HV320-EIP-V2
Ethernet/IP Communication Card
User Manual

HNC Electric Limited

1. Overview

Thank you for using our HV320-V2 series inverter and Ethernet/IP expansion card (hereinafter referred to as HV320-EIP-V2 card). HV320-EIP-V2 card is an Ethernet/IP fieldbus adapter card that complies with the internationally accepted Ethernet/IP Ethernet standard. This card is installed on the HV320-V2 series inverter to improve communication efficiency and facilitate the inverter networking function, making the inverter a slave station of the fieldbus and accepting control from the fieldbus master station. This manual requires the corresponding HV320-EIP-V2 card software version to be 1.00 or above, and the matching EDS file name is "HV320-EIP_V1.eds".

Please read this user guide carefully before using this product.

Figure 1-1 Appearance of the HV320-EIP-V2 card

2. Installation and Setup

2.1 Installing the HV320-EIP-V2 Card

The HV320-EIP-V2 card is installed inside the HV320-V2 series inverter. Before installation, disconnect the power supply of the inverter and wait for about 10 minutes until the charging indicator on the inverter lights up. Then, insert the HV320-EIP-V2 card into the inverter and tighten the screws to avoid damage caused by tension of the external signal cable on the inter-board signal socket.

Figure 2-1 shows the hardware layout of the HV320-EIP-V2 card. The 2* 8P bend pin socket (P1) is used to connect the inverter . The HV320-EIP-V2 card provides two network ports J3 and J4 for communication with the master and slave stations.

For hardware details, see Table 2-1

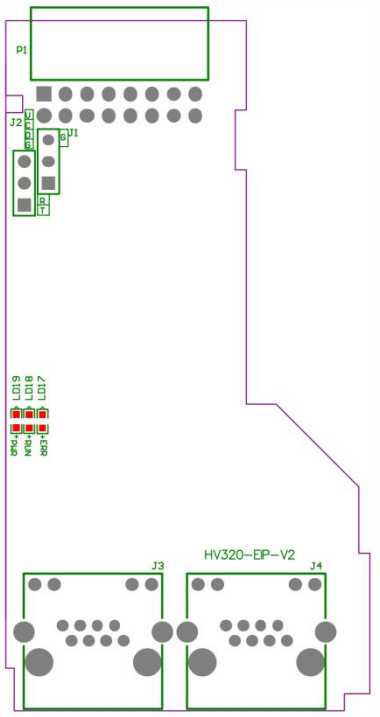

Figure 2-1 HV320-EIP-V2 card (hardware)

Table 2-1 Hardware description of HV320-EIP-V2 card

symbol	Hardware Name	Functional Description
P1	Pin connector	For connecting to frequency converter
J3, J4	network port	Uses standard Ethernet RJ45 socket, no direction, uses J3 and J4 to connect to PN card or PLC for communication
LD17	Ethernet/IP fault indicator (red)	Description of the HV320-EIP-V2 card, see Table 2-2.
LD18	Ethernet/IP communication indicator (green)	
LD19	Power indicator light (green)	

Table 2-2 HV320-EIP-V2 card specification description

Indicator signal		Status description	Solution
LD17	OFF state	normal	N/A
	Always red	communication fail	Please contact technical support.
LD18	Always green	EIP is normal	N/A
	OFF state	Communication with the drive is lost	P0-28 to 1 and check if the AC drive supports the HV320-EIP-V2 card.
LD19	Always green	normal	N/A
	OFF state	The communication board is not powered.	Check whether the J4 connector is connected properly and whether the inverter is powered on.

2.3 Ethernet/IP RJ45 interface

The HV320-EIP-V2 card uses standard Ethernet to connect to the Ethernet/IP master RJ45 socket. Its pin signal definition is the same as the standard Ethernet pin. They can be connected using a crossover cable or a straight-through cable.

Table 2-3 Ethernet/IP communication interface description

Terminal Symbols	Terminal Name	Describe
J3	Ethernet/IP interface 1	Ethernet/IP network interface.
J4	Ethernet/IP interface 2	

● When facing the RJ45 interface. Both interfaces must be connected correctly.
● Cat5e shielded twisted pair (STP) network cable must be used to ensure stability.

3. Communication Configuration

3.1 Communication configuration between HV320-EIP-V2 card and HV320-V2 series inverter After installing HV320-EIP-V2 card on HV320-V2 series inverter , complete the communication configuration to realize the communication between them.

