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Preface

Thank you for choosing the EM760-CM-TP1 (ModbusTCP) communication card developed by Sine Electric.

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EM760-CM-TP1(ModbusTCP)communication option card independently developed by Sine Electric It is an optional accessory for the Sine Electric EM 760 series high-performance vector inverter. When using ModbusTCP bus communication, this communication card is required. So that through this option card, The inverter is connected to the bus to realize bus communication.

Main features of the product:

1. Support ModbusTCP protocol and ModbusTCP slave station.
2. It has two ModbusTCP ports and can connect up to two client devices.
3. Support star network topology and linear network topology

Before using this product, please read this manual carefully and keep it properly.

Since we are always committed to improving our products and product information, the information provided by our company is as follows: Subject to change without prior notice.

For the latest changes and more, visit www.sinee.cn, or call 400-601-9298 Contact us.

Chapter 1 EM760-CM-TP1 Introduction

1.1 Features

1. Support ModbusTCP Agreement, support ModbusTCP Slave station.
2. Have two ModbusTCP port, up to two client devices can be connected.
3. Support star network topology and linear network topology

1.2 Functional specifications

ModbusTCP Network Interface:

Signal Terminal	definition
CH0	aisle0
CH1	aisle1

Note: Two channels IP Address, MAC The address is the same.

Interface with frequency converter:

project	Specification
Connectors	20PIN Connector pin terminal
Transmission method	SCI communication
Terminal Function	1. The communication card communicates with the inverter through this interface 2. The communication card obtains working power through this interface
Network Protocol	Modbus Protocol

Electrical specifications

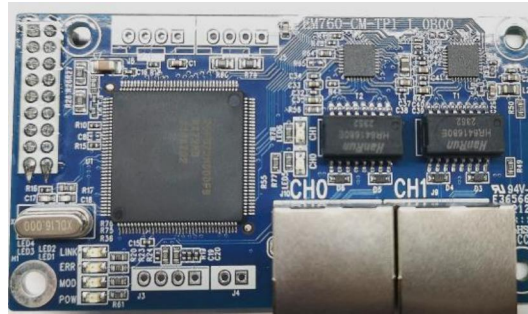
project	Specification
Supply voltage	5VDC (provided by inverter)
Insulation voltage	500VDC
Communication line power consumption	0.8W
Power consumption	1W
weight	25g

Environmental specifications

project	Specification
Anti-interference immunity	ESD(IEC 61800-5-1, IEC 6100-4-2) EFT(IEC 61800-5-1, IEC 6100-4-4) Surge Test(IEC 61800-5-1, IEC 6100-4-4) Conducted Susceptibility Test(IEC 61800-5-1, IEC 6100-4-6)
Operating/Storage Environment	Operation: -10°C~40°C, humidity 90% Storage: -25°C~80°C, humidity 95%
Impact/shock resistance	International standards IEC 61800-5-1, IEC 60068-2-6

Chapter 2 Product appearance and installation information

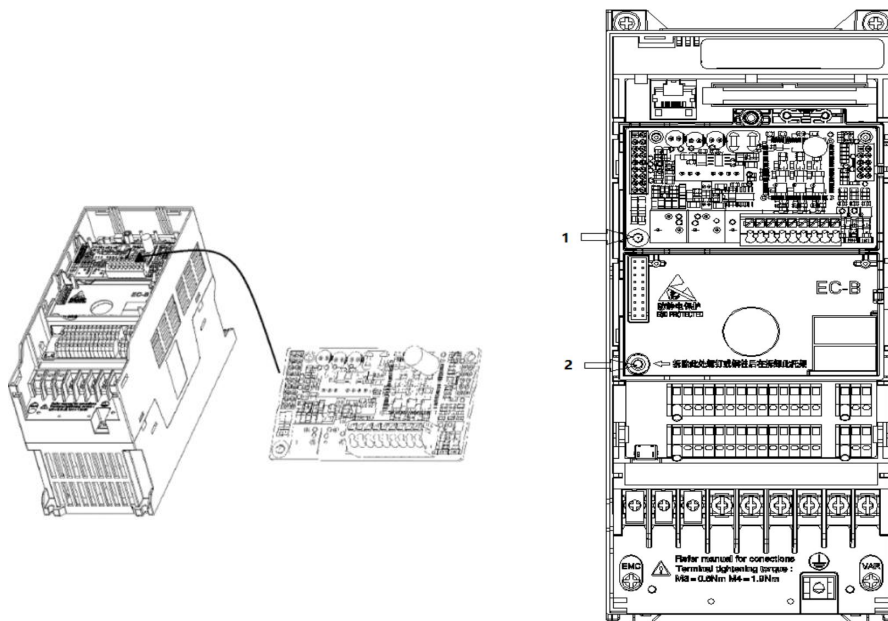
2.1 EM760-CM-TP1 Communication card physical picture



