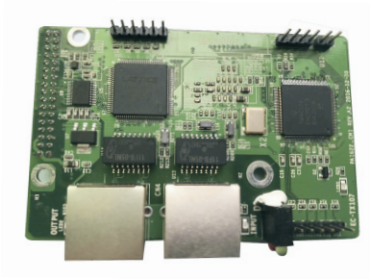
Operation Manual

EC -TX107

BACnet/IP Communication Card



SHENZHEN INVT ELECTRIC CO., LTD.

Safety precautions

The staff who will install or operate the communication card must take professional electrical and safety training for qualification, and must be familiar with installing, commissioning, operating, and maintaining the card to avoid any emergency.

Read this communication card manual and inverter manual carefully and follow all safety precautions before installing, removing, or operating the communication card. INVT will not be liable for any physical injury or death or device damage that is caused due to noncompliance with the safety precautions in the manuals.

- Disconnect any power input to the inverter completely and ensure the internal voltage is safe, because you need to detach the inverter enclosure to install or remove the communication card. For details, see the inverter manual. Noncompliance with this requirement may cause physical injuries or even death.
- Store the communication card in the place which is dustproof, damp-proof, free from electric shocks, and without mechanical pressure.
- The communication card is electrostatic sensitive. Take antistatic measures to prevent component damage.
- During communication card installation, fasten screws securely and ensure proper grounding.

Contents

1 Unpacking inspection

Check the following after receiving the products:

- Whether there is damage to the communication card
- Screen-printed model on the PCB, which is used to determine whether the communication card is correct, as shown in figure 1
- Whether the package contents are correct, as listed in table 1
- If there is communication card damage, incorrect model, or content loss, contact with your supplier.

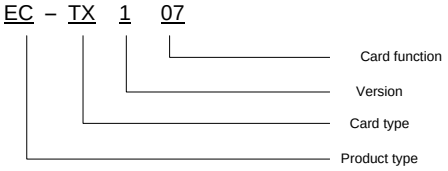
Table 1 Package contents

Item	Communication card	Screw (M3)	Manual
Physical picture			
Quantity	1	3	1

2 Overview

1. Thank you for using INVT EC-TX107 communication card (EC-TX107 for short). This manual describes the functional specifications, installation, basic operations and settings, and network protocol related content. To ensure proper installation and use, read this manual especially the communication with the inverter carefully before using the communication card.
2. This manual provides operation guidance and describes related commands for EC-TX107. For details about EC-TX107, access professional articles or information for reference.
3. EC-TX107 is defined as BACnet slave-station communication card and can be used in inverters (GD300-16) that support BACnet.
4. This manual assumes that you are familiar with GD300-16 inverter terms, functions, and parameters.
5. The communication supports both the linear and star network topologies.
6. To implement basic operations on the inverter, such as reading and writing inverter progress variables and function codes and reading inverter state variables, 32 analog objects are set for BACnet. If other objects are required, modify the software.

3 Type designation code



Identifier	Explanation	Remarks
EC	Product type	EC: expansion card
TX	Card type	TX: communication card
1	Version	The odd numbers such as 1, 3, 5, 7, and so on are used to indicate version iterations 1, 2, 3, 4, and so on.
07	Card function	07: communication card using the BACnet/IP communication mode

4 Product features

(1) Functions

- Support for BACnet protocol and BACnet/IP devices
- Providing 2 BACnet/IP ports to support 10/100M full and half duplex modes
- Support for linear and star network topologies
- Timeout detection and repeated IP detection

(2) BACnet services supported

- Service of reading a single property

This service can read any property of any object, but not limited to standard BACnet objects.

- Service of reading multiple properties

This service can read one or multiple property values of one or multiple objects, not limited to BACnet defined objects. All the “Read Access Specifications List” parameters with property identifiers can obtain the properties of an object and the property value implementation methods.

- Service of writing a single property

This service can modify a property value of a BACnet object. Essentially, it can write any property of any object, but not limited to standard BACnet objects.

- Service of writing multiple properties

This service can modify one or multiple specified property values of one or multiple BACnet objects. Essentially, this service can write any property of any object, but not limited to BACnet defined objects.

- I-Am service

The Who-Is service can determine the device object identifier and network address of another BACnet device on the same network. The Who-Is service is an unconfirmed service, which can be used to:

(1) Determine the device object identifiers and network addresses of all devices on the same network.

(2) Determine the network address of a device whose device object identifier is known. The I-Am service is also an unconfirmed service, responding to the Who-Is service request. The I-Am service can be sent at any time, but not limited to the time after the Who-Is service request is received. Especially, after a device

is started, an I-Am service request may be broadcasted. EC-TX107 uses a function code to control I-AM service broadcasting. By default, a request is sent once after the power on. You can enable continuous sending by setting the function code.