■ Communication card settings for the inverter

Inverter software version: L 8.00

The following parameters must be set to enable the HV320-EIP-V2 card to communicate with the HV320-V2 series inverter and connect the HV320-EIP-V2 card to the Ethernet/IP fieldbus network.

function code	name	Content	Settings	describe
P0-02	Run command source	0: Operation panel running command channel (LED off) 1: Terminal command channel (LED on) 2: Communication command channel (LED flashes)	2	Run command issued via communication
P0-03	Main frequency source X selection	0: Digital setting (preset frequency P0-08, UP/ DOWN can be modified, no memory is stored after power failure) 1: Digital setting (preset frequency P0-08, UP/ DOWN can be modified, power-off memory) 2: AI 1 3: AI2 4: AI3 5: PULSE setting (DI 5) 6: Multi-segment instructions 7: Simple PLC 8: PID 9: Communication setting	9	Given a target frequency By communication
P0-28	Serial communication protocol	0: Modbus protocol 1: Communication card bridge protocol	1	Select special item communication card for communication

■ Communication control related function codes

Function code	name	Predetermined area		Decimal address
U3-16	Frequency setting	-Maximum frequency~Maximum frequency 0.01Hz		29456
U3-17	control commands	0001: Forward operation 0002: Reverse operation 0003: Forward jog 0004: Reverse jog	0005: Free stop 0006: Deceleration and stop 0007: Fault reset	29457

Function code	name	Predetermined area		Decimal address
U3-18	DO control	BIT 0: DO 1 output control BIT 1: DO 2 output control BIT 2: RELAY 1 lose Out of control BIT 3: RELAY 2 lose Out of control BIT 4: FMR output control	BIT 5: VDO 1 BIT 6: VDO 2 BIT 7: VDO 3 BIT 8: VDO 4 BIT 9: VDO 5	29458
U3-19	AO 1 control	0～7 FFF means 0 %～ 100%		29459
U3-20	AO 2 control	0～7 FFF means 0 %～ 100%		29460
U3-21	FMP Control	0～7 FFF means 0 %～ 100%		29461
U3-22	Reserve	Reserve		------
U3-23	Speed control	Signed data, 1 rpm		29463

When using the HV320-EIP-V2 card, the default mapping of PZD1 is U3-17, and the default mapping of PZD2 is U3-16 . If you find that the command or frequency cannot be written to the inverter normally, but PZD3~ PZD12 can be written, and P0-02 =2 and P0-03 =9, you can check whether PE-00 is U3-17 and PE-01 is U3-16 on the inverter . If not, please manually change them to the correct values.

■ **Communication monitoring related function codes**

Function code	Name	Unit	Decimal address
U0-00	Operating frequency (Hz)	0.01 Hz	28672
U0-01	Set frequency (Hz)	0.01 Hz	28673
U0-02	Bus voltage (V)	0.1V	28674
U0-03	Output voltage(V)	1V	28675
U0-04	Output current(A)	0.01A	28676
U0-05	Output power (kW)	0.1kW	28677
U0-06	Output torque(%)	0.10%	28678
U0-07	DI input status	1	28679
U0-08	DO output status	1	28680