Picture 2.1.1

2.2 EM 760- CM - TP 1 Communication card and inverter connection

- closureEM760High performance vector inverter power supply.
- OpenEM760Inverter cover.
- First remove the expansion card bracket screws (Figure2.2.1 Medium 1 and2 position), use a slotted screw Use a screwdriver to fix the copper pillar that comes with the card to the original screw hole position, take out the expansion card and align it with the positioning pillar Press down, and then use screws to lock the expansion card and the copper pillar to complete the installation.



Picture 2.2.1

2.3 EM 760 Series inverter communication parameter setting

Inverter connection After installing the ModbusTCP communication card, the inverter communication parameters must be set according to Table 2.3.1. After setting the communication parameters, manually reset the communication card once, and the ModbusTCP master station can start and stop the inverter.

Table2.3.1

Parameter	Parameter name	Parameter setting value	Meaning
F00.02	Command source selection	2	The operation command is controlled by the communication card
F00.04	Main frequency source A choose	7	The frequency command is given directly by the communication card
F00.36	Communication control start and stop channel selection	4	ModbusTCP Communication control start and stop
F00.37	Communication given channel selection	4	ModbusTCP Communication control data given
F10.47	Communication card status	-	Thousands :CH0Channel Status 0: Communication card initialization 1: Starting TCPProtocol Stack 2: Waiting for client connection 3: Client connection successful 4: Communication card failure
F10.48	Communication card software version	-	
F10.52	Communication card manual reset	-	0: No operation 1: Communication card reset
F10.64	Communication card fault code	-	high 8 Bit Data: CH1 aisle shape state, same F10.47 Low8Bit Data: 1: Physical link failure 2: Start TCPProtocol stack failure

			4: Communication with the inverter is abnormal 8: The connection with the client is abnormally disconnected 16: Client communication timeout
F10.66	IPAddress	192	IPAddress: 192.168.0.2
F10.67	IPAddress	168	
F10.68	IPAddress	0	
F10.69	IPAddress	2	
F10.70	Subnet Mask High 16Bit	0xFFFF	Subnet mask: 255:255:0:0
F10.71	Subnet Mask Low 16Bit	0	
F10.72	Default Gateway High 16Bit	0xC0A8	Default Gateway: 192.168.0.1
F10.73	Default Gateway Low 16Bit	0x0001	
F10.74	MAC The address starts with two bytes	0x7490	MAC Address: 74:90:50:00:79:0A
F10.75	MAC The middle two bytes of the address	0x5000	
F10.76	MAC The last two bytes of the address	0x970A	
F10.77	ModbusTCP Bus timeout	0.0s	0.0s~10.0s, used to detect whether the communication with the client master station is normal. After connecting with the client to receive a frame of ModbusTCP data, if the client data is not received within the time set by this function code, the communication is judged to be abnormal and the inverter reports E16 fault. If it is set to 0, no detection will be performed.

2.4 Indicator Lights

Communication card and inverter communication indicator MOD

state	illustrate
Steady on (green)	The communication card and the inverter communicate normally
Destroy	Communication card and inverter communication abnormality

Communication card power indicator POWER

state	illustrate
Steady on (green)	Communication card power supply is normal
Destroy	Communication card power supply abnormality

Communication card fault indicator ERR

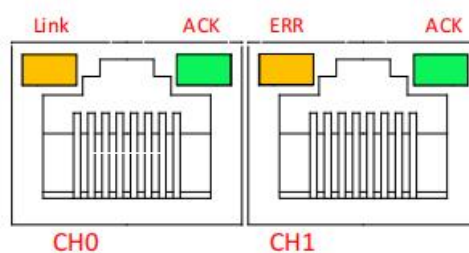
state	illustrate
Steady on (red)	Communication card failure
Flash	Inverter failure
Destroy	Communication card is working properly

Communication card status indicator LINK

state	illustrate
Destroy	Communication card is initializing
Flash	Communication card waiting for connection
Always on	Communication card connected successfully

Communication card channel status indicator CH0/CH1

state	illustrate
Destroy	Channel not used
Bright	Channel in use



Communication card network port communication indicator

state	illustrate
LinkAlways on	Indicates that an Ethernet connection has been established
Link Flash	Waiting for link
LinkDestroy	Indicates that no Ethernet connection is established
ACK Flash	Indicates that data interaction is in progress
ACK Destroy	Indicates that no data interaction is performed
ERRAlways on	Communication card failure
ERRFlash	Inverter failure

Chapter 3 Communication Examples

3.1 IP Address Settings

Users can use function codes F10.66~F10.76 to set up ModbusTCP from the station IP address and MAC address and other information, generally only need to set IP address information. Default gateway and MAC address, etc. automatically based on IP address.

