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Chapter 1 Introduction to EM760-CM-EC1

1.1 Product Features

- 1 Supports EtherCAT COE 402 and 301 protocols .
- 2 Supports automatic configuration of network address and setting of network address.
- 3 Supports EtherCAT synchronization cycle and can respond to the minimum synchronization cycle data of 500us. The frequency converter supports contour speed mode and contour torque mode. The running speed or torque data is issued by the master station, and parameters such as acceleration and deceleration time are determined by the inverter function code parameters.
- 4 Supported services include : P DO process data, SDO mailbox data, manufacturer-defined object dictionary, SDO read and write inverter function codes.

1.2 Functional Specifications

1 EtherCAT pass port :

EtherCAT Communication specifications	physical layer	100BASE-TX
	Communication Interface	RJ45 (IN/input, OUT/output)
	Network Architecture	Series connection
	Transmission rate	2*100Mbps (full duplex)
	Data frame length	Maximum bytes
	SyncManager	SM0 : Mailbox output SM1 : Mailbox input SM2 : Periodic data output SM3 : Periodic data input
	Application layer protocol	CoE : CANopen over EtherCAT
	synchronous mode	DC synchronous mode (SYNC0)
	communication object	SDO : Aperiodic Data Object PDO : Periodic Data Object
	LED indicator light (located in RJ45 interface)	EtherCAT ERR(ER)x1 EtherCAT Link/Activity(L/A)x2 EtherCAT RUN(RN)x1

	Application layer specifications	IEC61800-7 CiA402 Drive Profile
Supported CiA402 operating modes	1: Speed control mode 2: Torque control mode	

2 Interface with frequency converter:

project	Specification
Connector	2 0 PIN connector pin terminal
transfer method	SCI Communications
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

3 Electrical Specifications

project	Specification
voltage	5 VDC (provided by frequency converter)
Insulation voltage	5 00VDC
Communication line power consumption	0.8W _
power consumption	1 W
weight	2 5g _

4 Environmental specifications

project	Specification
Immunity	ESD(IEC 61800-5-1,IEC 6100-4-2) EFT(IEC 61800-5-1,IEC 6100-4-4) Surge Teat(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/impact resistance	International standards IEC 61800-5-1 , IEC 60068-2-6

Chapter 2 Product Appearance and Installation Information

2.1 EM760-CM- E C1 communication card physical picture



Figure 2.1.1

2.2 EM760-CM- E C1 communication card and inverter connection

- Turn off the power supply of EM760 high-performance vector inverter.
- Open the upper cover of the EM760 inverter.
- First remove the expansion card bracket screws (positions 1 and 2 in Figure 2.2.1 are both acceptable), use a flat-blade screwdriver to fix the copper post that comes with the card at the original screw hole position, take out the expansion card and align it with the positioning post Press down, and then use screws to lock the expansion card and the copper pillar to complete the installation.

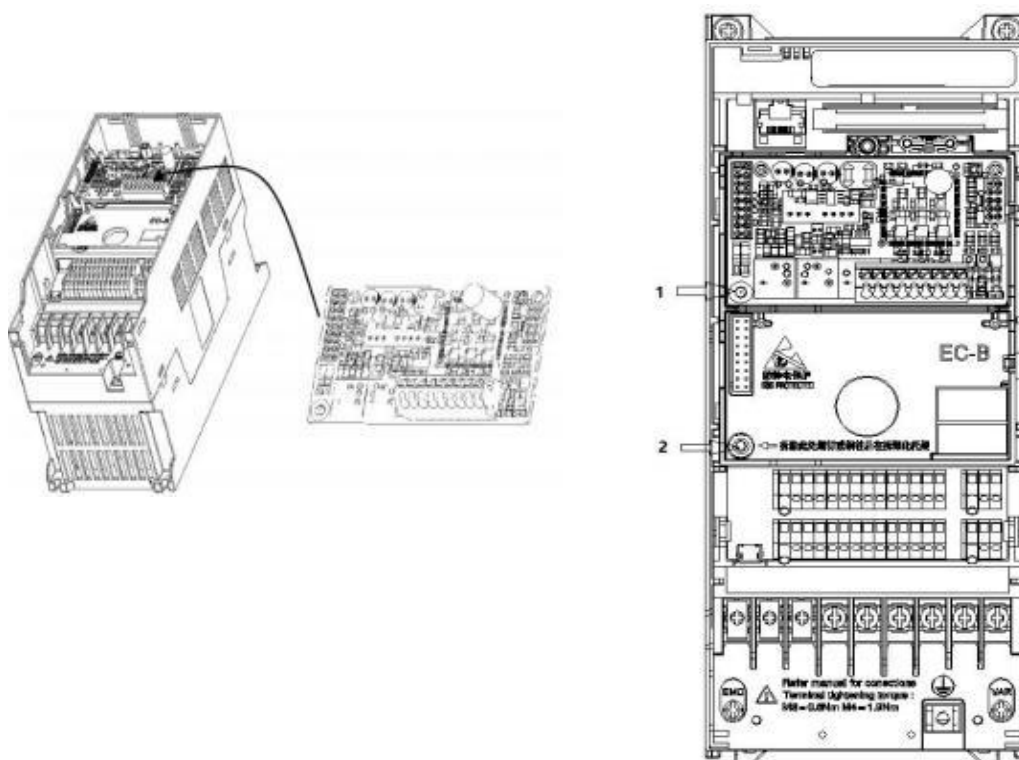


Figure 2. 2

2. 3 EM760 series inverter communication parameter setting

the Ether CAT communication card, the communication parameters of the frequency converter must be set according to Table 2.3.1 . After setting the communication parameters, the Ether CAT master station can start and stop the inverter.

Table 2.3. 1

parameter	parameter name	Parameter value	meaning
F00.02	Command source selection	2	The running command is controlled by the communication card
F00.04	Main frequency source A selection	7	The frequency command is given directly by the communication card
F00.36	Communication control start and stop channel selection	2	EtherCAT communication control start and stop
F00.07	Communication given channel selection	2	EtherCAT communication control data given
F10.51	Process data address given method	-	0: keyboard configuration 1: Master station configuration
F10.63	Slave node address alias	-	Set node address alias when using node addressing

Remark

F10.51 is set to 0, which can be used for master stations that do not need to import ESI (. xml). Please set F 10.51 to 1 when the main station needs to import ESI (. xml) file .

After the required inverter parameters are set, a communication connection is established with the master station.

After the slave node address alias is set, the communication card needs to be manually reset. Set F 10.52 to 1 and reset the communication card software. F 10.52 is reset to 0.

Chapter 3 Communication Examples

3.1 Function code and object dictionary

Object dictionary index = 0x2000+ first two digits of function code

Object dictionary sub-index = last two digits of function code + 1

For example:

Function code F 00.07 object dictionary index 0x 2000, sub-index 0x 08.

Function code F18. 12 object dictionary index 0x 2012, sub-index 0x0D.

3.2 SDO reads and writes inverter parameters

Take setting the digital given frequency of F00.07 as an example. Write data 5 000 to the object dictionary 0x 2000 and sub-index 0x 08. You can set F00.07 to 5 0. 00 hz .

When setting the function code F02.32 analog input curve selection, if you want to set the A11 curve selection curve four, you need to set the ones digit of the value of F 02.32 to 3. At this time, you cannot directly enter the object dictionary 0x 2002 , sub-index Write data 3 in 0x 21. Data 3 210 should be read first , and then 3 213 should be written. Even when using SDO to write data to the frequency converter, only a whole two-byte data can be read and written. It is recommended to directly use the LCD keyboard provided with EM760 to modify such function codes.

3.3 PDO process data configuration method

The EM760-CM-EC1 communication card uses two object dictionaries 0x1600 and 0x1A00 as the mapping parameter table of PDO data by default, and supports the mapping of a maximum of 16 object dictionaries. The default value of sub-index 0x01 of 0x1600 is 0x30000110, which is the control word of the frequency converter (see Appendix 2). The default value of sub-index 0x01 of 0x1A00 is 0x32000110, which is the status word of the frequency converter. Modification of the control word and status word addresses is prohibited. The sub-indexes 0x02~0x10 of 0x1600 and the sub-indexes 0x02~0x10 of 0x1A00 can be freely configured by the user. In the EM760 series inverter user manual, the attributes are marked as : "●" is a parameter that can be changed in any state and can be mapped to Rx PDO and Tx PDO . "×" is a read-only parameter and can be mapped to Tx PDO . A detailed mappable object dictionary can be viewed in T winCAT .

The method introduced below is mainly suitable for master stations such as motion controllers that do not have a graphical operation interface. Set the default PDO configuration of the driver in the master station.

1、**Keyboard configuration method**, this method requires setting F 10.51 = 0 ;

Function codes F 10.16 ~ F 10.31 correspond to 0x 1600 sub-index 0 x 02 ~ 0x10 . Setting 7 in F 10.16 means setting 0x 20000810 in 0x 1600:02 and mapping function code F 00.07 (object dictionary index 0x2000 , sub-index 0x 08 , data length 0x 10) into the process data. The setting methods for other function codes are the same.

Function codes F 10.32 ~ F 10.46 correspond to 0x 1 A 00 sub-index 0 x 02 ~ 0x10 . Setting 4609(0x1201) in F 10.32 means setting 0x 20120210 in 0x 1 A 00:02 . And mapping the function code F 18.01(object dictionary index 0x 2012 , sub-index 0x 02 , data length 0x 10) into the process in the data. The setting methods for other function codes are the same.

configuring the PDO process data mapping table on the keyboard, you need to set the data in F 10.16 ~ F 10.31 or F 10.32 ~ F 10.46 in sequence . You cannot skip a certain function code without setting it. The default PDO configuration of the driver needs to be set in the master station . The master station that requires ESI (.xml) file cannot be configured using this method.

