

NTA5000 ModBus Communication

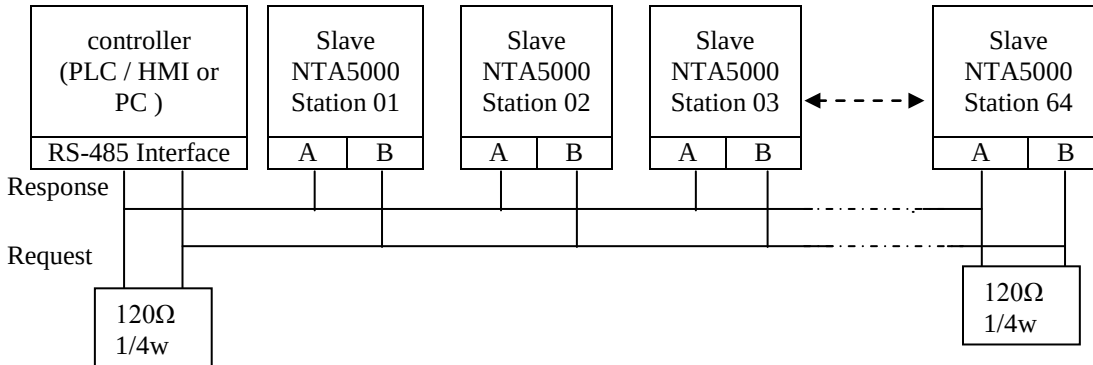
1 Communication Data Frame

NTA5000 series inverter can be Communication controlled by the PC or other controller with the Communication protocol, Modbus ASCII Mode & Mode RTU, RS485.

Frame length maximum 80 bytes.

As to communication format setting, please refer to the descriptions of group F08.xx.

A.1.1 Hardware installation



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

1.2 Data format frame: ASCII mode

STX(3AH)	Start bit = 3AH
Address High byte	Communication Address(Station): 2-digit ASCII Code
Address Low byte	
Function High byte	Function Code (command): 2-digit ASCII Code
Function Low byte	
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 High byte	LRC Check Code: 2-digit ASCII Code
LRC Check Low byte	
END High byte	End Byte : END Hi=CR(0DH) END Li = LF(0AH)
END Low byte	

1.3 Data format frame: 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.

1.4 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 64(40H)

1.5 Function Code

03H: Read the registers contents

06H: write a WORD to register

08H: Loop test

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

2 CMS (Checksum and time-out definition)

2.1 LRC

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

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

2.2 CRC CHECK

CRC Check Code is calculated 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), putting the result in the CRC register.
- (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 12h.

● 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

STX	‘.’
Address	‘0’
	‘1’
Function	‘8’
	‘6’
Exception code	‘5’
	‘1’
LRC Check	‘2’
	‘8’
END	‘CR’
	‘LF’

RTU Mode

SLAVE Address		02H
Function		83H
Exception code		52H
CRC-16	High	30H
	Low	CDH

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 Function Code

A.4.1 Read 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 number of read data, RTU mode 37words, ASCII mode 17words.

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

3. Read data Quantity $\geq$ 1.

(Example) Read the SLAVE station No.01, NTA5000 drive's frequency command.

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 33H	Function Code	30H 33H	Function Code	38H 33H
Start Address	32H 35H 32H 33H	DATA number	30H 32H	Error Code	35H 32H
Quantity	30H 30H 30H 31H	First holding register	31H 37H 37H 30H	LRC CHECK	32H 41H
LRC CHECK	42H 33H	LRC CHECK	37H 33H	END	0DH 0AH
END	0DH 0AH	END	0DH 0AH		

Instruction Message		Response Message (Normal)		Response (Fault)	
SLAVE Address	01H	SLAVE Address	01H	SLAVE Address	01H
Function Code	03H	Function Code	03H	Function Code	83H
Start Address	High A0H Low 23H	DATA number	02H	Error Code	52H
Quantity	High 00H Low 01H	First holding register	High 07H Low D0H	CRC-16	High C0H Low CDH
CRC-16	High 57H Low C0H	CRC-16	High BBH Low E8H		

