

INVERTER

E510



Communication - Addendum

- Modbus RTU / ASCII
- BACnet

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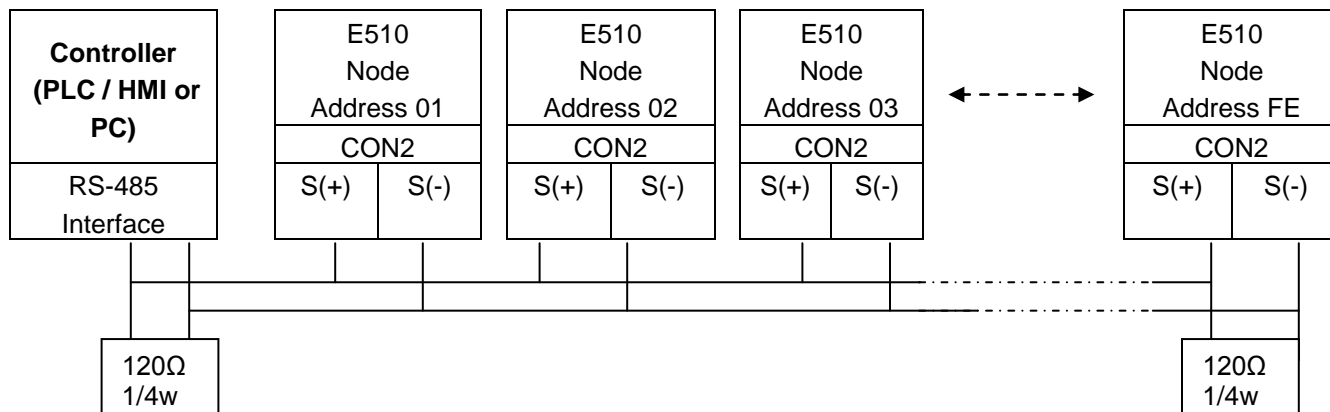
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1.0 Modbus Protocol Descriptions

1.0.1 Communication Connection and Data Frame

The inverter can communicate with a PC or PLC via RS485 using the Modbus RTU or Modbus ASCII protocol. The maximum frame length is 80 bytes.

Network Connection



**** Terminate the communications line with a (120 ohm, 1/4 watt) resistor at both ends.**

CON2 Pin out

PIN	Signal	PIN	Signal
1	RS-485 S+ signal	5	Tx signal
2	RS-485 S- signal	6	RS-485 S- signal
3	RS-485 S+ signal	7	VCC of isolated 5V power supply
4	Rx signal	8	GND of isolated 5V power supply

For RS-485 communication use pin 1 or pin 3 for S (+) and pin 2 or pin 6 for S (-)

Data Format Frame

Data Frame for ASCII Mode

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

Data Frame for RTU Mode

Master (PLC etc.) sends request to follower (inverter), and the follower sends a response to the master (PC, PLC). The data received is illustrated here.

The data length varies depending on the command (Function).

Node Address
Function Code
DATA
CRC CHECK
Signal Interval

** The inverter response time is 10ms.

Node Address

00H: Broadcast to all the drivers

01H: to the No. 01 inverter

0FH: to the No.15 inverter

10H: to the No.16 inverter and so on....., max to No. 254 (FEH)

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)

Checksum Calculation

LRC

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

Checksum	F1H	0FH ----- 2's complement
CS (H)		46H (ASCII)
CS (L) =	31H (ASCII)	

CRC

CRC Check: CRC code covers the content from node address to DATA. Please calculate it according to the following methods.

- (1) Load a 16-bit register with FFFF hex (all 1's). Call this CRC register.
- (2) Exclusive OR the first 8-bit byte of the message, 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 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 in the CRC register is the CRC value. When sending the CRC value, the Low-order byte should be sent firstly, then the High-order byte. For example, CRC value: 1241 Hex, the high-order byte should be set to 41hex and low-order byte 12hex.

CRC calculate program (C language):

```

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 );
}

```

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

RTU Mode		
Node Address	02H	
Function	83H	
Exception code	52H	
CRC-16	High	C0H
	Low	CDH

During a communication error the drive will response with an Exception Code and send a message back to the main system consisting of a Function Code that is “ANDED (and 80h)” with 80 Hex.

Exception code	Content
01	Function code error
02	Register number error
03	Number error
04	DATA setting error
05	Write mode error

1.0.2 Register and Data Format

Command Data (Read / Write)

Register No.	Bit	Content
2500H	Reserved	
2501H	0	Operation Command 1 : Run 0 : Stop
	1	Reverse Command 1 : Reverse 0 : Forward
	2	External Fault 1 : Fault
	3	Fault Reset 1 : Reset
	4	Reserved
	5	Reserved
	6	Multi-function Comm S1 1 : "ON"
	7	Multi-function Comm S2 1 : "ON"
	8	Multi-function Comm S3 1 : "ON"
	9	Multi-function Comm S4 1 : "ON"
	A	Multi-function Comm S5 1 : "ON"
	B	Multi-function Comm S6 1 : "ON"
	C	Reserved
	D	Reserved
	E	Inverter Mode 1 : "ON"
F	Torque Command set by Communication 1 : "ON"	
2502H	*Frequency Command (Unit: 0.01Hz)	
2503H	Torque Command (+/-8192 corresponding to the rated torque +/-100%)	
2504H	Speed limit (+/- 120 corresponding +/-120%)	
2505H	AO1 (0.00V ~ 10.00V)	
2506H	Reserved	
2507H	DO	
2508H	Reserved	
2509H	Reserved	
250AH	Reserved	
250BH	Reserved	
250CH	Reserved	
250DH	Reserved	
250EH	Reserved	
250FH	Reserved	
2510H	G12-00 H-WORD	
2511H	G12-00 L-WORD	

Note: Write a zero into the register for not used bit; do not write data to a reserved register.

