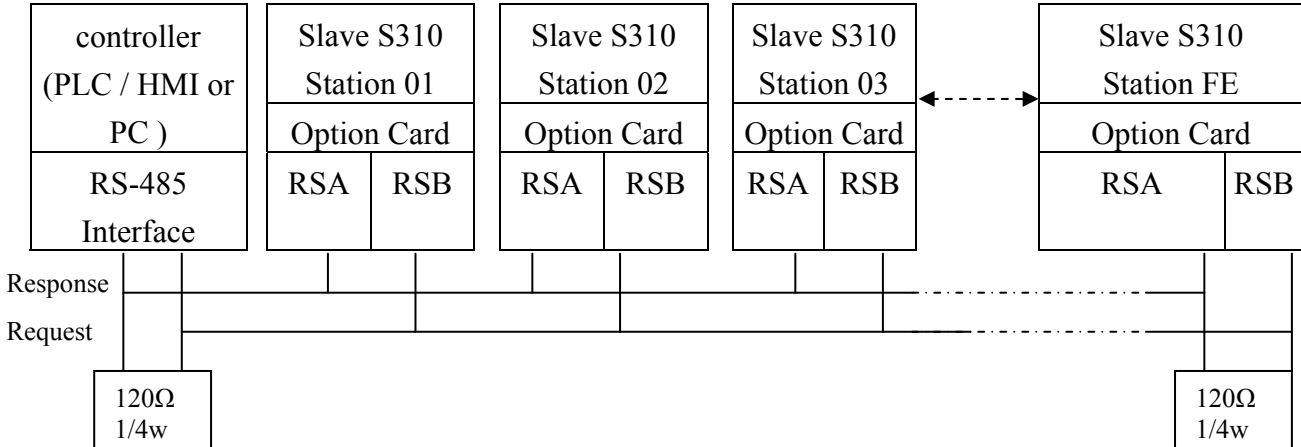


1. Communication Data Frame

S310 series inverter can be Communication controlled by the PC or other controller with the Communication protocol, Modbus ASCII Mode & Mode RTU, RS485 or RS232.

Frame length maximum 80 bytes.

1.1 Hardware installation



The network is terminated at each end with an external terminating resistor (120Ω, 1/4w)

1.2 Data format frame

1.2.1 FOR ASCII MODE

STX(3AH)	Start bit = 3AH
Address Hi	Communication Address(Station):
Address Lo	2-digit ASCII Code
Function Hi	Function Code (command):
Function Lo	2-digit ASCII Code
Command Start Address	command Start byte: 4-digit ASCII Code
Command Start Address	
Command Start Address	
Command Start Address	
Data length	The length of the command: 4-digit ASCII Code
Data length	
Data length	
Data length	
LRC Check Hi	LRC Check Code:
LRC Check Lo	2-digit ASCII Code
END Hi	End Byte :
END Lo	END Hi=CR(0DH), END Li = LF(0AH)

1.2.2 FOR RTU MODE

MASTER(PLC etc.)send request to SLAVE, whereas SLAVE response to MASTER.The signal receiving is illustrated here.

The data length is varied with the command(Function).

SLAVE Address
Function Code
DATA
CRC CHECK
Signal Interval

**The interval should be maintained at 10ms between command signal and request.

1.3 SLAVE Address

00H : Broadcast to all the drivers

01H : to the No.01 Drivers

0FH : to the No.15 Drivers

10H : to the No.16 Drivers

and so on,Max to 32(20H)

1.4 Function Code

03H : Read the register contents

06H : write a WORD to register

08H : Loop test

10H : write several data to register(complex number register write)

2.CMS (Checksum and time-out definition)

2.1 LRC

ex. ADDRESS 01H
 FUNCTION 03H
 COMMAND 01H
 00H
 DATA LENGTH 0AH

 0FH-----true complement
 Checksum = F1H
 CS(H) = 46H (ASCII)
 CS(L) = 31H (ASCII)