- I-Have service

The Who-Has service can determine the device object identifiers and network addresses of other BACnet devices. The local databases of these devices contain objects with given name or identifier properties. The devices use the I-Have service to respond to the Who-Has service request or inform that it has an object with the given name or identifier property. The I-Have service request can be sent at any time, but not limited to the time after the Who-Has service request is received. Both Who-Has and I-Have are unconfirmed services.

- Device communication control service

This service can send commands to a remote device. This will instruct the remote device to stop requesting and responding to all APDUs excluding those for device communication control or device re-initialization within a specified time segment. This service is mainly used for device diagnosis. A password can be required on the client, and the time limit can be set as no limitation, which indicates the device communication control service or device re-initiation service must be used. No password needs to be set for EC-TX107.

- Device re-initiation service

This service can send commands to a remote device. This will instruct the device to perform cold startup or perform hot startup to enter a preset initial state. This service is mainly used for device diagnosis. According to the service character, a password may be required before the BACnet server executes the service, while no password needs to be set for EC-TX107.

(3) Environment specifications

Table 2 Environment specifications

Item	Specifications
Work temperature	-10~50℃
Storage temperature	-20~60℃
Relative humidity	5%~95%
Other climate conditions	No condensation, frozen, rain, snow, or hail; solar radiation lower than 700W/m2
Air pressure	70~106kPa
Vibration and shock	5.9m/s2 (0.6g) when the sinusoidal vibration range is 9~200Hz

5 Components

The components of the communication card are shown in Figure 1.

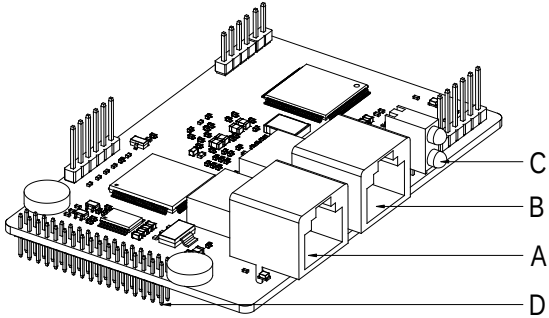


Figure 1 Communication card components

A: BACnet/IP communication Ethernet interface 1	B: BACnet/IP communication Ethernet interface 2
C: BACnet/IP state indicator	D: BACnet/IP communication card interface pins

(1) Communication ports

BACnet/IP uses standard RJ45 interface. EC-TX107 has two RJ45 interfaces which do not distinguish directions and can be swapped with each other. Figure 2 shows the two interfaces and table 3 lists the functions.

Figure 2 Two standard RJ45 interfaces

Table 3 Standard RJ45 interface functions

Pin	Name	Description
1	TX+	Transmit Data+
2	TX-	Transmit Data-
3	RX+	Receive Data+
4	n/c	Not connected
5	n/c	Not connected
6	RX-	Receive Data-
7	n/c	Not connected
8	n/c	Not connected

(2) State indicators

BACnet/IP sets two state indicators, in which the red indicator is the fault state indicator while the green indicator is the running state indicator. See table 4.

Table 4 BACnet/IP state indicators

Indicator	Name	Color
	Running state indicator (RUN)	Green
	Fault state indicator (ERROR)	Red

Table 5 and table 6 describe BACnet/IP running state indicator and fault state indicator respectively.

Table 5 Running state indicator (green)

No.	Network	State	Description
1	Off	Not powered on or faulty	Not powered on or faulty
2	0.5s on and 0.5s off (circular mode)	Online, waiting to receive BACnet data frames	Ethernet parameters set completely
3	On	In BACnet communication	BACnet data frames received

Table 6 Fault state indicator (red)

No.	Network	State	Description
1	Off	No fault	No fault
2	Turning on about 0.5s and off about 0.5s in two cycles, and then turning off about 2s (circular mode)	Faulty	Duplicate IP address set, and E-bcn reported on the inverter keypad
3	Turning on about 0.5s and off about 0.5s in three cycles and then turning off about 2s (circular mode)	Faulty	No BACnet data frames received within the specified timeout time (Timeout detection can be enabled only after being activated, which means the timeout time must not be 0.) E-bcn reported on the inverter keypad

6 Electrical connection

EC-TX107 uses standard RJ45 interfaces and supports both the linear and star network topologies. Figure 3 and figure 4 show the electrical connection diagrams in different network topologies.