Monitor Data (Read-only)

Register No.	Bit	Content	
2520H	0	Operation	1 : Run 0 : Stop
	1	Direction Forward	1 : Reverse 0 :
	2	Inverter ready Nor ready	1 : ready 0 :
	3	Fault	1 : Fault active
	4	Warning	1 : "ON"
	5	Zero Speed	1 : "ON"
	6	Is440V	1 : "ON"
	7	Frequency Agree	1 : "ON"
	8	Set Frequency Agree	1 : "ON"
	9	Frequency Detection 1	1 : "ON"
	A	Frequency Detection 2	1 : "ON"
	B	Under Voltage	1 : "ON"
	C	Baseblock	1 : "ON"
	D	Freq Ref. not from Comm.	1 : "ON"
	E	Seq. not from Comm.	1 : "ON"
	F	Over Torque	1 : "ON"
2521H	0	Reserved	31 Reserved
	1	UV	32 Reserved
	2	OC	33 Reserved
	3	OV	34 Reserved
	4	OH1	35 Reserved
	5	OL1	36 Reserved
	6	OL2	37 LSCFT(Rtry)
	7	OT	38 CF07
	8	UT	39 Reserved
	9	SC	40 Reserved
	10	Ground OC	41 OLDOP
	11	Reserved	42 Reserved
	12	Input Phase Loss	43 Reserved
	13	Output Phase Loss	44 FBLSS
	14	Reserved	45 Reserved
	15	Reserved	46 OH4
	16	Reserved	47 SS1
	17	External Fault 01	48 CF20
	18	External Fault 02	49 MtrSw (DI Motor Switch Fault)
	19	External Fault 03	50 OC_A

		20	External Fault 04	51	OC_D
		21	External Fault 05	52	OC_C
		22	External Fault 06	53	UD_C
		23	Reserved	54	CF_08
		24	Reserved	55	STO2
		25	PID Feedback Error	56	STO3
		26	Keypad Removed	57	PO
		27	Reserved	58	Reserved
		28	CE	59	Reserved
		29	STO1	60	Reserved
		30	Over Torque 2	61	Reserved
Register No.		Bit	Content		
2522H	DI State		Multi-function Comm S1	1 :“ON”	
		1	Multi-function Comm S2	1 :“ON”	
		2	Multi-function Comm S3	1 :“ON”	
		3	Multi-function Comm S4	1 :“ON”	
		4	Multi-function Comm S5	1 :“ON”	
		5	Multi-function Comm S6	1 :“ON”	
		6	Reserved		
		7	Reserved		
		8	Reserved		
		9	Reserved		
		A	Reserved		
		B	Reserved		
		C	Reserved		
		D	Reserved		
		E	Reserved		
F	Reserved				
2523H		Frequency command (0.01Hz)			
2524H		Output frequency (0.01Hz)			
2525H		Reserved			
2526H		DC voltage command (0.1V)			
2527H		Output current (0.1A)			

Register No.	Bit	Content						
2528H	0	No alarm	20	EF4	40	EF	60	
	1	OV	21	EF5	41	Reserved	61	
	2	UV	22	EF6	42	Reserved	62	
	3	OL2	23	EF7	43	RDP	63	
	4	OH2	24	EF8	44	Reserved	64	
	5	Reserved	25	Reserved	45	OL1	65	
	6	OT	26	CLB	46	HP_ER	66	
	7	Reserved	27	Reserved	47	SE10	67	
	8	Reserved	28	CT	48	Reserved	68	
	9	UT	29	USP	49	BB1	69	
	10	OS	30	RDE	50	BB2	70	
	11	PGO	31	WRE	51	BB3	71	
	12	DEV	32	FB	52	BB4	72	
	13	CE	33	VRYE	53	BB5	73	
	14	CALL	34	SE01	54	BB6	74	
	15	Reserved	35	SE02	55	BB7	75	
	16	EF0	36	SE03	56	BB8	76	
	17	EF1	37	Reserved	57	Reserved		
	18	EF2	38	SE05	58	Reserved		
	19	EF3	39	HPERR	59	Reserved		
2529H		Digital Output State						
252AH		AO1 (0.00V ~ 10.00V)						
252BH		Reserved						
252CH		AI 1 Input (0.1%)						
252DH		AI 2 Input (0.1%)						
252EH		Reserved						
252FH		L510(s)/ E510(s)/ A510(s)/ F510 Check						

Note: Write a zero into the register for not used bit; do not write data to a reserved register.

Read Holding Register [03H]

Read consecutive holding registers. The address of the first holding register is specified in the protocol
 Example: Read frequency command from the inverter with node address 1.

