

Communication: Modbus

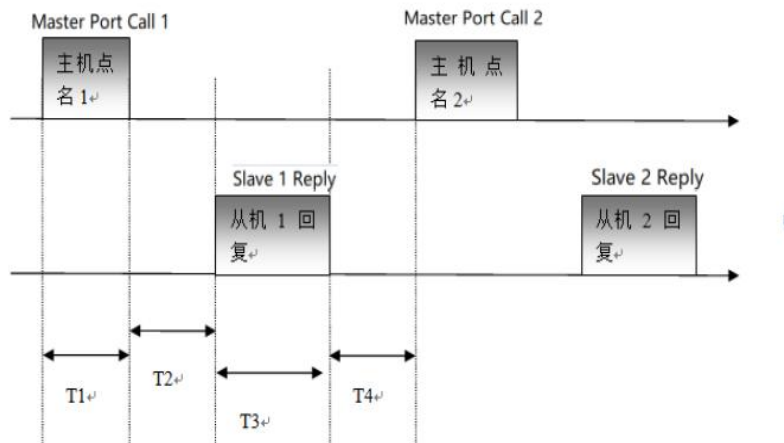
Data Transmitted via UART	
Baud rate: 9600bps	
Transmission: RTU	
Start: LSB first	
Start bit: 1	
Date bit: 8	
Verification: None	
Stop bit: 1	

Software & Hardware

1. Standard Modbus-RTU, RS485 master cable, Master-slave half duplex asynchronous serial communication;
2. Default communication setting : 9600-8-N-1; Low bit first, big edian in front, little edian afterwards;
3. Master port :External controller ; Modbus slave: Frequency converter ; Default slave address : 0xAA; (0xA0 ~ 0xBF adjustable)
4. This protocol supports the following 3 Modbus function codes for Modbus holding register
 - 1). Function code 03H: Read multiple holding registers
 - 2). Function code 06H: Write single holding register
 - 3). Function code 10H: Write multiple holding registers
5. If Modbus slave can't connect to correct data for 15 seconds, communication error will be reported (not open considering compability), once correct data received,error will be eliminated

Communication Timing Procedure

1. Master port calls at a regular interval, interval:1000ms [Calculation of duration: Master port call T1+Slave reply wait time T2+ Slave replytime T3)+T4]
2. Timing as follows :



3. Conditions:

- 1). Response time of Modbus slave (T2): Upon receipt of name frame from master port, Modbus slave has to send outfirst byte of response frame within 50ms
- 2). Sending time from master port (T4) :Upon receipt of last byte from reply frame, wait at least 50ms before sendingout next data.
- 3). Timing is accounted by 1ms, maximum deviation is 1ms, a deviation of +/-1ms is acceptable by above mentionedtiming conditions

Function Code

1	Description: Register reading	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
---	-------------------------------	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Note: Master control board register reading, broadcast is not supported.

Function code: 0x03 (user grade)

Table 1 Request Frame				

0x03	Address	Function Code	Start Address	Number of data	CRC Verification Code
	1 Byte	1 Byte	2 Bytes	2 Bytes	2 Bytes

0x05	Table 2 Response Frame				

Address	Function Code	Number of Byte	Valid Data	CRC Verification Code
1 Byte	1 Byte	1 Byte	n Bytes	2 Bytes

Note: Address, function code , start address, Data of response frame same as request frame

Description: Register Writing (Write single register)

Note: Write master board data into register, broadcasting is not supported

Function code: 0x06 (user grade)

Table 3 Request Frame				

0x06					
	Address	Function Code	Start Address	Valid Data	CRC Verification Code
	1 Byte	1 Byte	2 Bytes	2 Bytes	2 Bytes

0x06	Table 4 Response Frame
------	------------------------

Address	Function Code	Start Address	Valid Data	CRC Verification Code
1 Byte	1 Byte	2 Bytes	2 Bytes	2 Bytes

Note: Address, function code , start address, Data of response frame same as request frame
--

	Description: Register Writing (Write multiple registers)
--	--

Note: Write master board data into register, broadcasting is not supported

Function code: 0x10 (user grade)

Table 5 Request Frame						
-----------------------	--	--	--	--	--	--

0x10	Address	Function Code	Start Address	Number of Data	Number of Byte	Valid Data	CRC Verification Code
	1 Byte	1 Byte	2 Bytes	2 Bytes	1 Byte	n Bytes	2 Bytes

0x10	Table 6 Response Frame	
------	------------------------	--

Address	Function Code	Start Address	Number of data	CRC Verification Code
1 Byte	1 Byte	2 Bytes	2 Bytes	2 Bytes

Note: Address, function code , start address, Data of response frame same as request frame
--

Note	1.Transmission format for "Start address", "Data/Quantity" and "Valid Data is the same, 8 big edian first,then 8 little edians. E.g.: To transmit 0x1234, Transmit 0x12 first, then 0x34
	2. Transmission format for CRC verification code is: 8 little edians first, then 8 big edians E.g.:To transmit 0xAA55, Transmit 0x55 first, then 0xAA

1. Transmission format for "Start address", "Data/Quantity" and "Valid Data is the same, 8 big edian first, then 8 little edians.
E.g.: To transmit 0x1234, Transmit 0x12 first, then 0x34

Note 2. Transmission format for CRC identification code is 2 little-endians first, then 2 big-endians.

