

Counter Meter Communication Protocol

1. Type and Format of Communication Data

This series counter meter are using asynchronous serial transmission communication interface, the TTL accompany to standard RS485 requirement. Communication compatible with standard Modbus RTU transmission, Start bit of frame data format is one bit, 8 data bit, un-checked, one stop bit. Baud rate of communication transmission data is 4800 or 9600 Bit/S which can set freely.

Frame Data Format

Start Bit	Data Bit	Checkout Bit	Stop Bit
1	8	No	1

2. Transmission Process of Communication Message

When the Communication order of Host computer be send to follow computer, the follow computer which with the same address of Host computer would accept this order. For example, when CRC check and order format are both without any question, then the follow computer will carry out this operation and send the result back to Host computer.

2-1 Meter Address (One Bit)

Meter address be included in the message's address zone, the range of address is 1-247. Host computer will choose the follow computer whose meter address can accompany to Host computer order's address zone. When the follow computer send back the result, it will put it's own meter address into the return-message's address zone, then that the Host computer can recognize which follow computer give reply. (Meter address is Unique)

2-2 Function Code (One Bit)

Function code be included into the function code zone. Host computer send function code, which can instruct the operation, to follow computers, When the follow computer make a reply, function code will tell the host computer whether there is anything wrong.

Function Code Definition

Function Code	Definition	Operation
0x03	Read Register	Read single or many register's data
0x10	Multi-write Register	Put numerous data into register

2-3 Data Area Which be included into the message's data zone, length of data will be different according to the function code.

3. Host Computer Order Format and Follow Computer Return Message Format

3-1 Multi-read Register

For Example: Host Computer send out read order, register data of follow computer OUT2 alarm value

Order format	Host Computer Send Out Order		
ADD Zone	Meter Address		0X01
Function Zone	Function Code		0X03
Data Zone	Start Register	High Bit	0X00
		Low Bit	0X05
	Read Register	High Bit	0X00
		Low Bit	0X01
Error Check Zone	CRC Check Code	Low Bit	0X94
		High Bit	0X0B

Message Format	Follow Computer Return Message		
ADD Zone	Meter Address		0X01
Function Zone	Function Code		0X03
Data Zone	Data Bit Number		0X04
		OUT2 register data	
	Low Bit 1		0XC0
		Low Bit 2	
High Bit 1		0XFB	
	High Bit 2		0X34
Error Check Zone	CRC Check Code	Low Bit	0XA4
		High Bit	0XC7

Note: This is just an example for read single register data's order and return format, when it is need to read many registers at the same time, you just should know the register's start address and the number of read register. When return the data, low bit data will always before then high bit data.

3-2 Multi-write Register

For Example: Host computer send out order, write data 1000.000 into follow computer, register of OUT2 alarm value.

Order format	Host Computer Send Out Order		
ADD Zone	Meter Address		0X01
Function Zone	Function Code		0X10
Data Zone	Start Register ADD	High Bit	0X00
		Low Bit	0X05
	Write Register Quantity	High Bit	0X00
		Low Bit	0X01
	Write data bit		0X04
	Data which will be write into OUT2 register	Low Bit 1	0X40
		Low Bit 2	
High Bit 1		0X0F	
High Bit 2		0X00	
Error Check Zone	CRC Check Code	Low Bit	0X83
		High Bit	0X87

Message Format	Follow Computer Return Message		
Meter Address	ADD Zone		0X01
Function Code	Function Zone		0X10
Data Zone	Start Register ADD	High Bit	0X00
		Low Bit	0X05
	Write Register Quantity	High Bit	0X00
		Low Bit	0X01
Error Check Zone	CRC Check Code	Low Bit	0X11
		High Bit	0XC8

4. Communication Error Processing

When the meter check out the error which is not CRC check code error, then it will return error information to Host computer, Follow computer will return those information—function code high bit 1, meter address, error code—back to host computer.

4-1 Format of Error Code which be returned from Follow Computer

ADD Code	Function Code	Error Code	CRC Check Code Low Bit	CRC Check Code High Bit
One Bit	One Bit	One Bit	One Bit	One Bit

4-2 Error Code

0X01	Function Code Illegality	The meter didn't recognize the function code
0X02	Register Address Illegality	Receiving register address exceed the range of register's address
0X03	Register quantity Illegality	Receiving register quantity exceed the range of register's quantity
0X04	Data value Illegality	Receiving data value exceed the range of register's data value

