General Manual for Digital Products (RS-232 / RS-485)

The handbook is applicable to the following products, such as 485 relay modules, 485 digital input modules and 485 digital input-output modules.

Contents

Chapter 1 Hardware Parameters 2
Chapter 2 Setting of Communication Way 3
Chapter 3 Register Address 5
Chapter 4 Modbus-RTU Transimission Pricinple 10
Chapter 5 Description of Module Indicators 23

Chapter 1: Hardware Parameters

1：Relay output parameters

Refer to the following table according to different brands and different models.

Check list for relay parameters(loop voltage 12V/24V)			
Brand	Model	Contact type	Contact volume
OMROM	G2R-1(with base)	Open and close	10A/250VAC 10A/30VDC
IDEC	RJ1V-C-D24(with base)	Open and close	12A/250VAC 12A/30VDC
Hongfa	HF115F(with base)	Open and close	12A/250VAC
Tyco	RT114024(with base)	Open and close	12A/250VAC

2： Transistor output parameter

Output transistor model: IRF9540N (Field-effect tube)
Load voltage: 12~24VDC
Continuous load current: <=2A (with radiator)
Instant maximum current: 16A(continuous time 300mS)
Output type: output voltage after trigger : 12~24VDC; Floating without trigger
Output insulation: sustainable voltage±1500V
Output indicator: attached

3：Digital input parameters

Input way: compatible with NPN/PNP

Triggering voltage: 3.3V / 5V / 12V / 24V optional
Input insulation：sustainable voltage ±1500V
Input indicator: attached

4：Current supply requirement parameters

Working voltage: default voltage: 24V; 12V optional
Maximum voltage: 24V(18~30V) / 12V(10~15V)

Current requirement: relay output mode 0.2A(4 paths triggered)
0.95 A(32 paths triggered)
transistor output mode 0.5A(16 paths triggered)
pure input mode: 0.3A(32 paths triggered)
Reverse connection protection: all products applicable

5： Communication circuit parameter

Insulation or not: all insulated

Insulation voltage: ±1500V

Communication protocol：Modbus-RTU

Baud Rate：1200/2400/4800/9600/19200/38400/57600/115200 BPS

Data format: 1 start byte 8 data bytes parity checking, 1 or 2 stop bytes

Maximum panel points: 32 modules sharing the BUS

Transmission distance: ≥800M(Double twisted cable)

Screening terminals: support

Chapter 2: Setting of Communication Ways

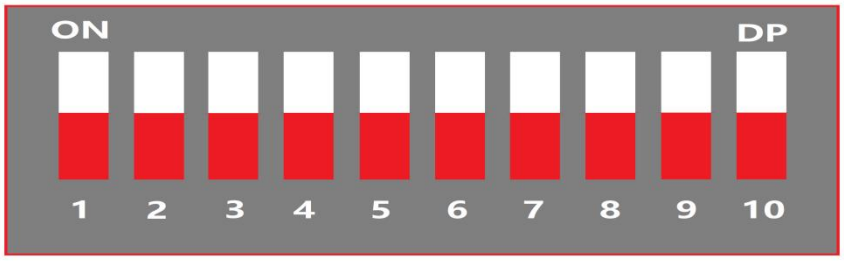
1, In order to make the operation easy, 10 red dial code switches are set on the board.

2, These dial code switches are used to allocate the baud rate, data byte and serial port verification for RS485/RS32 products.

3, The connections for RS232/RS485 are independent, which makes the simultaneous or independent work of the products possible.

4, The baud rate, data byte and serial port verification of the products keep unchanged.

Explanation: If the dial code switches provided by Foshan Qingjun Electronics Co., Ltd. are used for the first time, the gears of the products must be preset to the specified position. The adjustment of the dial code do not take effect after the device is re-started.