2. Transmission format for CRC verification code is: 8 little edians first, then 8 big edians
Eg.:To transmit 0xAA55, Transmit 0x55 first, then 0xAA

--	--

Definition	Spec Address (decimal)	Spec Address (hexadecimal)	Attribution	Function	Data Type	Function Description	
Commands on the Master Board (Write the register)	3001	0BB9	W	Running capacity setting	INT16	0: OFF; 30-120 (0x001E~0x0078) : Running capacity;	
	3002	0BBA	W	Flow rate setting (lpm gpm)	INT16	0: OFF; Valid data: see Flow Rate Appendix	
	3003	0BBB	W	Flow rate setting (US gpm)	INT16	0: OFF; Valid data: see Flow Rate Appendix	
	3004	0BBC	W	Flow rate setting (L/min)	INT16	0: OFF; Valid data: see Flow Rate Appendix	
	3005	0BBD	W	Flow rate setting (m3/h)	INT16	0: OFF; Valid data: see Flow Rate Appendix	
	Spec address priority: 3005>3004>3003>3002>3001. It is recommended that each data frame contains only one instruction message.						
Master Board Data Reading (Read the register)	2001	07D1	R	Error Code	INT16	Bit0	1: Pressure sensor failure 0: No error
						Bit1	1: Communication Error 0: No error
						Bit2	1: No water protection 0: No error
						Bit3	1: RTC time reading error 0: No error
						Bit4	1: Display Board EEPROM reading failure 0: No error
						Bit5	1: Circuit board error 0: No error
						Bit6	1: Motor power overload 0: No error
						Bit7	1: PFC protection 0: No error
						Bit8	1: DC abnormal voltage 0: No error
						Bit9	1: AC current sampling circuit failure 0: No error
						Bit10	1: Phase-deficient protection 0: No error
						Bit11	1: Master driver board error 0: No error
						Bit12	1: Heat sink sensor error 0: No error
						Bit13	1: Heat sink over heat 0: No error
						Bit14	1: Output over current 0: No error
						Bit15	1: Abnormal input voltage 0: No error
	2002	07D2	R	Pool pump Running state	INT16	Bit0	1: Pool pump running 0: Pool pump stop running
						Bit1-bit15	Reserved
	2003	07D3	R	Running capacity	INT16	True value	
	2004	07D4	R	Power	INT16	True value	unit is W
	2005	07D5	R	Flow rate	INT16	True value	
	2006	07D6	R	Pressure value	INT16	True value	unit is 0.1kpa
	2007	07D7	R	Power consumption	INT16	True value	unit is kWh, value is expanded by 1,000 times
	2008	07D8	R	Mode code	INT16		20/25/30/40
	2009	07D9	R	Software version	INT16	True value	
	3001	0BB9	R	Running capacity setting	INT16		30-120: means valid date
	3002	0BBA	R	Flow rate setting (lmp gpm)	INT16		Valid data: see Flow Rate Appendix
	3003	0BBB	R	Flow rate setting (US gpm)	INT16		Valid data: see Flow Rate Appendix
	3004	0BBC	R	Flow rate setting (L/min)	INT16		Valid data: see Flow Rate Appendix
	3005	0BBD	R	Flow rate setting (m3/h)	INT16		Valid data: see Flow Rate Appendix

Flow Rate Appendix

Valid Flow Rate of 0.8kW model			
m³/h	L/min	Imp gpm	us gpm
20	320	70	85
19	300	65	80
18	280	60	75
17	260	55	70
16	240	50	65
15	220	45	60
14	200	40	55
13	180	35	50
12	160	30	45
11	140	25	40
10	120	20	35
9	100	15	30
8	80		25
7			20
6			
5			

Valid Flow Rate of 1.05kW model			
m³/h	L/min	Imp gpm	us gpm
25	420	95	110
24	400	90	105
23	380	85	100
22	360	80	95
21	340	75	90
20	320	70	85
19	300	65	80
18	280	60	75
17	260	55	70
16	240	50	65
15	220	45	60
14	200	40	55
13	180	35	50
12	160	30	45
11	140	25	40
10	120	20	35
9	100	15	30
8	80		25
7			20
6			
5			

Valid Flow Rate of 1.4kW model			
m³/h	L/min	Imp gpm	us gpm
30	520	120	135
29	500	115	130
28	480	110	125
27	460	105	120
26	440	100	115
25	420	95	110
24	400	90	105
23	380	85	100
22	360	80	95
21	340	75	90
20	320	70	85
19	300	65	80
18	280	60	75
17	260	55	70
16	240	50	65
15	220	45	60
14	200	40	55
13	180	35	50
12	160	30	45
11	140	25	40
10	120	20	35
9	100	15	30
8	80		25
7			20
6			
5			

Valid Flow Rate of 1.75kW model			
m³/h	L/min	Imp gpm	us gpm
35	620	145	160
34	600	140	155
33	580	135	150
32	560	130	145
31	540	125	140
30	520	120	135
29	500	115	130
28	480	110	125
27	460	105	120
26	440	100	115
25	420	95	110
24	400	90	105
23	380	85	100
22	360	80	95
21	340	75	90
20	320	70	85
19	300	65	80
18	280	60	75
17	260	55	70
16	240	50	65
15	220	45	60
14	200	40	55
13	180	35	50
12	160	30	45
11	140		40
10			35
9			
8			