5. Meter's Reference Address

No.	Register ADD	Register Name	Data Type	Measuring Range	Nature	Note
0	0x0001	Value PV	long	-----	R	Reserve 3 decimal point
1	0x0002	Batch Value BV	Unsigned long	-----	R	
2	0x0003	Alarm Status	Unsigned long	-----	R	
3	0x0004	OUT1 Alarm (PS1)	Unsigned long	1~999999000	R/W	Reserve 3 decimal point
4	0x0005	OUT2 Alarm (PS2)	Unsigned long	1~999999000	R/W	Reserve 3 decimal point
5	0x0006	BA.Oalarm (BA.S)	Unsigned long	1~999999	R/W	
6	0x0007	Scale Factor SCL	Unsigned long	0.00001-9999.99	R/W	Reserve 5 decimal point
7	0x0008	Initial Value W	long	-99999-999999	R/W	Reserve 3 decimal point
8	0x0009	Meter's Status 1	Unsigned long	-----	R/W	
9	0x000A	Meter's Status 2	Unsigned long	-----	R/W	
10	0x000B	Meter's Status 3	Unsigned long	-----	R/W	
11	0x000C	Meter's Status 4	Unsigned long	-----	R/W	

* PV, PS1, PS2 will acquiesce in 3 decimal point. Actual data=return data or write in data/1000. If Read PV register return data=1, the the actual PV value=0.001. At the same time, when write 1000000 into PS2 register, then the actual OUT2setting value (PS2)=1000.0000.

6. Alarm Status (Add:0x0003)

Bit31	Bit30	Bit29	Bit28	Bit27	Bit26	Bit25	Bit24	Bit23	Bit22	Bit21	Bit20	Bit19	Bit18	Bit17	Bit16
Reserve								BA.O Alarm Output Symbol							
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
OUT2 Alarm Output Symbol								OUT1 Alarm Output Symbol							

- 6-1、Bit0-Bit7 OUT1 Alarm Output Symbol: 0x00: OUT1 Alarm No Output, 0x01: OUT1 Alarm and Output.
- 6-2、Bit8-Bit15 OUT2 Alarm Output Symbol: 0x00: OUT2 Alarm No Output, 0x01: OUT2 Alarm and Output.
- 6-3、Bit16-Bit23 BA.O Alarm Output Symbol: 0x00: BA.O Alarm No Output, 0x01: BA.O Alarm and Output.

7. Register of Meter Status (Add: 0x0009)

Bit31	Bit30	Bit29	Bit28	Bit27	Bit26	Bit25	Bit24	Bit23	Bit22	Bit21	Bit20	Bit19	Bit18	Bit17	Bit16
OUT2 Output delay time setting menu								OUT1 Output delay time setting menu							
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
OUT Output type setting value								SIG Input terminal SSR choosing							

- 7-1、Bit0-Bit7: SIG Input terminal SSR choosing (choosing range: 0x00-0x01).
- Bit0-Bit7=0x00: NPN Input mode, Meter's signal input terminal will connect with 12V auxiliary power supply through inner 7.4K resistance.
- Bit0-Bit7=0x01: PNP input mode, Meter's signal input terminal will connect with public earth wire through inner 5.4K resistance.
- 7-2、Bit8-Bit15: OUT Meter's output mode choosing (Choosing range according to current status).

Bit8—Bit15 Output mode							
Bit8—Bit15	Output mode	Bit8—Bit15	Output mode	Bit8—Bit15	Output mode	Bit8—Bit15	Output mode
0x00	F	0x01	N	0x02	C	0x03	R
0x04	K	0x05	P	0x06	Q	0x07	A
0x08	S	0x09	T	0x0a	D		

Note: Before you are changing the output mode to D, please sure that the count frequency CP≤1KHZ, otherwise it will return the error code!

7-3、Bit16—Bit31: OUT1、OUT2 Alarm Output delay time choosing menu (Choosing range 0x00-0x08).

Bit16—Bit23Corresponding OUT1output delay time			
Bit16—Bit23	Delay time	Bit16—Bit23	Delay time
0x00	10mS	0x01	50mS
0x02	100mS	0x03	200mS
0x04	500mS	0x05	1000mS
0x06	2000mS	0x07	5000mS
0x08	HOLD		

Note: Bit16—Bit23 choosing range (0-8)

Bit24—Bit31Corresponding OUT2output delay time			
Bit24—Bit31	Delay time	Bit24—Bit31	Delaytime
0x00	10mS	0x01	50mS
0x02	100mS	0x03	200mS
0x04	500mS	0x05	1000mS
0x06	2000mS	0x07	5000mS

Note :Bit24—Bit31Choosing range (0-7)

8. Register 2 of Meter Status (Add:0x000A)

Bit31	Bit30	Bit29	Bit28	Bit27	Bit26	Bit25	Bit24	Bit23	Bit22	Bit21	Bit20	Bit19	Bit18	Bit17	Bit16
In input Mode Choose								DATA Power OFF data preserve choose							
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
DPDecimal point display choose								RSTInput control signal valid length of pulse choose							

