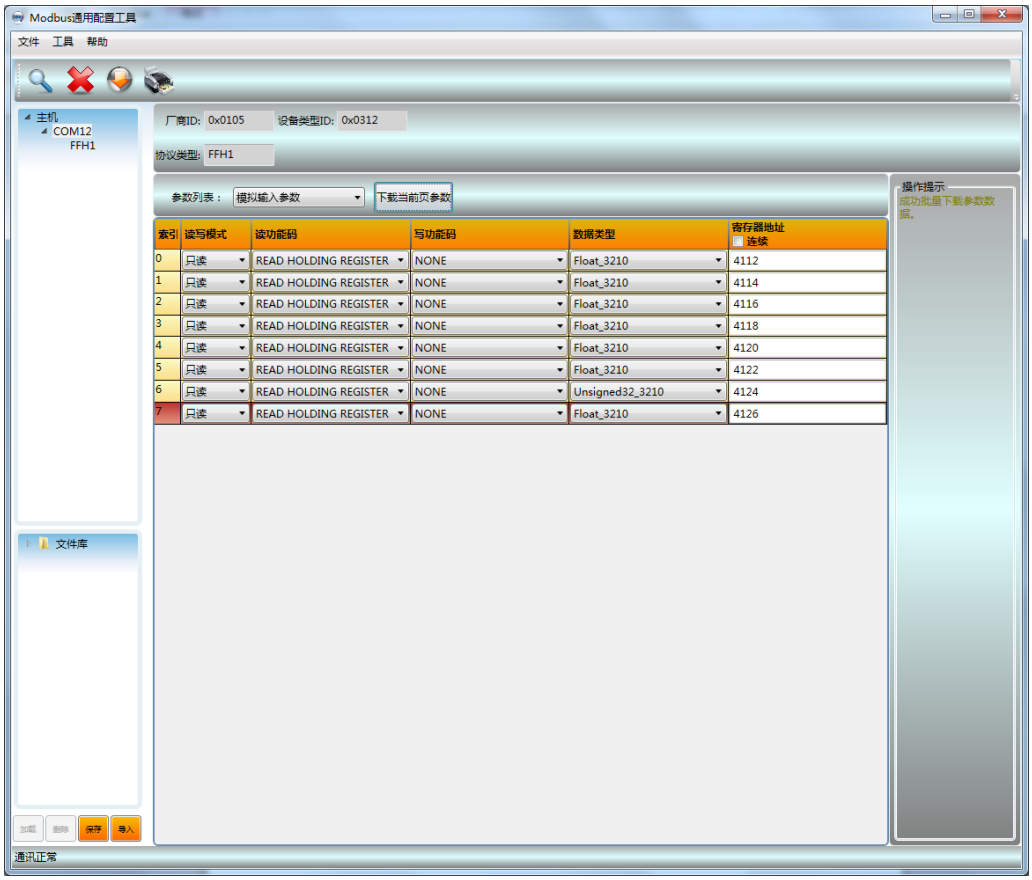


Figure 4.7 Configuration of other public parameter

Step 5.

Open the options page of analog input parameter, firstly choose the needed function code, secondly choose the data type of analog input data, finally enter the register address .




| 索引 | 读写模式 | 读功能码 | 写功能码 | 数据类型 | 寄存器地址 连续 |
|---|---|---|---|---|---|
| 0 | 只读 | READ HOLDING REGISTER | NONE | Float_3210 | 4112 |
| 1 | 只读 | READ HOLDING REGISTER | NONE | Float_3210 | 4114 |
| 2 | 只读 | READ HOLDING REGISTER | NONE | Float_3210 | 4116 |
| 3 | 只读 | READ HOLDING REGISTER | NONE | Float_3210 | 4118 |
| 4 | 只读 | READ HOLDING REGISTER | NONE | Float_3210 | 4120 |
| 5 | 只读 | READ HOLDING REGISTER | NONE | Float_3210 | 4122 |
| 6 | 只读 | READ HOLDING REGISTER | NONE | Unsigned32_3210 | 4124 |
| 7 | 只读 | READ HOLDING REGISTER | NONE | Float_3210 | 4126 |

Figure 4.8 Configuration of analog input parameter

*Note:The register address is a actual address,if the register address presented by users Modbus slave device is addressing, then need to minus 1 to get the actual address.*

**Step 6.**

USIGN16 data paremeter options page,firstly choose the read-write mode of USIGN16 data,secondly choose the data type and using function code, finally enter the register address,as shown below:

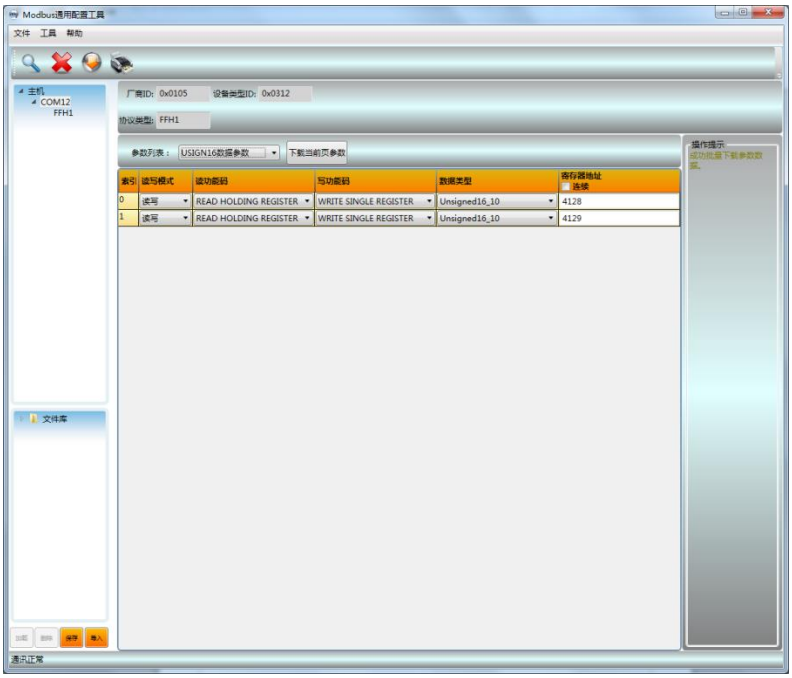



Figure 4.9 USIGN16 data paremeters configuration

**Step 7**

Return to the public parameters options page, modify the mark of data configuration to “Data Valid”,click on the botton of “BULK DOWNLOAD”,write the configuration data to the device,as shown below:

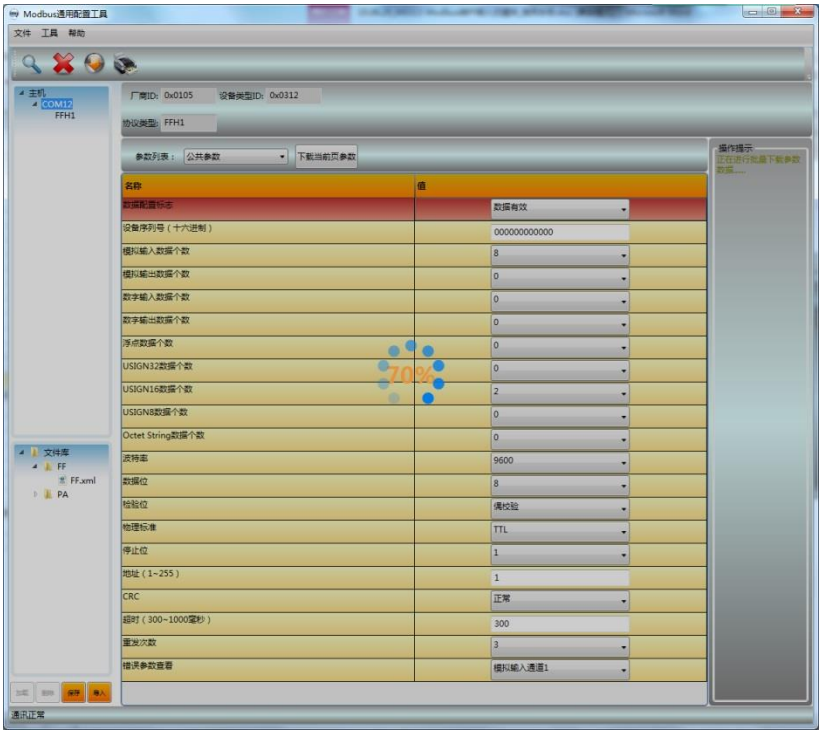



Figure 4.10Enable data is valid and download parameter

**Step 8.**

Switch the eighth position M of DIP switch S2 to the “OFF”state, using the NI configuration software to connect the device into FF network,to check the transducer blocks parameter,as shown below:

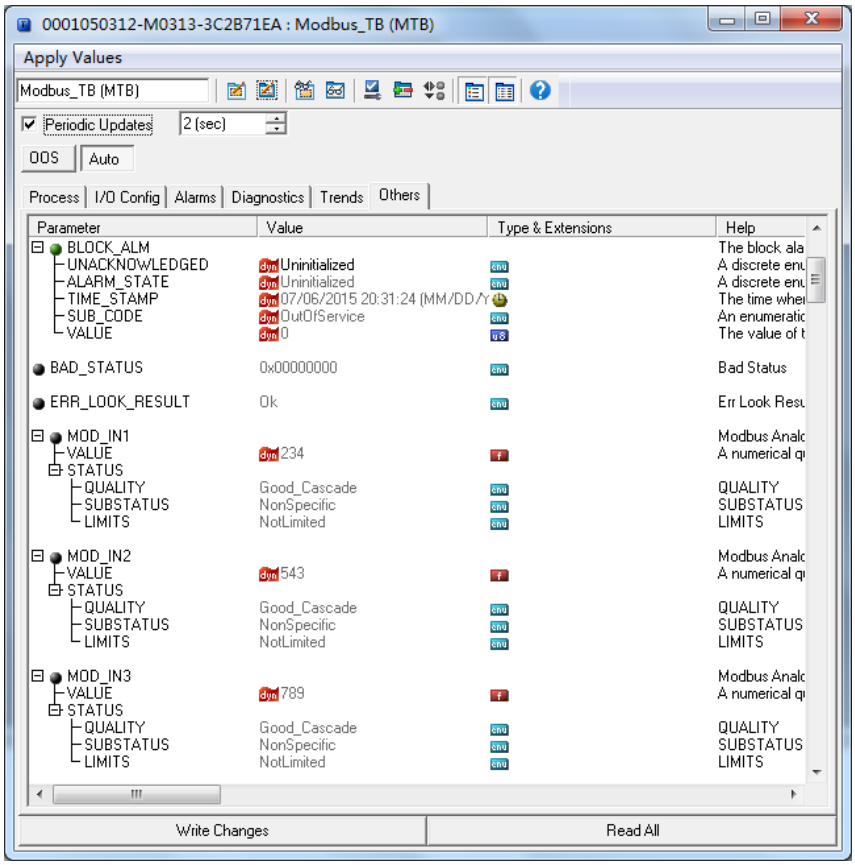



Figure 4.11 Detection of Modbus slave devices data via FF configuration software

By applying above steps,you can make the FF device works normly.The Modbus slave devices data are transferred to AI,AO,DI and DO function blocks via transducer block parameter.

If the function block is not in the Auto status, then the data will not be updated.Please refer to the solving method in the section 4.6.

## 4.6 Reason of unsuccessfully Switch Transducer Block to Auto Status

There are multiple reasons why transducter block can’t be turned into Auto status.You can figure these problems out by checking the state of eighth position M of DIP switch S2,and parameter BLOCK_ERR，XD_ERROR，BAD_STATUS and ERR_LOOK_RESULT of transducer block

**Situation 1**

After the device is power on, if the parameter values of XD_ERROR function block is “Configuration error”, the ERR_LOOK_RESULT is “OK”,the BAD_STATUS is “0x00000000”. Please check if the eighth

position M of DIP switch S2 is in “OFF” state.If not,please switch it to “OFF” state.(Under normal work mode)

