



G0313

Modbus to FF Gateway

User Manual



Warning

1. Please don't take off/install gateway at random.
2. Please check if the power of gateway meets the power request in the User Manual.

Version: V2.1

Disclaimer

The contents of this manual have been checked to confirm the consistency of the described hardware and software. Because the error can not be completely excluded, there is no guarantee of absolute consistency. However, we will regularly check the data in this manual and make necessary corrections in subsequent versions. Any suggestions for improvement are welcome.

Microcyber Corporation, 2021

Technical data changes at any time.

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Microcyber Corporation successfully developed the first internationally certified fieldbus protocol master stack, the first nationally certified fieldbus instrument, and the first German TÜV certified safety instrument in China. It co-chaired with other units to formulate the first domestic industrial Ethernet protocol standard EPA, the first industrial wireless communication protocol standard WIA-PA, and become the IEC international standard. Microcyber Corporation's products and technology have won two national second prize for scientific and technological progress, one national scientific and technological invention award, one first prize for scientific and technological progress of the Chinese Academy of Sciences, and one first prize for scientific and technological progress of Liaoning Province. The United States Emerson, Britain Rotork, Britain and other top enterprises have adopted key technologies or components in their products and successfully completed more than 200 large-scale automation projects.

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Carrying employee ideal, creating customer value and promoting enterprise development.

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Chapter 1 Summary

G0313 Modbus to FF Gateway is a gateway device of Modbus protocol and FF protocol developed by Microcyber. As Modbus master station, G0313 Modbus to FF Gateway communicates with Modbus-RTU device via RS485 interface, and it can convert the data of Modbus-RTU device to FF device variable output. G0313 Modbus to FF Gateway is shown in Figure 1.1:



Figure 1.1 G0313 Modbus to FF Gateway

1. 1 Outer Size Diagram

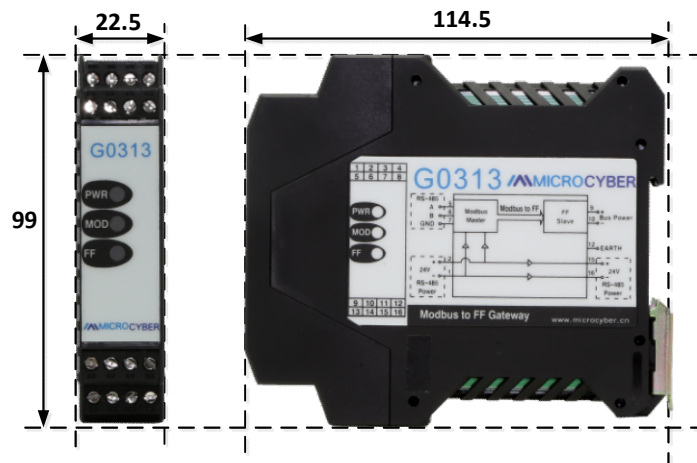


Figure 1.2 Outer Size of Gateway Device (Unit: mm)

1. 2 Structure Diagram

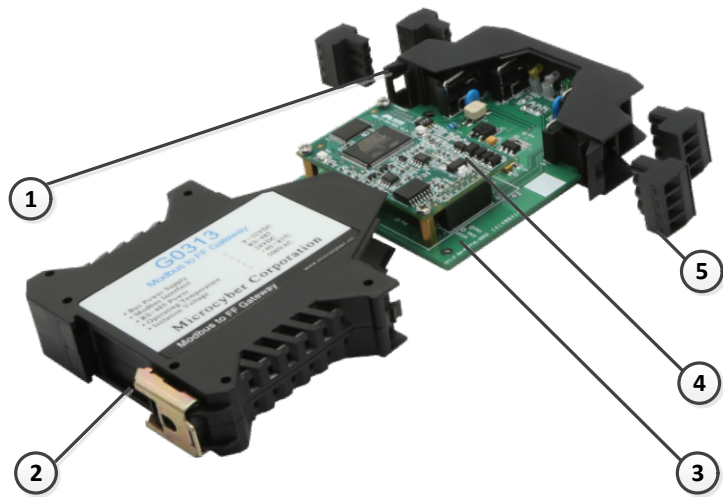


Figure 1.3 Whole Structure of Gateway Device

1	Upper Case	2	Lower Case	3	FF Communication Card
4	Modbus	5	Terminal		

Chapter 2 Installation

G0313 Modbus to FF Gateway size is 99×22.5×114.5mm, and supports standard DIN rail installation.

2.1 Wiring

G0313 Modbus to FF Gateway's terminal distribution and meaning is shown in Figure 2.1.