U0-09	AI 1 voltage (V)	0.01V	28681
U0-10	AI 2 voltage (V)	0.01V	28682
U0-11	AI 3 voltage (V)	0.01V	28683
U0-12	Count value	1	28684
U0-13	Length value	1	28685
U0-14	Load speed display	100.00%	2868600.00%
U0-15	PID Setting	1	28687
U0-16	PID Feedback	1	28688
U0-17	PLC stage	1	28689
U0-18	PULSE input pulse frequency (Hz)	0.01 kHz	28690
U0-19	Feedback speed (Hz)	0.01 Hz	28691
U0-20	Remaining running time	0.1Min	28692
U0-21	AI 1 voltage before correction	0.001V	2869300.00%
U0-22	AI 2 voltage before correction	0.001V	28694
U0-23	AI 3 voltage before correction	0.001V	28695
U0-24	Line speed	1m/ Min	28696
U0-25	Current power-on time	1 Min	28697
U0-26	Current running time	0.1 Min	28698
U0-27	PULSE input pulse frequency	1Hz	28699
U0-28	Communication setting value	0.01%	28700
U0-29	Encoder feedback speed	0.01 Hz	28701
U0-30	Main frequency X display	0.01 Hz	28702
U0-31	Auxiliary frequency Y display	0.01 Hz	28703
U0-32	View the value of any memory address	1	28704
U0-33	Synchronous machine rotor position	0.1°	2870500.00%
U0-34	Motor temperature value	1℃	2870600.00%
U0-35	Target torque(%)	0.10%	28707
U0-36	Resolver position	1	28708
U0-37	Power factor perspective	0.1°	28709
U0-38	ABZ position	1	28710
U0-39	VF separation target voltage	1V	28711
U0-40	VF separation output voltage	1V	28712
U0-41	DI input status intuitive display	1	28713
U0-42	DO input status intuitive display	1	28714
U0-43	DI input status intuitive display 1	1	28715
U0-44	DI input status intuitive display 2	1	28716
U0-45	accident details	1	28717
U0-58	Z signal counter	1	28730
U0-59	Setting frequency(%)	0.01%	28731
U0-60	Operating frequency(%)	0.01%	28732
U0-61	Inverter status	1	28733
U0-62	Current fault code	1	28734
U0-63	Operating frequency after droop control	0.01 Hz	38375

U0-64	Current Back EMF	0.1V	28736
U0-65	reserve	-	-
U0-66	Expansion card model	100: CANopen 200: Profibus - DP 300: CANlink 400: Profinet 500: EtherCAT	28738
U0-67	Expansion card version number	0.01	28739
U0-68	Inverter status	1	28740
U0-69	Operating frequency (Hz)	0.01 Hz	28741
U0-70	Motor speed	1 rpm	28742
U0-71	Output current	0.1A	28743

1. When using the HV320 - EIP - V2 card, the default mapping of PZD1 is U0-68, and the default mapping of PZD2 is U0-69 . If you find that the status or operating frequency cannot be read normally, but PZD3~ PZD12 can be read, you can check whether PE-20 is U0-68 and PE-21 is U0-69 on the inverter . If not, please manually change it to the correct value.

3.2 Ethernet/IP Communication

3.2.1 Ethernet/IP topology

Ethernet/IP include bus, star, and tree. By making reasonable use of switches, a variety of networking can be achieved.