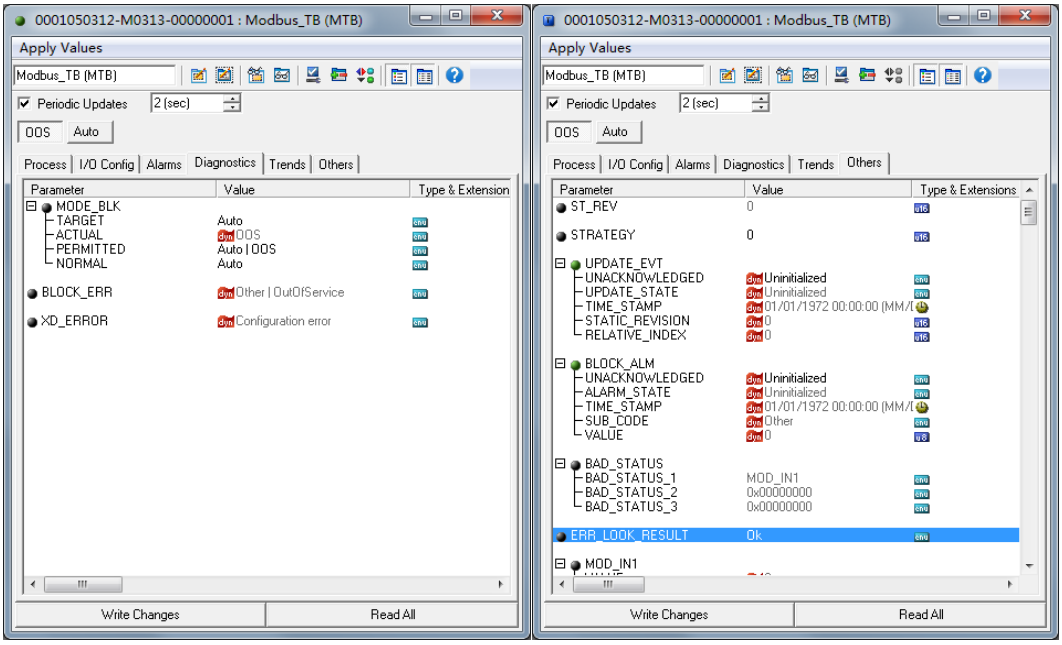



Figure 4.12 OOS situation 1 of transducer block

**Situation 2**

After the device is power on, if the parameter values of XD_ERROR function block is“Configuration error”, the ERR_LOOK_RESULT is “Comm Failure”,the BAD_STATUS for example is “MOD_IN1”,it indicates that there is configuration problem with communication parameter.Please check the situation of configuration of communication parameter via Modbus general configuration tool.

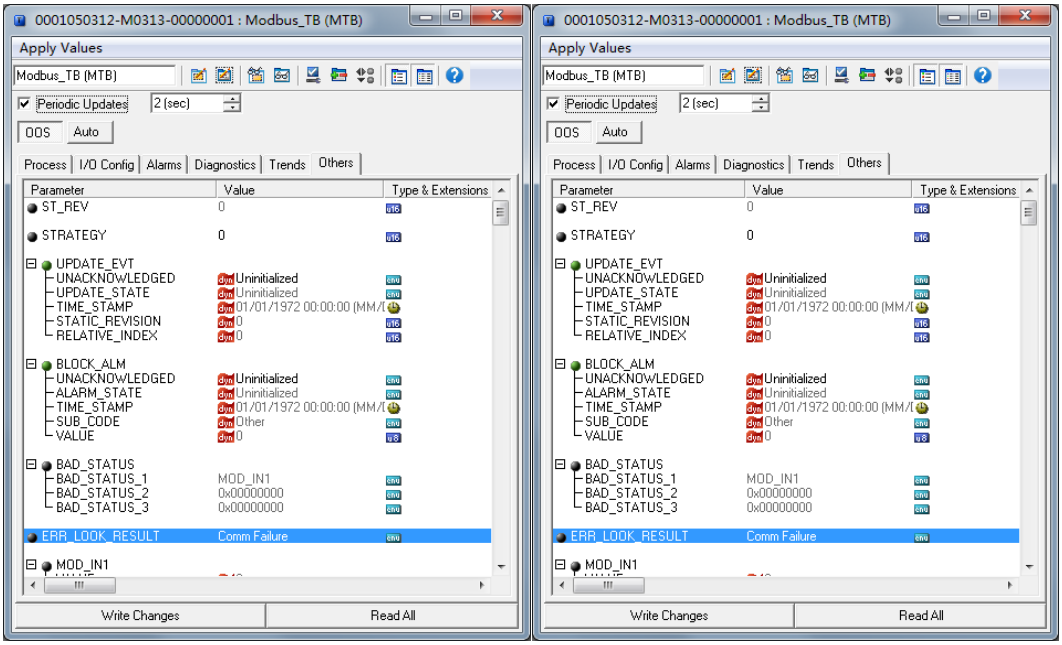



Figure 4.13 OOS situation 2 of transducer block

**Situation 3**

After the device is power on, if the parameter values of XD_ERROR function block is “Configuration error”,the ERR_LOOK_RESULT is “ Function Code Mismatch”,the BAD_STATUS for example is “MOD_IN1”, it indicates that there is configuration problem with function code of parameter.Please check the situation of function code’s configuration of parameter via Modbus general configuration tool.