ASCII Mode

Command Message

3AH	STX
30H	Node Address
31H	
30H	Function
33H	
30H	Starting Register
31H	
32H	
33H	
30H	Number of Registers
30H	
30H	
31H	
?	LRC CHECK
?	
0DH	END
0AH	

Response Message (Normal)

3AH	STX
30H	Node Address
31H	
30H	Function
33H	
30H	Data Length
32H	
31H	Data
37H	
37H	
30H	
?	LRC CHECK
?	
0DH	END
0AH	

Response Message (Error)

3AH	STX
30H	Node Address
32H	
38H	Function
33H	
35H	Exception code
32H	
?	LRC CHECK
?	
0DH	END
0AH	

RTU Mode

Command Message

Node Address	01 H	
Function	03H	
Starting Register	High	01H
	Low	23H
Number of Registers	High	00H
	Low	01H
CRC-16	High	74H
	Low	3CH

Response Message (Normal)

Node Address	01H	
Function	03H	
Data Length	02H	
Data	High	17H
	Low	70H
CRC-16	High	AFH
	Low	82H

Response Message (Error)

Node Address	02H	
Function	83H	
Exception code	52H	
CRC-16	High	C0H
	Low	CDH

Loop back test [08H]

Check the communication between the master and the follower (inverter). The data used can be arbitrary.

ASCII Mode

Command Message

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

Response Message (Normal)

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

Response Message (Error)

3AH	STX
30H	Node Address
31H	
38H	Function
38H	
32H	Exception code
30H	
?	LRC CHECK
?	
0DH	END
0AH	

RTU Mode

Command Message

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

Response Message (Normal)

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

Response Message (Error)

Node Address	01H	
Function	88H	
Exception code	20H	
CRC-16	High	47H
	Low	D8H

Write Single Holding Register [06H]

Write single holding register. The register address of the holding register is specified in the message.

Example: Write a 60.00Hz frequency command to node address 1.

ASCII Mode

Command Message		Response Message (Normal)		Response Message (Error)	
3AH	STX	3AH	STX	3AH	STX
30H	Node Address	30H	Node Address	30H	Node Address
31H		31H		31H	
30H	Function	30H	Function	38H	Function
36H		36H		36H	
30H	Starting Register	30H	Starting Register	35H	Exception code
31H		31H		32H	
30H		30H		?	LRC CHECK
32H		32H		?	
31H	DATA	31H	DATA	0DH	END
37H		37H		0AH	
37H		37H			
30H		30H			
?	LRC CHECK	?	LRC CHECK		
?		?			
0DH	END	0DH	END		
0AH		0AH			

RTU Mode

Command Message			Response Message (Normal)			Response Message (Error)		
Node Address		01 H	Node Address		01H	Node Address		01H
Function		06H	Function		06H	Function		86H
Start No	High	01H	Start No	High	01H	Exception 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	27H	CRC-16	High	27H			
	Low	E2H		Low	E2H			

Write Multiple Holding Register [10H]

Write multiple holding registers. The address of the first holding register is specified in the message.

Example: Write a 60.00Hz frequency command to node address 1 and enable FWD run command.

ASCII Mode

Command Message

3AH	STX
30H	Node Address
31H	
31H	Function
30H	
30H	Starting Register
31H	
30H	
31H	
30H	Number of Registers
30H	
30H	
32H	
30H	Number of Bytes*
34H	
30H	DATA 1
30H	
30H	
31H	
31H	
37H	DATA 2
37H	
30H	
?	LRC CHECK
?	
0DH	END
0AH	

Response Message (Normal)

3AH	STX
30H	Node Address
31H	
31H	Function
30H	
30H	Starting Register
31H	
30H	
31H	
30H	Number of Registers
30H	
30H	
32H	
?	LRC CHECK
?	
0DH	END
0AH	

Response Message (Error)

3AH	STX
30H	Node Address
31H	
39H	Function
30H	
35H	Exception code
32H	
?	LRC CHECK
?	
0DH	END
0AH	

* Number of bytes is register amount x 2

RTU Mode

Command Message

Node Address		01H
Function		10H
Starting Register	High	01H
	Low	01H
Number of Registers	High	00H
	Low	02H
Number of Bytes*		04H
DATA 1	High	00H
	Low	01H
DATA 2	High	17H
	Low	70H
CRC-16	High	60H
	Low	27H

Response Message (Normal)

Node Address		01H
Function		10H
Starting Register	High	01H
	Low	01H
Number of Registers	High	00H
	Low	02H
CRC-16	High	11H
	Low	F4H

Response Message (Error)