2.2 CRC CHECK: CRC Check Code is from SLAVE Address to end of the data. The calculation method is illustrated as follow:

- (1) Load a 16-bit register with FFFF hex (all 's1). Call this the CRC register.
- (2) Exclusive OR the first 8-bit byte of the message with the low-order byte of the 16-bit CRC register, putting the result in the CRC register.
- (3) Shift the CRC register one bit to the right (toward the LSB), Zero-filling the MSB, Extract and examines the LSB.
- (4) (If the LSB was 0): Repeat Steps(3)(another shift). (If the LSB was 1): Exclusive OR the CRC register with the polynomial value A001 hex (1010 0000 0000 0001).
- (5) Repeat Steps (3) and (4) until 8 shifts been performed. When this is done, a complete 8-bit byte Will be processed .
- (6) Repeat Steps (2) through (5) for next 8-bit byte of the message, Continue doing this until all bytes have been processed. The final content of the CRC register is the CRC value. Placing the CRC into the message: When the 16-bit CRC (2 8-bit bytes) is transmitted in the message, the Low-order byte will be transmitted first, followed by the high-order byte, For example, if the CRC value is 1241 hex, the CRC-16 Upper put the 41h, the CRC-16 Lower put the 21h.

●CRC calculation application program

```

UWORD ch_sum ( UBYTE long , UBYTE *rxdbuff ) {
    BYTE i = 0;
    UWORD wkg = 0xFFFF;
    while ( long-- ) {
        wkg ^= rxdbuff++;
        for ( i = 0 ; i < 8; i++ ) {
            if ( wkg & 0x0001 ) wkg = ( wkg >> 1 ) ^ 0xa001;
            else wkg = wkg >> 1;
        }
    }
    return( wkg );
}

```

3. Error code

ASCII Mode		RTU Mode		
STX	\ ': '	SLAVE Address	02H	
Address	\ '0'	Function	83H	
	\ '1'	Exception code	52H	
Function	\ '8'	CRC-16	High	C0H
	\ '6'		Low	CDH
Exception code	\ '5'			
	\ '1'			
LRC Check	\ '2'			
	\ '8'			
END	\ 'CR'			
	\ 'LF'			

Under communication linking, the driver responses the Exception Code and send Function Code AND 80H to main system if there is error happened.

Error Code	Description
51	Function Code Error
52	Address Error
53	Data Amount Error
54	DATA Over Range
55	Writing Mode Error

4. Inverter Control

4.1 Command Data (Readable and Writable)

Register No.	Content			
2500/A000H	Reserved			
2501/A001H	Operation Signal			
	Bit	Description	1	0
	0	Operation Command	Run	Stop
	1	Reverse Command	Reverse	Forward
	2	Reserved		
	3	Fault Reset	Reset	
	4	Jog Command	Jog	
	5	Reserved		
	6	Multi-function Command S1	ON	OFF
	7	Multi-function Command S2	ON	OFF
	8	Multi-function Command S3	ON	OFF
	9	Multi-function Command S4	ON	OFF
	A	Multi-function Command S5	ON	OFF
	B	Reserved		
	C	Multi-function Command R1A	ON	OFF
	D	Reserved		
E	Reserved			
F	Reserved			
2502/A002H	Frequency Command			
2503/A003H	Reserved			
2504/A004H	Reserved			
2505/A005H	Reserved			
2506/A006H	Reserved			
2507/A007H	Reserved			
2508/A008H	Reserved			
2509/A009H	Reserved			

Note: Write in zero for Not used BIT, do not write in data for the reserved register.

4.2 Monitor Data(Only for reading)

Register No.	Content			
2520/A020H	Bit	Description	1	0
	0	Operation state	Run	Stop
	1	Direction state	Reverse	Forward
	2	Inverter operation prepare state	ready	unready
	3	Abnormal	Abnormal	
	4	DATA setting error	Error	
	5	Reserved		
	6	Reserved		
	7	Reserved		
	8	Reserved		
	9	Reserved		
	A	Reserved		
	B	Reserved		
	C	Reserved		
	D	Reserved		
E	Reserved			
F	Reserved			
2521/A021H	異常内容			
	Code	Description	Code	Description
	00	Reserved	01	OH(Inverter over heat)
	02	OC(Over current at stop)	03	LV(Under voltage)
	04	OV(Over voltage)	05	B.B.(External bb)
	06	CTER	07	Reserved
	08	EPR(EEPROM error)	09	OL2(Inverter over load)
	10	OL1(Motor over load)	11	E.S.(Emergency stop)
	12	Reserved	13	OC-C(Over current at constant speed)
	14	OC-A(Over current during accelerating)	15	OC-D(Over current during decelerating)
	16	OC-S	17	LV-C(Under voltage during running)
	18	OV-C(Over voltage at constant speed)	19	OH-C(Inverter over heat during running)
	20	STP0(stop at 0 Hz)	21	STP1(Direct start disable)
	22	STP2(Control panel emergency stop)	23	ERR1(Keypad operation error)
	24	ERR2(Parameter setting error)	25	Reserved
	26	ERR5(Communication failure)	27	ERR6 Communication failure
	28	ERR7	29	ERR8
	30	Reserved	31	Reserved
	32	Reserved	33	Reserved
	34	Reserved	35	Reserved
	36	LOC(parameter Locked)	37	Reserved
	38	Reserved	39	Reserved