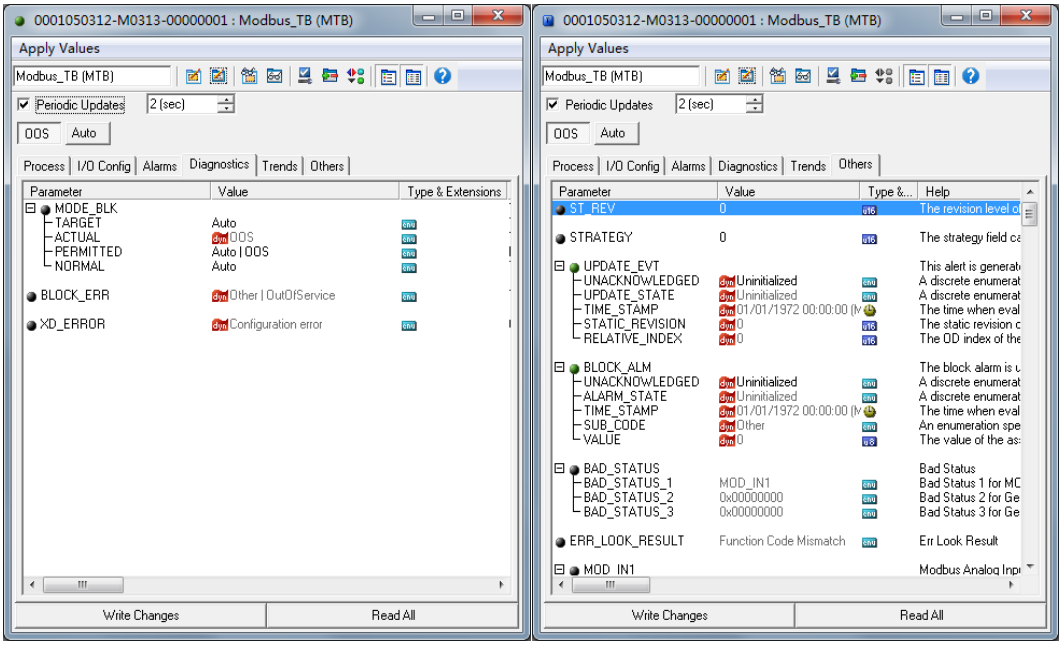



Figure 4.14 OOS situation 3 of transducer block

**Situation 4**

After the device is power on, if the parameter values of XD_ERROR function block is“Configuration error”, the ERR_LOOK_RESULT is“Data Type Mismatch”, the BAD_STATUS for example is “MOD_IN_D1”,it indicates that there is configuration problem with data type of parameter. Please check the situation of data type’s configuration of parameter via Modbus general configuration tool.

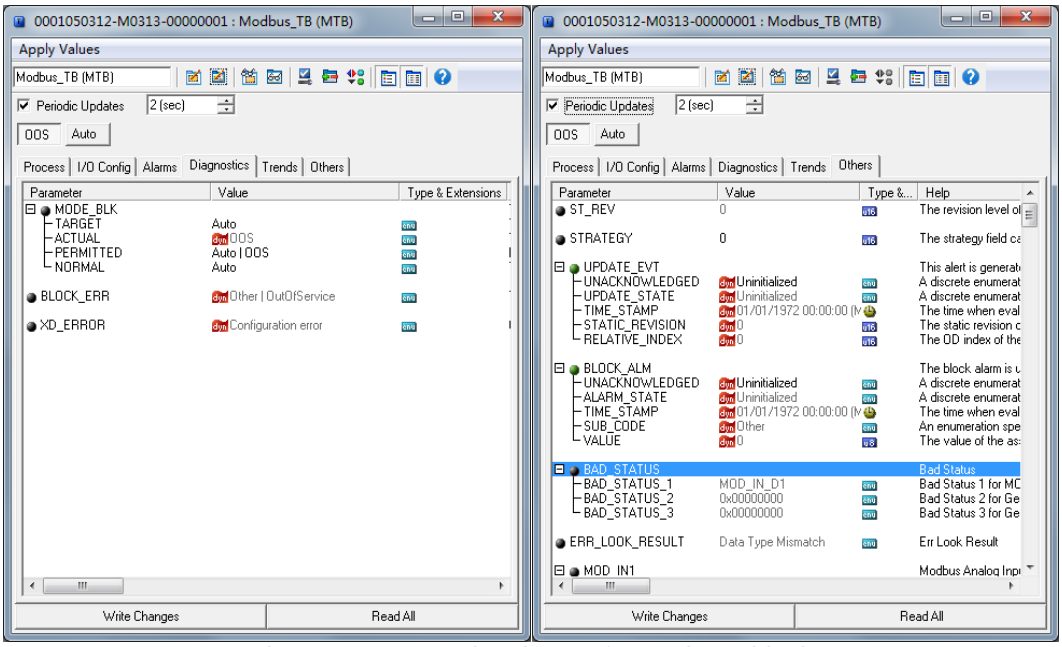



Figure 4.15 OOS situation 4 of transducer block

**Situation 5**

After the device is power on, if the parameter values of XD_ERROR function block is“Data Integrity Error”,the ERR_LOOK_RESULT is“Comm Failure”,the BAD_STATUS for example is “MOD_IN1”,it indicates that there is interrupt signal problem in the process of normal communication.Please check the device connection.

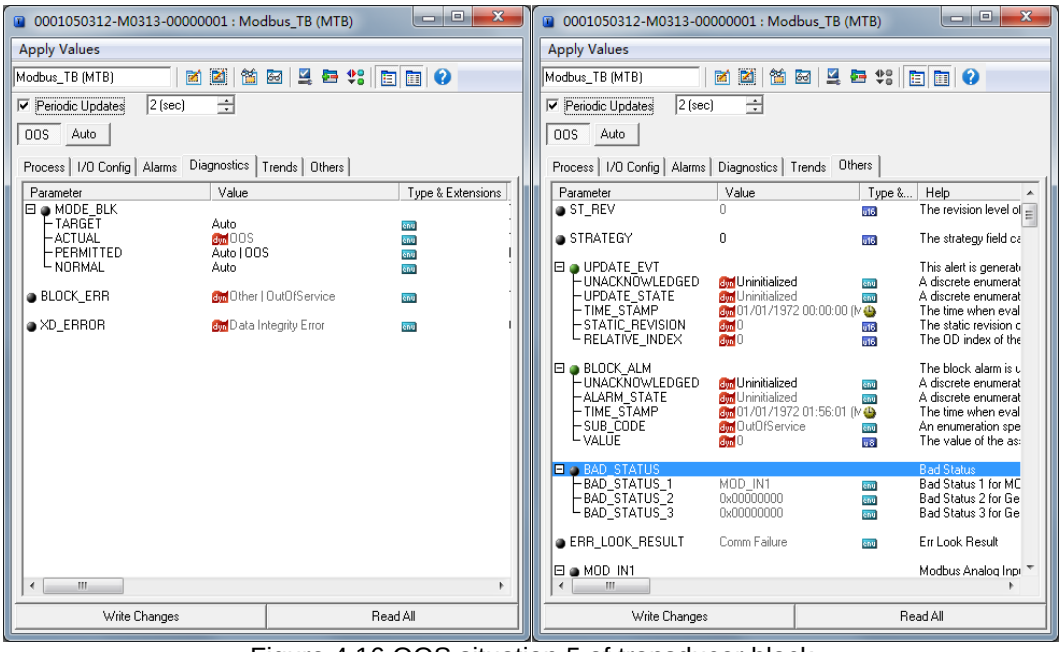



Figure 4.16 OOS situation 5 of transducer block

**Situation 6**

After the device is power on, if the parameter values of XD_ERROR function block is “Data Integrity Error”,the ERR_LOOK_RESULT is “Illegal Data Address”,the BAD_STATUS is “MOD_IN1”, it indicates

that there is read address problem in the process of normal communication.Please check the configuration of data register.