Data verification of communication port	S1	S2
No verification 1 stop byte	0FF	OFF
No verification 2 stop bytes	0FF	ON
Odd verification 1 stop byte	ON	0FF
Even verification 1 stop byte	ON	ON

Baud rate options	S3	S4	S5
1200	OFF	OFF	OFF
2400	OFF	OFF	ON
4800	OFF	ON	OFF
9600	OFF	ON	ON
19200	ON	OFF	OFF
38400	ON	OFF	ON
57600	ON	ON	OFF
115200	ON	ON	ON

Setting of module hardware address	S6	S7	S8	S9	S10
0	OFF	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	OFF	ON
2	OFF	OFF	OFF	ON	OFF
3	OFF	OFF	OFF	ON	ON
4	OFF	OFF	ON	OFF	OFF
5	OFF	OFF	ON	OFF	ON
6	OFF	OFF	ON	ON	OFF
7	OFF	OFF	ON	ON	ON
8	OFF	ON	OFF	OFF	OFF
9	OFF	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON	OFF
11	OFF	ON	OFF	ON	ON
12	OFF	ON	ON	OFF	OFF
13	OFF	ON	ON	OFF	ON
14	OFF	ON	ON	ON	OFF
15	OFF	ON	ON	ON	ON
16	ON	OFF	OFF	OFF	OFF
17	ON	OFF	OFF	OFF	ON
18	ON	OFF	OFF	ON	OFF
29	ON	OFF	OFF	ON	ON
20	ON	OFF	ON	OFF	OFF
21	ON	OFF	ON	OFF	ON
22	ON	OFF	ON	ON	OFF
23	ON	OFF	ON	ON	ON
24	ON	ON	OFF	OFF	OFF
25	ON	ON	OFF	OFF	ON
26	ON	ON	OFF	ON	OFF
27	ON	ON	OFF	ON	ON
28	ON	ON	ON	OFF	OFF
29	ON	ON	ON	OFF	ON
30	ON	ON	ON	ON	OFF
31	ON	ON	ON	ON	ON

Chapter 3:Register Address

General registers	Related products	Modbus address（16 bytes）	PLC Address	Default value	Supported function codes	Compatible with step-step operation	Properties
Output 0 Output1 Output2 Output3	4-channel，8-channel，16-channel, 24-channel，32-channel,48-channel,64-channel,(relay/transistor) module	0000H	40001	0x0000	01，03， 05，06， 15，16	compatible	1=close；0=open；editable readable **no black out saving**
Output4 Output5 Output6 Output7	8-channel，16-channel，24-channel，32-channel，48-channel, 64-channel (relay/transistor)module						
Output8 Output9 Output 10 Output 11 Output 12 Output 13 Output 14 Output 15	16-channel，24-channel，32-channel，48-channel，64-channel (relay/transistor)module						
Output 16 Output 17 Output 18 Output 19 Output 20 Output 21 Output 22 Output 23	24-channel，32-channel，48-channel，64-channel (relay/transistor)module	0001H	40002	0x0000			
Output 24 Output 25 Output 26 Output 27 Output 28 Output 29 Output 30 Output 31	32-channel，48-channel，64-channel (relay/transistor)module						
Output 32 Output 33 Output 34	48-channel，64-channel (relay/transistor)module	0002H	40003	0x0000			

Output 35					**01，03， 05，06， 15，16**	**compatible**	**1= valid； 0=invalid； Read only No black out saving**
Output 36							
Output 37							
Output 38							
Output 39							
Output 40							
Output 41							
Output 42							
Output 43							
Output 44							
Output 45							
Output 46							
Output 47							
Output 48	64-channel (relay/transistor)module	0003H	40004	0x0000			
Output 49							
Output 50							
Output 51							
Output 52							
Output 53							
Output 54							
Output 55							
Output							

56							
Output 57							
Output 58							
Output 59							
Output 60							
Output 61							
Output 62							
Output 63							