The following diagram shows the bus topology

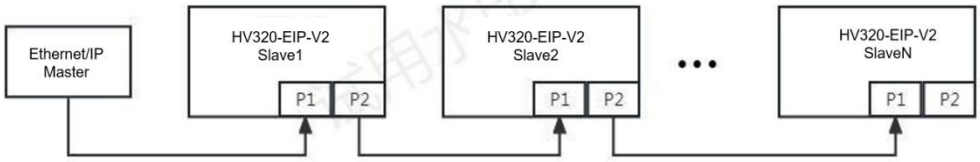

Figure 3-1 Bus connection topology

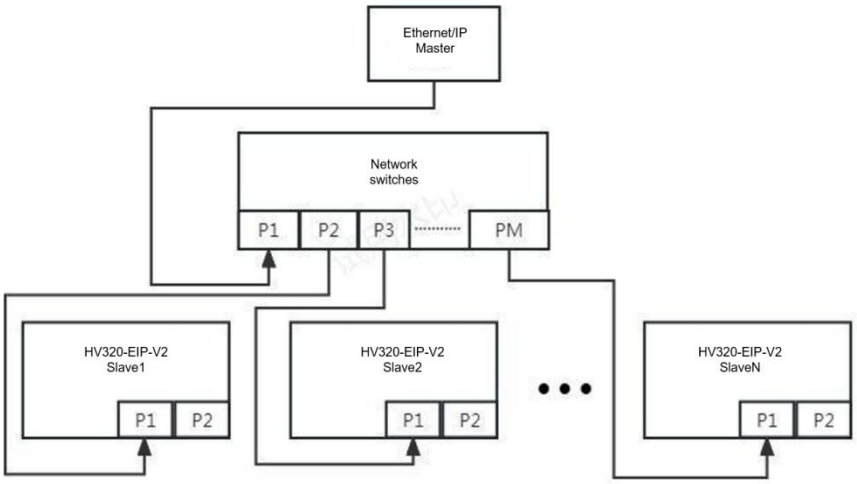

Figure 3-2 Star connection topology

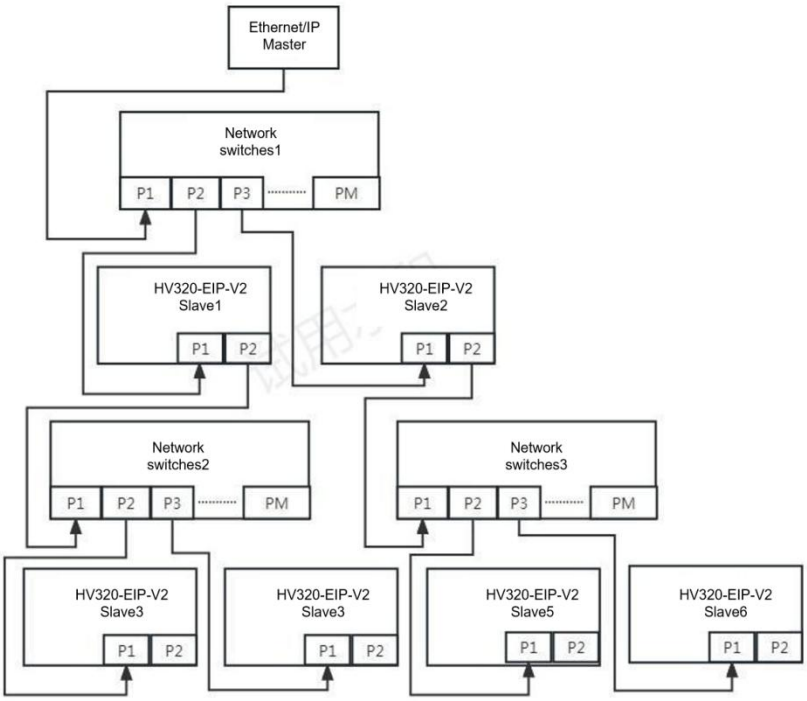

Figure 3-3 Tree connection topology

3.3.3 Data transmission format

Ethernet/IP Data Format

The usage type is divided into five types : PPO type , PPO1, PPO2, PPO3, PPO4, PPO5

The functions that each data format can accomplish are as follows:

Table 3-2: PPO type description

Type of data	Supported Features
PPO1	● Single function parameter operation ● Inverter command, frequency setting ● Inverter status, operating frequency reading
PPO2	● Single function parameter operation ● Inverter command, frequency setting ● Inverter status, operating frequency reading ● 4 function parameters are written periodically ● 4 function parameters are read periodically
PPO3	● Inverter command, frequency setting ● Inverter status, operating frequency reading
PPO 4	● Inverter command, frequency setting ● Inverter status, operating frequency reading ● 4 function parameters are written periodically ● 4 function parameters are read periodically
PPO5	● Single function parameter operation ● Inverter command, frequency setting ● Inverter status, operating frequency reading ● 10 function parameters are written periodically ● 10 function parameters are read periodically

PPO Type Description

The data block contained in the PPO type data format is divided into two areas, namely the PK W area (parameter area) and the PZ D area (process data area). The type data format is shown in the figure below：

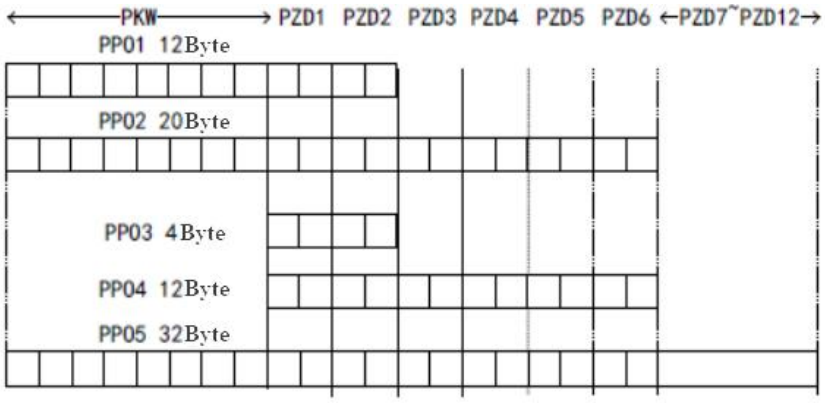

Figure 3-4: PPO type data format

PKW Data Description

PKW data mainly realizes the master station's read and write operations on a single parameter of the inverter. The communication address of the inverter parameter is directly given by the communication data. The functions realized are as follows:

a) Reading inverter function parameters

b) Change of inverter function parameters

Data Format

PKW data contains three groups of array areas, namely PKE , IND, and PWE, among which the PKE data byte length is 2 bytes, IND is 2 bytes, and PWE, PWE is 4 bytes.