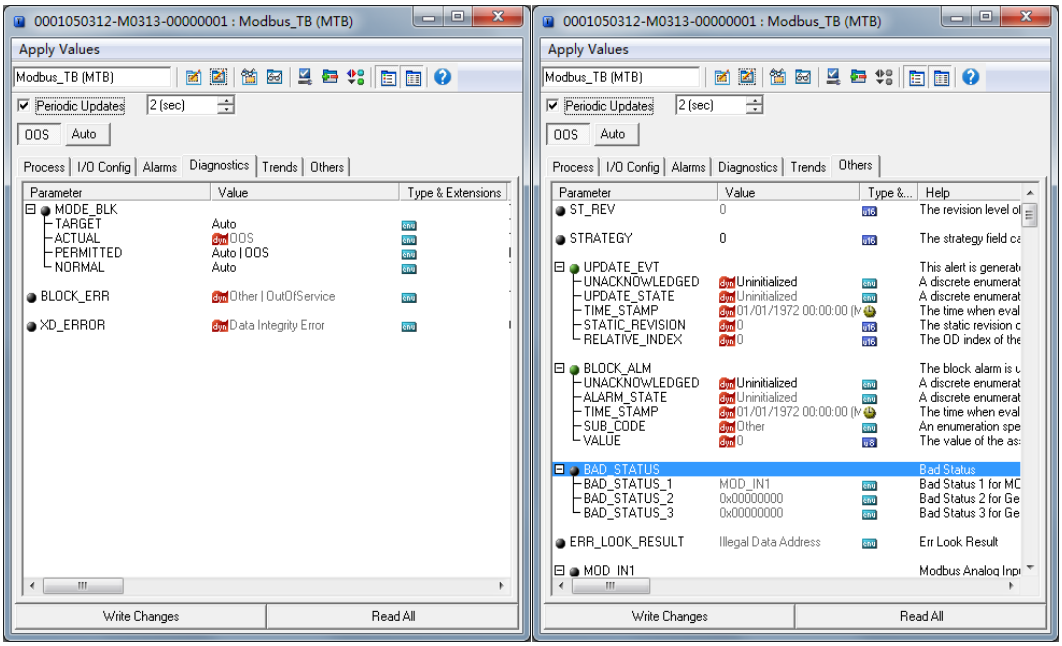



Figure 4.17 OOS situation 6 of transducer block

**Situation 7**

After the device is power on, if the parameter values of XD_ERROR function block is “Data Integrity Error”,the ERR_LOOK_RESULT is “Illegal Function”,the BAD_STATUS for example is “MOD_IN1”,it indicates that there is function code matching problem in the process of normal communication.Please check the configuration of data’s function code.

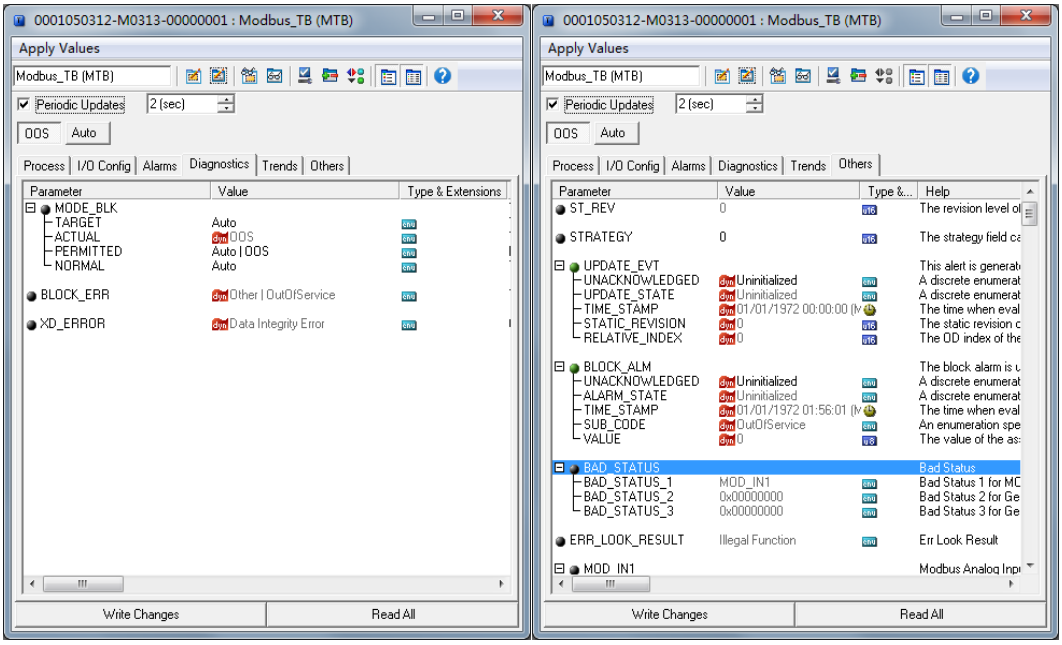



Figure 4.18 OOS situation 7 of transducer block

**Situation 8**

After the device is power on, if the parameter values of XD_ERROR function block is “Data Integrity Error”,the ERR_LOOK_RESULT is “Unknown Exception Code”,the BAD_STATUS is “MOD_IN1”,it indicates that there is problem with device in the process of normal communication,the error return code fails to be resolved.Please check the specific communication configuration of Modbus slave device.