Address adjustment, ensure that the default gateway and IP address are set in the same network segment, different IP address of the communication card MAC address is different.

3.2 ModbusTCP Communication Protocol

ModbusTCP communication card uses the network port communication interface as a communication slave to access a single host and multiple slaves of PC/PLC control network. Users can use computers or PLC centralized control is achieved through this communication protocol. Set the inverter operation command, modify or read parameters, read the inverter's working status and fault information, etc.

ModbusTCP Communication card support Modbus-TCP slave communication protocol. This communication protocol defines the communication. If the slave device encounters an error when receiving information or cannot complete the communication, the slave will organize a fault message as a response to the action required by the host.

The Modbus-TCP protocol communication data format is as follows. The inverter only supports the reading or writing of Word type parameters. The corresponding communication read operation command is 0x03; the write operation command is 0x06; the multi-write operation command is 0x10; not supported. Supports byte or bit read and write operations.

Figure 3.2.1 ModbusTCP Data frame structure

MBAP Header				PDU	
Transaction Identifier	Protocol Identifier	length	Unit Identifier	Function code	Data Field
2 bytes	2 bytes	2 bytes	1 byte	1 byte	N bytes

Figure 3.2.2 MBAP Message header structure

Domain	Describe	Client	Server
Transaction Identifier	Modbus Request/Response Service ID	Client startup	The server copies the received request
Protocol Identifier	0x0000 represent Modbus protocol	Client startup	The server copies the received request

length	Contains unit identifier, function bytes for code and data fields number	Client startup (please beg)	Server start (response)
Unit Identifier	Slave device address	Client startup	The server copies the received request

3.2.1 0x03 Read multiple registers or status word function code

In a remote device, use this function code to read the contents of a continuous block of holding registers. PDUThe starting register address and the number of registers are specified.

The register data in the response message is divided into two bytes for each register. The first byte includes the high-order bits, and the second byte includes the low-order bits

askPDU

Function code	1 Bytes	0x03
Starting address	2 Bytes	0x0000~0xFFFF
Number of registers	2 Bytes	1~16

responsePDU

Function code	1 Bytes	0x03
Number of bytes	1 Bytes	2×N*
Register Value	N*×2 Bytes	

N*=Number

of registers

mistakePDU

Error code	1 Bytes	0x83
Exception code	1 Bytes	See table3

The following is a request to read registers F19.00~F19.05 (the most recent fault related information). example :

Ask		Response			
domain name	(ten six Enter system)	Domain name (normal)	(ten six Enter system)	domain name (different often)	(ten Six system)
Function code	03	Function code	03	Function	83
Starting addressHi	13	Number of bytes	0C	Exception code	03 (Example, below same)
Starting addressLo	00	send live Device value Hi (F19.00)	00		

Number of registers Hi	00	send live Device value Lo (F19.00)	11	
Number of registers Lo	06	send live Device value Hi (F19.01)	00	
		send live Device value Lo (F19.01)	00	
		send live Device value Hi (F19.02)	00	
		send live Device value Lo (F19.02)	00	
		send live Device value Hi (F19.03)	01	
		send live Device value Lo (F19.03)	2C	
		send live Device value Hi (F19.04)	00	
		send live Device value Lo (F19.04)	00	
		send live Device value Hi (F19.05)	00	
		send live Device value Lo (F19.05)	00	

From the returned data, we can see that the inverter has 17 (0011H) Temperature sensor abnormality. When the output frequency is 0.00Hz, the output current is 0.00A, the bus voltage is 300V (012CH), acceleration and deceleration The status is standby and the working time is 0hour.

3.2.2 0x06 Write single register or command function code

Use this function code to write a single holding register in a remote device.

Ask The PDU specifies the address of the register to be written.

A normal response is the answer to the request and is returned after the register contents are written.