1	2	3	4
5	6	7	8
G1013			
PWR			
HART			
FF			
 中科博微 MICROCYBER			
9	10	11	12
13	14	15	16

1	24V-	2	24V+
3	NC	4	NC
5	HART+	6	HART-
7	NC	8	EARTH
9	FF+	10	FF-
11	EARTH	12	NC
13	NC	14	NC
15	24V+	16	24V-

Figure 2.1 Terminal Definition of G0313 Modbus to FF Gateway

G0313 Modbus to FF Gateway's power supply has two parts, FF bus power and 24V power of RS485 communication. Shielded twisted-pair cable is recommended, which can help device improve resistance to electromagnetic interference.

2.2 Configuration of DIP Switch

There is a 3-bit DIP switch for G0313 Modbus to FF Gateway, shown as Figure 2.2. SIM, WP and RST switches from top to bottom.

- SIM: Simulation switch, used for "simulation function".
- WP: Write protection, all the write operation for FF smart pressure transmitter shall be refused, which avoid data modification at random.
- RST: Reset, reset device date 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 reset to factory original.

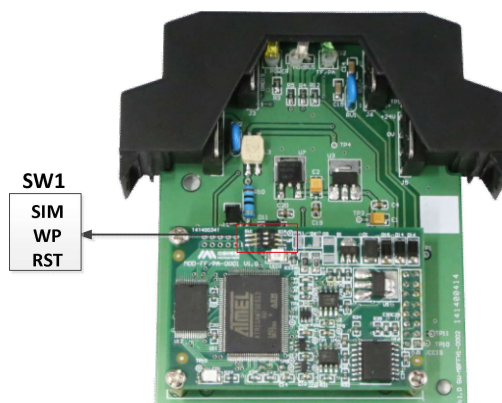


Figure 2.2 DIP Switch of G0313 Modbus to FF Gateway

Chapter 3 Working Principle

Modbus to FF gateway is a gateway device 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 Diagram of Modbus to FF Gateway is shown in Figure 3.1:

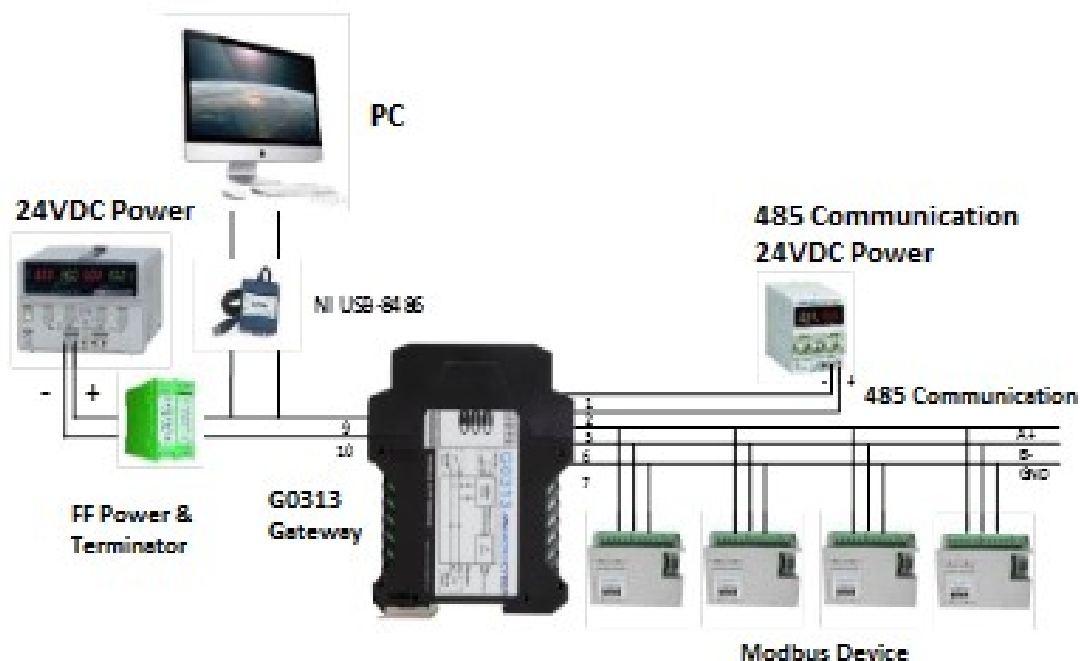


Figure 3.1 System Wiring Diagram of Modbus to FF Gateway

Modbus to FF Gateway supports 4 Modbus slave devices, 8 groups of analog input output and discrete 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 between variables and AI, AO, DI and DO function blocks. Principle Diagram for MODBUS to FF Gateway is shown in Figure 3.2.