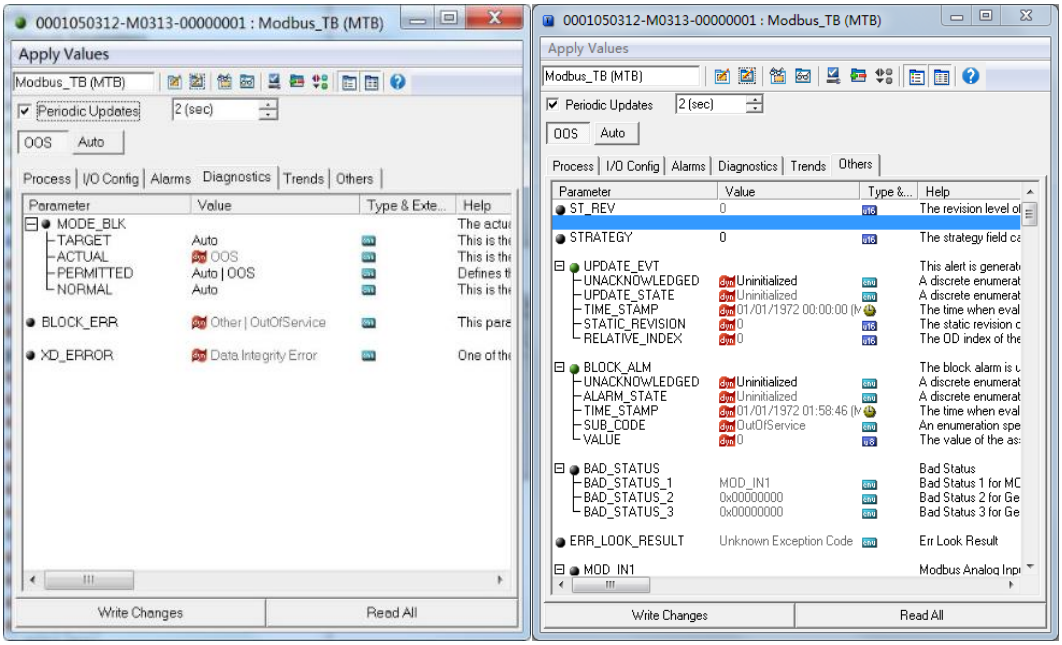



Figure 4.19 OOS situation 8 of transducer block

**Situation 8**

After the device is power on, if the parameter values of XD_ERROR function block is “Data Integrity Error”,the ERR_LOOK_RESULT is “Slave Device Failure”,the BAD_STATUS is “MOD_IN1”, it indicates that there is problem with device in the process of normal communication, the error return code is “Slave Device Failure”.Please check the status of Modbus slave device.

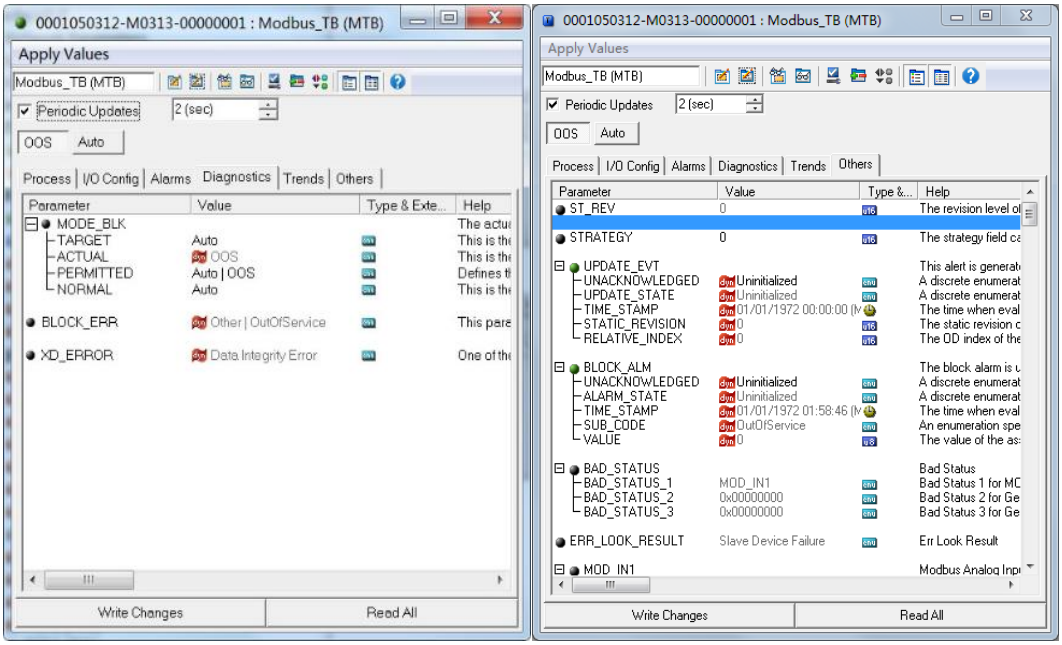



Figure 4.20 OOS situation 9 of transducer block

# 5 Maintenance

- Simple Maintenance

| LED Indicator Light | Color | Normal Status | Abnormal Status | Abnormal Reason | Correction Method |
|---|---|---|---|---|---|
| FF Communication | Green | Flash | Light off | No FF communication | Check FF master and interface |
| | | | | Power fault | Check power supply and connection |
| | | | | Internal fault | Contact technical support |
| | | | Light on | No FF communication | Check FF master and interface |
| | | | | Internal fault | Contact technical support |
| Modbus Communication | Green | Flash | Light off | Not connect slave device | Connect slave device |
| | | | | Slave device fault | Check slave and connection |
| | | | | Internal fault | Contact technical support |
| | | | Light on | In configuration mode | Check situation of eighth position M of DIP switch S2 |
| | | | | Not send data | Configuration fault |
| | | | | Internal fault | Contact technical support |

- Daily maintenance means cleaning device only.
- Fault maintenance: Please return to the factory if there's fault.

# 6 Technical Specification

## 6.1 Basic Parameters

| | |
|---|---|
| Measure Object | Modbus RTU slave device |
| FF Bus Power | 9～32VDC |
| Quiescent current | ≤14mA |
| Bus Protocol | Two-wire, FF Protocol |
| Insulating Voltage | Modbus and FF bus interface, 1000VAC |
| Temperature Scale | -40℃～85℃ |
| Humidity Scale | 5～95%RH |
| Start Time | ≤5s |
| Refresh Time | 0.2s |

## 6.2 Performance Index

| | |
|---|---|
| Electromagnetic compatibility | Meet GB/T 18268.1-2010<br>Test method for FF port meets GB/T 18268.23-2010 |

## 6.3 Physical Properties

| | |
|---|---|
| Weight | 16 g |
| Structural Material | Coating：Polyester epoxy resin |

## 6.4 Default Communication Parameters

| | |
|---|---|
| Slave Address | 1 |
| Baud Rate | 9600 |
| Data Bit | 8 |
| Stop Bit | 1 |
| Calibration | EVEN |
| CRC Calibration | Low byte ahead |

## 6.5 Supportive Modbus Function Code

| | |
|---|---|
| 1 | Read loop status |
| 2 | Read discrete input status |
| 3 | Read keeping register value |
| 4 | Read input register value |
| 5 | Write loop |
| 6 | Write single register values |
| 15 | Write multiple loop |
| 16 | Write multiple register values |