4.2 LOOP BACK testing [08H]

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

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		30H	Function Code		30H	Function Code	38H	
		38H			38H			38H
Test Code		30H	Test Code		30H	Error Code	32H	
		30H			30H			30H
		30H			30H	LRC CHEC	37H	
		30H			30H			35H
DATA		41H	DATA		41H	END	0DH	
		35H			35H			0AH
		33H			33H			
		37H			37H			
LRC CHECK		31H	LRC CHECK		31H			
		42H			42H			
END		0DH	END		0DH			
		0AH			0AH			

Instruction Message			Response Message (Normal)			Response (Fault)		
SLAVE Address		01H	SLAVE Address		01H	SLAVE Address		01H
Function Code		08H	Function Code		08H	Function Code		88H
Test Code	High	00H	Test Code	High	00H	Error Code		20H
	Low	00H		Low	00H	CRC-16	High	47H
DATA	High	A5H	DATA	High	A5H		Low	D8H
	Low	37H		Low	37H			
CRC-16	High	DAH	CRC-16	High	DAH			
	Low	8DH		Low	8DH			

4.3 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, write NTA5000 drive frequency reference 60.0HZ.

Instruction Message		ASCII Mode 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 35H 30H 32H	Start Address	32H 35H 30H 32H	Error Code	35H 32H
DATA	31H 37H 37H 30H	DATA	31H 37H 37H 30H	LRC CHECK	32H 37H
LRC CHECK	34H 42H	LRC CHECK	34H 42H	END	0DH 0AH
END	0DH 0AH	END	0DH 0AH		

Instruction Message			RTU Mode 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			

4.4 Write in several holding registers [10H]

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

Note: 1. Limit number of read data, RTU mode 35words, ASCII mode 15words.

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

3. Read data Quantity $\geq$ 1.

(Example)Set SLAVE station No.01, NTA5000 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			Response Message (Normal)			Response (Fault)		
SLAVE Address		01H	SLAVE Address		01H	SLAVE Address		01H
Function Code		10H	Function Code		10H	Function Code		90H
Start Address	High	25H	Start Address	High	25H	Error Code		52H
	Low	01H		Low	01H	CRC-16	High	CDH
Quantity	High	00H	Quantity	High	00H		Low	FDH
	Low	02H		Low	02H			
DATA Number *		04H	CRC-16	High	1BH			
First DATA	High	00H		Low	04H			
	Low	01H						
Next DATA	High	17H						
	Low	70H						
CRC-16	High	CBH						
	Low	26H						

* DATA Numbers are the actual number timers 2

5 Inverter Control

5.1 Command Data (Readable and Writable)

Register No.	Content			
2500H	Reserved			
2501H	Operation Signal			
	Bit	Description	1	0
	0	Operation Command	Run	Stop
	1	Reverse Command	Reverse	Forward
	2	Abnormal	EFO	
	3	Fault Reset	Reset	
	4	Jog Forward Command	Jog Forward	
	5	Jog Reverse Command	Jog Reverse	
	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	Multi-function Command S6	ON	OFF
	C	Multi-function Command R1	ON	OFF
	D	Multi-function Command T1	ON	OFF
	E	Reserved		
F	Reserved			
2502H	Frequency Command			
2503H	Reserved			
2504H	Reserved			
2505H	Reserved			
2506H	Reserved			
2507H	Reserved			
2508H	Reserved			
2509H	Reserved			