Register No.	Content				
2522/A022H	Bit		Description	1	0
	Sequence input status	0	Terminal S1	Closed	Opened
		1	Terminal S2	Closed	Closed
		2	Terminal S3	Closed	Closed
		3	Terminal S4	Closed	Closed
		4	Terminal S5	Closed	Closed
		5	reserved		
		6	Multi-function Output1 (RELAY1)	On	OFF
		7	reserved		
		8	reserved		
		9	reserved		
	Contact output	A	reserved		
		B	reserved		
		C	reserved		
		D	reserved		
E		reserved			
F		reserved			
2523/A023H	frequency command (100/1Hz)				
2524/A024H	Output frequency (100/1Hz)				
2525/A025H	Output voltage command (10/1V)				
2526/A026H	Output DC voltage command (10/1V)				
2527/A027H	Output current (10/1A)				
2528/A028H	reserved				
2529/A029H	reserved				
252A/A02AH	reserved				
252B/A02BH	reserved				
252C/A02CH	TM2 AIN input value (1024 / 10V) *1				
252D/A02DH	Keypad AIN input value (1024 / 10V) *1				
252E/A02EH	reserved				
252F/A02FH	reserved				
2530/A030H	reserved				

(Note) 1、 Do not write in data for the reserved register.

5.Function Code

5.1Read the data in the holding register [03H]

Master unit reads the contents of the holding register with the continuous number for the specified quantity.

Note: 1、Limit the number of read data, RTU: 37, ASCII:17.

2、Can only Continuous read the address of the same Group

3、Read data Quantity ≥ 1 .



Only on the data in the same Group of continuous reading (Example) Read the SLAVE station No:01 ,S310 drive's frequency command.

ASCII Mode

Instruction Message

STX	3AH
SLAVE Address	30H 31H
Function Code	30H 33H
Start Address	32H
	35H
	32H
	33H
Quantity	30H
	30H
	30H
	31H
LRC CHECK	42H
	33H
END	0DH
	0AH

Response Message (Normal)

STX	3AH
SLAVE Address	30H 31H
Function Code	30H 33H
DATA number	30H
	32H
First holding register	31H
	37H
	37H
LRC CHECK	30H
	37H
END	33H
	0DH
	0AH

Response(Fault)

STX	3AH
SLAVE Address	30H 31H
Function Code	38H 33H
Error Code	35H
	32H
LRC CHECK	32H
	41H
END	0DH
	0AH

RTU Mode

Instruction Message

SLAVE Address	01H	
Function Code	03H	
Start Address	High	25H
	Low	23H
Quantity	High	00H
	Low	01H
CRC-16	High	7EH
	Low	CCH

Response Message (Normal)

SLAVE Address	01H	
Function Code	03H	
DATA number	02H	
First holding register	High	07H
	Low	D0H
CRC-16	High	BBH
	Low	E8H

Response(Fault)

SLAVE Address	01H	
Function Code	83H	
Error Code	52H	
CRC-16	High	C0H
	Low	CDH

5.2 LOOP BACK testing [08H]

The function code is check communication between MASTER and SLAVE, the Instruction message is returned as a response message without being change, Any values can be used for test coders or data.

ASCII Mode

Instruction Message

STX	3AH
SLAVE Address	30H 31H
Function Code	30H 38H
Test Code	30H
	30H
	30H
	30H
DATA	41H
	35H
	33H
	37H
LRC CHECK	31H
	42H
END	0DH
	0AH

Response Message (Normal)

STX	3AH
SLAVE Address	30H 31H
Function Code	30H 38H
Test Code	30H
	30H
	30H
	30H
DATA	41H
	35H
	33H
	37H
LRC CHECK	31H
	42H
END	0DH
	0AH

Response(Fault)

STX	3AH
SLAVE Address	30H 31H
Function Code	38H 38H
Error Code	32H
	30H
LRC CHECK	37H
	35H
END	0DH
	0AH

RTU Mode

Instruction Message

SLAVE Address	01H
Function Code	08H
Test Code	High 00H
	Low 00H
DATA	High A5H
	Low 37H
CRC-16	High DAH
	Low 8DH

Response Message (Normal)

SLAVE Address	01H
Function Code	08H
Test Code	High 00H
	Low 00H
DATA	High A5H
	Low 37H
CRC-16	High DAH
	Low 8DH

Response(Fault)

SLAVE Address	01H
Function Code	88H
Error Code	20H
CRC-16	High 47H
	Low D8H

5.3 Write holding register [06H]

Specified data are written into the several specified holding registers from the Specified number, respectively.