General registers	Related products	Modbus address（16bytes）	PLC address	Default value	Supported function codes	Compatible with step-step operation	Properties
Input 0	4-channel，6-channel，8-channel, 12-channel,16-channel, 32-channel (digital input module)	0004H	40005	0x0000	03 ，16	compatible	1=valid ; 0=invalid ; Read-only **no black out saving**
Input1							
Input2							
Input 3							
Input 4	6-channel，8-channel,12-channel 16-channel, 32-channel (digital input module)						
Input 5							
Input 6	8-channel, 12-channel, 16-channel, 32-channel (digital input module)						
Input 7							
Input 8	12-channel, 16-channel, 32-channel (digital input module)						
Input 9							
Input 10							
Input 11							
Input 12	16-channel, 32-channel (digital input module)						
Input 13							

Input 14							
Input 15							
Input 16	32-channel (digital input module)	0005H	40006	0x0000			
Input 17							
Input 18							
Input 19							
Input 20							
Input 21							
Input 22							
Input 23							
Input 24							
Input 25							
Input 26							
Input 27							
Input 28							
Input 29							
Input 30							
Input 31							

Special registers	Related products	Modbus address （16 byte）	PLC address	Default value	Supported function codes	Compatible with step-step operation	Properties
Overtime time register (high 16 bytes+ low 16 bytes)	(relay/transistor)module (digital input module)	7530H (high 16 bytes)	430001	0x0000	03、06、16	incompatible	1=close；0=open；Readable Editable **Black out saving**
		7531H (low 16 bytes)	430002	0x2710 (10 seconds)			
Frontal 16 paths Mask off code registers	4-channel, 8-channel, 16-channel,24-channel ,32-channel (relay/transistor)module	7532H or mask off code	430003	0x0000			
		7533H and mask off code	430004				
Rear 16 paths mask off registers	24-channel, 32-channel (relay/transistor)module	7534H or mask off code	430005				
		7535H and mask off code	430006				

“Timeout register”explanation:

The communication is reckoned as overtime if the breakdown time is longer than that set in the registers. The error indicator keeps ON until the communication returns to the normal state.

When the overtime communication occurs, the output state is decided by the following format.

“Output state=(the state before overtime | OR) & AND”

Overtime output state	OR mask off code	AND mask off code
Unchanged	0	1
Open(default)	0	0
Close	1	1

Take the 16-channel relay module for an example.

Conditions: more than 3 seconds after the communication breakdown, 0-7 channels open, 8-11 channels keep unchanged and 12-15 channels close.

1) Firstly set the overtime time as 3 seconds, that is to say, put the registers to the states of 7530H=0x0000 and 7531H=0x0bb8. Thus the following result is got.

【0x0000(high 16 bytes) *65536】+ 0x0bb8(low 16 bytes) = 0x0bb8（3000mS）

2）And then set the corresponding OR mask off code and AND mask off code
7532H=0xF000 （1111 0000 0000 0000）
7533H=0xFF00 （1111 1111 0000 0000）

3）The result comes out 3 seconds later after the communication breakdown.

Attention: Since the above calculation is based on the relay module of 16 paths, it is enough to set the frontal mask off codes. If the modules of 24 paths or 32 paths are used, it is necessary to set the mask off codes of the other 16 paths.

Chapter 4 Modbus-RTU communication Principle

1：Brief Introduction of Modbus-RTU Communication Principle

Modbus-RTU protocol works with the mode of response under enquiry. That is to say, the sub-station will work immediately with the order from the main station, which includes the demand on the sub-station and the additional information necessary to implement the demand.

The selected sub-station carries out the demand after it receives the order from the main station and feedback to the main station according to the implementation result. If the implementation is successful, the main station gets the normal response. Otherwise, the main station gets the abnormal response.

The main station reacts according to the feedback from the sub-station and carries out the next operation.