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

5.2 Monitor Data (Only for reading)

Register No.	Content																																																																																				
2520H	<table><tr><td>Bit</td><td>Description</td><td>1</td><td>0</td></tr><tr><td>0</td><td>Operation state</td><td>Run</td><td>Stop</td></tr><tr><td>1</td><td>Direction state</td><td>Reverse</td><td>Forward</td></tr><tr><td>2</td><td>Inverter operation prepare state</td><td>ready</td><td>unready</td></tr><tr><td>3</td><td>Abnormal</td><td>Abnormal</td><td></td></tr><tr><td>4</td><td>DATA setting error</td><td>Error</td><td></td></tr></table>				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																																																										
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2525H	Output voltage command (10/1V)																																																										
2526H	DC voltage command (1/1V)																																																										
2527H	Output current (10/1A)																																																										
2528H	Reserved																																																										
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252AH	PID feedback (100% / fmax , 10/1%)																																																										
252BH	PID input (100% / fmax, 10/1%)																																																										
252CH	TM2 AI1 input value (100% / 10V) *1																																																										
252DH	TM2 AI2 input value (100% / 10V) *1																																																										
252EH	Reserved																																																										
252FH	Reserved																																																										
2530H	Reserved																																																										

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

5.3 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 F08.03 is 0803H.

the address of Pr F10.11 is 0A0BH

Group00		Group01		Group02	
Register No.	Function	Register No.	Function	Register No.	Function
0000H	F00.00	0100H	F01.00	0200H	F02.00
0001H	F00.01	0101H	F01.01	0201H	F02.01
0002H	F00.02	0102H	F01.02	0202H	F02.02
0003H	F00.03	0103H	F01.03	0203H	F02.03
0004H	F00.04	0104H	F01.04	0204H	F02.04
0005H	F00.05	0105H	F01.05	0205H	F02.05
0006H	F00.06	0106H	F01.06	0206H	F02.06
0007H	F00.07	0107H	F01.07	0207H	F02.07
0008H	F00.08	0108H	F01.08	0208H	F02.08
0009H	F00.09	0109H	F01.09	0209H	F02.09
000AH	F00.10	010AH	F01.10	020AH	F02.10
000BH	F00.11	010BH	F01.11	020BH	F02.11
000CH	F00.12	010CH	F01.12	020CH	F02.12
000DH	F00.13	010DH	F01.13	020DH	F02.13
000EH	F00.14	010EH	F01.14	020EH	F02.14
		010FH	F01.15	020FH	F02.15
		0110H	F01.16	0210H	F02.16
		0111H	F01.17	0211H	F02.17
		0112H	F01.18	0212H	F02.18
		0113H	F01.19		
		0114H	F01.20		
		0115H	F01.21		
		0116H	F01.22		
		0117H	F01.23		

Group03		Group04		Group05	
Register No.	Function	Register No.	Function	Register No.	Function
0300H	F03.00	0400H	F04.00	0500H	F05.00
0301H	F03.01	0401H	F04.01	0501H	F05.01
0302H	F03.02	0402H	F04.02	0502H	F05.02
0303H	F03.03	0403H	F04.03	0503H	F05.03
0304H	F03.04	0404H	F04.04	0504H	F05.04
0305H	F03.05	0405H	F04.05	0505H	F05.05
0306H	F03.06	0406H	F04.06	0506H	F05.06
0307H	F03.07	0407H	F04.07	0507H	F05.07
0308H	F03.08	0408H	F04.08	0508H	F05.08
0309H	F03.09	0409H	F04.09	0509H	F05.09
030AH	F03.10	040AH	F04.10	050AH	F05.10
030BH	F03.11	040BH	F04.11	050BH	F05.11
030CH	F03.12	040CH	F04.12	050CH	F05.12
030DH	F03.13	040DH	F04.13	050DH	F05.13
030EH	F03.14	040EH	F04.14	050EH	F05.14
030FH	F03.15	040FH	F04.15		
0310H	F03.16	0410H	F04.16		
0311H	F03.17	0411H	F04.17		
0312H	F03.18	0412H	F04.18		
0313H	F03.19	0413H	F04.19		
0314H	F03.20	0414H	F04.20		
0315H	F03.21				