The data format is shown in the following table:

TABLE 3-3: PKW DATA FORMAT

The master sends data PKW							
Operation Command	Parameter address		Reserve			Write operation: parameter value Read operation: empty	
PKE	PKE	IND	IND	PWE	PWE	PWE	PWE
Communication card response data PKW							
Operation Command	Parameter address		Reserve			Success: Return value Failed: Error message	
PKE	PKE	IND	IND	PWE	PWE	PWE	PWE

Table 3-4: PKW data description

Master sends data PKW description		**Inverter response data PKW description**
PKE	High 4 bits: command code 0: No request 1: Read parameter data 2: Change parameter data (The above command codes are	High 4 bits: Response code 0 : No request 1 : Parameters are correct. 7 : Unable to execute Lower 8 bits: parameter address high bits

	decimal numbers according to) Lower 4 bits: reserved Lower 8 bits: parameter address high bits	
IND	High 8 bits: parameter address low bits Lower 8 bits: reserved	High 8 bits: parameter address low bits Lower 8 bits: reserved
PWE	High 16 bits: reserved Lower 16 bits: not used for read requests; indicates parameter value for write requests	When the request is successful: parameter value When a request fails: Error code (same as standard MODBUS Consistent) 1 : Illegal command 2 : Illegal address 3 : Illegal data 4 : Other errors

Application examples

The master station reads the inverter function parameter P0-08 sending data PKW area and the inverter response data PKW area as shown in the figure below

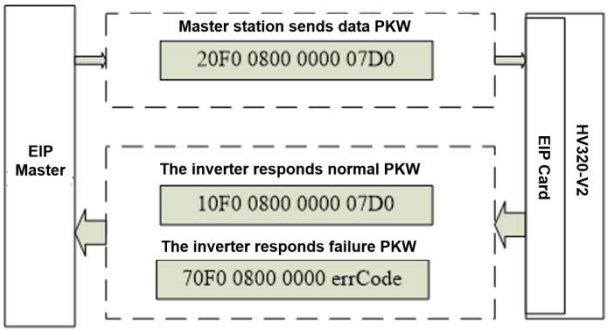

Figure 3-5: Example of the master station reading parameters and sending PKW data

PZD area data description

The PZD area enables the master station to modify and read the inverter data in real time and exchange data periodically.

The frequency converter is directly configured. It mainly includes the following contents:

a) Inverter control command and target frequency are given in real time

b) Real-time reading of the inverter's current status and operating frequency

c) Real-time interaction of function parameters and monitoring parameter data between the inverter and the Ethernet/IP master station

Note: " HV320-EiP_V1.eds " and later versions

The default mapping of PZD1 written is U3-17, and the default mapping of PZD2 is U3-16 .

The default mapping of PZD1 read is U0-68 , and the default mapping of PZD2 is U0-69 .

PZD process data mainly completes the periodic data interaction between the master station and the inverter. The interaction data is shown in Table 8 below:

Table 3-5 Interaction data

Master sends data **PZD** area			Inverter response data **PZD** area		
PZD1	PZD2	PZD3~PZD12	PZD1	PZD2	PZD3~PZD12
Control Word (U3–17)	Frequency setting (U3–16)	Real-time change of inverter function parameters	Status word (U0–68)	Operating frequency (U0–69)	Real-time reading of inverter function parameters

Table 3-6

Master sends data **PZD** description		Inverter response data **PZD** area	
PZD1	Inverter command word (the command source needs to be set to communication, that is, P0-02=2) 0001: Forward operation 0002: Reverse operation 0003: Forward jog 0004: Reverse jog 0005: Free stop 0006: Deceleration and stop 0007: Fault reset 0008: Fault reset (fault reset is only possible in communication control mode)	PZD1	Inverter operating status information 0001: Forward operation 0002: Reverse operation 0003: Shutdown
PZD2	The inverter target frequency (frequency source is set to "communication") is in the range from the negative frequency upper limit (negative value) to the positive frequency upper limit (including the decimal point, for example, 2000 corresponds to 20.00 Hz on the AC drive). When the given target frequency exceeds this range, the AC drive runs at the frequency upper limit. For example, if the Frequency High Limit setting is 50.00 Hz and the Comm Setting is 6000, the AC drive will run forward at 50.00 Hz. If the Frequency High Limit setting is 50.00 Hz and the Comm Setting is -6000, the AC drive will run reverse at 50.00 Hz.	PZD2	Inverter operating frequency (unit: 0.01Hz) Returns the actual operating frequency of the current inverter. The returned data value is a 16-bit signed data.
PZD3~ PZD12	Change function parameter values in real time , do not write to EEPROM	PZD3~ PZD12	Function parameters real-time reading