Node Address		01H
Function		90H
Exception code		52H
CRC-16	High	CDH
	Low	FDH

* Data amount is register amount x 2

1.0.3 Parameter Data

Function	Register No	Function	Register No	Function	Register No
Group 0		Group 1		Group 2	
0 – 00	0000H	1 – 00	0100H	2 – 00	0200H
0 – 01	0001H	1 – 01	0101H	2 – 01	0201H
0 – 02	0002H	1 – 02	0102H	2 – 02	-
0 – 03	0003H	1 – 03	0103H	2 – 03	0203H
0 – 04	0004H	1 – 04	0104H	2 – 04	0204H
0 – 05	0005H	1 – 05	0105H	2 – 05	0205H
0 – 06	0006H	1 – 06	0106H	2 – 06	0206H
0 – 07	0007H	1 – 07	0107H	2 – 07	0207H
0 – 08	0008H	1 – 08	0108H	2 – 08	-
0 – 09	0009H	1 – 09	0109H	2 – 09	0209H
0 – 10	000AH	1 – 10	010AH	2 – 10	020AH
0 – 11	000BH	1 – 11	010BH	2 – 11	020BH
0 – 12	000CH	1 – 12	010CH	2 – 12	020CH
0 – 13	000DH	1 – 13	010DH	2 – 13	020DH
0 – 14	000EH	1 – 14	010EH	2 – 14	-
0 – 15	000FH	1 – 15	010FH	2 – 15	020FH
0 – 16	0010H	1 – 16	0110H	2 – 16	0210H
0 – 17	0011H	1 – 17	0111H	2 – 17	0211H
0 – 18	0012H	1 – 18	0112H	2 – 18	-
0 – 19	0013H	1 – 19	0113H	2 – 19	0213H
0 – 20	-	1 – 20	0114H	2 – 20	0214H
0 – 21	-	1 – 21	0115H	2 – 21	0215H
0 – 22	-	1 – 22	0116H	2 – 22	0216H
0 – 23	-	1 – 23	0117H	2 – 23	0217H
0 – 24	-	1 – 24	0118H	2 – 24	0218H
0 – 25	-	1 – 25	0119H	2 – 25	0219H
0 – 26	001AH	1 – 26	011AH	2 – 26	021AH
0 – 27	001BH			2 – 27	-
0 – 28	-			2 – 28	-
0 – 29	-			2 – 29	-
0 – 30	-			2 – 30	-
0 – 31	-			2 – 31	-
0 – 32	-			2 – 32	0220H
0 – 33	-			2 – 33	0221H
0 – 34	0022H			2 – 34	0222H
0 – 35	0023H				
0 – 36	0024H				

Function	Register No	Function	Register No	Function	Register No
Group 3		Group 4		Group 5	
3 – 00	0300H	4 – 00	0400H	5 – 00	0500H
3 – 01	0301H	4 – 01	0401H	5 – 01	0501H
3 – 02	0302H	4 – 02	0402H	5 – 02	0502H
3 – 03	0303H	4 – 03	0403H	5 – 03	0503H
3 – 04	0304H	4 – 04	0404H	5 – 04	0504H
3 – 05	0305H	4 – 05	0405H	5 – 05	0505H
3 – 06	0306H	4 – 06	0406H	5 – 06	0506H
3 – 07	0307H	4 – 07	0407H	5 – 07	0507H
3 – 08	0308H	4 – 08	0408H	5 – 08	0508H
3 – 09	0309H	4 – 09	-	5 – 09	0509H
3 – 10	030AH	4 – 10	040AH	5 – 10	050AH
3 – 11	030BH	4 – 11	040BH	5 – 11	050BH
3 – 12	030CH	4 – 12	040CH	5 – 12	050CH
3 – 13	030DH	4 – 13	040DH	5 – 13	050DH
3 – 14	030EH	4 – 14	-	5 – 14	050EH
3 – 15	030FH	4 – 15	040FH	5 – 15	050FH
3 – 16	0310H	4 – 16	0410H	5 – 16	0510H
3 – 17	0311H			5 – 17	0511H
3 – 18	0312H			5 – 18	0512H
3 – 19	0313H			5 – 19	0513H
3 – 20	0314H			5 – 20	0514H
3 – 21	0315H			5 – 21	0515H
3 – 22	0316H			5 – 22	0516H
3 – 23	0317H			5 – 23	0517H
3 – 24	0318H			5 – 24	0518H
3 – 25	0319H			5 – 25	0519H
3 – 26	031AH			5 – 26	051AH
3 – 27	031BH			5 – 27	051BH
3 – 28	031CH			5 – 28	051CH
3 – 29	031DH			5 – 29	051DH
3 – 30	031EH			5 – 30	051EH
3 – 31	-			5 – 31	051FH
3 – 32	-			5 – 32	0520H
3 – 33	0321H			5 – 00	0500H
3 – 34	0322H			5 – 01	0501H
				5 – 02	0502H
				5 – 03	0503H
				5 – 04	0504H
				5 – 05	0505H

				5 – 06	0506H
				5 – 07	0507H
				5 – 08	0508H
				5 – 09	0509H
				5 – 10	050AH
				5 – 11	050BH
				5 – 12	050CH
				5 – 13	050DH

Function	Register No	Function	Register No	Function	Register No
Group 5		Group 6		Group 6	
5 – 33	0521H	6 – 00	0600H	6 – 41	0629H
5 – 34	0522H	6 – 01	0601H	6 – 42	062AH
5 – 35	0523H	6 – 02	0602H	6 – 43	062BH
5 – 36	0524H	6 – 03	0603H	6 – 44	062CH
5 – 37	0525H	6 – 04	0604H	6 – 45	062DH
5 – 38	0526H	6 – 05	0605H	6 – 46	062EH
5 – 39	0527H	6 – 06	0606H	6 – 47	062FH
5 – 40	0528H	6 – 07	0607H		
5 – 41	0529H	6 – 08	0608H		
5 – 42	052AH	6 – 09	0609H		
5 – 43	052BH	6 – 10	060AH		
5 – 44	052CH	6 – 11	060BH		
5 – 45	052DH	6 – 12	060CH		
5 – 46	052EH	6 – 13	060DH		
5 – 47	052FH	6 – 14	060EH		
5 – 48	0530H	6 – 15	060FH		
		6 – 16	0610H		
		6 – 17	0611H		
		6 – 18	0612H		
		6 – 19	0613H		
		6 – 20	0614H		
		6 – 21	0615H		
		6 – 22	0616H		
		6 – 23	0617H		
		6 – 24	0618H		
		6 – 25	0619H		
		6 – 26	061AH		
		6 – 27	061BH		
		6 – 28	061CH		
		6 – 29	061DH		