2. **Master station configuration method** . This method requires setting F 10.51= 1 ;

Configuration steps :

1. Confirm that the slave station is in pre -op state. That is, function code F 10.47 = 1XXXX.
2. Stop PDO allocation function (sub-index 0x00 of 0x1C12 and 0x1C13 is set to 0) ;
3. Stop the PDO mapping function (sub-index 0x00 of 0x1600 and 0x1A00 are all set to 0);
4. Set the mapping address of the PDO mapping object (0x1600 and 0x1A00); Write 32 -bit object dictionary data to 0x1600:01~0x1600:10 , such as 0x20000810 (F 00.07). Write 32 - bit object dictionary data to 0x1A 00:01~0x1600 : 10 , such as 0x 20120210 (F18.01) .
5. Set the largest sub-index mapped by PDO mapping objects (0x1600 and 0x1A00) .
6. Set the PDO allocation object (set sub-index 0x01 of 0x1C12 and 0x1C13 to 0x 1600 and 0x 1A00 respectively).
7. Re-open the PDO allocation function (set sub-index 0x00 of 0x1C12 and 0x1C13 to 1).

3. 4 Frequency converter start and stop control

Run the command given directly:

For details of the inverter communication and status function codes, see Appendix 2. The control word is 7 000h (object dictionary index 0x 3000 , sub-index 0 x 01). The status word is 7 200 h (object dictionary index 0x 3200 , sub-index 0 x 01) .Write the corresponding control command code into 0x 3000:01 through SDO to control the start and stop operation of the inverter. Read the data in 0 x 3200:01 to obtain the status information of the inverter. When the EtherCAT communication connection is interrupted, the operating fate is still valid.

Run command PDO given:

using PDO process data, the value of 0x 1600:01 in the object dictionary is fixed to 0x 30000110 , and the value of 0x 1A00:01 is fixed to 0x 32000110, and modification is prohibited. The process data issued by the master station will only take effect when the run command is written in 7 000 H (object dictionary index 0x 3000 , sub-index 0 x 01) and written into the inverter function code. When the EtherCAT communication connection is interrupted, the inverter automatically stops, and the shutdown mode is determined by function code F 04.19 . If you need to stop the machine in an emergency, you can use the EM760 supporting LCD keyboard to press the stop key to stop the machine (F 12.01 needs to be set to 1), and the F 00.02 command source will automatically switch to keyboard control. When using communication card control again, you need to set F 00. 02 = 2

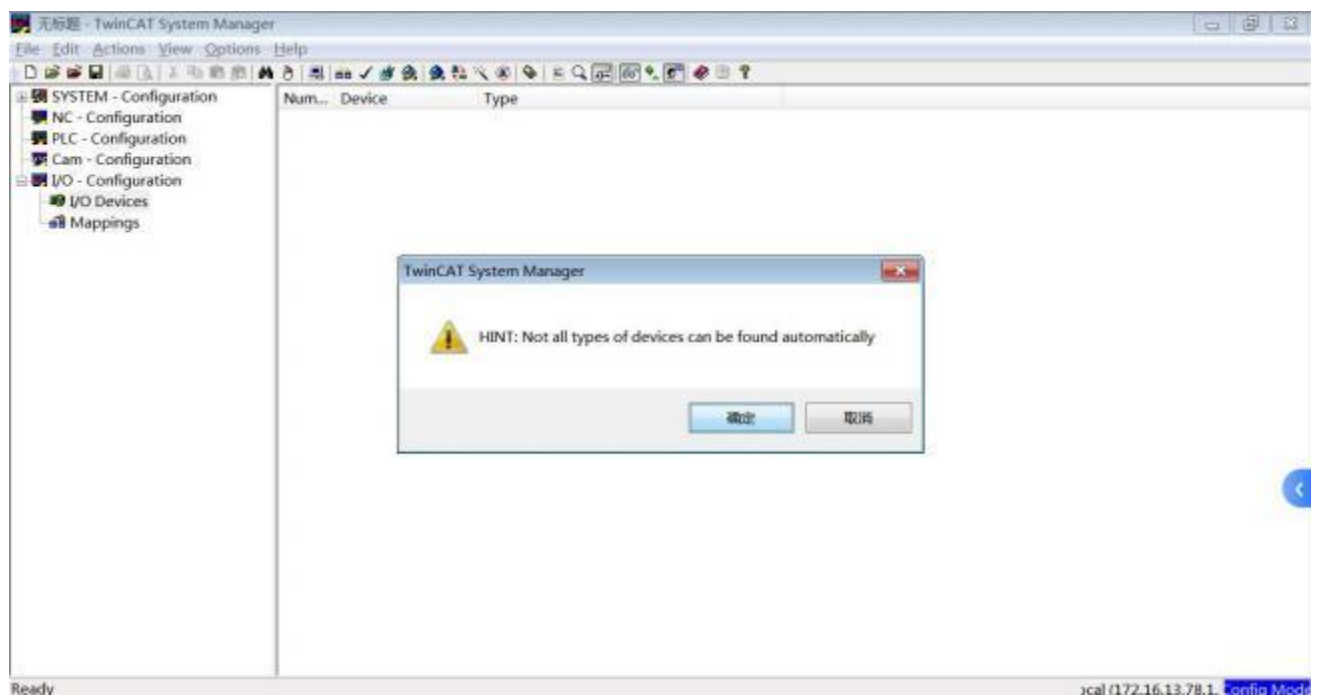
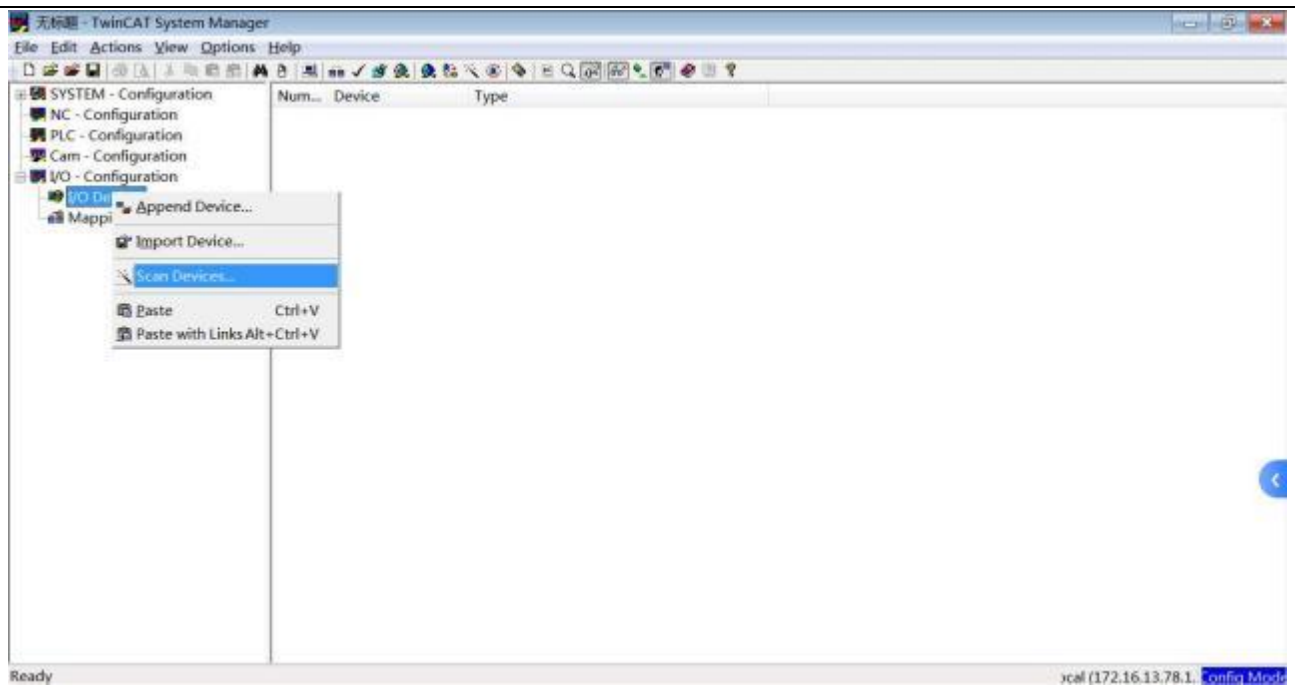
3.5 Operation examples