8-1、Bit0-Bit7: RST Input control signal valid length of pulse choose (Range 0x00-0x01)。

Bit0-Bit7=0x00: Input control signal valid length of pulse is 20mS。

Bit0-Bit7=0x01: Input control signal valid length of pulse is 1mS。

8-2、Bit8-Bit15: DPDecimal point display choose (Range 0x00-0x03)。

Bit8—Bit15	Decimal Point	Bit8—Bit15	Decimal Point	Bit8—Bit15	Decimal Point	Bit8—Bit15	Decimal Point
0x00	No Decimal Point	0x01	One Decimal Point	0x02	Two Decimal Point	0x03	Three Decimal Point

8-3、Bit16-Bit23: DATA Power OFF data preserve choose (Range 0x00-0x01)

Bit16-Bit23=0x00: Count comes to Zero when Power OFF.

Bit16-Bit23=0x01: Count value will be preserved when power off and will recount from this value from next time power on!

8-4、Bit24-Bit31: INInput mode choose (Range 0x00-0x04)。

Bit24—Bit31	Input Mode	Bit24—Bit31	Input Mode	Bit24—Bit31	Input Mode	Bit24—Bit31	Input Mode
0x00	U	0x01	D	0x02	UD-A	0x03	UD-B
0x04	UD-C						

9. Register 3 of Meter Status (Add:0x000B)

Bit31	Bit30	Bit29	Bit28	Bit27	Bit26	Bit25	Bit24	Bit23	Bit22	Bit21	Bit20	Bit19	Bit18	Bit17	Bit16
CPS Count Frequency UPPer limit Choose Menu								ADD Meter Communication ADD Setting Menu							
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
BAUD Communication Baud Rate Setting Menu								LOCK Button Level Setting Menu							

9-1、Bit0-Bit7: LOCK Button Level Setting Menu (Range0x00-0x03)。

Bit8—Bit15	Level	Bit8—Bit15	Level	Bit8—Bit15	Level	Bit8—Bit15	Level
0x00	L.OFF	0x01	LOC.1	0x02	LOC.2	0x03	LOC.3

9-2、Bit8-Bit15: BAUD Communication Baud Rate Setting Menu (Range 0x00-0x01)。

Bit8-Bit15=0x00: Baud Rate=9600Bit/S (9600)。

Bit8-Bit15=0x01: Baud Rate=4800Bit/S (4800)。

9-3、Bit16-Bit23: ADD Meter Communication ADD Setting Menu (Range 0x01-0xf7)。

9-4、Bit24-Bit31: CPS Count Frequency UPPer limit Choose Menu (range decide by output mode)。

Bit24—Bit31	Frequency Uppper Limit	Bit24—Bit31	Frequency Uppper Limit	Bit24—Bit31	Frequency Uppper Limit	Bit24—Bit31	Frequency Uppper Limit
0x00	1HZ	0x01	30HZ	0x02	1KHZ	0x03	5KHZ
0x04	10KHZ						

Note: Output mode is D mode. Bit24-Bit31, choosing range (0x00—0x02), otherwise choosing range is (0x00—0x04)

10. Data Error Code

10-1. Data error code, under the condition of order format, meter address, function code and CRC check code are all correct, when the host computer write error data into the follow computer, follow computer will return back the error code which is in corresponding to the host computer, detail as follows:

Error Code	Definition	Error Code	Definition
0x14	OUT1 Alarm Value(PS1)Error	0x15	OUT2 Alarm Value(PS2)Error
0x16	BA.O Alarm Value (BA.S) Error	0x17	SCL Coefficient Error
0x18	W Initial Value Error	0x19	SIG Input Logic Choose Error
0x1A	OUT Output Mode Choose Error	0x1B	OUT1 Output Delay Time Choose Error
0x1C	OUT2 Output Delay Time Choose Error	0x1D	RST Min Reset time Choose Error
0x1E	DP Decimal Point Choose Error	0x1F	DATA Reserve Count Value Choose Error
0x20	IN Input Mode Choose Error	0x21	LOCK Button Choose Error
0x22	BAUD Communication Baud Rate Choose Error	0x23	ADD Meter Communication Address Setting Error
0x24	CPS Max. Count Speed Choose Error	0x25	
0x26		0x27	

Announcement:

When write the data into the meter through communication port, the write-in time of each storage element is limited, CI series counter meter can accept at least 100 thousand times write-in. If write-in time exceed than the provide, it can cause the damage on meter's storage element!