# Appendix 1 Parameter List for Modbus Transducer Block

| Index | Parameter | Data Type | Effective Range | Default Values | Storage | Functional Description |
|---|---|---|---|---|---|---|
| 1 | ST_REV | Unsigned16 | | 0 | S/RO | Static version |
| 2 | TAG_DESC | OctString(32) | | Spaces | S | Bit No |
| 3 | STRATEGY | Unsigned16 | | 0 | S | Policy |
| 4 | ALERT_KEY | Unsigned8 | 1 to 255 | 0 | S | Alarm |
| 5 | MODE_BLK | DS-69 | | O/S | S | Mode |
| 6 | BLOCK_ERR | Bitstring(2) | | | D/RO | Error |
| 7 | UPDATA_EVT | DS-73 | | | D | Static data update event |
| 8 | BLOCK_ALM | DS-72 | | | D | Function block alarm |
| 9 | TRANSDUCER_TYPE | Unsigned16 | | 65535 | N/RO | Function block type |
| 10 | XD_ERROR | Unsigned8 | | 0 | D/RO | Function block error description |
| 11 | SENSOR_TYPE | Unsigned16 | | 65535 | D/RO | Sensor type |
| 12 | BAD_STATUS | DS-258 | | | D/RO | Consist of three 32-bit state sub-parameter, any bit is set to 1 indicates that the corresponding command gets no response, the error code of parameter could be observed by configuration. |
| 13 | ERR_LOOK_RESULT | Unsigned8 | 0-255 | | D/RO | 32 I/O command negative response of exception code index address,for example 0 indicates MOD_IN1 negative response code. |
| 14 | MOD_IN1 | DS-65 | | | D/RO | Analog input 1 |
| 15 | MOD_IN2 | DS-65 | | | D/RO | Analog input 2 |
| 16 | MOD_IN3 | DS-65 | | | D/RO | Analog input 3 |
| 17 | MOD_IN4 | DS-65 | | | D/RO | Analog input 4 |
| 18 | MOD_IN5 | DS-65 | | | D/RO | Analog input 5 |
| 19 | MOD_IN6 | DS-65 | | | D/RO | Analog input 6 |
| 20 | MOD_IN7 | DS-65 | | | D/RO | Analog input 7 |
| 21 | MOD_IN8 | DS-65 | | | D/RO | Analog input 8 |
| 22 | MOD_OUT1 | DS-65 | | | D/RO | Analog output 1 |
| 23 | MOD_ OUT 2 | DS-65 | | | D/RO | Analog output 2 |
| 24 | MOD_ OUT 3 | DS-65 | | | D/RO | Analog output 3 |
| 25 | MOD_ OUT 4 | DS-65 | | | D/RO | Analog output 4 |
| 26 | MOD_ OUT 5 | DS-65 | | | D/RO | Analog output 5 |
| 27 | MOD_ OUT 6 | DS-65 | | | D/RO | Analog output 6 |
| 28 | MOD_ OUT 7 | DS-65 | | | D/RO | Analog output 7 |
| 29 | MOD_ OUT 8 | DS-65 | | | D/RO | Analog output 8 |
| 30 | MOD_IN_D1 | DS-66 | | | D/RO | Discrete input 1 |
| 31 | MOD_IN_D 2 | DS-66 | | | D/RO | Discrete input 2 |
| 32 | MOD_IN_D 3 | DS-66 | | | D/RO | Discrete input 3 |
| 33 | MOD_IN_D 4 | DS-66 | | | D/RO | Discrete input 4 |
| 34 | MOD_IN_D 5 | DS-66 | | | D/RO | Discrete input 5 |
| 35 | MOD_IN_D 6 | DS-66 | | | D/RO | Discrete input 6 |
| 36 | MOD_IN_D 7 | DS-66 | | | D/RO | Discrete input 7 |
| 37 | MOD_IN_D 8 | DS-66 | | | D/RO | Discrete input 8 |
| 38 | MOD_OUT_D1 | DS-66 | | | D/RO | Discrete output 1 |
| 39 | MOD_OUT_D 2 | DS-66 | | | D/RO | Discrete output 1 |
| 40 | MOD_OUT_D 3 | DS-66 | | | D/RO | Discrete output 1 |
| 41 | MOD_OUT_D 4 | DS-66 | | | D/RO | Discrete output 1 |
| 42 | MOD_OUT_D 5 | DS-66 | | | D/RO | Discrete output 1 |
| 43 | MOD_OUT_D 6 | DS-66 | | | D/RO | Discrete output 1 |
| 44 | MOD_OUT_D 7 | DS-66 | | | D/RO | Discrete output 1 |
| 45 | MOD_OUT_D 8 | DS-66 | | | D/RO | Discrete output 1 |
| 46 | GENERIC_FLOAT_PARAM_1 | DS-256 | | | S | General float parameter 1 |
| 47 | GENERIC_FLOAT_PARAM_2 | DS-65 | | | S | General float parameter 2 |
| 48 | GENERIC_FLOAT_PARAM_3 | DS-256 | | | S | General float parameter 3 |
| 49 | GENERIC_FLOAT_PARAM_4 | DS-65 | | | S | General float parameter 4 |
| 50 | GENERIC_FLOAT_PARAM_5 | DS-256 | | | S | General float parameter 5 |
| 51 | GENERIC_FLOAT_PARAM_6 | DS-65 | | | S | General float parameter 6 |
| 52 | GENERIC_FLOAT_PARAM_7 | DS-256 | | | S | General float parameter 7 |
| 53 | GENERIC_FLOAT_PARAM_8 | DS-65 | | | S | General float parameter 8 |
| 54 | GENERIC_FLOAT_PARAM_9 | DS-256 | | | S | General float parameter 9 |
| 55 | GENERIC_FLOAT_PARAM_10 | DS-66 | | | S | General float parameter 10 |
| 56 | GENERIC_USIGN32_PARAM_1 | Unsigned32 | | | S | General 32-bit unsigned parameter 1 |
| 57 | GENERIC_USIGN32_PARAM_2 | Unsigned32 | | | S | General 32-bit unsigned parameter 2 |
| 58 | GENERIC_USIGN32_PARAM_3 | Unsigned32 | | | S | General 32-bit unsigned parameter 3 |
| 59 | GENERIC_USIGN32_PARAM_4 | Unsigned32 | | | S | General 32-bit unsigned parameter 4 |
| 60 | GENERIC_USIGN32_PARAM_5 | Unsigned32 | | | S | General 32-bit unsigned parameter 5 |
| 61 | GENERIC_USIGN32_PARAM_6 | Unsigned32 | | | S | General 32-bit unsigned parameter 6 |
| 62 | GENERIC_USIGN32_PARAM_7 | Unsigned32 | | | S | General 32-bit unsigned parameter 7 |
| 63 | GENERIC_USIGN32_PARAM_8 | Unsigned32 | | | S | General 32-bit unsigned parameter 8 |
| 64 | GENERIC_USIGN32_PARAM_9 | Unsigned32 | | | S | General 32-bit unsigned parameter 9 |
| 65 | GENERIC_USIGN32_PARAM_10 | Unsigned32 | | | S | General 32-bit unsigned parameter 10 |
| 66 | GENERIC_USIGN16_PARAM_1 | Unsigned16 | | | S | General 16-bit unsigned parameter 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **67** | GENERIC_USIGN16_PARAM_2 | Unsigned16 | | | S | General 16-bit unsigned parameter 2 |
| **68** | GENERIC_USIGN16_PARAM_3 | Unsigned16 | | | S | General 16-bit unsigned parameter 3 |
| **69** | GENERIC_USIGN16_PARAM_4 | Unsigned16 | | | S | General 16-bit unsigned parameter 4 |
| **70** | GENERIC_USIGN16_PARAM_5 | Unsigned16 | | | S | General 16-bit unsigned parameter 5 |
| **71** | GENERIC_USIGN16_PARAM_6 | Unsigned16 | | | S | General 16-bit unsigned parameter 6 |
| **72** | GENERIC_USIGN16_PARAM_7 | Unsigned16 | | | S | General 16-bit unsigned parameter 7 |
| **73** | GENERIC_USIGN16_PARAM_8 | Unsigned16 | | | S | General 16-bit unsigned parameter 8 |
| **74** | GENERIC_USIGN16_PARAM_9 | Unsigned16 | | | S | General 16-bit unsigned parameter 9 |
| **75** | GENERIC_USIGN16_PARAM_10 | Unsigned16 | | | S | General 16-bit unsigned parameter 10 |
| **76** | GENERIC_USIGN8_PARAM_1 | Unsigned8 | | | S | General 8-bit unsigned parameter 1 |
| **77** | GENERIC_USIGN8_PARAM_2 | Unsigned8 | | | S | General 8-bit unsigned parameter 2 |
| **78** | GENERIC_USIGN8_PARAM_3 | Unsigned8 | | | S | General 8-bit unsigned parameter 3 |
| **79** | GENERIC_USIGN8_PARAM_4 | Unsigned8 | | | S | General 8-bit unsigned parameter 4 |
| **80** | GENERIC_USIGN8_PARAM_5 | Unsigned8 | | | S | General 8-bit unsigned parameter 5 |
| **81** | GENERIC_USIGN8_PARAM_6 | Unsigned8 | | | S | General 8-bit unsigned parameter 6 |
| **82** | GENERIC_USIGN8_PARAM_7 | Unsigned8 | | | S | General 8-bit unsigned parameter 7 |
| **83** | GENERIC_USIGN8_PARAM_8 | Unsigned8 | | | S | General 8-bit unsigned parameter 8 |
| **84** | GENERIC_USIGN8_PARAM_9 | Unsigned8 | | | S | General 8-bit unsigned parameter 9 |
| **85** | GENERIC_USIGN8_PARAM_10 | Unsigned8 | | | S | General 8-bit unsigned parameter 10 |
| **86** | GENERIC_STRINGV_PARAM_1 | Octet String(32) | | | S | General 32-bit strings parameter 1 |
| **87** | GENERIC_STRINGV_PARAM_2 | Octet String(32) | | | S | General 32-bit strings parameter 2 |