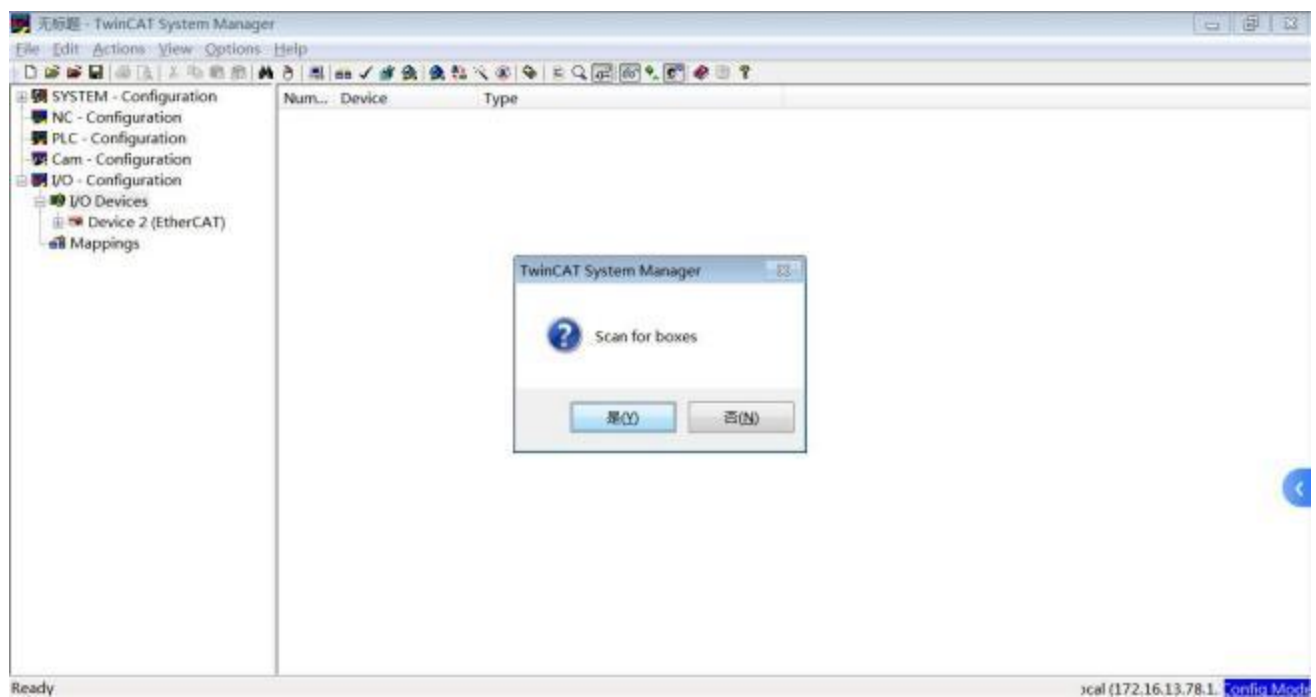
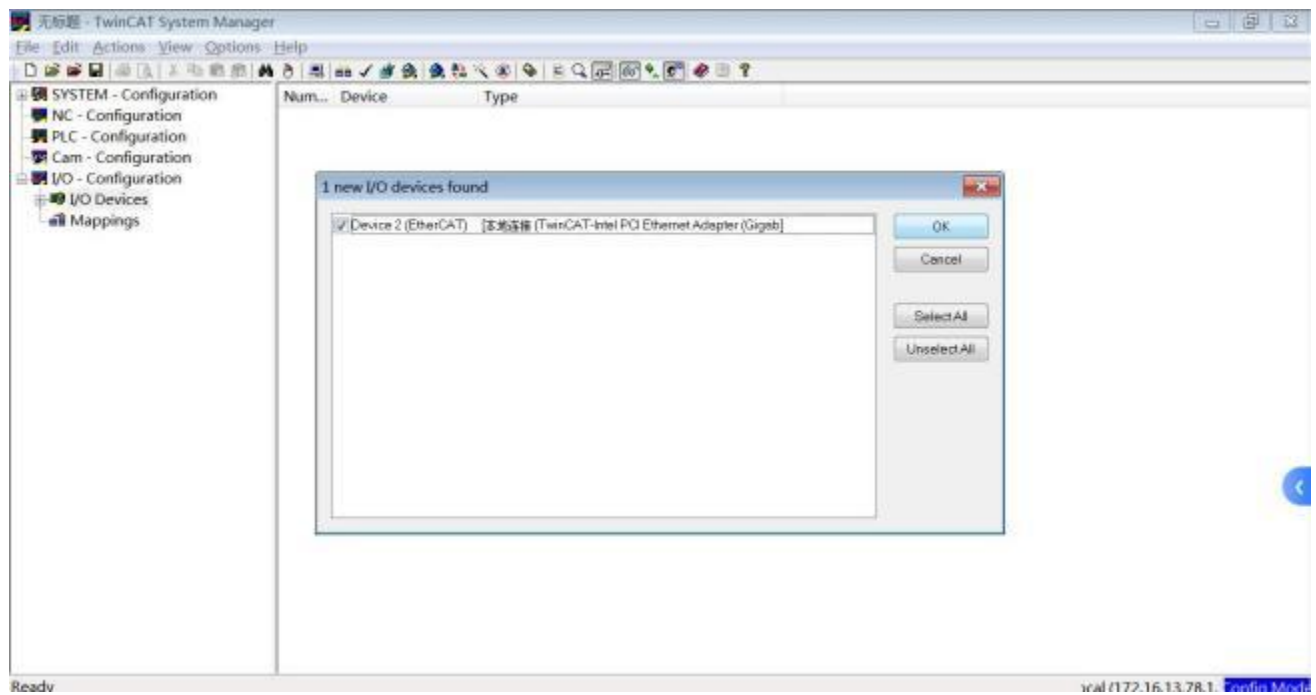
Take Twin CAT2.0 as an example to demonstrate the entire process of connecting the master station to the communication card slave station.

When connecting to an unknown slave device for the first time, you need to import the ESI file first. Place the ESI file in .xml format into the Io \EtherCAT folder under the Twin CAT installation path , and reopen the Twin CAT software.

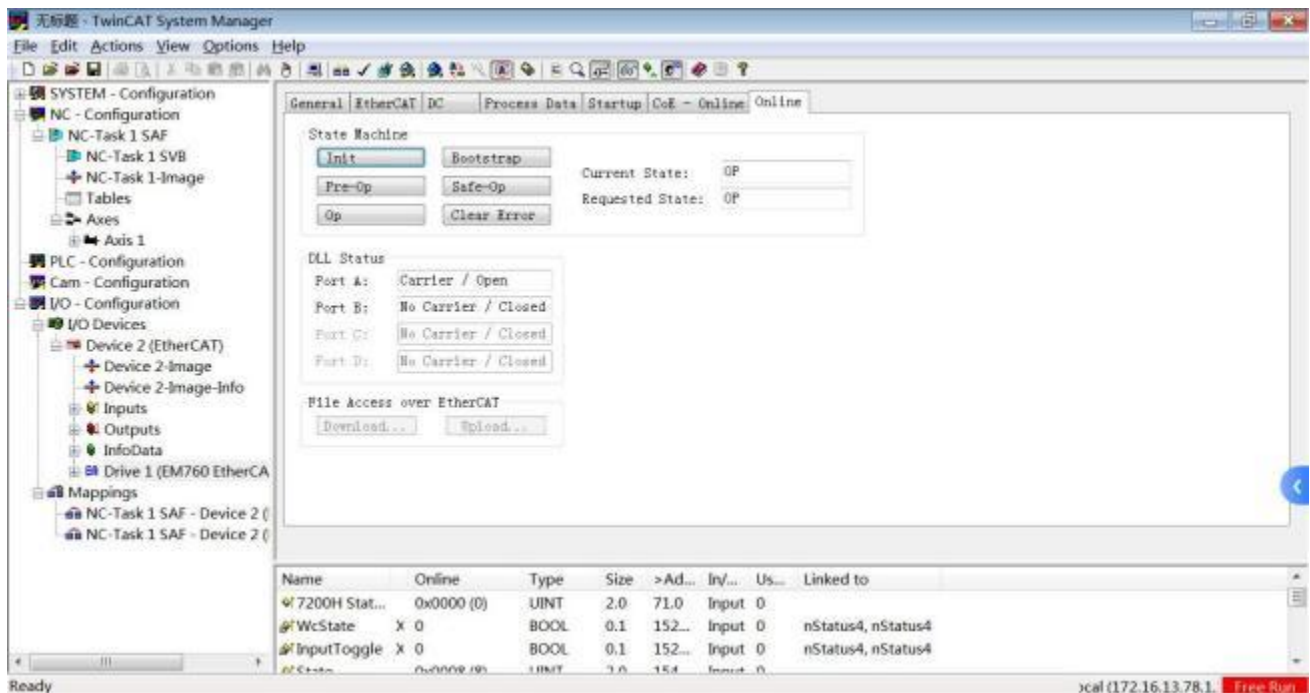
1 . Scan for slave devices.

Click on the I/ OD device , right-click and select Scan. Devices. Select Confirm or OK in the pop-up window .