(Example)Set SLAVE station No:01,S310 drive as forward run at frequency reference 60.0HZ.

ASCII Mode

Instruction Message		Response Message (Normal)		Response(Fault)	
STX	3AH	STX	3AH	STX	3AH
SLAVE Address	30H 31H	SLAVE Address	30H 31H	SLAVE Address	30H 31H
Function Code	30H 36H	Function Code	30H 36H	Function Code	38H 36H
Start Address	32H	Start Address	32H	Error Code	35H
	35H		35H		32H
	30H		30H	LRC CHECK	32H
	32H		32H		37H
DATA	31H	DATA	31H	END	0DH
	37H		37H		0AH
	37H		37H		
	30H		30H		
LRC CHECK	34H	LRC CHECK	34H		
	42H		42H		
END	0DH	END	0DH		
	0AH		0AH		

RTU Mode

Instruction Message			Response Message (Normal)			Response(Fault)		
SLAVE Address		01H	SLAVE Address		01H	SLAVE Address		01H
Function Code		06H	Function Code		06H	Function Code		86H
Start Address	High	25H	Start Address	High	25H	Error Code		52H
	Low	02H		Low	02H	CRC-16	High	C3H
DATA	High	17H	DATA	High	17H		Low	9DH
	Low	70H		Low	70H			
CRC-16	High	2DH	CRC-16	High	2DH			
	Low	12H		Low	12H			

5.4 Write in several holding registers [10H]

Specified data are written into the several specified holding registers from the Specified number, respectively.

Note: 1、 Limit the number of read data, RTU: 37, ASCII:17.

2、 Can only Continuous read the address of the same Group

3、 Read data Quantity ≥ 1 .

(Example)Set SLAVE station No:01, S310 drive as forward run at frequency reference 60.0HZ.

ASCII Mode

Instruction Message		Response Message (Normal)		Response(Fault)	
STX	3AH	STX	3AH	STX	3AH
SLAVE Address	30H	SLAVE Address	30H	SLAVE Address	30H
	31H		31H		31H
Function Code	31H	Function Code	31H	Function Code	39H
	30H		30H		30H
Start Address	32H	Start Address	32H	Error Code	35H
	35H		35H		32H
	30H		30H	LRC CHECK	31H
	31H		31H		44H
Quantity	30H	Quantity	30H	END	0DH
	30H		30H		0AH
	30H		30H		
	32H		32H		
DATA Number*	30H	LRC CHECK	43H		
	34H		37H		
First DATA	30H	END	0DH		
	30H		0AH		
	30H				
	31H				
Next DATA	31H				
	37H				
	37H				
	30H				
LRC CHECK	33H				
	42H				
END	0DH				
	0AH				

RTU Mode

Instruction Message

SLAVE Address	01H	
Function Code	10H	
Start Address	High	25H
	Low	01H
Quantity	High	00H
	Low	02H
DATA Number *	04H	
First DATA	High	00H
	Low	01H
Next DATA	High	17H
	Low	70H
CRC-16	High	CBH
	Low	26H

Response Message (Normal)

SLAVE Address	01H	
Function Code	10H	
Start Address	High	25H
	Low	01H
Quantity	High	00H
	Low	02H
CRC-16	High	1BH
	Low	04H

Response(Fault)

SLAVE Address	01H	
Function Code	90H	
Error Code	52H	
CRC-16	High	CDH
	Low	FDH

* DATA Numbers are the actual number timers 2

6 Comparison list between parameter and register

Note:

Parameter register No.: GGnnH, “GG” means Group number, “nn” means Parameter number
for example: the address of Pr 08-03 is 0803H. the address of Pr 10-11 is 0A0BH