# Appendix 2 Common parameter list

| No | Parameter | Description |
|---|---|---|
| 1 | Data configure flags | Data configure flags<br>0xFEDCCDEF：Data Valid<br>0x00000000：Data Invalid |
| 2 | Device's serial number | Device's serial number SN（6 bytes） |
| 3 | Number of analog input data | Number of analog input data (0~8) |
| 4 | Number of analog output data | Number of analog output data (0~8) |
| 5 | Number of input digital data | Number of input digital data (0~8) |
| 6 | Number of output digital data | Number of output digital data (0~8) |
| 7 | Number of float data | Number of float data (0~10) |
| 8 | Number of USIGN32 data | Number of USIGN32 data (0~10) |
| 9 | Number of USIGN16 data | Number of USIGN16 (0~10) |
| 10 | Number of USIGN8 data | Number of USIGN8 data (0~10) |
| 11 | Number of data Octet String | Number of data Octet String (0~2) |
| 12 | Baud rate | Baud Rate<br>0： 2400<br>1： 4800<br>2： 9600<br>3： 14400<br>4： 19200 |
| 13 | Data bit | Data bit<br>0： 8<br>1： 7 |
| 14 | Check bit | Check bit<br>0： None<br>1： Even<br>2： Odd |
| 15 | Physical standard | Interface type<br>0： TTL<br>1： RS232<br>2： RS485 |
| 16 | Stop bit | Stop bit<br>0： One Stop Bit<br>1： Two Stop Bits |
| 17 | Address | Slave station address(1~255)，this address is the slave station address under normal working mode |
| 18 | CRC | CRC Sequence-checking<br>0： Normal<br>1： Swapped |
| 19 | Timeout | Timeout value (300~1000，unit ms) |
| 20 | Resend times | Resend times (1~10) |
| 21 | View error parameter | View error parameter (0~73，all the 74 channel datas, which respectively indicate analog input,analog output, digital input, digital output, float data, USIGN32 data、USIGN16 data、USIGN8 data and Octet String data) |

# Appendix 3 Model Selection Table for M0313 Module

| MOD-FFH1 | M0313 Modbus to FF built-in module | | | | | |
|---|---|---|---|---|---|---|
| | Code | Master/Slave | | | | |
| | M | Master Station | | | | |
| | | Code | Module Form | | | |
| | | N | General | | | |
| | | | Code | Hardware Interface | | |
| | | | T | TTL level | | |
| | | | | Code | Software Interface | |
| | | | | M | Modbus RTU | |
| | | | | | Code | Bus interface on module |
| | | | | | N | No Bus inteface |
| MOD-FFH1- | M | N | T | M | N | —— Selection Example |

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