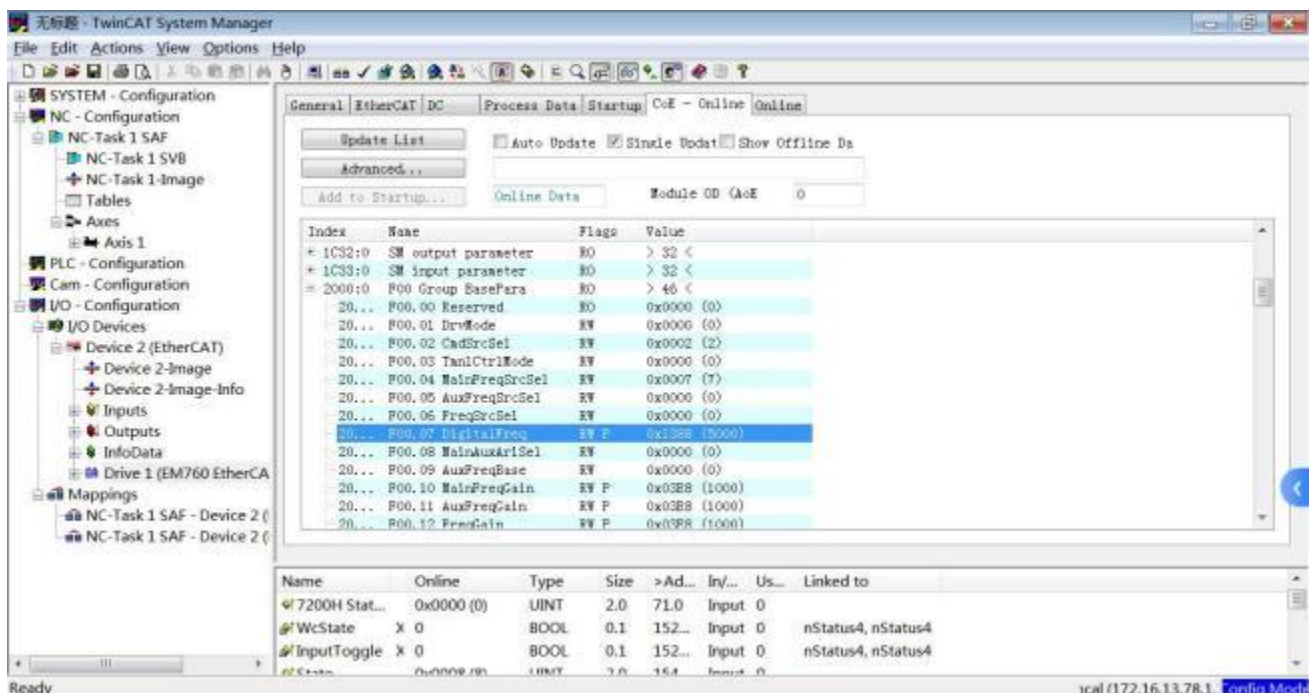


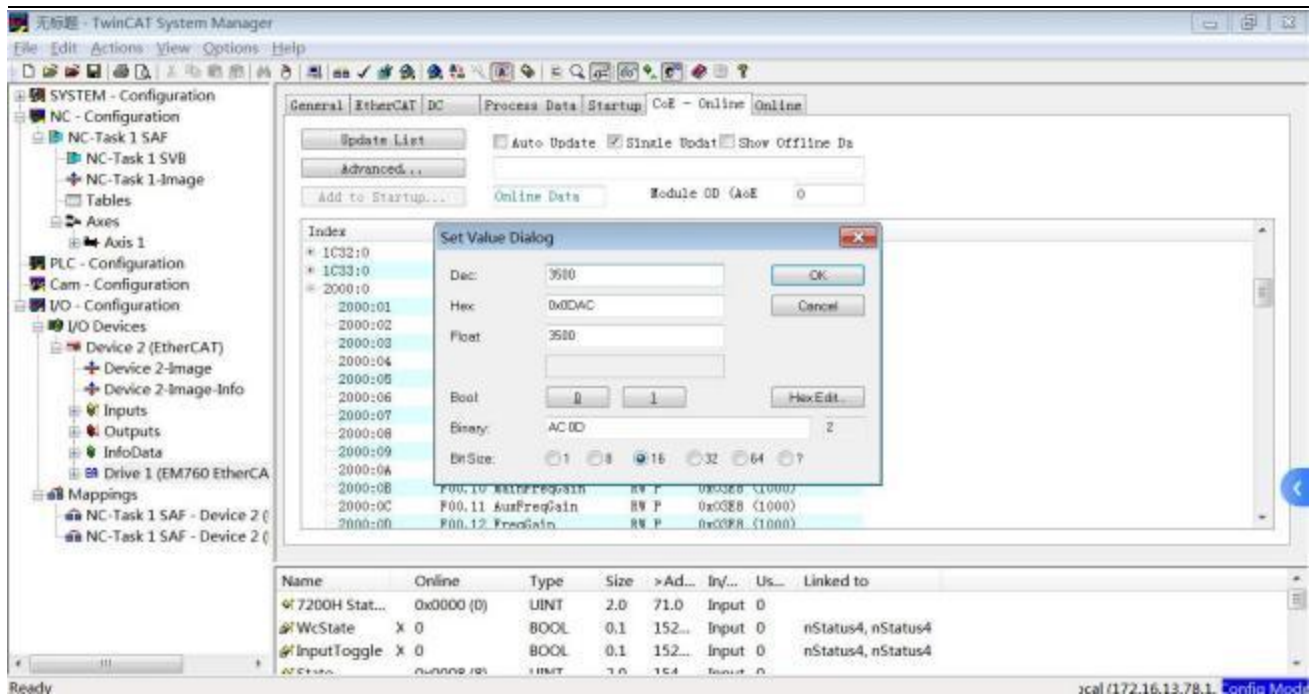


The device scan connection is successful, and you can see that the Current State status is OP on the Online interface .