		6 – 30	061EH		
		6 – 31	061FH		
		6 – 32	0620H		

Function	Register No	Function	Register No	Function	Register No
Group 7		Group 8		Group 9	
7 – 00	0700H	8 – 00	0800H	9 – 00	0900H
7 – 01	0701H	8 – 01	0801H	9 – 01	0901H
7 – 02	0702H	8 – 02	0802H	9 – 02	0902H
7 – 03	0703H	8 – 03	0803H	9 – 03	0903H
7 – 04	0704H	8 – 04	-	9 – 04	0904H
7 – 05	0705H	8 – 05	0805H	9 – 05	0905H
7 – 06	0706H	8 – 06	0806H	9 – 06	0906H
7 – 07	0707H	8 – 07	0807H	9 – 07	0907H
7 – 08	0708H	8 – 08	0808H	9 – 08	0908H
7 – 09	0709H	8 – 09	0809H	9 – 09	0909H
7 – 10	070AH	8 – 10	080AH	9 – 10	090AH
7 – 11	070BH	8 – 11	-		
7 – 12	070CH	8 – 12	-		
7 – 13	070DH	8 – 13	080DH		
7 – 14	070EH	8 – 14	080EH		
7 – 15	070FH	8 – 15	080FH		
7 – 16	0710H	8 – 16	0810H		
7 – 17	0711H	8 – 17	-		
7 – 18	0712H	8 – 18	-		
7 – 19	0713H	8 – 19	-		
7 – 20	0714H	8 – 20	-		
7 – 21	0715H	8 – 21	0815H		
7 – 22	0716H	8 – 22	0816H		
7 – 23	0717H	8 – 23	0817H		
7 – 24	0718H	8 – 24	0818H		
7 – 25	0719H	8 – 25	0819H		
7 – 26	-	8 – 26	-		
7 – 27	-	8 – 27	-		
7 – 28	-	8 – 28	-		
7 – 29	-	8 – 29	-		
7 – 30	-	8 – 30	081EH		
7 – 31	-	8 – 31	-		
7 – 32	-	8 – 32	-		
7 – 33	0721H	8 – 33	-		
7 – 34	0722H	8 – 34	-		

7 – 35	0723H	8 – 35	0823H		
7 – 36	0724H	8 – 36	0824H		
7 – 37	0725H	8 – 37	-		
7 – 38	0726H	8 – 38	-		
		8 – 39	-		
		8 – 40	0828H		
		8 – 41	0829H		
		8 – 42	082AH		
		8 – 43	082BH		
		8 – 44	082CH		

Function	Register No	Function	Register No	Function	Register No
Group 10		Group 11		Group 11	
10 – 00	0A00H	11 – 00	0B00H	11 – 46	-
10 – 01	0A01H	11 – 01	0B01H	11 – 47	-
10 – 02	0A02H	11 – 02	0B02H	11 – 48	-
10 – 03	0A03H	11 – 03	0B03H	11 – 49	-
10 – 04	0A04H	11 – 04	0B04H	11 - 50	-
10 – 05	0A05H	11 – 05	0B05H	11 - 51	-
10 – 06	0A06H	11 – 06	0B06H	11 – 52	-
10 – 07	0A07H	11 – 07	0B07H	11 – 53	-
10 – 08	-	11 – 08	0B08H	11 – 54	-
10 – 09	0A09H	11 – 09	0B09H	11 – 55	0B37H
10 – 10	0A0AH	11 – 10	0B0AH	11 – 56	-
10 – 11	0A0BH	11 – 11	0B0BH	11 – 57	-
10 – 12	0A0CH	11 – 12	0B0CH	11 – 58	-
10 – 13	0A0DH	11 – 13	-	11 – 59	0B3BH
10 – 14	0A0EH	11 – 14	0B0EH	11 – 60	0B3CH
10 – 15	0A0FH	11 – 15	-	11 – 61	0B3DH
10 – 16	0A10H	11 – 16	-	11 – 62	0B3EH
10 – 17	0A11H	11 – 17	0B11H	11 – 63	0B3FH
10 – 18	0A12H	11 – 18	-	11 – 64	-
10 – 19	0A13H	11 – 19	-	11 – 65	-
10 – 20	0A14H	11 – 20	-	11 – 66	0B42H
10 – 21	0A15H	11 – 21	-	11 – 67	0B43H
10 – 22	0A16H	11 – 22	-	11 – 68	0B44H
10 – 23	0A17H	11 – 23	-	11 – 69	0B45H
10 – 24	0A18H	11 – 24	-	11 – 70	0B46H
10 – 25	0A19H	11 – 25	-	11 – 71	0B47H
10 – 26	0A1AH	11 – 26	-	11 – 72	0B48H
10 – 27	0A1BH	11 – 27	-	11 – 73	0B49H