2：Modbus-RTU function code

Function code	Items	Function	Properties	Related products
01	Coil	Multi-coils	Read	Relay/ transistor module
03	Holding registers	Multi-holding registers	Read	Relay/ transistor module (digital output module)
05	Coil	single coil	Edit	Relay/ transistor module
06	Holding registers	Single holding register	Edit	Relay/ transistor module
15	Coil	Multi-coils	Edit	Relay/ transistor module

16	Holding registers	Multi-holding registers	Edit	Relay/ transistor module(digital output module)

3：Examples for multi-functional codes

Function Code :No. 01

Function code No. 01 is used to read the coil state. It can read one single coil or multi-coils **from address 0-31 according to the demand of the user.**

Attention: The module will feedback Error when it receives the order to read the coil that does not exist.

1) The main station demand(from the PLC/touching screen/ computer)

For example, the state of reading 16 coils starting from Coil 0.

Message contents	Length	Scope	Sample
Sub-station address	1 byte	0x01～0x1F	0x01
Function Code	1 byte	0x01	0x01
Initial address	2 bytes	0x0000～0x000F	0x0000
Coil quantity	2 bytes	0x0001～0x0010	0x0010
CRC verification	2 bytes	0x0000～0xFFFF	0x3DC6

Attention： The amount of demanded coils must be controlled within the maximum of module path. Otherwise, the module will feedback ERROR.

2）Normal response from the sub-station

Message contents	Length	Scope	Sample
Sub-station address	1 byte	0x01～0x1F	0x01
Function code	1 byte	0x01	0x01
Byte quantity	2 bytes	N	0x02
Input state	N bytes	0x0001～0x0010	0x00FF
CRC Verification	2 bytes	0x0000～0xFFFF	0XF9BC

Remarks: N=coils quantity/8, if the remainder is not 0, N=N+1.
Therefore, N is 0 for coil of Q15~Q8 and 1 for Q7~Q0.

3）Abnormal response from the sub-station

Message contents	Length	Scope	Sample
Sub-station address	1 byte	0x01～0x1F	0x01
Function code	1 byte	0x82	0x82
Error code	1 byte	0x01（not a supported function code）	0x01
		0x02（initial address is out range of the scope）	
		0x03（coil quantity is beyond the scope）	
		0x04（data verification error）	

CRC verification	2 bytes	0x0000～0xFFFF	0x8160

Function Code: No. 03

Function code No.03 is used to read the contents from the holding register and it can read one single or multiple holding registers once. But it can not read the non-existential registers, which leads to a Error feedback.

1）Main station demand.

E.g. the mains station demands for reading 1 register starting from 0000H.

Demand contents	Length	Scope	Sample
Sub-station address	1 byte	0x01～0x1F	0x01
Function Code	1 byte	0x03	0x03
Initial address	2 bytes	0x0000～0x000F	0x0000
Input quantity	2 bytes	0x0001～0x0010	0x0001
CRC Verification	2 bytes	0x0000～0xFFFF	0x840A

2）Normal Response from sub-station

Demand contents	Length	Scope	Sample
Sub-station address	1 byte	0x01～0x1F	0x01
Function Code	1 byte	0x03	0x03
Byte quantity	1 byte	N	0x02

Input quantity	N bytes		0x00FF
CRC Verification	2 bytes	0x0000～0xFFFF	0xF804

Remarks: N= the byte quantity after it.
The normal response for coil Q15-Q8 is 0 and Q7-Q0 1

3）The abnormal response from the sub-station.

Demand contents	Length	Scope	Sample
Sub-station address	1 byte	0x01～0x1F	0x01
Function code	1 byte	0x83	0x83
Error code	1 byte	0x01（not a supported function code）	0x01
		0x02（the initial address is out the range of specification）	

		0x03（the register quantity is beyond the specification）	
		0x04（data checking error）	
CRC verification	2 bytes	0x0000∽0xFFFF	0x80F0

Function Code: No. 05

No. 05 function code is used to write a single coil.

1）The main station demand

For example, the main station demands coil 0 be close, i.e. Q0=1.