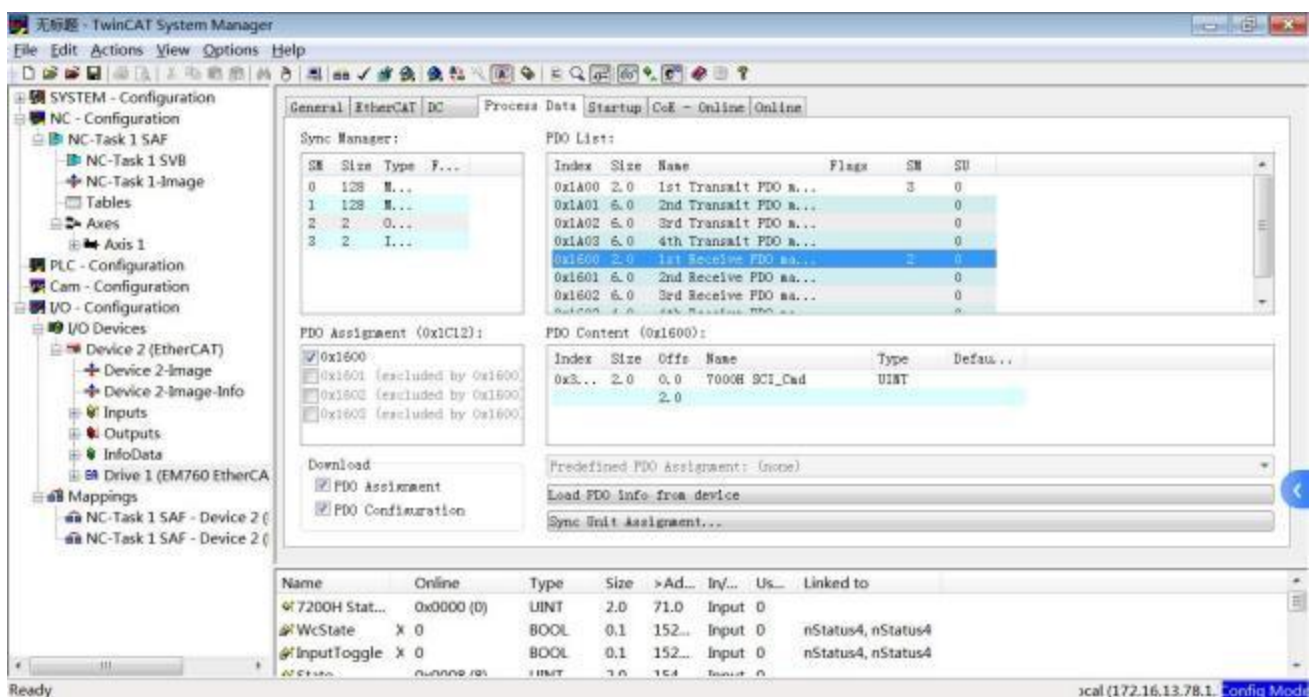


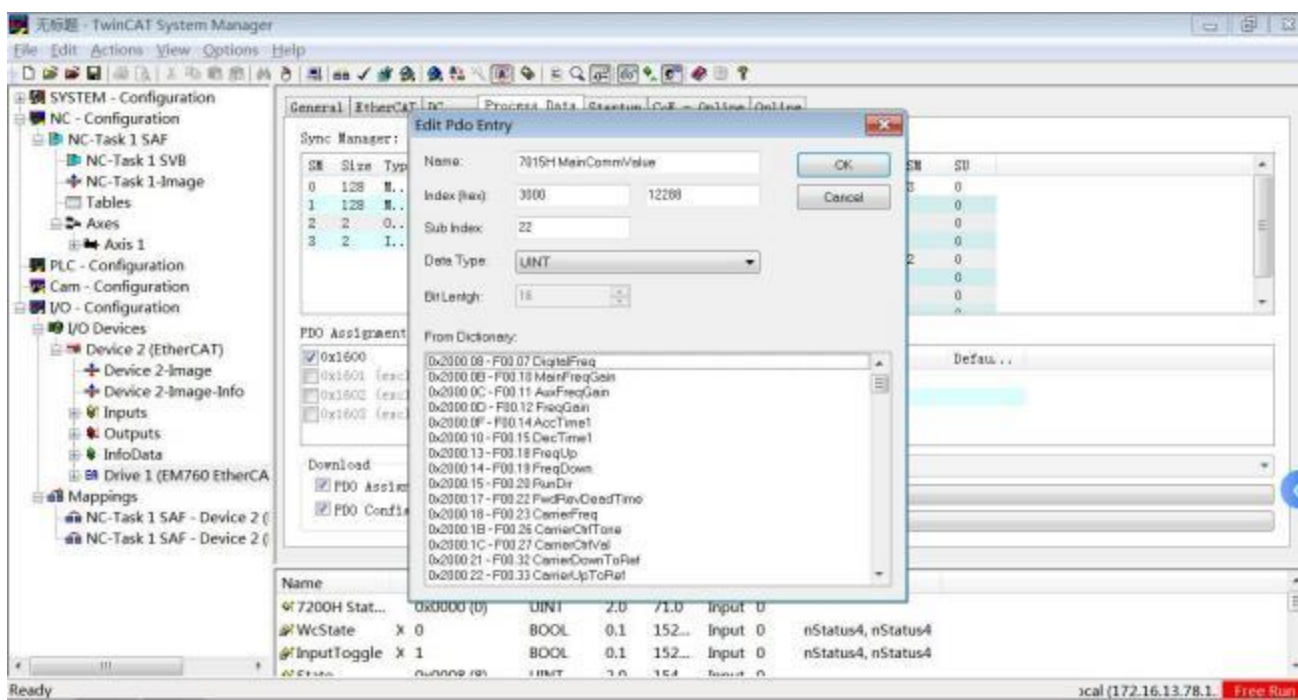
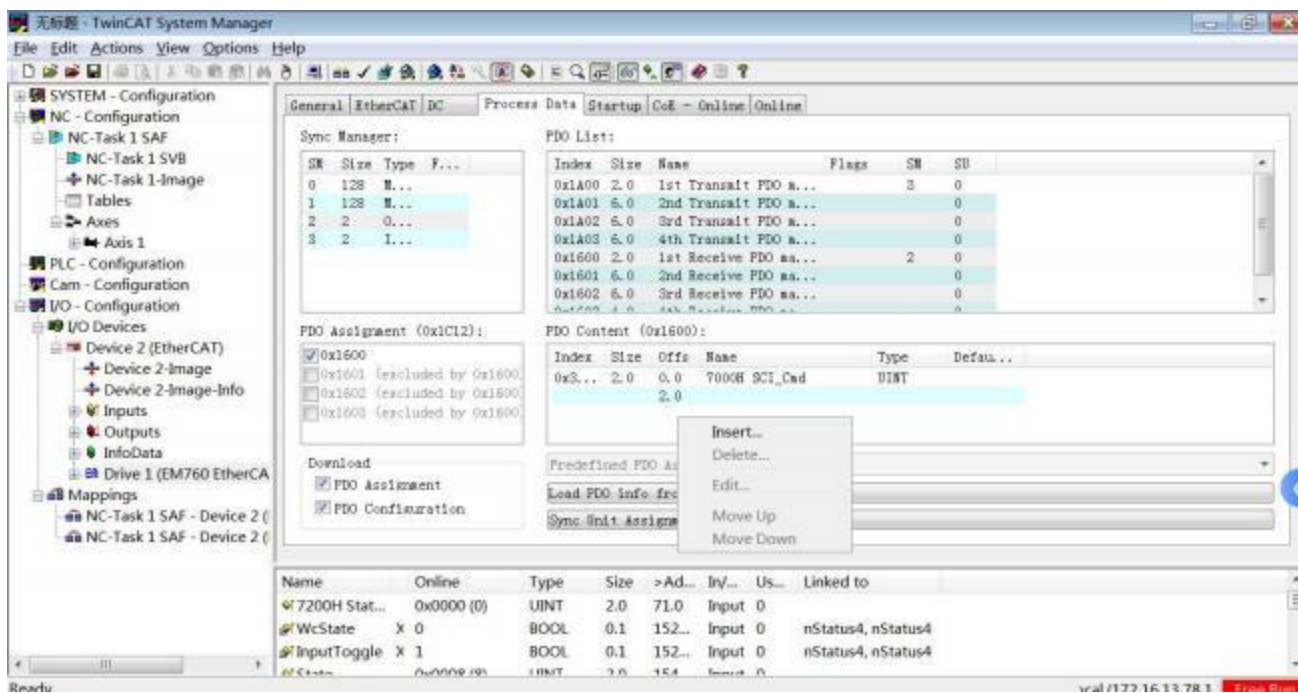
2. SDO online modification parameters. Enter the C oE-On line interface, such as modifying the F 00.07 digital given frequency, find the corresponding object dictionary and double-click to open the Set Value Dialog interface, enter the data 3 500 , click OK , the data modification is successful, set F 00.07 =35.00hz .



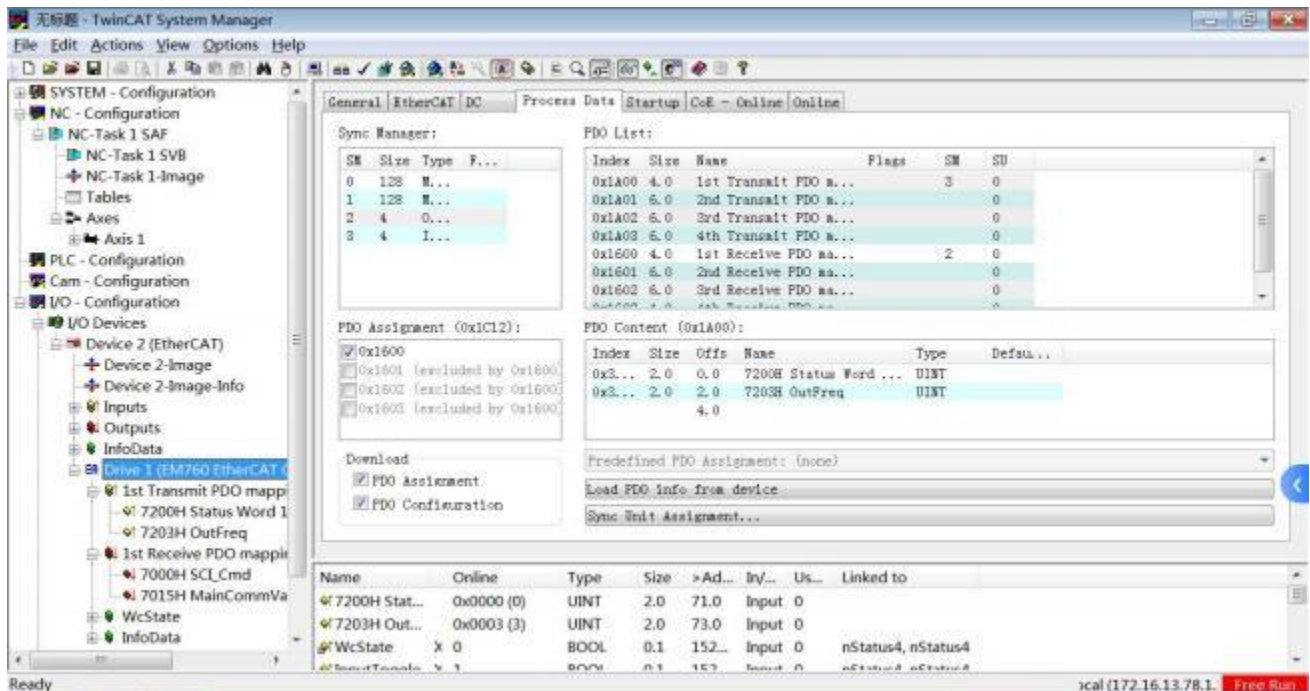


3. PDO configuration. Click to select the Process Data interface and select the mapping table as 0x1600 or 0x1A00. Right-click in the PDO Content function box and select Insert to add PDO configuration (or select Delete to delete the currently configured PDO mapping data).