G0313 Gateway

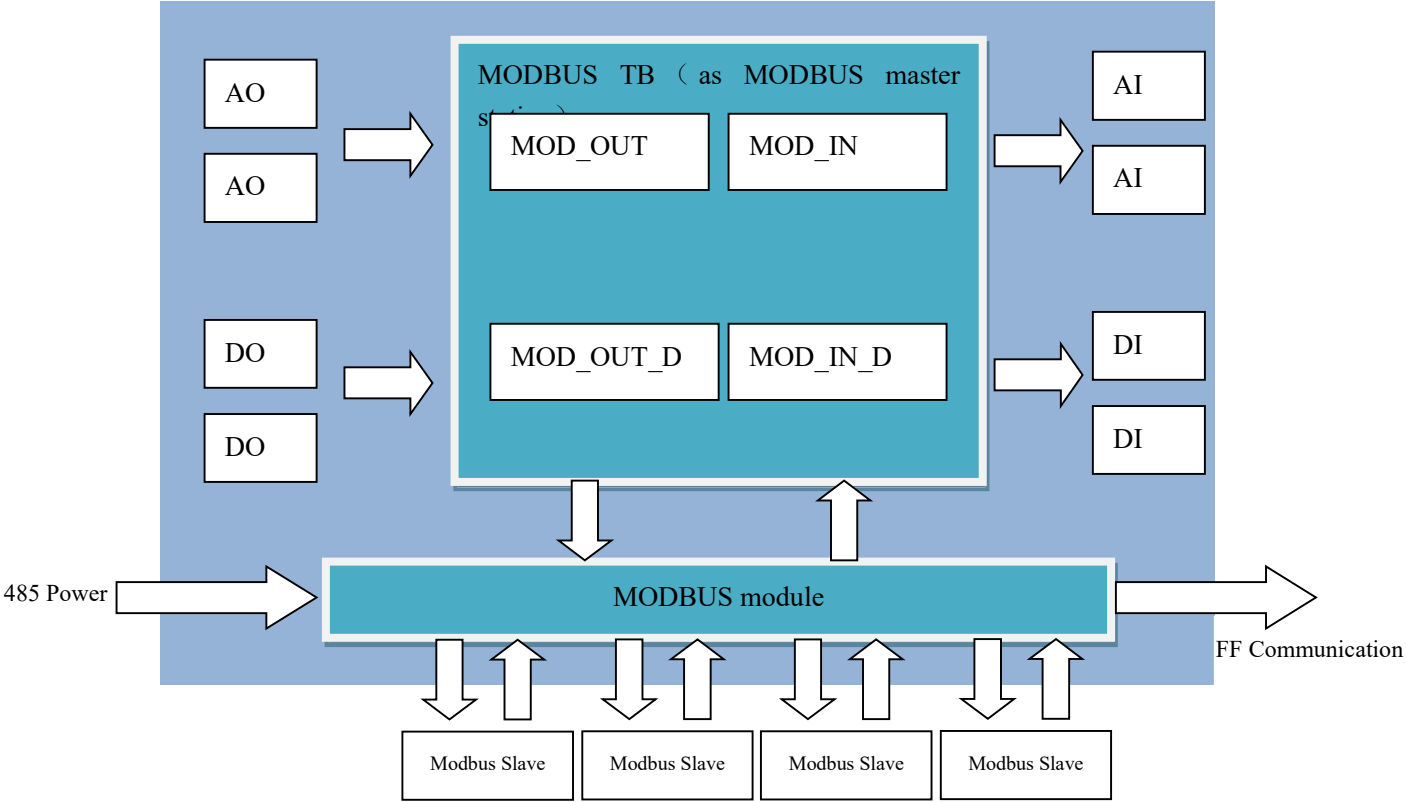


Figure 3.2 Principle Diagram for MODBUS to FF Gateway

Chapter 4 Configuration of Gateway

4. 1 Topologic Connection

FF transmitter supports many net topologies shown as Figure 4.1. shows 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 length can be extended to 10 kilometers.