Demand contents	Length	Scope	Sample
Sub-station address	1 byte	0x01∽0x1F	0x01
Function code	1 byte	0x05	0x05
Coil address	2 bytes	0x0000∽0x000F	0x0000
Coil state	2 bytes	0x0000 or 0Xff00	0xFF00
CRC verification	2 bytes	0x0000∽0xFFFF	0x8C3A

2）Normal response from the sub-station

Demand contents	Length	Scope	Sample
Sub-station address	1 byte	0x01～0xlF	0x01
Function code	1 byte	0x05	0x05
Coil address	2 bytes	0x0000～0x000F	0x0000
Coil state	2 bytes	0x0000 or 0xFF00	0XFF00
CRC verification	2 bytes	0x0000～0xFFFF	0x8C3A

3）Abnormal response from the sub-station

Demand contents	Length	Scope	Sample
Sub-station address	1 byte	0x01～0xlF	0x01
Function code	1 byte	0x85	0x85
Error code	1 byte	0x01（not a supported function code）	0x01
		0x02（out the range of the coil address）	
		0x03（coil state is beyond the specified scope）	

		0x04（data verification code）	
CRC verification	2 bytes	0x0000∽0xFFFF	0x8350

Function Code: No.06

No.06 function code is used to write a single holding register.

Attention: The holding register designated in the demand must exist and is editable. Otherwise, the module will give an error response.

1）The main station demand

For example, the main station demands the constant 0x0001 be input into the 0000H register.

Demand contents	Length	Scope	Sample
Sub-station address	1 byte	0x01∽0x1F	0x01
Function code	1 byte	0x06	0x06
Initial address	2 bytes	0x0000∽0x000F	0x0000
Register value	2 bytes	0x0000∽0xFFFF	0x0001
CRC Verification	2 bytes	0x0000∽0xFFFF	0x480A

2） Normal response from the sub-station

Demand contents	Length	Scope	Sample
Sub-station address	1 byte	0x01～0x1F	0x01
Function code	1 byte	0x06	0x06
Initial address	bytes	0x0000～0x000F	0x0000
Register' value	2 bytes	0x0000～0xFFFF	0x0001
CRC Verification	2 bytes	0x0000～0xFFFF	0x480A

3) The abnormal response from the sub-station

Demand contents	Length	Scope	Sample
The sub-station address	1 byte	0x01～0x1F	0x01
Function code	1 byte	0x86	0x86
Error code	1 byte	0x01（not a supported function code）	0x01
		0x02（the initial address is out the range of the module）	

		0x03（the register is not within the specified sphere）	
		0x04（data verification error）	
CRC verification	2 bytes	0x0000∽0xFFFF	0x830A

Function code No.15

No. 15 function code is mainly used to edit multiple coils and it can be used to edit a single or several coils successively.

Attention: the coil designated by the main station must exist and is editable. Otherwise, the module will give an error response.

1） The main station demand

The tables below are the results when the main station demands an operation to edit the coil, beginning from coil 0 to 16. That is to say, Q15=1 and Q14-Q00=0.

Demand contents	Length	Scope	Sample
Sub-station address	1 byte	0x01∽0x1F	0x01
Function code	1 byte	0x0F	0x0F
Initial address	2 bytes	0x0000∽0x000F	0x0000
Coil quantity	2 bytes	0x0001∽0x0010	0x0010
Byte quantity	1 byte	N	0x02
Coil state	N byte(s)		0x8000

CRC verification	2 bytes	0x0000～0xFFFF	0x83E0

Attention: N=coil quantity/8. If the remainder is not 0, N=N+1.