0316H	F03.22	Group06		Group07	
0317H	F03.23	Register No.	Function	Register No.	Function
0318H	F03.24	0600H	F06.00	0700H	F07.00
0319H	F03.25	0601H	F06.01	0701H	F07.01
031AH	F03.26	0602H	F06.02	0702H	F07.02
031BH	F03.27	0603H	F06.03	0703H	F07.03
031CH	F03.28	0604H	F06.04	0704H	F07.04
031DH	F03.29	0605H	F06.05	0705H	F07.05
031EH	F03.30	0606H	F06.06	0706H	F07.06
031FH	F03.31	0607H	F06.07	0707H	F07.07
0320H	F03.32	0608H	F06.08	0708H	F07.08
0321H	F03.33	0609H	F06.09	0709H	F07.09
0322H	F03.34	060AH	F06.10	070AH	F07.10
0323H	F03.35	060BH	F06.11	070BH	F07.11
0324H	F03.36			070CH	F07.12
0325H	F03.37	Group08		070DH	F07.13
0326H	F03.38	Register No.	Function	070EH	F07.14
0327H	F03.39	0800H	F08.00	070FH	F07.15
0328H	F03.40	0801H	F08.01	0710H	F07.16
0329H	F03.41	0802H	F08.02	0711H	F07.17
032AH	F03.42	0803H	F08.03		
032BH	F03.43	0804H	F08.04		
032CH	F03.44	0805H	F08.05		
032DH	F03.45	0806H	F08.06		
032EH	F03.46	0807H	F08.07		
032FH	F03.47	0808H	F08.08		
0330H	F03.48	0809H	F08.09		

Group09		Group10		Group11	
Register No.	Function	Register No.	Function	Register No.	Function
0900H	F09.00	0A00H	F10.00	0B00H	F11.00
0901H	F09.01	0A01H	F10.01	0B01H	F11.01
0902H	F09.02	0A02H	F10.02	0B02H	F11.02
0903H	F09.03	0A03H	F10.03	0B03H	F11.03
0904H	F09.04	0A04H	F10.04	0B04H	F11.04
0905H	F09.05	0A05H	F10.05	0B05H	F11.05
0906H	F09.06	0A06H	F10.06	0B06H	F11.06
0907H	F09.07	0A07H	F10.07	0B07H	F11.07
0908H	F09.08	0A08H	F10.08	0B08H	F11.08
0909H	F09.09	0A09H	F10.09	0809H	F11.09
090AH	F09.10	0A0AH	F10.10		
090BH	F09.11	0A0BH	F10.11		
090CH	F09.12	0A0CH	F10.12		
090DH	F09.13	0A0DH	F10.13		
090EH	F09.14	0A0EH	F10.14		
090FH	F09.15	0A0FH	F10.15		
0910H	F09.16				
0911H	F09.17				

Group12		Group13			
Register No.	Function	Register No.	Function	Register No.	Function
0C00H	F12.00	0D00H	F13.00	0D18H	F13.24
0C01H	F12.01	0D01H	F13.01	0D19H	F13.25
0C02H	F12.02	0D02H	F13.02	0D1AH	F13.26
0C03H	F12.03	0D03H	F13.03	0D1BH	F13.27
0C04H	F12.04	0D04H	F13.04	0D1CH	F13.28
0C05H	F12.05	0D05H	F13.05	0D1DH	F13.29
0C06H	F12.06	0D06H	F13.06	0D1EH	F13.30
0C07H	F12.07	0D07H	F13.07	0D1FH	F13.31
0C08H	F12.08	0D08H	F13.08	0D20H	F13.32
0C09H	F12.09	0D09H	F13.09	0D21H	F13.33
		0D0AH	F13.10	0D22H	F13.34
		0D0BH	F13.11	0D23H	F13.35
		0D0CH	F13.12	0D24H	F13.36
		0D0DH	F13.13	0D25H	F13.37
		0D0EH	F13.14	0D26H	F13.38
		0D0FH	F13.15	0D27H	F13.39
		0D10H	F13.16	0D28H	F13.40
		0D11H	F13.17	0D29H	F13.41
		0D12H	F13.18	0D2AH	F13.42
		0D13H	F13.19	0D2BH	F13.43
		0D14H	F13.20	0D2CH	F13.44
		0D15H	F13.21	0D2DH	F13.45
		0D16H	F13.22	0D2EH	F13.46
		0D17H	F13.23	0D2FH	F13.47