IST210A series MODBUS communication protocol

IST210A series communication agreement is with MODBUS ASCII (American standard code for information inter change) mode: Each byte consists of 2 ASCII characters, for example: The expression of the numerical value of 54Hex ASCII is that “54” consists of “5” (35Hex) and 4(34 Hex).

1. Definition of coding

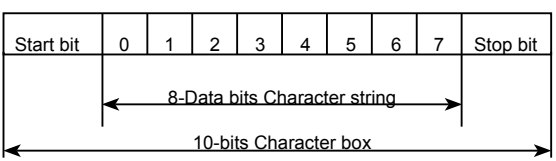
Communication agreement belongs to hexadecimal system, of which each character represents the following information.

Character	“0”	“1”	“2”	“3”	“4”	“5”	“6”	“7”
ASCII code	30H	31H	32H	33H	34H	35A	36A	37A
Character	“8”	“9”	“A”	“B”	“C”	“D”	“E”	“F”
ASCII code	38A	39H	41H	42H	43A	44A	45H	46H

2. Character structure

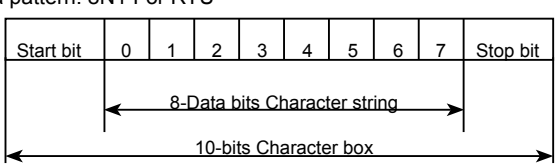
10 – Bit character box (For ASCII)

Data pattern: 8N1 For ASCII

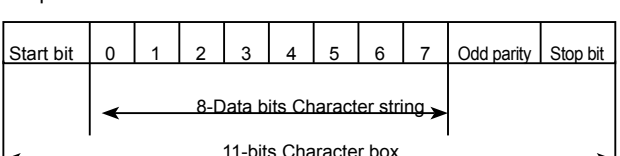


10 – Bit character box (For RTU)

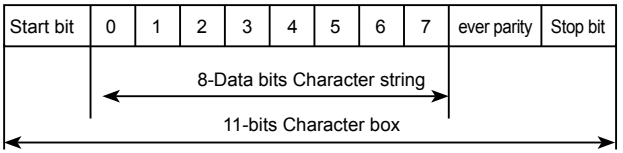
Data pattern: 8N1 For RTU



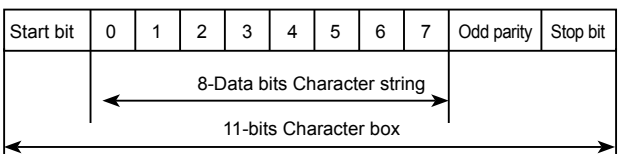
Data pattern: 8O1 For ASCII



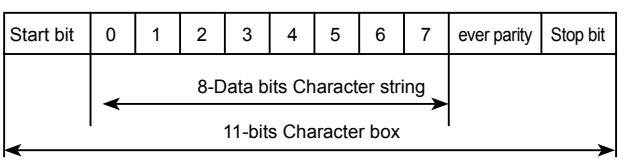
Data pattern: 8E1 For ASCII



Data pattern: 8O1 For RTU



Data pattern: 8E1 For RTU



3. Structure of communication data

Data format box

ASCII mode:

STX	Start character = ':'(3AH)
Address Hi	Communication address:
Address Lo	8-bit address consists of 2 ASCII codes
Function Hi	Function code:
Function Lo	8-bit function code consists of 2 ASCII codes
DATA (n-1)	Data characters:
……	n × 8-bit data content consists of 2n ASCII codes
DATA 0	n ≤ 16, with the maximum of 32 ASCII codes

LRC CHK Hi	LRC Check:
LRC CHK Lo	8-bit LRC Check consists of 2 ASCII codes
END Hi	End character:
END Lo	END Hi = CR (0DH), END Lo = LF (0AH)

RTU mode:

START	Keep that zero-input signal is more than or equal to 10 ms
Address	Communication address: 8-bit binary address
Function	Function code: 8-bit binary address
DATA (n-1)	Data characters: n × 8-bit data, n = 16
……	
DATA 0	
CRC CHK Low	CRC Check:
CRC CHK High	16-bit CRC Check consists of 2 8-bit binary systems
END	Keep that zero-input signal is more than or equal to 10 ms

Communication Address

00H: All driver Broadcasts

01H: For inverter with 01st address

0FH: For inverter with 15th address

10H: For inverter with 16th address, by analogy, the maximum could reach 240.

Function code and Data Characters

03H: Read out the content of temporary storage

06H: Write a WORD into temporary storage; Function code 03H: Read out the content of temporary storage.

For example: Driver address 01H, reads out the data characters in 2 successive temporary storages as follows: Initial temporary storage address 2102H

Function code 06H: Write a WORD into temporary storage.

Format of enquiry message character string:

STX	':'
Address	'1'
	'0'
Function	'0'
	'3'
Starting address	'2'
	'1'
	'0'
	'2'
Number of data (count by word)	'0'
	'0'
	'0'
	'2'
LRC Check	'D'
	'7'
END	CR
	LF

Format of response message character string:

STX	':'
Address	'0'
	'1'
Function	'0'
	'3'
Number of data (count by byte)	'0'
	'4'
Content of starting address 2102H	'1'
	'7'
	'7'
	'0'
Content of address 2103 H	'0'
	'0'
	'0'
	'0'
LRC Check	'7'
	'1'
END	CR
	LF

ASCII mode:

RTU mode:
Format of enquiry message:

Address	01H
Function	03H
Starting data address	21H
	02H
Number of data (count by word)	00H
	02H
CRC CHK Low	6FH
CRC CHK High	F7H

Format of response message:

Address	01H
Function	03H
Number of data (count by byte)	04H
Content of data address 8102H	17H
	70H
Content of data address 8103H	00H
	00H
CRC CHK Low	FEH
CRC CHK High	5CH

For example: Driver address 01H, writes 6000 (1770H) into the internal setting parameter 0100H of driver.