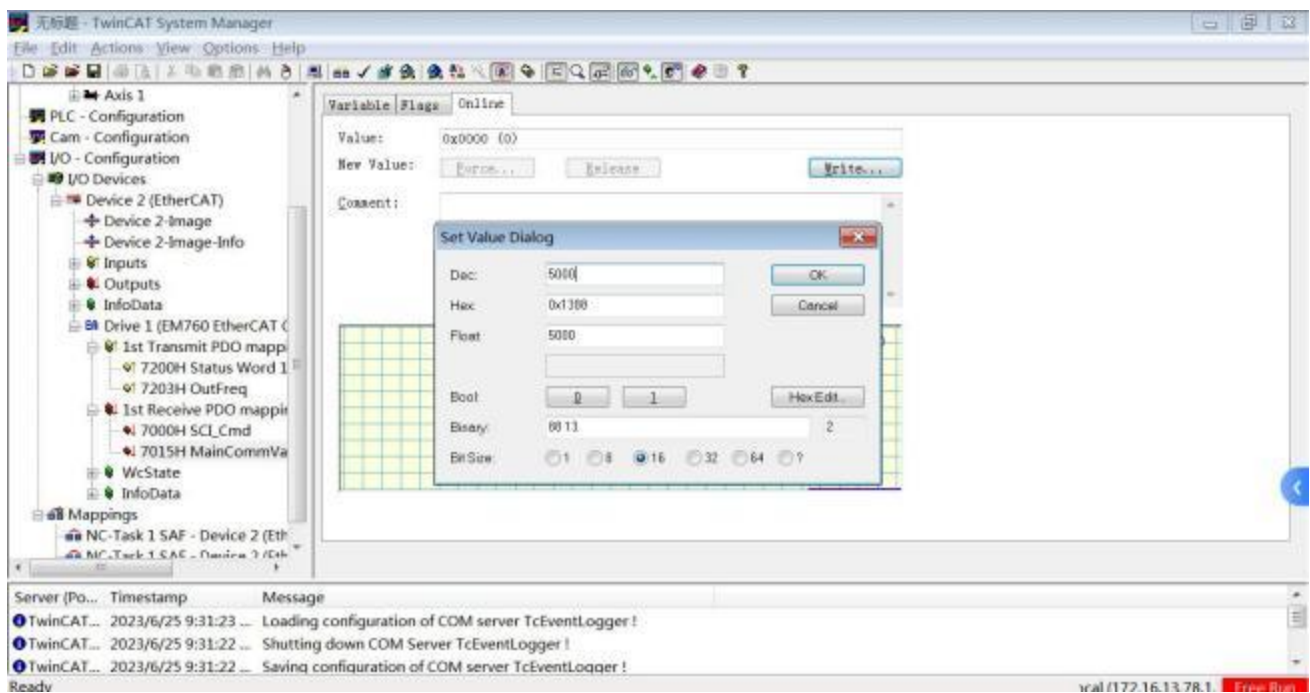


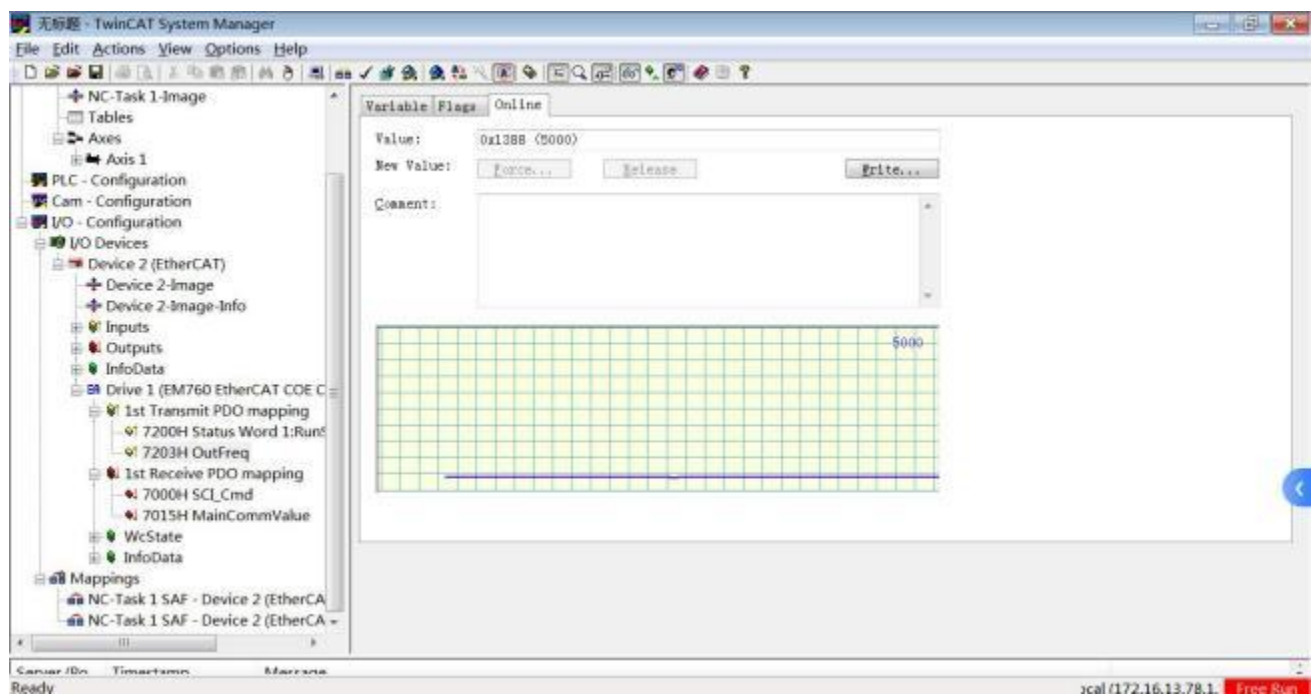
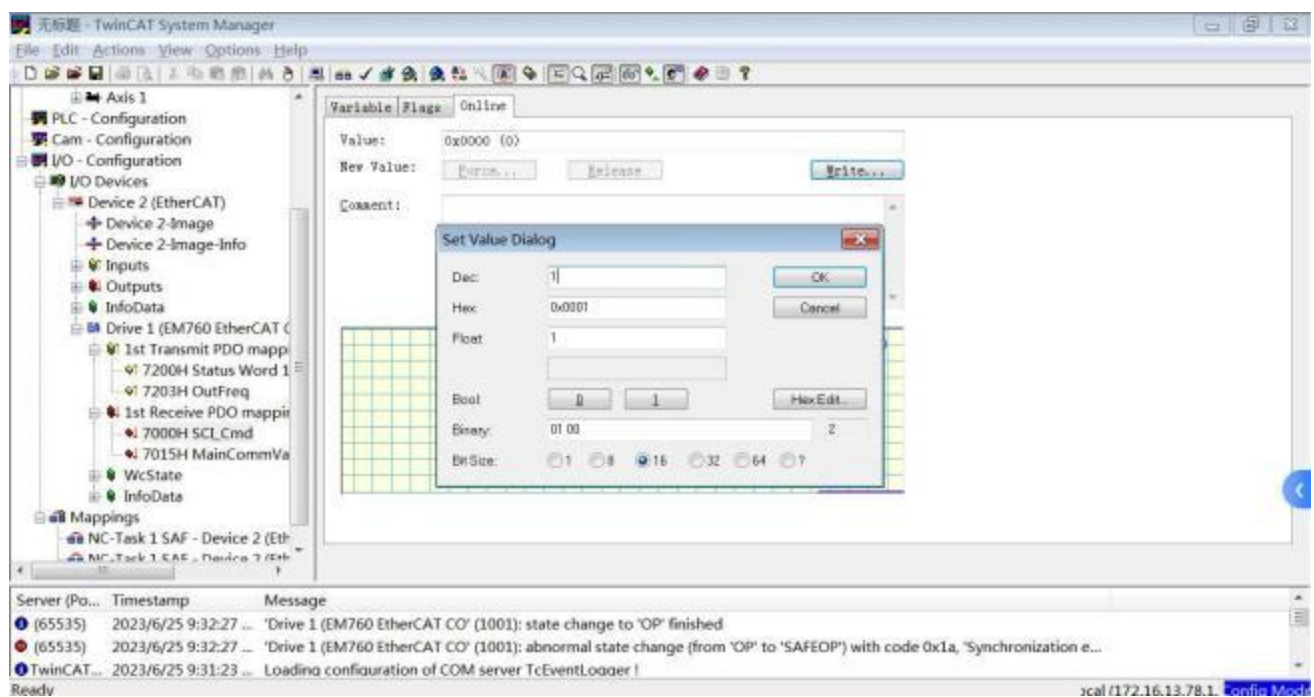


After all configurations are completed, click Set / Release Twin CAT to update the configuration.



Select the corresponding object dictionary and click Write on the On line page . data input. Write the running command in 7000H and the inverter starts running. at 1st _ Transmit PD O View the data returned in real time in mapping.





Chapter 4 Faults and Indicators

4.1 EtherCAT indicator light description

The following figure shows the definition of each LED indicator on the RJ45 terminal :



L/A0 and L/A1 (green light)

L/A0 displays the status of the IN communication interface, and L/A1 LED displays the status of the OUT communication interface:

L/A0 L/A1	describe	illustrate
go out		Communication is not connected
flashing		Communication is connected and activated
Always on		Communication is connected but not yet activated

RUN (yellow light)

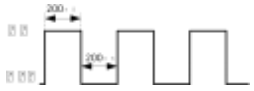
RUN displays the state of the EtherCAT communication card State Machine .

RUN LED	describe	illustrate
go out		The state machine is in the INIT state.
Continuous flashing (200ms)		The state machine is in the Pre-Operational state.

Flashing intermittently (1s)		The state machine is in the Safe-Operational state
Always on		The state machine is in the Operational state

ERR (yellow light)

ERR displays the status of EtherCAT communication.

ERRLED	describe	illustrate
go out		EtherCAT communication is in normal status.
Continuous flashing (200ms)		Received Object setting command from EtherCAT whose State cannot be set (state machine conversion cannot be completed).
Flashing intermittently (1s)		Sync error/ SyncManager error
Always on		PDO watch timeout

Communication card and inverter communication indicator light

state	illustrate
Always on (green)	the EtherCAT card and the inverter is normal
destroy	between EtherCAT card and inverter

Communication card power indicator light

state	illustrate
Always on (green)	EtherCAT card power supply is normal
destroy	EtherCAT card power supply abnormality

4.2 Frequently asked questions and their troubleshooting

card status information display function code is shown in Table 4.2. 1 below .

Table 4.2. 1

function code	name	Parameter value	illustrate
F 10.47	Communication card status	—	0XXXX: In it status 1 XXXX : Pre -op status 2 XXXX : S a fe-op status 3XXXX : op status 4XXXX : ESC status error 5XXXX : SCI data reception abnormality
F 10.48	Communication card software version	1 0000	The software version of the communication card is V 100B00, which is the same as the software serial number 1 of card slot 1 (2)
F 10.64	ESC status code	—	See Table 4.2. 1 - continued
F16.14 /F16.15	Card slot 1(2) type	2	The card slot is inserted into the EtherCAT communication card.
F16.16 /F16.18	Card slot 1(2) software serial number 1	1 00.00	The communication card software version is V 100B00
F16.17 /F16.19	Card slot 1(2) software serial number 2	1 0 . 000	The communication card software E SI (.xml) file version is V 100B00

Table 4.2. 1 - continued _

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Bit Name	Error Flag				AL Status				AL Status Code							

Bit	Bit Name	Description
b7 to b0	AL Status Code	See Appendix 1
b11 to b8	AL Status	1: Init state
		3: Bootstrap state
		2: Pre-Operational state
		4: Safe-Operational state
		8: Operational state
b15 to b12	Error Flag	0: The device is in the state as requested or flag was cleared by command.
		1: The device has not entered the requested state or the state was changed as a result of local action.