2） The normal response from the sub-station

Demand contents	Length	Scope	Sample
Sub-station address	1 byte	0x01～0xlF	0x01
Function code	1 byte	0x0F	0x0F
Initial Address	bytes	0x0000～0x000F	0x0000
Coil quantity	2 bytes	0x0001～0x0010	0x0010
CRC verification	2 bytes	0x0000～0xFFFF	0x5407

3）The abnormal response from the sub-station

Demand contents	Length	Scope	Sample
Sub-station address	1 byte	0x01～0x1F	0x01
Function code	1 byte	0x8F	0x8F
Error code	1 byte	0x01（not a supported function code）	0x01
		0x02（initial address is out the range of the specification）	

		0x03（the coil quantity is out the range of the specification）	
		0x04（data verification error）	
CRC verification	2 bytes	0x0000∽0xFFFF	0x85F0

Function code: No.16

No.16 function code is used to edit holding registers.

Attention: The holding register designated by the main station must exist and is editable. Otherwise, the module will give an error response.

1）The main station demand.

What follows is just an example when the main station gives an order to edit 4 holding registers starting from address 30000. The address 30000 and 30001 mean overtime time parameters and its vale is 0x0000710, i.e. 10000mS. The address 30002 and 30003 refer to the mask off code or its parameters and their values are 0x0081 and 0xFFFF respectively. In the case of overtime break down, the module outputs Q7 and Q0 means Close and other states keep unchanged.

Demand contents	Length	Scope	Sample
Substation address	1 byte	0x01∽0x1F	0x01
Function code	1 byte	0x10	0x10
Initial address	2 bytes	0x7530	0x7530
Holding Register quantity	2 bytes	N	0x0004
Byte quantity	1 byte	2*N	0x08
Register value	2*N bytes		0x0000, 0x2710

			0x0081, 0xFFFF
CRC verification	2 bytes	0x0000～0xFFFF	0xD383

Attention: N must be even numbers that is over 0, such as 2,4,6,8 and etc. other input will cause an error response.

2）The normal response from the sub-station.

Demand contents	Length	Scope	Sample
Sub-station address	1 byte	0x01～0x1F	0x01
Function code	1 byte	0x10	0x10
Initial address	2 bytes	0x7530	0x7530
Register quantity	2 bytes	N	0x0004
CRC verification	2 bytes	0x0000～0xFFFF	0xDBC9

3）The abnormal response from the sub-station

Demand contents	Length	Scope	Sample
Sub-station address	1 byte	0x01～0x1F	0x01
Function code	1 byte	0x90	0x90
Error code	1 byte	incompatible	0x01

		0x02（initial address is out the range of specification）	
		0x03（The register quantity is out the range of specification）	
		0x04（data verification error）	
CRC verification	2 bytes	0x0000～0xFFFF	0x8DC0

Chapter 5: Description of Module Indicator

1:Input indicator

Input indicator is only available with the digital input modules. Since the input circuit is compatible with the NPN/PNP modes, the indicator is ON when the input signal is valid. Otherwise the indicator is OFF.

2: Output indicator

There is an output indicator for each path, which is located close to the output circuit. When the path in under work, it is ON. Otherwise, it is OFF.

3: System indicators

There are 3 types of system indicators, i.e. power supply indicator, communication indicator and overtime indicator.

Power supply indicator: the indicator is ON when the module is connected to the power.

Communication indicator: the indicator flickers when the module finds the right data in the 485 BUS. Otherwise, it is OFF. The flickering speed increases with the data transmission speed.

Overtime indicator: the indicator start to work when the module is disconnected or when the break-down time is over the specification of the register(The outputs of the mask off registers are different from each other) . Otherwise, the indicator is OFF.

The demos of all brands of PLCs and configuration software of touch screens and the solutions are available in our company. Please contact us without hesitation if you want to know more details about the products.

Foshan Qingjun Electronics Co., Ltd.
Address：Room 307, the 3rd floor, Building B, Chaofa Chuangyi Park, 2# Lianhe Road, Nanhai District, Foshan city, Guangdong, China
TEL：（86）0757 81809248
FAX：（86）0757 81809249
Company website：fsqjkj.en.alibaba.com