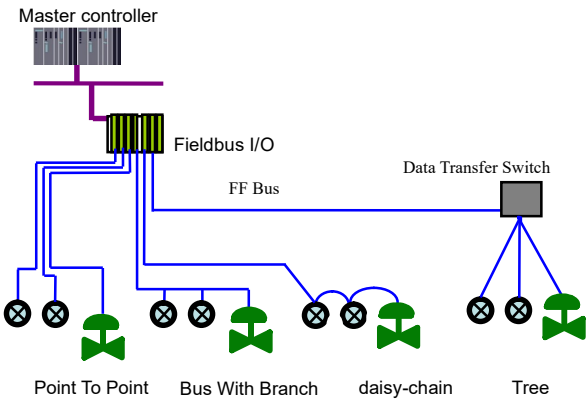


Figure 4.1 Topology of FF Bus

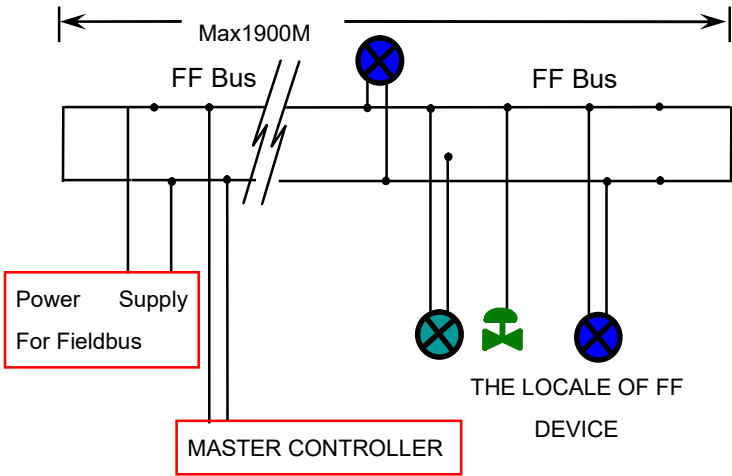


Figure 4.2 FF Bus Connection

4. 2 Introduction for Function

Default configuration of Modbus to FF Gateway 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), each channel is corresponding to analog/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 only 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, filtration, square root, 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 is a position automatic control module, which magnifies or shrinks the deviation in proportion, and adds and sums it up. It has the function of PID control and setting point adjustment, process value(PV) filtering and alarm, output tracking, etc.

4.3 Modbus Transform Block Parameters

Index	Parameter Name	Data Type	Valid Range	Default Value	Save	Mode	Function Description
1	ST_REV	Unsigned16		0	S/RO		Static Version
2	TAG_DESC	OctString(32)		Spaces	S		Bit Number
3	STRATEGY	Unsigned16		0	S		Strategy
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		Failure
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		Transducer Block Type
10	XD_ERROR	Unsigned8		0	D/RO		Transducer Block Failure Descriptionj
11	SENSOR_TYPE	Unsigned16		65535	D/RO		Sensor Type
12	MEDIA	Unsigned8	0: RS232 1: RS485	0	S	O/S	Physical Transmission

							Medium, the present round card supports RS232
13	BAUD_RATE	Unsigned8	0:9600 1:19200 2:15625 3:31250 4:62500 5:125000	0	S	O/S	MODBUS Communication Baud Rate
14	STOP_BITS	Unsigned8	0: 1bit 1: 2bit	0	S	O/S	MODBUS Communication Stop Bit
15	PARITY	Unsigned8	0: None, 1: Even 2: Odd	0	S	O/S	MODBUS Communication Calibration Bit
16	CRC_ORDER	Unsigned8	0:No swap 1:Swap	0	S	O/S	CRC High and low bit exchange, the high bit is first in default.
17	TIME_OUT	Unsigned16	0-65535	300	S	O/S	After sending MODBUS request, the maximum time waiting for slave station response. The unit is ms, default 1000ms.
18	NUMBER_OF_RETRY	Unsigned8	0-255	1	S	O/S	When the waiting response is timeout, the number for resending the request.
19	SLVAE_ADDRESS	Unsigned8	0-255	1	S	O/S	MODBUS slave address
20	BAD_STATUS	Bitstring(4)				D/RO	Communication Status for 32 input output commands. When certain bit is 1, it means the related command doesn't receive the response. Please refer to the following table for the parameter

							description.
21	EXP_CODE_NUMBER	Unsigned8	0-31	0	D		Code address of 32 input output negative response in abnormal. E.g. 0 represents the negative response code of MOD_IN1.
22	EXP_CODE_VALUE	Unsigned8	0-255	0	D/RO		Abnormal code of 32 input output command negative response, which is indicated by EXP_CODE_NUMBER indicated index.
23	MOD_IN1	DS-65			D/RO		Analog input1
24	SCALE_LOC_IN1	DS-256			S	O/S	Analog input 1 Configure
25	MOD_IN2	DS-65			D/RO		Analog input2
26	SCALE_LOC_IN2	DS-256			S	O/S	Analog input 2 Configure
27	MOD_IN3	DS-65			D/RO		Analog input3
28	SCALE_LOC_IN3	DS-256			S	O/S	Analog input 3 Configure
29	MOD_IN4	DS-65			D/RO		Analog input4
30	SCALE_LOC_IN4	DS-256			S	O/S	Analog input 4 Configure
31	MOD_IN5	DS-65			D/RO		Analog input5
32	SCALE_LOC_IN5	DS-256			S	O/S	Analog input 5 Configure
33	MOD_IN6	DS-65			D/RO		Analog input6
34	SCALE_LOC_IN6	DS-256			S	O/S	Analog input 6 Configure
35	MOD_IN7	DS-65			D/RO		Analog input7
36	SCALE_LOC_IN7	DS-256			S	O/S	Analog input 7 Configure
37	MOD_IN8	DS-65			D/RO		Analog input8
38	SCALE_LOC_IN8	DS-256			S	O/S	Analog input 8 Configure
39	MOD_OUT1	DS-65			D/RO		Analog output1
40	SCALE_LOC_OUT 1	DS-256			S	O/S	Analog output 1 Configure