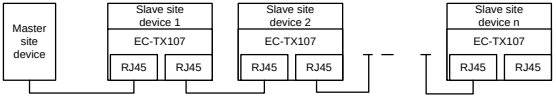


Figure 3 Electrical connection in the linear network topology

Note: In the star network topology, switches are required.

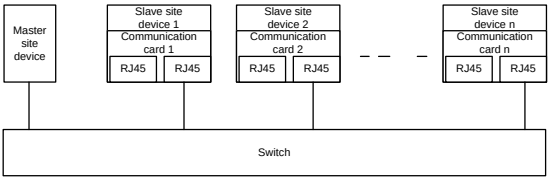


Figure 4 Electrical connection in the star network topology

7 Installation

The procedure for installing EC-TX107 is as follows:

1. Disconnect all power supply inputs to the inverter to ensure the inverter internal voltage is safe.
2. Detach the inverter cover from the inverter and find the control board.
3. Align the communication card contact pins with the expansion card slots on the control board and insert them.
4. Tighten the three screws.
5. Connect and secure the communication cable.
6. Mount the inverter cover.

Figure 5 shows the diagram of installing the communication card into GD300-16.

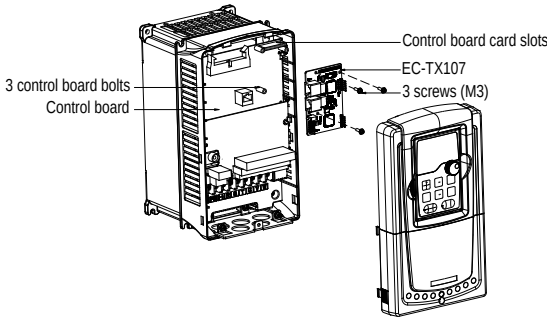


Figure 5 Communication card installation diagram

8 Communication

8.1 Communication settings

EC-TX107 can be used only as a BACnet slave site. Before communication, related GD300-16 inverter function codes must be set. The procedure is as follows:

1. Set the device number for EC-TX107.

The BACnet protocol specifies the device number range 0~4194303. The device number is set by the inverter function codes P15.38 and P15.39. For details, see section 9.1 Setting the device number.

2. Set the IP address and subnet mask for EC-TX107.

The default IP address and subnet mask of each communication card are 192.168.0.1 and 255.255.255.0. You can set each network segment address depending on requirements. For details, see section 9.2 Setting the IP address.

3. Set the communication timeout time.

The default communication timeout time is 0, which indicates timeout detection is disabled. You can set the timeout time to a value greater than 0 to activate timeout detection. Note that timeout detection is applicable only to BACnet communication.

4. Set the control mode.

If you want to control the inverter, enable BACnet communication control. That is, set P00.01=2 and P00.02=1. Generally, if you want to set a value through BACnet communication, set the corresponding function code to be controlled through BACnet communication. For details about related function codes, see Appendix 1.

Note: After steps 1 to 3 are performed, the communication card can communicate properly. If you want to control the inverter through BACnet communication, set related function codes to implement BACnet communication control.

8.2 Packet format

BACnet/IP packets are based on Ethernet data frames, whose formats are listed in Table 7.

Table 7 Data frame formats of BACnet/IP packets

14 bytes	20 bytes	8 bytes	N bytes			
Ethernet data head	IP data head	UDP data head	BVLLPCI	NPCI	APCI	Service related data block

8.3 Object definition

EC-TX107 supports seven types of objects, including device, binary input, binary output, binary value, analog input, analog output, and analog value. Table 8 lists the properties for the objects. Only analog value objects are described in details since the application layer defines only analog value objects.

Note: If objects rather than analog value objects are required, modification needs to be performed in the application layer software.

Table 8 Supported objects and properties

Property	Object						
	Device	Binary input	Binary output	Binary value	Analog input	Analog output	Analog value
Object_Identifier	√	√	√	√	√	√	√
Object_Name	√	√	√	√	√	√	√
Object_Type	√	√	√	√	√	√	√
Description	√	√	√	√	√	√	√
system_status	√						
Vendor_Name	√						
Vendor_Identifier	√						
Model_Name	√						
Firmware_Revision	√						
Appl_Software _Revision	√						
Protocol_Version	√						
Protocol_Revision	√						
Services_Supported	√						
Object_Types _Supported	√						
Object_List	√						
Max_APDU_Length	√						
Segmentation_ Support	√						
APDU_Timeout	√						
Number_APDU _Retries	√						
Device_Address	√						

Property	Object						
	Device	Binary input	Binary output	Binary value	Analog input	Analog output	Analog value
_Binding							
Database_Revision	√						
Local_Time	√						
Local_Date	√						
UTC_Offset	√						
Daylight_Savings_Status	√						
Location	√						
Present_Value		√	√	√	√	√	√
Status_Flags		√	√	√	√	√	√
Event_State		√	√	√	√	√	√
Out_Of_Service		√	√	√	√	√	√
Units					√	√	√
Priority_Array			√	√*		√	√*
Relinquish_ Default			√	√*		√	√*
Polarity		√	√				
Inactive_Text		√	√	√			
Active_Text		√	√	√			

8.4 Analog value object instances

EC-TX107 defines 32 analog value objects (AV0~AV31), as listed in table 9.