4. Configure the slave station in LAEconfig software

1) Install the configuration software on your computer 

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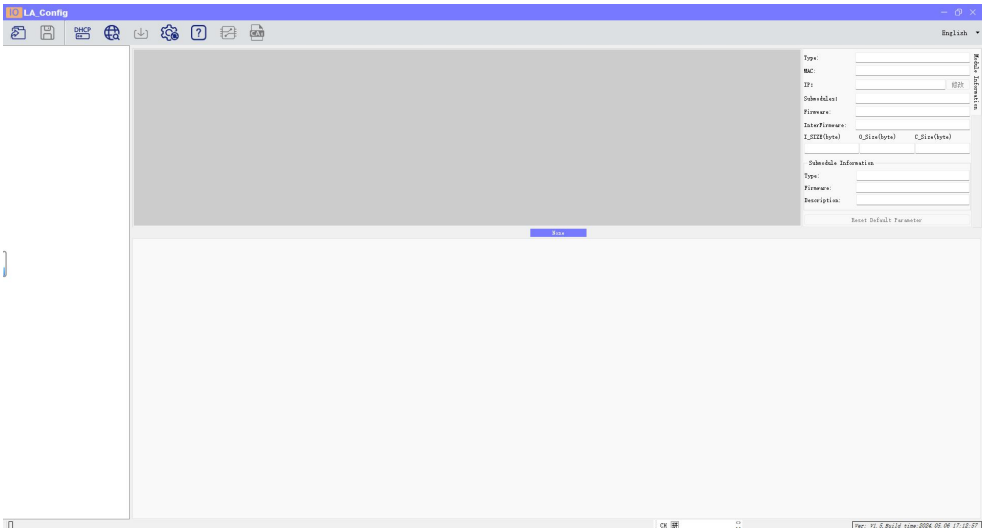
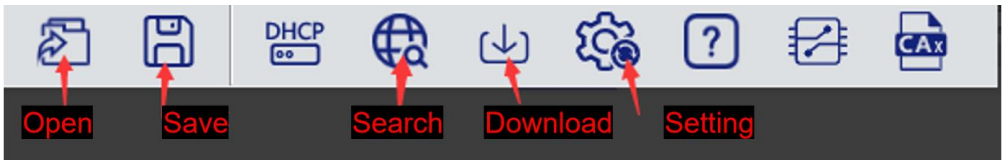
2) After the installation is complete, click 

Open the software.

3) Software interface introduction

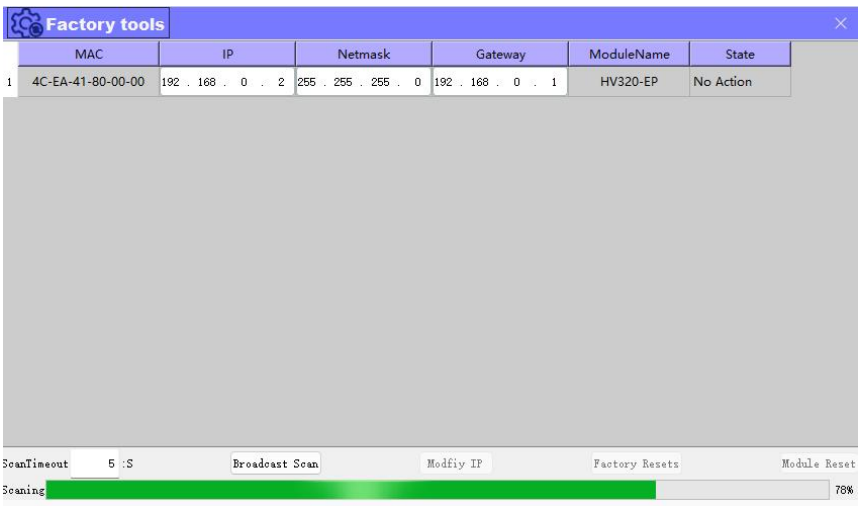


4) The software interface includes: toolbar, module information tree directory, parameter setting area, module information display area, etc.