41	MOD_OUT 2	DS-65			D/RO		Analog output 2
42	SCALE_LOC_OUT 2	DS-256			S	O/S	Analog output 2 Configure
43	MOD_OUT 3	DS-65			D/RO		Analog output 3
44	SCALE_LOC_OUT 3	DS-256			S	O/S	Analog output 3 Configure
45	MOD_OUT 4	DS-65			D/RO		Analog output 4
46	SCALE_LOC_OUT 4	DS-256			S	O/S	Analog output 4 Configure
47	MOD_OUT 5	DS-65			D/RO		Analog output 5
48	SCALE_LOC_OUT 5	DS-256			S	O/S	Analog output 5 Configure
49	MOD_OUT 6	DS-65			D/RO		Analog output 6
50	SCALE_LOC_OUT 6	DS-256			S	O/S	Analog output 6 Configure
51	MOD_OUT 7	DS-65			D/RO		Analog output7
52	SCALE_LOC_OUT 7	DS-256			S	O/S	Analog output 7 Configure
53	MOD_OUT 8	DS-65			D/RO		Analog output8
54	SCALE_LOC_OUT 8	DS-256			S	O/S	Analog output8 Configure
55	MOD_IN_D1	DS-66			D/RO		Discrete input 1
56	LOC_IN_D 1	DS-257			S	O/S	Discrete input 1 Configure
57	MOD_IN_D 2	DS-66			D/RO		Discrete input 2
58	LOC_IN_D 2	DS-257			S	O/S	Discrete input 2 Configure
59	MOD_IN_D 3	DS-66			D/RO		Discrete input 3
60	LOC_IN_D 3	DS-257			S	O/S	Discrete input 3 Configure
61	MOD_IN_D 4	DS-66			D/RO		Discrete input 4
62	LOC_IN_D 4	DS-257			S	O/S	Discrete input 4 Configure
63	MOD_IN_D 5	DS-66			D/RO		Discrete input 5
64	LOC_IN_D 5	DS-257			S	O/S	Discrete input 5 Configure
65	MOD_IN_D 6	DS-66			D/RO		Discrete input 6
66	LOC_IN_D 6	DS-257			S	O/S	Discrete input 6 Configure
67	MOD_IN_D 7	DS-66			D/RO		Discrete input 7
68	LOC_IN_D 7	DS-257			S	O/S	Discrete input 7

							Configure
69	MOD_IN_D 8	DS-66			D/RO		Discrete input 8
70	LOC_IN_D 8	DS-257			S	O/S	Discrete input 8 Configure
71	MOD_OUT_D1	DS-66			D/RO		Discrete output 1
72	LOC_OUT_D 1	DS-257			S	O/S	Discrete output 1 Configure
73	MOD_OUT_D 2	DS-66			D/RO		Discrete output 2
74	LOC_OUT_D 2	DS-257			S	O/S	Discrete output 2 Configure
75	MOD_OUT_D 3	DS-66			D/RO		Discrete output 3
76	LOC_OUT_D 3	DS-257			S	O/S	Discrete output 3 Configure
77	MOD_OUT_D 4	DS-66			D/RO		Discrete output 4
78	LOC_OUT_D 4	DS-257			S	O/S	Discrete output 4 Configure
79	MOD_OUT_D 5	DS-66			D/RO		Discrete output 5
80	LOC_OUT_D 5	DS-257			S	O/S	Discrete output 5 Configure
81	MOD_OUT_D 6	DS-66			D/RO		Discrete output 6
82	LOC_OUT_D 6	DS-257			S	O/S	Discrete output 6 Configure
83	MOD_OUT_D 7	DS-66			D/RO		Discrete output 7
84	LOC_OUT_D 7	DS-257			S	O/S	Discrete output 7 Configure
85	MOD_OUT_D 8	DS-66			D/RO		Discrete output 8
86	LOC_OUT_D 8	DS-257			S	O/S	Discrete output 8 Configure

4. 3. 1 Communication Parameter for Modbus Transducer Block

The user is able to configure the Modbus communication parameter, such as baud rate, stop bit, communication timeout, etc. The Modbus communication configuration parameters are shown as following:

Parameter Name	Data Type	Function Description
MEDIA	USIGN8	Physical transmission medium, 0: RS232, 2: RS485
BAUD_RATE	USIGN8	Baud rate, 0:2400, 1:4800, 2: 9600 (默认), 3:14400, 4:19200
STOP_BIT	USIGN8	Stop bit, 0: one stop bit, 1: two stop bits
PARITY	USIGN8	Calibration bit, 0: no calibration bit, 1: even calibration, 2: odd calibration
CRC_ORDER	USIGN8	CRC calibration byte order, 0: high byte first, 1: low byte first

TIME_OUT	USIGN16	After sending MODBUS request, the maximum time waiting for slave station response. The unit is ms, default 300ms.
NUMBER_OF_RETRY	USIGN8	When the waiting response is timeout, the number for resending the request. The range is 0-255.
SLAVE_ADDRESS	USIGN8	Support 4 Modbus slave stations, Modbus slave address. The range is 0-255(0 not used).