10 – 28	0A1CH	11 – 28	-		
10 – 29	0A1DH	11 – 29	-		
10 – 30	0A1EH	11 – 30	-		
10 – 31	0A1FH	11 – 31	-		
10 – 32	-	11 – 32	-		
10 – 33	0A21H	11 – 33	-		
10 – 34	0A22H	11 – 34	-		
10 – 35	0A23H	11 – 35	-		
10 – 36	-	11 – 36	-		
10 – 37	-	11 – 37	-		
10 – 38	-	11 – 38	-		
10 – 39	0A27H	11 – 39	-		
10 – 40	0A28H	11 – 40	-		
		11 – 41	-		
		11 – 42	-		
		11 – 43	-		
		11 – 44	-		
		11 – 45	-		

Function	Register No	Function	Register No	Function	Register No
Group 12		Group 13		Group 14	
12 – 00	High WORD: 2510H Low WORD: 2511H	13 – 00	0D00H	14 – 00	0E00H
12 – 01	0C01H	13 – 01	0D01H	14 – 01	0E01H
12 – 02	0C02H	13 – 02	0D02H	14 – 02	0E02H
12 – 03	0C03H	13 – 03	0D03H	14 – 03	0E03H
12 – 04	0C04H	13 – 04	0D04H	14 – 04	0E04H
12 – 05	0C05H	13 – 05	0D05H	14 – 05	0E05H
12 – 06	-	13 – 06	0D06H	14 – 06	0E06H
12 – 07	-	13 – 07	0D07H	14 – 07	0E07H
12 – 08	-	13 – 08	0D08H	14 – 08	0E08H
12 – 09	-	13 – 09	0D09H	14 – 09	0E09H
12 – 10	-	13 – 10	0D0AH	14 – 10	0E0AH
12 – 11	0C0BH			14 – 11	0E0BH
12 – 12	0C0CH			14 – 12	0E0CH
12 – 13	0C0DH			14 – 13	0E0DH
12 – 14	0C0EH			14 – 14	0E0EH
12 – 15	0C0FH			14 – 15	0E0FH
12 – 16	0C10H			14 – 16	0E10H

12 – 17	0C11H			14 – 17	0E11H
12 – 18	0C12H			14 – 18	0E12H
12 – 19	0C13H			14 – 19	0E13H
12 – 20	0C14H			14 – 20	0E14H
12 – 21	-			14 – 21	0E15H
12 – 22	-			14 – 22	0E16H
12 – 23	-			14 – 23	0E17H
12 – 24	-			14 – 24	0E18H
12 – 25	-			14 – 25	0E19H
12 – 26	-			14 – 26	0E1AH
12 – 27	-			14 – 27	0E1BH
12 – 28	0C1CH			14 – 28	0E1CH
12 – 29	0C1DH			14 – 29	0E1DH
12 – 30	-			14 – 30	0E1EH
12 – 31	-			14 – 31	0E1FH
12 – 32	-			14 – 32	0E20H
12 – 33	-			14 – 33	0E21H
12 – 34	-			14 – 34	0E22H
12 – 35	-			14 – 35	0E23H
12 – 36	0C24H			14 – 36	0E24H
12 – 37	0C25H			14 – 37	0E25H
12 – 38	0C26H			14 – 38	0E26H
12 – 39	0C27H			14 – 39	0E27H
				14 – 40	0E28H
				14 – 41	0E29H
				14 – 42	0E2AH
				14 – 43	0E2BH

Function	Register No	Function	Register No	Function	Register No
Group 15		Group 16		Group 17	
15 – 00	0F00H	16 – 00	1000H	17 – 00	1100H
15 – 01	0F01H	16 – 01	1001H	17 – 01	1101H
15 – 02	0F02H	16 – 02	1002H	17 – 02	1102H
15 – 03	0F03H	16 – 03	1003H	17 – 03	1103H
15 – 04	0F04H	16 – 04	1004H	17 – 04	1104H
15 – 05	0F05H	16 – 05	1005H	17 – 05	1105H
15 – 06	0F06H	16 – 06	1006H	17 – 06	1106H
15 – 07	0F07H	16 – 07	1007H	17 – 07	-
15 – 08	0F08H	16 – 08	1008H	17 – 08	1108H
15 – 09	0F09H	16 – 09	1009H	17 – 09	1109H
15 – 10	0F0AH			17 – 10	110AH

15 – 11	0F0BH			17 – 11	-
15 – 12	0F0CH			17 – 12	110CH
15 – 13	0F0DH			17 – 13	110DH
15 – 14	0F0EH			17 – 14	110EH
15 – 15	0F0FH				
15 – 16	0F10H				
15 – 17	0F11H				
15 – 18	0F12H				
15 – 19	0F13H				
15 – 20	0F14H				
15 – 21	0F15H				
15 – 22	0F16H				
15 – 23	0F17H				
15 – 24	0F18H				
15 – 25	0F19H				
15 – 26	0F1AH				
15 – 27	0F1BH				
15 – 28	0F1CH				
15 – 29	0F1DH				
15 – 30	0F1EH				
15 – 31	0F1FH				
15 – 32	0F20H				