Ask PDU

Function code	1Bytes	0x06
Register Address	2Bytes	0x0000~0xFFFF
Register Value	2Bytes	0x0000~0xFFFF

responsePDU

Function code	1Bytes	0x06
Register Address	2Bytes	0x0000~0xFFFF
Register Value	2Bytes	0x0000~0xFFFF

mistakePDU

Error code	1Bytes	0x86
Exception code	1Bytes	See table

The following is a request to 1 Example of changing the drive control mode (F00.01) to "2: FVC":

Ask		Response			
domain name	(ten six Enter system)	Domain name (normal)	(sixteen Enter system)	domain name (differ ent often)	(ten Six system)
Function	06	Function	06	Function	86
Register Address Hi	00	Register Address Hi	00	Exception code	03
Register Address Lo	01	Register Address Lo	01		
Register ValueHi	00	Register Value Hi	00		
Register ValueLo	02	Register Value Lo	02		

3.2.3 0x10 Write multiple registers or command function code

Use this function code to write a block of consecutive registers (1 to 16 registers) in a remote device.

The value requested to be written is specified in the request data field.
Each register divides the data into two bytes.

A normal response returns the function code, the starting address, and the number of registers to be written.

Ask PDU

Function code	1Bytes	0x10
Starting address	2Bytes	0x0000~0xFFFF
Number of registers	2Bytes	1~16
Number of bytes	1Bytes	2×N*
Register Value	N*×2Bytes	

N*=Number
of registers
responsePDU

Function code	1Bytes	0x10
Starting address	2Bytes	0x0000~0xFFFF
Number of registers	2Bytes	1~16

mistakePDU

Error code	1Bytes	0x90
Exception code	1Bytes	See table3

The following is a request that will00 01and00 03WriteF03.00Start 2registers (i.e. setting Y1andY2Output terminal function) example:

Ask		Response			
domain name	(ten six Enter system)	domain name (just often)	(ten six Enter system)	domainname ((Hexadecimal different often)	(Hexadecimal system)
Function	10	Function	10	Function	90
Starting addressHi	03	Starting addressHi	02	Exception code	03
Starting addressLo	00	Starting addressLo	03		
Number of registersHi	00	Number of registersHi	00		
Number of registersLo	02	Number of registers Lo	02		
Number of bytes	04				
send live Device value Hi (F03.00)	00				
send live Device value Lo (F03.00)	01				
send live Device value Hi (F03.01)	00				
send live Device value Lo (F03.01)	03				

surface3Exception code definition

Exception code	name	meaning
01H	Illegal function	The function code received by the slave (inverter) is out of the configured range
02H	Illegal data site	The data address received from the slave (inverter) is not a permitted address; in particular, The combination of register start address and transfer length is invalid
03H	Illegal data frame	The length of the data received from the slave (inverter) or CRC Check is incorrect
04H	Slave device failure	unrecoverable error occurred when the slave (inverter) attempted to perform the requested operation . The reason is a logical error or write EEPROM Failure, etc.
05H	Data out of range	The data received by the slave (inverter) exceeds the minimum to maximum value range of the corresponding register
06H	Parameters read only	The current register is read-only and cannot be written.
07H	Parameters running Unchangeable	The inverter is in operation. The current register cannot be written. Please stop the machine.
08H	Parameters are protected by password Protect	The current register is password protected

3.3 Common fault analysis

1. Function code F16.14/F16.15 = 3. The keyboard display is recognized as CA Nopen Card.

reason:

①: The current control board software version is too old and not supported ModbusTCP Communication card.

②: The current communication card is damaged.

2. Modification IP Cannot use PING after address Command verification communication.

reason:

①: Not used after modification F10.52 Control communication card reset

②: MAC Address Conflict

3. PLC Communication timeout occurs when controlling multiple linear connection devices to establish communication connections.

reason:

①: When the PLC starts to send Ethernet data frames for the first time, it sends broadcast data to query the IP address setting. Prepared MAC address, establish The connection between MAC address and IP address exists for a long time. It is recommended to increase the communication timeout judgment time.

4. Frequency converter alarm E16 Fault

reason:

F10.64 The lower eight bits are 1: Communication card is damaged. CH0 or CH1 Channel abnormality.

F10.64 The lower eight bits are 2: Communication card is damaged. TCP/IP The protocol stack failed to start.

F10.64 The lower eight bits are 4: The inverter communication is abnormal, the returned data is abnormal, and the control board is damaged.

The lower eight bits of F10.64 are 8: The communication connection with the master station is abnormally disconnected. The network cable is loose or The previous communication card is damaged.