4. 3. 2 Register Parameter for Modbus Transducer Block

The MODBUS transducer block provides 8 couples of Analog input output and 8 couples of discrete input output parameters. The parameters are related to MODBUS register, and realized data exchange according to specified data type. MODBUS register configure parameters are divided into analog parameter configure and discrete parameter configure. Comparing with discrete one, the analog one has the range conversion (also called linear conversion) function.

DS-256 Analog Configure Parameter MOD_SCALE_LOC_PARM

The new data type DS-256 is configure parameter for analog input output, it can carry out the conversion between FF float data and MODBUS register data. DATA_TYPE data type parameter indicates the MODBUS register data type, and it does linear conversion to MODBUS register data and gives FF float data or converts FF float data to DATA_TYPE indicated data and writes into MODBUS register via FROM_EU100, FROM_EU0, TO_EU100 and TO_EU0.

Data Member	Data Type	Function Description
FROM_EU100	FLOAT	Upper limit for input range
FROM_EU0	FLOAT	Lower limit for input range
TO_EU100	FLOAT	Upper limit for output range
TO_EU0	FLOAT	Lower limit for output range
DATA_TYPE	USIGN8	Data type parameter, please refer to the table of DATA_TYPE parameter description for detailed
FUNCTION_CODE	USIGN8	MODBUS function code, indicates which function code is used for communication by the command.
REGISTER_ADR_OF_VALUE	USIGN16	MODBUS register address related to analog value
REGISTER_ADR_OF_STATUS	USIGN16	MODBUS register address related to analog status

DS-257 Discrete Configure Parameter MOD_LOC_PARM

The new data type DS-257 is configuration parameter for discrete input output, it can carry out the conversion between FF discrete data and MODBUS register data. The data type DATA_TYPE only supports Unsigned8_0 and Unsigned8_1. For Unsigned8_0, the low 8-bit bytes of register data correspond to the FF discrete parameter, and for Unsigned8_1, the high 8-bit bytes of register data corresponds to the FF discrete parameter.

Data Member	Data Type	Function Description
-------------	-----------	----------------------

DATA_TYPE	USIGN8	Data type, show as the table followed
FUNCTION_CODE	USIGN8	MODBUS function code, indicates which function code is used for communication by the command.
REGISTER_ADR_OF_VALUE	USIGN16	MODBUS register address related to analog value
REGISTER_ADR_OF_STATUS	USIGN16	MODBUS register address related to analog status

The Relationship Between Parameter Status and REGISTER_ADR_OF_STATUS

When REGISTER_ADR_OF_STATUS is 0, it is configured as an invalid register address. Otherwise, it is a valid register address.

Parameter	REGISTER_ADR_OF_STATUSConfigure invalid (default)	REGISTER_ADR_OF_STATUSConfigure valid
Input	If the MODBUS communication is normal, the parameter status is "GOOD NON-CASCADE", otherwise, it is "BAD NO COMMUNICATION WITH LAST VALUE"	The round card will read the related address data from instrument card via MODBUS communication, making the low 8 bits the parameter status and high 8 bits omitted.
Output	The round card won't send and data about parameter status to instrument card via MODBUS.	The round card will send the data to register related to instrument card address via MODBUS. The parameter will occupy the low 8 bits of register data, and the high 8 bits will be set as 0.

Parameter Description for DATA_TYPE

Index	Name	Data Type	Data Length	Valid Range	Others
1	Float_0123	Single Precision Float	4		Only analog input output parameter supportive
2	Float_1032	Single Precision Float	4		Only analog input output parameter supportive
3	Float_3210	Single Precision Float	4		Only analog input output parameter supportive
4	Float_2301	Single Precision Float	4		Only analog input output parameter supportive
5	Unsigned8_0	Unsigned int	1	0 - 255	
6	Unsigned8_1	Unsigned int	1	0 - 255	
7	Unsigned16_01	Unsigned short int	2	0 - 65535	Only analog input output parameter supportive
8	Unsigned16_10	Unsigned short int	2	0 - 65535	Only analog input output parameter supportive