LRC Check of ASCII mode

ASCII mode:

Format of enquiry message character string:

STX	':'
Address	'0'
	'1'
Function	'0'
	'6'
Data address	'0'
	'1'
	'0'
	'0'
Data content	'1'
	'7'
	'7'
	'0'
LRC Check	'7'
	'1'
END	CR
	LF

Format of response message character string:

STX	':'
Address	'0'
	'1'
Function	'0'
	'6'
Data address	'0'
	'1'
	'0'
	'0'
Data content	'1'
	'7'
	'7'
	'0'
LRC Check	'7'
	'1'
END	CR
	LF

RTU mode:

Format of enquiry message:

Address	01H
Function	06H
Data address	01H
	00H
Data content	17H
	70H
CRC CHK Low	86H
CRC CHK High	22H

Format of response message:

Address	01H
Function	06H
Data address	01H
	00H
Data content	17H
	70H
CRC CHK Low	86H
CRC CHK High	22H

LRC Check is the value added from Address to Data Content. For example, the LRC Check of the above 3.3.1 enquiry message is as: 01H + 03H + 21H + 02H + 00H + 02H = 29H, then the complement of 2 (D7H) is taken.

CRC Check of RTU mode

CRC Check is from Address to Data content, and its running rule is as follows:

Step 1: Make 16-bit temporary storage (CRC temporary storage) = FFFFH.

Step 2: Exclusive OR first 8-bit byte message instruction and low 16-bit CRC temporary storage: Perform Exclusive OR, and store the result into CRC temporary storage.

Step3: Move CRC temporary storage one more bit, and fill 0 into high bit position.

Step 4: Check right shift value, if being 0, store the new value for step 3 into CRC temporary storage, otherwise in case of Exclusive OR A001H and CRC temporary storage, store the result into CRC temporary.

Step 5: Repeat Step 3 ~ Step 4, and operate completely for 8-bit.

Step 6: Repeat Step 2 ~ Step 5, and take the message instruction for next 8-bit, till all message instructions are operated completely.

Finally, the value gotten of CRC temporary storage is CRC Check. It is noteworthy that, CRC Check must be placed into the check mode of message instruction interchangeably.

The following is the example of CRC Check running written in C language:

Unsigned char * data ←//Message instruction pointer

Unsigned char length ←//Length of message instruction

```
unsigned int crc_chk (unsigned char*data, unsigned char length)
{
  int j;
  unsigned int reg_crc=OXffff;
  while( 1ength--) {
     reg_crc^=*data    ;
     for (j = 0; j<8; j    ) {
       if (reg_crc & Ox01) {  /*LSB (b0) =1 */
       reg_ere= (reg_crc>>1) ^OXa001;
     }else{
       reg_cre=reg_crc>>1;
            }
         }
         return reg_crc; //Finally feedback the value of CRC temporary storage
       }
```

7-9 Advanced application parameters

P800	Advanced application parameter lock		Initial value: 1	
	Setting range	0 – 1	Unit	1
	content	0: Lock 1: Unlock		

If P800 is set to “0”,you can not use the advanced parameters.

P801	System 50Hz/60Hz selection		Initial value: 0	
	Setting range	0 – 1	Unit	1
	content	0: 50Hz 1: 60Hz		

50Hz/60Hz system could be set via the parameter according the condition of electric network.

P802	constant and variable torque selection		Initial value : 0	
	Setting range	0 – 1	Unit	1
	content	0: Constant torque 1: Variable torque		

For fan and pump load, you can select “variable torque” for better energy saving.

P803	Overvoltage protection setting		Initial value: change	
	Setting range	760 – 820	Unit	1

P803 sets DC-bus overvoltage protection level. This function could be used to avoid over voltage protection during deceleration.

P804	Undervoltage protection setting		Initial value: change	
	Setting range	380 – 450	Unit	1

P804 sets voltage protection level.
If the input voltage is low, inverter is easy to trip for undervoltage. This function could be used to avoid inverter protection undervoltage
.

P805	Over temperature protection setting		Initial value: change	
	Setting range	40 – 120	Unit	1

P805 sets the over temperature protection level of inverter. In high temperature environment, the protection level could be improved appropriately, to guarantee the normal running of inverter. However, too high setting value will result in IGBT damage, so the only solution is to improve the effect of heat elimination, so as to achieve the goal of cooling-down.

P806	Current display filter time		Initial value: 2.0	
	Setting range	0 – 100	Unit	1

This parameter setting is relevant to the stabilization of current display, and shall not be modified in general. If the setting is too small, current display will fluctuate.

P807	0-10V analogue output low end calibration coefficient		Initial value: *	
	Setting range	0 – 65535	Unit	1

P808	0-10V analog output high end calibration coefficient Initial value : *			
	Setting range	0 – 65535	Unit	1
P809	0-20mA analogue output low end calibration coefficient Initial value: *			
	Setting range	0 – 65535	Unit	1
P810	0-20mA analog output high end calibration coefficient Initial value: *			
	Setting range	0 – 65535	Unit	1

The above parameters are factory default setting, normally shall not be adjusted, otherwise it may cause abnormal operation.