Function	Register No	Function	Register No	Function	Register No
Group 18		Group 20		Group 21	
18 – 00	1200H	20 – 00	1400H	21 – 00	-
18 – 01	1201H	20 – 01	1401H	21 – 01	-
18 – 02	1202H	20 – 02	1402H	21 – 02	-
18 – 03	1203H	20 – 03	1403H	21 – 03	-
18 – 04	1204H	20 – 04	1404H	21 – 04	-
18 – 05	1205H	20 – 05	-	21 – 05	1505H
18 – 06	1206H	20 – 06	-	21 – 06	1506H
		20 – 07	1404H	21 – 07	1507H
		20 – 08	1408H	21 – 08	1508H
		20 – 09	1409H		
		20 – 10	140AH		
		20 – 11	140BH		
		20 – 12	140CH		
		20 – 13	140DH		
		20 – 14	140EH		
		20 – 15	140FH		

		20 – 16	1410H		
		20 – 17	1411H		
		20 – 18	1412H		
		20 – 19	-		
		20 – 20	-		
		20 – 21	-		
		20 – 22	-		
		20 – 23	-		
		20 – 24	-		
		20 – 25	-		
		20 – 26	-		
		20 – 27	-		
		20 – 28	-		
		20 – 29	-		
		20 – 30	-		
		20 – 31	-		
		20 – 32	-		
		20 – 33	1421H		
		20 – 34	1422H		
		20 – 35	1423H		

Function	Register No				
Group 22					
22 – 00	1600H				
22 – 01	-				
22 – 02	1602H				
22 – 03	1603H				
22 – 04	1604H				
22 – 05	1605H				
22 – 06	1606H				
22 – 07	-				
22 – 08	1608H				
22 – 09	-				
22 – 10	160AH				
22 – 11	160BH				
22 – 12	160CH				
22 – 13	160DH				
22 – 14	160EH				
22 – 15	160FH				
22 – 16	1610H				
22 – 17	-				

22 – 18	1612H				
22 – 19	-				
22 – 20	-				
22 – 21	1615H				
22 – 22	1616H				
22 – 23	1617H				

1.1 BACnet Protocol Descriptions

The E510 inverter has a built-in BACnet MS/TP communication protocol. Control or monitor the inverter via BACnet allowing for reading and writing of specific parameters. The BACnet implementation supports the following standard objects:

- Inverter Objects
- Analog Input Value
- Digital Input Value
- Analog Output
- Digital Output
- Analog
- Digital

Refer to Table 1.1.3.1 for property information of each object. User can retrieve object properties using the dedicated BACnet software to control or monitor the inverter.

Table 1.1.3.1 Object and property supporting list

Property	Inverter (DEV)	Analog Input (AI)	Analog Output (AO)	Analog Value (AV)	Digital Input (BI)	Digital Output (BO)	Digital Value (BV)
Object_Identifier	V	V	V	V	V	V	V
Object_Name	V	V	V	V	V	V	V
Object_Type	V	V	V	V	V	V	V
System_Status	V						
Vendor_Name	V						
Vendor_Identifier	V						
Model_Name	V						
Firmware_Revision	V						
Applcation_Software_Supported	V						
Protocol_Version	V						
Protocol_Revision	V						
Protocol_Services_Supported	V						
Protocol_Object_Type_Supported	V						
Object_List	V						
Max_APDU_Length_Accepted							
Segmentation_Supported							
APDU_Timeout							
Number_Of_APDU_Retries							
Max_Masters	V						
Max_Info_Frames	V						
Device_Address_Binding							
Location	V						
Presnent_Value		V	V	V	V	V	V
Status_Flags							
Event_State							
Reliability							
Out_Of_Service							
Units		V	V	V			
Priority_Array							

Relinquish_Default							
Polarity							
Inactive_Text							
Active_Text							

1.1.1 BACnet Object Properties

This section gives an overview of the BACnet objects supported by the inverter.

Refer to Table 1.1.1.1 for the inverter property information.

Refer to Table 1.1.1.2 ~ Table 1.2.1.7 for object information that the inverter supports.

Table 1.1.1.1 – Inverter property list

Property	Inverter
Object_Identifier	DEV
Object_Name	VFD
Object_Type	8
System_Status	0
Vendor_Name	VFD
Vendor_Identifier	461
Model_Name	VFD
Firmware_Revision	0.14
Applocation_Software_Supported	0.14
Protocol_Version	1
Protocol_Revision	5
Protocol_Services_Supported	{ readProperty , writeProperty , who is }
Protocol_Object_Type_Supported	{ Analog_Input , Analog_Output, Analog_Value Binary_Input, Binary_Output, Binary_Value, Device}
Max_Masters	127
Max_Info_Frames	1

Table 1.1.1.2 Analog input property list (READ)

No.	Object Name	Description	Unit	Classification	Range
AI0	TM2 AIN	AI1 input	Volt	R	0 - 10
AI1	TM2 AIN2	AI2 input	Volt	R	0 - 10
AI2	Error code	Recent fault message	No Units	R	0 - 45
AI3	Freq cmd	Frequency command	Hz	R	0 - 60
AI4	Frequency	Output frequency	Hz	R	0 - 60
AI5	Current	Output current	Amps	R	
AI6	Control Mode	Control mode	No Units	R	0 - 2
AI7	Motor R-Volt	Motor rated voltage	Volt	R	
AI8	Motor R-HP	Motor rated power	horsepower	R	
AI9	Motor R-RPM	Motor rated rotation speed	No Units	R	
AI10	Motor R-Hz	Motor rated frequency	Hz	R	
AI11	CarrierFreq	Carrier frequency	kHz	R	4 - 16
AI12	Comm Station	INV communication station	No Units	R	1 - 254
AI13	BaudRate	Baudrate setting	No Units	R	0 - 3
AI14	BacnetSel	Communication mode selection	No Units	R	0 - 1
AI15	DevInstance	Inverter number	No Units	R	1 - 254