Frequently asked questions or problems:

1. The inverter software does not support

Function code value: F 10.48 = 0 , F 16.14/F16.15 = 2 , F 16.16/F16.18 = 0 , F 16.17/F16.19 = 0 .

Cause analysis: The current inverter control board software does not support the EtherCAT communication card.

Solution: Contact our customer service to replace the control board.

2. Communication card abnormality

Function code value: F 16.14/F16.15 = 3 .

Cause analysis: The communication card has no control program or the card slot of the inverter control board is damaged.

Solution: Contact our customer service to replace the product.

3. The frequency converter reports E 16 communication abnormal fault.

Cause Analysis:

Case 1: If the inverter is shut down, the communication card M OD LED lights up.

A serious timeout occurred in the communication between the communication card and the inverter, and the communication card software has been reset. Press the stop button to clear the fault. It may be necessary to reconnect with the communication card for different master stations.

Case 2: If the frequency converter is shut down, the communication card MOD LED light goes out.

The communication between the communication card and the inverter is abnormal and cannot be restored by reset. It is recommended to cut off the power and check whether there is a short-circuit connection in the 20pin connector terminal of the communication card . Or the communication card or the card slot interface of the inverter control board has been damaged.

4. PDO process data sending run command is invalid**Cause Analysis:**

- 1 、 The inverter parameters are not set according to Table 2.2-1 .
- 2 、 0x0 1 sub-index of the object dictionary 0x 1600 is not set to the inverter control word.
- 3 、 pressing the stop t button to stop the machine, F 00.02 is not restored to 2.

5. The PDO process data sending parameter is invalid

Cause analysis: The PDO process data configuration parameters need to be written into the inverter after the PDO writes the run command.

6. Some SDO parameters cannot be written to the inverter.**Cause Analysis:**

- 1 、 The currently written data is not within the parameter setting range of this function code.
- 2 、 The function code attribute is read-only or cannot be modified during runtime.

7. The master station or keyboard cannot configure PDO**Cause Analysis:**

- 1 、 the master station configures PDO , function code F 10. 51 is not set to 1.

- 2、 keyboard configures PDO , function code F 10.51 is not set to 0 , or the master station is not set to use the drive default PDO .

8. No fault will be reported when the inverter is shut down

Cause analysis : F 10.47 = 4XXXX, AL Status Code = 0x002B. The connection between the master station and the communication card is disconnected, and the communication card does not receive the P DO process data.

9 . The communication card cannot enter the op state during initialization.

Cause analysis: Configuration error, check AL Status Code .

10. The main station cannot scan the communication card device

Cause Analysis:

- 1、 S I (.xml) file is not imported into the main station .
- 2、 There is a problem with the connection line between the main station and the communication card.
- 3、 There is a serious mismatch between the object dictionary and the inverter function code, and ESC cannot initialize.

appendix

Appendix 1 AL Status Code

#define ALSTATUSCODE_NOERROR	0x0000 /**< \brief No error*/
#define ALSTATUSCODE_UNSPECIFIEDERROR	0x0001 /**< \brief Unspecified error*/
#define ALSTATUSCODE_NOMEMORY	0x0002 /**< \brief No Memory*/
#define ALSTATUSCODE_INVALID_REVISION	0x0004 /**< \brief Output/Input mapping is not valid for this hardware or software revision (0x1018:03)*/
#define ALSTATUSCODE_FW_SII_NOT_MATCH	0x0006 /**< \brief Firmware and EEPROM do not match. Slave needs BOOT-INIT transition*/
#define ALSTATUSCODE_FW_UPDATE_FAILED	0x0007 /**< \brief Firmware update not successful. Old firmware still running*/
#define ALSTATUSCODE_INVALIDALCONTROL	0x0011 /**< \brief Invalid requested state change*/
#define ALSTATUSCODE_UNKNOWNALCONTROL	0x0012 /**< \brief Unknown requested state*/
#define ALSTATUSCODE_BOOTNOTSUPP	0x0013 /**< \brief Bootstrap not supported*/
#define ALSTATUSCODE_NOVALIDFIRMWARE	0x0014 /**< \brief No valid firmware*/
#define ALSTATUSCODE_INVALIDMBXCFGINBOOT	0x0015 /**< \brief Invalid mailbox configuration (BOOT state)*/
#define ALSTATUSCODE_INVALIDMBXCFGINPREOP	0x0016 /**< \brief Invalid mailbox configuration (PreOP state)*/
#define ALSTATUSCODE_INVALIDSMCFG	0x0017 /**< \brief Invalid sync manager configuration*/
#define ALSTATUSCODE_NOVALIDINPUTS	0x0018 /**< \brief No valid inputs available*/
#define ALSTATUSCODE_NOVALIDOUTPUTS	0x0019 /**< \brief No valid outputs*/
#define ALSTATUSCODE_SYNCERROR	0x001A /**< \brief Synchronization error*/
#define ALSTATUSCODE_SMWATCHDOG	0x001B /**< \brief Sync manager <u>watchdog</u> */
#define ALSTATUSCODE_SYNCTYPESNOTCOMPATIBLE	0x001C /**< \brief Invalid Sync Manager Types*/
#define ALSTATUSCODE_INVALIDSMOUTCFG	0x001D /**< \brief Invalid Output Configuration*/
#define ALSTATUSCODE_INVALIDSMINCFG	0x001E /**< \brief Invalid Input Configuration*/
#define ALSTATUSCODE_INVALIDWDCFG	0x001F /**< \brief Invalid <u>Watchdog</u> Configuration*/
#define ALSTATUSCODE_WAITFORCOLDSTART	0x0020 /**< \brief Slave needs cold start*/
#define ALSTATUSCODE_WAITFORINIT	0x0021 /**< \brief Slave needs INIT*/
#define ALSTATUSCODE_WAITFORPREOP	0x0022 /**< \brief Slave needs PREOP*/
#define ALSTATUSCODE_WAITFORSAFEOP	0x0023 /**< \brief Slave needs SAFEOP*/
#define ALSTATUSCODE_INVALIDINPUTMAPPING	0x0024 /**< \brief Invalid Input Mapping*/
#define ALSTATUSCODE_INVALIDOUTPUTMAPPING	0x0025 /**< \brief Invalid Output Mapping*/
#define ALSTATUSCODE_INCONSISTENTSETTINGS	0x0026 /**< \brief Inconsistent Settings*/
#define ALSTATUSCODE_FREERUNNOTSUPPORTED	0x0027 /**< \brief FreeRun not supported*/
#define ALSTATUSCODE_SYNCHRONNOTSUPPORTED	0x0028 /**< \brief SyncMode not supported*/
#define ALSTATUSCODE_FREERUNNEEDS3BUFFERMODE	0x0029 /**< \brief FreeRun needs 3Buffer Mode*/
#define ALSTATUSCODE_BACKGROUNDWATCHDOG	0x002A /**< \brief Background <u>Watchdog</u> */
#define ALSTATUSCODE_NOVALIDINPUTSANDOUTPUTS	0x002B /**< \brief No Valid Inputs and Outputs*/
#define ALSTATUSCODE_FATALSYNCERROR	0x002C /**< \brief Fatal Sync Error*/
#define ALSTATUSCODE_NOSYNCERROR	0x002D /**< \brief No Sync Error*/
#define ALSTATUSCODE_CYCLETIMETOOSMALL	0x002E /**< \brief EtherCAT cycle time smaller Minimum Cycle Time supported by slave*/

#define ALSTATUSCODE_DCINVALIDSYNCCFG	0x0030 /**< \brief Invalid DC SYNCH Configuration*/
#define ALSTATUSCODE_DCINVALIDLATCHCFG	0x0031 /**< \brief Invalid DC Latch Configuration*/
#define ALSTATUSCODE_DCPLLSYNCEERROR	0x0032 /**< \brief PLL Error*/
#define ALSTATUSCODE_DCSYNCIOERROR	0x0033 /**< \brief DC Sync IO Error*/
#define ALSTATUSCODE_DCSYNCMISSEDEERROR	0x0034 /**< \brief DC Sync Timeout Error*/
#define ALSTATUSCODE_DCINVALIDSYNCCYCLETIME	0x0035 /**< \brief DC Invalid Sync Cycle Time*/
#define ALSTATUSCODE_DCSYNCOCYCLETIME	0x0036 /**< \brief DC Sync0 Cycle Time*/
#define ALSTATUSCODE_DCSYNCOCYCLETIME	0x0037 /**< \brief DC Sync1 Cycle Time*/
#define ALSTATUSCODE_MBX_AOE	0x0041 /**< \brief MBX_AOE*/
#define ALSTATUSCODE_MBX_EOE	0x0042 /**< \brief MBX_EOE*/
#define ALSTATUSCODE_MBX_COE	0x0043 /**< \brief MBX_COE*/
#define ALSTATUSCODE_MBX_FOE	0x0044 /**< \brief MBX_FOE*/
#define ALSTATUSCODE_MBX_SOE	0x0045 /**< \brief MBX_SOE*/
#define ALSTATUSCODE_MBX_VOE	0x004F /**< \brief MBX_VOE*/
#define ALSTATUSCODE_EE_NOACCESS	0x0050 /**< \brief EEPROM no access*/
#define ALSTATUSCODE_EE_ERROR	0x0051 /**< \brief EEPROM Error*/
#define ALSTATUSCODE_EXT_HARDWARE_NOT_READY	0x0052 /**< \brief External hardware not ready. This AL Status Code should be used if the EtherCAT-Slave refused the state transition due to an external connection to another device or signal is missing*/
#define ALSTATUSCODE_DEVICE_IDENT_VALUE_UPDATED	0x0061 /**< \brief In legacy identification mode (dip switch mapped to register 0x12) this error is returned if the EEPROM ID value does not match to <u>dipswitch</u> value*/
#define ALSTATUSCODE_MODULE_ID_LIST_NOT_MATCH	0x0070 /**< \brief Detected Module <u>Ident</u> List (0xF030) and Configured Module <u>Ident</u> List (0xF050) does not match*/
#define ALSTATUSCODE_SUPPLY_VOLTAGE_TOO_LOW	0x0080 /**< \brief The slave supply voltage is too low*/
#define ALSTATUSCODE_SUPPLY_VOLTAGE_TOO_HIGH	0x0081 /**< \brief The slave supply voltage is too high*/
#define ALSTATUSCODE_TEMPERATURE_TOO_LOW	0x0080 /**< \brief The slave temperature is too low*/
#define ALSTATUSCODE_TEMPERATURE_TOO_HIGH	0x0081 /**< \brief The slave temperature is too high*/