9	Unsigned32_0123	Unsigned long int	4	0 - 4294967295	Only analog input output parameter supportive
10	Unsigned32_1032	Unsigned long int	4	0 - 4294967295	Only analog input output parameter supportive
11	Unsigned32_3210	Unsigned long int	4	0 - 4294967295	Only analog input output parameter supportive
12	Unsigned32_2301	Unsigned long int	4	0 - 4294967295	Only analog input output parameter supportive
13	Signed8_0	Signed int	1	-128 - 127	
14	Signed8_1	Signed int	1	-128 - 127	
15	Signed16_01	Signed short int	2	-32768 - 32767	Only analog input output parameter supportive
16	Signed16_10	Signed short int	2	-32768 - 32767	Only analog input output parameter supportive
17	Signed32_0123	Signed long int	4	-2,147,483,648 - 2,147,483,647	Only analog input output parameter supportive
18	Signed32_1032	Signed long int	4	-2,147,483,648 - 2,147,483,647	Only analog input output parameter supportive
19	Signed32_3210	Signed long int	4	-2,147,483,648 - 2,147,483,647	Only analog input output parameter supportive
20	Signed32_2301	Signed long int	4	-2,147,483,648 - 2,147,483,647	Only analog input output parameter supportive

*** Only support analog input and output parameters**

Specification about Data Format

In the data type table above, the suffix of DataType_abcd, abcd means the data's serial number in MODBUS slave station. 0 represents the low 8 bits of data in the first register, 1 represents the high 8 bits of data in the first register, 2 represents the low 8 bits of data in the second register, 3 represents the high 8 bits of data in the second register. MODBUS_FF module memory selects little-end mode, so Unsigned32_0123 represents MODBUS slave station register data gives value to long int variable in MODBUS_FF module in original order, while Unsigned32_1032 represents MODBUS slave station register data after high and low bit bytes exchange gives value to long int variable in MODBUS_FF module.

4. 3. 3 Modbus Transform Block State Parameter

BAD_STATUS parameter description

If the communication fails, the corresponding bit is set to 1, otherwise 0.

BIT	PARAMETER	BIT	PARAMETER
0	MOD_IN1	16	
1	MOD_IN2	17	MOD_IN_D 2
2	MOD_IN3	18	MOD_IN_D 3

3	MOD_IN4	19	MOD_IN_D 4
4	MOD_IN5	20	MOD_IN_D 5
5	MOD_IN6	21	MOD_IN_D 6
6	MOD_IN7	22	MOD_IN_D 7
7	MOD_IN8	23	MOD_IN_D 8
8	MOD_OUT1	24	MOD_OUT_D 1
9	MOD_OUT 2	25	MOD_OUT_D 2
10	MOD_OUT 3	26	MOD_OUT_D 3
11	MOD_OUT 4	27	MOD_OUT_D 4
12	MOD_OUT 5	28	MOD_OUT_D 5
13	MOD_OUT 6	29	MOD_OUT_D 6
14	MOD_OUT 7	30	MOD_OUT_D 7
15	MOD_OUT 8	31	MOD_OUT_D 8

ERR_LOOK_SEL and ERR_LOOK_RESULT Parametric Description

The input and output parameters negative response data query function of ERR_LOOK_SEL and ERR_LOOK_RESULT. Users can query the response value of each input and output data and use the ERR_LOOK_SEL to select a certain input and output parameters to query, The communication response data of this parameter can be obtained by reading the ERR_LOOK_RESULT parameters. ERR_LOOK_RESULT,0 indicates no error ;0 x01–0x0B is Modbus standard negative response data; 0 xFF indicates master-slave communication failure.

The two parameters are described in detail as follows:

1) ERR_LOOK_SEL Parameters

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

2) ERR_LOOK_RESULT Parameters

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

4. 4 Example for Modbus Transducer Block Configuration

Take NI-Configurator Software as an example, this Chapter will show how to Configure MODBUS transducer block.