F10.64 The lower eight bits are 16: Communication with the master station is abnormal.
F10.75 Set time No data was received from the master station.

Appendix Communication command function code

Function Code 0000H~6F63H		For function code FXX.YY, the high bit of the address is the hexadecimal of XX. Low isYY Hexadecimal. like F12.03, its address is 0C03H (12D=0CH, 03D=03H). Data that needs to be written frequently but does not need to be saved without power failure can be stored at address +8000H.	
Control Commands (write only) 7000H~71FFH	7000H Control Word	0000H	Invalid instruction
		0001H	Forward operation
		0002H	Reverse operation
		0003H	JOG Forward
		0004H	JOG Reversal
		0005H	Slow down and stop
		0006H	Fast parking
		0007H	Free parking
	7001H	Main channel frequency A Communication percentage Than given	-100.00%~100.00% (Maximum frequency base allow)
	7002H	Auxiliary channel frequency B communication percentage Than given	-100.00%~100.00% (Maximum frequency base allow)
	7003H	Torque communication setting	-200.00%~200.00% (Digital given base allow)
	7004H	processPID Given communication given	-100.00%~100.00%
	7005H	processPID Feedback communication setting	-100.00%~100.00%
	7006H	VF Separation mode voltage setting	0.00%~100.00%
	700FH	Master-slave communication setting	-100.00%~100.00% (most big value base allow)
	7015H	Main channel frequency A Communication given	0.00~Fmax
	7016H	Auxiliary channel frequency B Communication given	0.00~Fmax
	7017H	Upper limit frequency communication setting	0.00~Fmax
	7018H	The upper limit frequency of torque control is Information given	0.00~Fmax

Working status 7200H~73FF H	7200H Status word 1	Bit7~0 Running status	00H	Parameter settings
			01H	Slave operation
			02H	JOGrun
			03H	Self-learning operation
			04H	Slave machine parking
			05H	JOGparking
			06H	Fault Status
			07H	Factory self-inspection
		Bit15~8 Fault Information	00H	The inverter is operating normally
			xxH	Inverter fault status, "xx" is the fault code code
	7201H Status word2	Bit0 Given direction	1	- Given valid
			0	+ Given Valid
		Bit1 Running direction	1	Frequency output inversion
			0	Frequency output forward
		Bit3~2 How it works	00	Speed control method
			01	Torque control method
			10	Servo control method
			11	reserve
	7202H Monitoring frequency +/- Status word 1 (1: -; 0: +)	bit0	Output frequency	
		bit1	Given frequency	
		bit2	Synchronous frequency	
		bit3	PGCard feedback frequency	
		bit4	Estimating feedback frequency	
		bit5	Estimated slip frequency	
		Bit6	Load speed	
		Bit15~6	reserve	
	7203H	Output frequency		
	7204H	Output voltage		
	7205H	Output Power		
	7206H	Operating speed		
	7207H	Bus voltage		
	7208H	Output torque		
	7209H	Switch input 1	bit15~bit1correspondX16~X1	
	720AH	Switch input 2	bit 15~ bit 8 corresponds to VX 8~ VX 1; bit 3~ bit 0 corresponds to AI4~AI3	
	720BH	Switching output 1	bit15~bit0 right answer Y 14/Y13/.../Y3/Y2/Y1/R2 /R1	

	720CH	Switching output 2	bit15~bit8correspondXY8~VY1	
	720DH	The first two failures		
	720EH	The first three failures		
	720FH	The most recent failure		
	7210H	The most recent fault output frequency		
	7211H	The most recent fault output current		
	7212H	The bus voltage at the most recent fault		
	7213H	The most recent fault operation status		
	7214H	The last fault working time		
	7215H	Set acceleration time		
	7216H	Set deceleration time		
	7217H	Cumulative length		
	7218H	reserve		
	7219H	UP/DOWNOffset frequency sign (0/1: +/-)		
	7222H	Bit7~0 Running status	00H	Shutdown status
			01H	Forward operation (upward)
			02H	Reverse run (downward)
			03H	JOGForward
			04H	JOGReversal
			05H~0FFH	reserve
		Bit15~8 Fault Information	00H	Inverter is normal
			xxH	Inverter fault status, "xx" is fault Fault Code
	7224H	Output Current		
	7225H	Given frequency		
	7226H	Current load capacity	Unit: 0.1t	
	7227H	Current altitude	Unit: 1m	
	7228H	Cumulative power- on time		
	7230H	Warning Signs	0: No warning; Others: Current warning indicator.	