Register No.	Function	Register No.	Function	Register No.	Function
Group00		Group01		Group02	
0000H	Reserved	0100H	01-00	0200H	02-00
0001H	00-01	0101H	01-01	0201H	02-01
0002H	00-02	0102H	01-02	0202H	02-02
0003H	00-03	0103H	01-03	0203H	02-03
0004H	Reserved	0104H	01-04	0204H	02-04
0005H	00-05	0105H	01-05	0205H	02-05
0006H	Reserved	0106H	01-06	0206H	Reserved
0007H	00-07	0107H	Reserved	0207H	Reserved
0008H	00-08	0108H	Reserved	0208H	Reserved
0009H	00-09	0109H	01-09	0209H	Reserved
000AH	00-10	010AH	Reserved	020AH	Reserved
000BH	00-11	010BH	01-11	020BH	Reserved
000CH	00-12	010CH	01-12	020CH	02-12
000DH	00-13	010DH	01-13	020DH	02-13
000EH	00-14				

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Register No.	Function	Register No.	Function	Register No.	Function
Group03		Group04		Group05	
0300H	Reserved	0400H	Reserved	0500H	05-00
0301H	03-01	0401H	04-01	0501H	Reserved
0302H	03-02	0402H	Reserved	0502H	05-02
0303H	03-03	0403H	04-03	0503H	05-03
0304H	03-04	0404H	Reserved	0504H	05-04
0305H	03-05	0405H	Reserved	0505H	05-05
0306H	03-06	0406H	Reserved	0506H	05-06
0307H	03-07	0407H	Reserved	0507H	05-07
0308H	03-08	0408H	04-08	0508H	05-08
0309H	Reserved	0409H	04-09	0509H	05-09
030AH	Reserved	040AH	Reserved	050AH	05-10
030BH	Reserved	040BH	Reserved	050BH	05-11
030CH	Reserved	040CH	Reserved		
030DH	Reserved	040DH	Reserved		
030EH	Reserved	040EH	Reserved		
030FH	Reserved	040FH	04-15		
0310H	Reserved	0410H	04-16		
0311H	03-17	0411H	04-17		
0312H	03-18	0412H	04-18		
0313H	03-19				
0314H	03-20				
0315H	03-21				
0316H	03-22				
0317H	03-23				
0318H	03-24				
0319H	03-25				
031AH	03-26				
031BH	03-27				
031CH	03-28				
031DH	03-29				
031EH	03-30				
031FH	03-31				
0320H	03-32				

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Register No.	Function	Register No.	Function	Register No.	Function
Group06 (Reserved)		Group07		Group08	
		0700H	07-00	0800H	08-00
		0701H	07-01	0801H	Reserved
		0702H	07-02	0802H	08-02
		0703H	07-03	0803H	08-03
		0704H	07-04	0804H	08-04
		0705H	07-05	0805H	08-05
		0706H	07-06	0806H	08-06
		0807H	08-07
		070CH	Reserved	0808H	08-08
		070DH	07-13		

Register No.	Function	Register No.	Function	Register No.	Function
Group09 (Reserved)		Group10		Group11	
		0A00H	Reserved	0B00H	11-00
		0A01H	10-01	0B01H	11-01
		0A02H	Reserved	0B02H	11-02
		0A03H	10-03		
		0A04H	10-04		
		0A0FH	10-16		

Register No.	Function	Register No.	Function	Register No.	Function
Group12		Group13			
0C00H	12-00	0D00H	13-00		
0C01H	12-01	0D01H	13-01		
0C02H	12-02	0D02H	13-02		
0C03H	Reserved	0D03H	13-03		
0C04H	Reserved	0D04H	13-04		
0C05H	Reserved	0D05H	13-05		
0C06H	12-06	0D06H	13-06		
0C07H	12-07	0D07H	13-07		
		0D08H	Reserved		

		0D09H	Reserved		
		0D0AH	Reserved		
		0D0BH	Reserved		
		0D0CH	Reserved		
		0D0DH	Reserved		
		0D0EH	Reserved		
		0D0FH	Reserved		
		0D10H	13-16		
		0D11H	13-17		
		0D12H	13-18		
		0D13H	13-19		
		0D14H	13-20		
		0D15H	13-21		
		0D16H	13-22		
		0D17H	13-23		
		0D18H	Reserved		
		0D19H	Reserved		
		0D1AH	Reserved		
		0D1BH	Reserved		
		0D1CH	Reserved		
		0D1DH	Reserved		
		0D1EH	Reserved		
		0D1FH	Reserved		
		0D20H	13-32		
		0D21H	13-33		
		0D22H	13-34		
		0D23H	13-35		
		0D24H	13-36		
		0D25H	13-37		
		0D26H	13-38		
		0D27H	13-39		