Table 1.1.1.3 – Analog output property list (READ/ WRITE)

No.	Object Name	Description	Unit	Classification	Range
AO0	Set frequency	Frequency command	Hz	R/W	0-599
AO1	TB2 AO1	Analog output voltage 1	Volt	R	0-10
AO2	-	-	-	-	-
AO3	Motor R-Amp	Motor rated current	Amps	R/W	0-65535
AO4	PwrL Sel	Momentary stop and restart selection	No Units	R	0-1
AO5	RestartSel	Number of Fault Auto-Restart Attempts	No Units	R	0-10
AO6	RestartDelay	Fault Auto-Restart Time	No Units	R	0-7200
AO7	FreqCommand1	Speed frequency setting-stage 0	seconds	R/W	0-599
AO8	FreqCommand2	Speed frequency setting-stage 1	Hz	R/W	0-599
AO9	FreqCommand3	Speed frequency setting-stage 2	Hz	R/W	0-599
AO10	FreqCommand4	Speed frequency setting-stage 3	Hz	R/W	0-599
AO11	FreqCommand5	Speed frequency setting-stage 4	Hz	R/W	0-599
AO12	FreqCommand6	Speed frequency setting-stage 5	Hz	R/W	0-599
AO13	FreqCommand7	Speed frequency setting-stage 6	Hz	R/W	0-599
AO14	FreqCommand8	Speed frequency setting-stage 7	Hz	R/W	0-599
AO15	FreqCommand9	Speed frequency setting-stage 8	Hz	R/W	0-599
AO16	FreqCommand10	Speed frequency setting-stage 9	Hz	R/W	0-599
AO17	FreqCommand11	Speed frequency setting-stage 10	Hz	R/W	0-599
AO18	FreqCommand12	Speed frequency setting-stage 11	Hz	R/W	0-599
AO19	FreqCommand13	Speed frequency setting-stage 12	Hz	R/W	0-599
AO20	FreqCommand14	Speed frequency setting-stage 13	Hz	R/W	0-599
AO21	FreqCommand15	Speed frequency setting-stage 14	Hz	R/W	0-599
AO22	FreqCommand16	Speed frequency setting-stage 15	Hz	R/W	0-599
AO23	RunMode	Main run command source	Hz	R/W	0-2
AO24	ReverseOper	Direction locked command	No Units	R/W	0-1
AO25	StoppingSel	Stop modes selection	No Units	R/W	0-1
AO26	FrequenceComm	Main frequency command source	No Units	R/W	0-5
AO27	FreqUpperLim	Upper limit frequency	No Units	R/W	0-599
AO28	FreqLowerLim	Lower limit frequency	HZ	R/W	0-598.99
AO29	Acc Time1	Acceleration time 1	HZ	R/W	0-6000.0
AO30	Dec Time1	Deceleration time 1	seconds	R/W	0-6000.0

Table 1.1.4.4 Analog value property list (READ/ WRITE)

No.	Object Name	Description	Unit	Classification	Range
AV0	PID – P Gain	Proportional gain (P)	No Units	R/W	0 - 10
AV1	PID – I Time	Integral time (I)	No Units	R/W	0 - 100
AV2	PID – D Time	Differential time (D)	No Units	R/W	0 – 10

Table 1.1.1.5 Digital input property list (READ)

No.	Object Name	Description	Unit	Classification	Range
BI0	Run/Stop	Operation status	Stop / Run	R	0 - 1
BI1	Direction	Operation direction	FWD/REV	R	0 - 1
BI2	status	Inverter status	OK/Fault	R	0 - 1
BI3	Abnormal	Error occurs	Close/Open	R	0 - 1
BI4	DI_1 status	S1 status	Close/Open	R	0 - 1
BI5	DI_2 status	S2 status	Close/Open	R	0 - 1
BI6	DI_3 status	S3 status	Close/Open	R	0 - 1
BI7	DI_4 status	S4 status	Close/Open	R	0 - 1
BI8	DI_5 status	S5 status	Close/Open	R	0 - 1
BI9	DI_6 status	Operation status	Close/Open	R	0 - 1

Table 1.1.1.6 Digital output property list (READ/ WRITE)

No.	Object Name	Description	Unit	Classification	Range
BO0	RY1 status	Relay output 1 status	Close/Open	R	0 - 1
BO1	RY2 status	Relay output 2 status	Close/Open	R	0 - 1
BO2	-	-	-	-	-

Table 1.1.1.7 Digital value property list (READ/ WRITE)

No.	Object Name	Description	Unit	Classification	Range
BV0	RUN/STOP	RUN/STOP	Stop / Run	R/W	0 - 1
BV1	FWD/REV	FWD/REV	FWD/REV	R/W	0 - 1

TECO   **Westinghouse**

INVERTER

E510

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