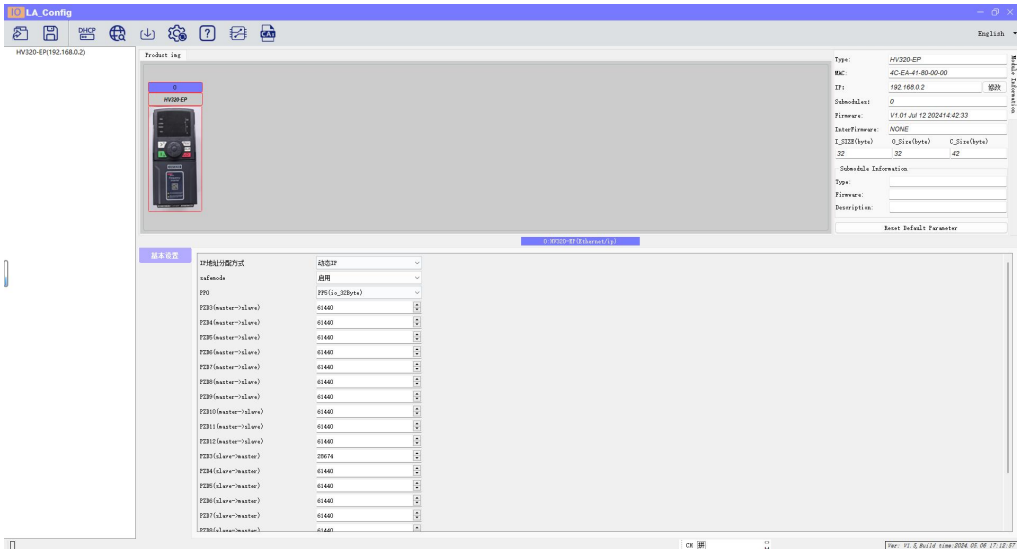


5) Modify the IP address of the inverter

Click the button in the toolbar  , click Global Scan, select the IP address to be modified, and click Modify IP Address. The IP address allocation process begins, and whether the allocation is successful can be displayed in the status column at the back.



6) Modify the inverter parameters



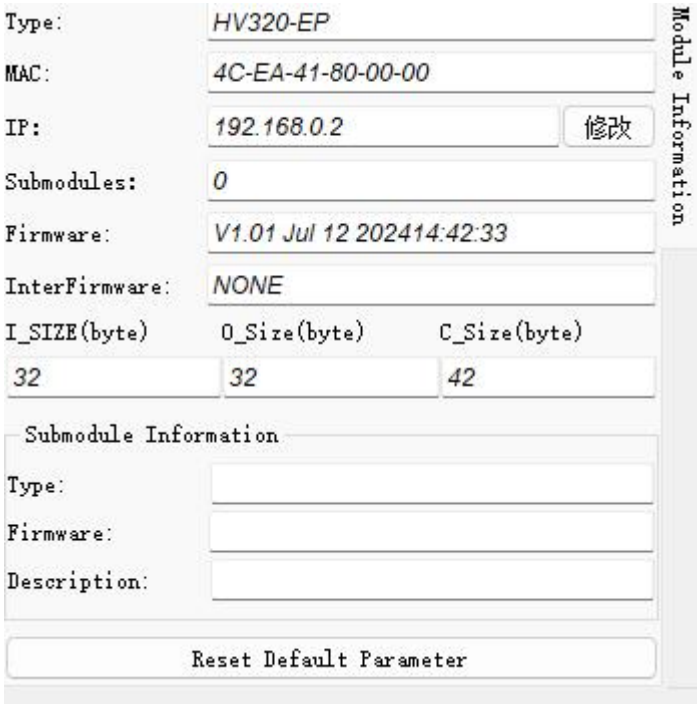
7) After modifying the parameters, download the inverter parameters

Set the module parameters in the parameter setting area. After setting, click  to download the module parameters.

At this point, the inverter parameter setting is completed.

Next is the Ethernet/IP master station settings. Configure the relevant parameters according to the configuration software of different master stations.

Note: The main parameters are input and output bytes



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