4. 4. 1 Configure for MODBUS Communication Parameter

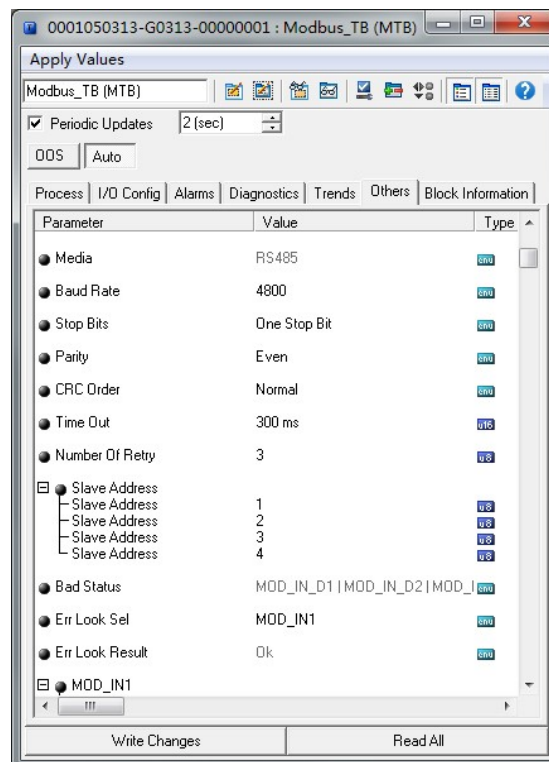


Figure 4.3 Modbus Communication parameter configuration

4. 4. 2 Configure for MODBUS Register

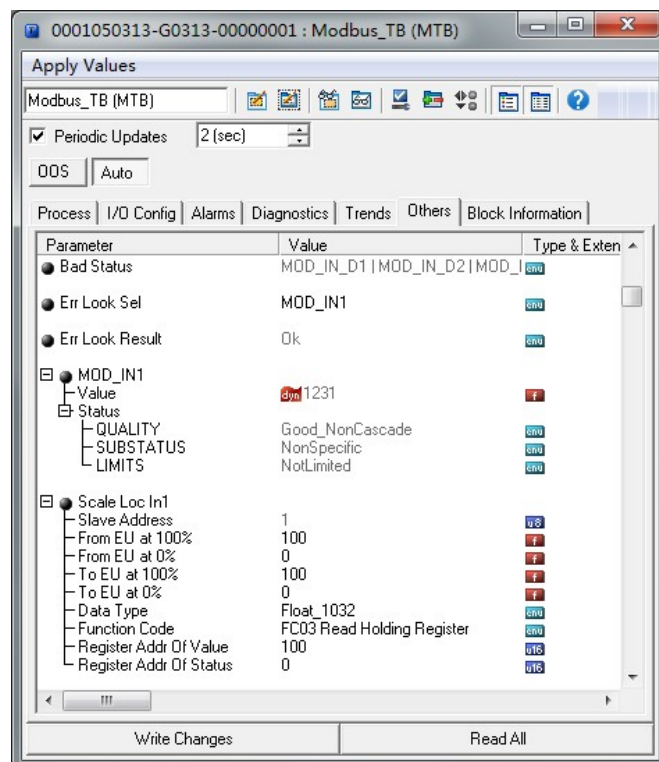


Figure 4.4 Modbus Register configuration

Now let's take analog input parameter MOD_IN1 as an example to describe MODBUS register configure. For analog input parameter, it is only needed to configure SCALE_LOC_IN_X. The X range is 0-8. The SCAL_LOC_IN_1 configure is shown as following:

```
FROM_EU100 = 4095
FROM_EU0 = 0
TO_EU100 = 100
TO_EU0 = 0
DATA_TYPE = "Unsigned16_01"
FUNCTION_CODE = "FC03 Read Holding Register"
REGISTER_ADDR_OF_VALUE = 14
REGISTER_ADDR_OF_STATUS = 0
```

The configure means that, the function code 3 is used to read MODBUS register, data register address is 14, status register address, set as 0, means the status is determined by transducer blocks automatically, rather than reading from MODBUS slave station. The data, read from MODBUS slave station is used as data rather than status. Data type Unsigned16_01 gives the data from slave station to transducer block, without high and low bytes exchange. When transducer block received the register data, after the range conversion, it will give the data result to MOD_IN1. For example, if register data is 0x0ABC, whose decimal is 2748, the value of MOD_IN1 is calculated as following:

$$\frac{2748 - 0}{4095 - 0} = \frac{value - 0}{100 - 0}$$

Chapter 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
485 Communication	Yellow-green	Flash	Light off	Not connect slave device	Connect slave device
				Slave device fault	Check slave and connection
				Internal fault	Contact technical support
485 Power	Yellow	Light on	Light off	Power fault	Check power supply and connection
				Internal fault	Contact technical support

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

Chapter 6 Technical Specification

6.1 Basic Parameters

Measure Object	Modbus RTU slave device
Modbus Power	24VDC
FF Bus Power	9~32VDC
Bus Protocol	Two-wire, FF Protocol
Insulating Voltage	Modbus and FF bus interface, 500VAC
Temperature Scale	-40°C~85°C
Humidity Scale	5~95%RH
Start Time	≤5s
Refresh Time	0.2s

6.2 Performance Index

Protection Level	Housing protection level is IP20.
Electromagnetic compatibility	Meet GB/T 18268.1-2010 Test method for FF port meets GB/T 18268.23-2010.

6.3 Physical Properties

Weight	0.2kg
Structural Material	Housing: Polyamide PA6.6; Coating: Polyester epoxy resin

6.4 Default Communication Parameters

Slave Address	1, 2, 3, 4
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
16	Write multiple register values

Appendix 1 Type Selection List

Type Selection List	G0313		Modbus to FF Gateway			
			Code		Hardware Interface	
			R4 (Omitting)		RS485	
					Code	Software Interface
					MRM (Omitting)	Modbus RTU Master
	G0313		-	(R4	-	MRM)



MICROCYBER CORPORATION

Microcyber Corporation

[Http://www.microcybers.com](http://www.microcybers.com)

Add: 17-8 Wensu Street, Hunnan New District, Shenyang, China 110179

Tel: 0086-24-31217278 / 31217280

Fax: 0086-24-31217293

Email: huang.xin@microcyber.cn