Appendix 2 Communication command function code

Object dictionary index = first two digits of function code - 0 x 4000

Object dictionary sub-index = last two digits of function code + 1

For example:

Function code 7000H object dictionary index 0x 3000, sub-index 0x 01

Function code 7015H object dictionary index 0x 3000, sub-index 0x 16.

Function code 7200H object dictionary index 0x 3200, sub-index 0x 01.

Function code 7230H object dictionary index 0x 3200, sub-index 0x 31.

control commands (just write) 7000H~71FFH	7000H control word	0000H	Invalid command	
		0001H	Forward running	
		0002H	reverse run	
		0003H	JOG forward	
		0004H	JOG reverse	
		0005H	Slow down and stop	
		0006H	Quick stop	
		0007H	free parking	
		0008H	Fault reset	
		0009H	+/-Input switching (communication card not supported)	
		000AH	Parameter recovery (keyboard)	
		000BH	JOG parking	
		000CH~00FFH	reserve	
	7001H	Main channel frequency A communication percentage given	-100.00% ~ 100.00% (maximum frequency reference)	
	7002H	Auxiliary channel frequency B communication percentage given	-100.00% ~ 100.00% (maximum frequency reference)	
	7003H	Torque communication given	-200.00% ~ 200.00% (digital reference)	
	7004H	Process PID given communication given	-100.00% ~ 100.00%	
		Process PID feedback	-100.00% ~ 100.00%	

	7005H	communication given							
	7006H	VF separation mode voltage given				0.00% ~ 100.00%			
	7007H	reserve							
	7008H (not yet done)	Set acceleration time (acceleration/deceleration time 1)				0~65000 (the number of decimal points is set by function code)			
	7009H (not yet done)	Set deceleration time (acceleration and deceleration time 1)				0~65000 (the number of decimal points is set by function code)			
	700AH	The upper limit frequency communication percentage is given				0.00% ~ 200.00% (digital reference)			
	700BH	The upper limit frequency communication percentage of torque control is given				0.00% ~ 200.00% (digital reference)			
	700CH	Inertia compensation linear speed input				0.00% ~ 100.00% (digital reference)			
	700DH ~ 700EH	reserve							
	700FH	Master-slave communication given				-100.00% ~ 100.00% (maximum value basis)			
	7010H Virtual terminal (do not do)	B it15	B it 14	B it 13	B it 12	B it 11	B it 10	B it 9	B it 8
		R2	R1	Y2	Y1	IF	IS	VF	VS
		B it7	B it 6	B it 5	B it 4	B it 3	B it 2	B it 1	B it 0
		X8	X7	X6	X5	X4	X3	X2	X1
	7011H (do not do)	B it15	B it 14	B it 13	B it 12	B it 11	B it 10	B it 9	B it 8
		VX8	VX7	VX6	VX5	VX4	VX3	VX2	VX1
		B it7	B it 6	B it 5	B it 4	B it 3	B it 2	B it 1	B it 0
		X16	X15	X14	X13	X12	X11	X10	X9
	7012H (keyboard)	Keyboard UP				0/1: UP hotkey function is invalid and valid			
	7013H (keyboard)	Keyboard DOWN				0/1: DOWN hot key function is invalid and valid			

	7014H	external fault		External device (including option card) fault input
	7015H	Main channel frequency A communication given		0.00 ~ Fmax -32000 ~ 32000
	7016H	Auxiliary channel frequency B communication given		0.00 ~ Fmax
	7017H	Upper limit frequency communication given		0.00 ~ Fmax
	7018H	The upper limit frequency communication reference of torque control		0.00 ~ Fmax
	7019H	Torque upper limit communication reference for speed control		0.0 ~ 250.0% (you can press 100.0% or send it directly)
	701AH	Traffic flow is given and communication is given		0.00 ~ 100.00%
	701BH	Pressure given communication given		(EA300 reserved)
	701CH	Tension communication given		(EM610)
	701DH	Line speed communication given		(EM610)
	701AH~71FFH	reserve		
	7200H Status word 1	B it7~0 Operating status	00H	Parameter settings
			01H	Run from machine
			02H	JOG operation
			03H	Self-learning operation
			04H	Stop the machine
			05H	JOG parking
			06H	fault status
			07H	Factory self-inspection
			08H~0FFH	reserve
		B it15~8	00H	Frequency converter operates normally

working status 7200H~73FFH		accident details	xxH	Frequency converter fault status, "xx" is the fault code
	7201H Status word 2	B it0 given direction	1	- Given valid
			0	+ given is valid
		B it1 Running direction	1	Frequency output inversion
			0	Frequency output forward
		B it3~2 Operation	00	Speed control method
			01	Torque control method
		mode	10	Servo control method
			11	reserve
		B it4 Parameter protection	1	Parameter protection is valid (current parameters cannot be operated)
			0	Parameter protection is invalid (current parameters can be operated)
		B it6~5	reserve	
		B it8~7 given way	00	keyboard control
			01	Terminal control
			10	Communication control
			11	reserve
		B it9 Factory password	0	Factory password protection is active (not unlocked)
			1	Factory password protection is invalid (already unlocked)
		B it10 warn	0	none
			1	Warning status (see 7230H)
		B it15~11	reserve	
	7202H Monitoring frequency +/-	bit0	Output frequency	
		bit1	given frequency	
		bit2	Sync frequency	
		bit3	PG card feedback frequency	
		bit4	Estimate feedback frequency	

	status word 1 (1:-;0:+)	bit5	Estimate slip frequency
		Bit6	load speed
		Bit15~6	reserve
	7203H	Output frequency	
	7204H	The output voltage	
	7205H	Output Power	
	7206H	Running speed	
	7207H	bus voltage	
	7208H	Output torque	
	7209H	Switch input 1	bit15~bit1 corresponds to X16~X1
	720AH	Switch input 2	bit15~bit8 correspond to VX8~VX1; bit3~bit0 correspond to AI4~AI3
	720BH	Switching output 1	bit15~bit0 correspond to Y 14/Y13/ ... /Y3/Y2/Y1/R2/R1
	720CH	Switching output 2	bit15~bit8 correspond to XY8~VY1
	720DH	First and second failures	
	720EH	First three failures	
	720FH	Latest failure	
	7210H	The latest fault output frequency	
	7211H	The latest fault output current	
	7212H	The latest fault bus voltage	
	7213H	The latest fault operating status	
	7214H	Last working time of failure	
	7215H	Set acceleration time	
	7216H	Set deceleration time	
	7217H	cumulative length	
	7218H	reserve	
	7219H	UP/DOWN offset frequency sign (0/1: +/-)	
	721AH	LCD mode 1 displays 1, and the corresponding value is the current value of the function code selected by F12.33.	
	721BH	LCD mode 1 displays 2, and the corresponding value is the current value of the function code selected by F12.34.	

	721CH	LCD mode 1 displays 3, and the corresponding value is the current value of the function code selected by F12.35.		
	721DH	LCD mode 1 displays 4, the corresponding value is the current value of the function code selected by F12.36		
	721EH	LCD mode 1 displays 5, and the corresponding value is the current value of the function code selected by F12.37.		
	721FH	The large LCD line displays 3, and the corresponding value is F12.38. Select the current value of the function code.		
	7220H	The large LCD line displays 4, and the corresponding value is F12.39. Select the current value of the function code.		
	7221H	The large LCD line displays 5, and the corresponding value is the current value of the function code selected by F12.40.		
	7222H	B it7~0 Operating status	00H	shutdown state
			01H	Forward running (upward)
			02H	Reverse operation (downward)
			03H	JOG forward
			04H	JOG reverse
			05H~0FFH	reserve
	7222H	B it15~8 accident details	00H	The inverter is normal
			xxH	Frequency converter fault status, "xx" is the fault code
	7223H	GPS status	0	reserve
			1	Lock status
			2	Unlocked status
			3	Release status (function is invalid)
	7224H	Output current		
	7225H	given frequency		
	7226H	Current load capacity	Unit: 0.1t	
	7227H	current altitude	Unit: 1m	
	7228H	Accumulated power-on time		

	7229H	To be added	
	722AH	To be added	
	722BH	To be added	
	722CH	To be added	
	722DH	To be added	
	722EH	To be added	
	722FH	To be added	
	7230H	warning sign	0: No warning; Others: Current warning mark.