Table 9 Analog value objects

Instance ID	Object name	Description
AV0	CONTROL_WORD	Inverter control word.
AV1	PZD2_SEND	It corresponds to the inverter function code P15.02 (PZD2 receiving). If you set P15.02 to an option, such as P15.02=1, set frequency, 5000 is written to its current value property, which means the frequency is set to 50Hz. (Note: The communication module must be set

Instance ID	Object name	Description
		to the inverter controller).
AV2	PZD3_SEND	It corresponds to the inverter function code P15.03 (PZD3 receiving). You need to set P15.03. The work principle is similar to that for AV1.
AV3	PZD4_SEND	It corresponds to the inverter function code P15.04 (PZD4 receiving). You need to set P15.04. The work principle is similar to that for AV1.
AV4	PZD5_SEND	It corresponds to the inverter function code P15.05 (PZD5 receiving). You need to set P15.05. The work principle is similar to that for AV1.
AV5	PZD6_SEND	It corresponds to the inverter function code P15.06 (PZD6 receiving). You need to set P15.06. The work principle is similar to that for AV1.
AV6	PZD7_SEND	It corresponds to the inverter function code P15.07 (PZD7 receiving). You need to set P15.07. The work principle is similar to that for AV1.
AV7	PZD8_SEND	It corresponds to the inverter function code P15.08 (PZD8 receiving). You need to set P15.08. The work principle is similar to that for AV1.
AV8	PZD9_SEND	It corresponds to the inverter function code P15.09 (PZD9 receiving). You need to set P15.09. The work principle is similar to that for AV1.
AV9	PZD10_SEND	It corresponds to the inverter function code P15.10 (PZD10 receiving). You need to set P15.10. The work principle is similar to that for

Instance ID	Object name	Description
		AV1.
AV10	PZD11_SEND	It corresponds to the inverter function code P15.11 (PZD11 receiving). You need to set P15.11. The work principle is similar to that for AV1.
AV11	PZD12_SEND	It corresponds to the inverter function code P15.12 (PZD12 receiving). You need to set P15.12. The work principle is similar to that for AV1.
AV12	STATUS_WORD	Inverter state word.
AV13	PZD2_RECEIVE	It corresponds to the inverter function code P15.13 (PZD2 sending). If you set P15.13 to an option, such as P15.13=1, running frequency, its current object value property is read as the current inverter running frequency.
AV14	PZD3_RECEIVE	It corresponds to the inverter function code P15.14 (PZD3 sending). You need to set P15.14. The work principle is similar to that for AV13.
AV15	PZD4_RECEIVE	It corresponds to the inverter function code P15.15 (PZD4 sending). You need to set P15.15. The work principle is similar to that for AV13.
AV16	PZD5_RECEIVE	It corresponds to the inverter function code P15.16 (PZD5 sending). You need to set P15.16. The work principle is similar to that for AV13.
AV17	PZD6_RECEIVE	It corresponds to the inverter function code P15.17 (PZD6 sending). You need to set P15.17. The work principle is similar to that for AV13.

Instance ID	Object name	Description
AV18	PZD7_RECEIVE	It corresponds to the inverter function code P15.18 (PZD7 sending). You need to set P15.18. The work principle is similar to that for AV13.
AV19	PZD8_RECEIVE	It corresponds to the inverter function code P15.19 (PZD8 sending). You need to set P15.19. The work principle is similar to that for AV13.
AV20	PZD9_RECEIVE	It corresponds to the inverter function code P15.20 (PZD9 sending). You need to set P15.20. The work principle is similar to that for AV13.
AV21	PZD10_RECEIVE	It corresponds to the inverter function code P15.21 (PZD10 sending). You need to set P15.21. The work principle is similar to that for AV13.
AV22	PZD11_RECEIVE	It corresponds to the inverter function code P15.22 (PZD11 sending). You need to set P15.22. The work principle is similar to that for AV13.
AV23	PZD12_RECEIVE	It corresponds to the inverter function code P15.23 (PZD12 sending). You need to set P15.23. The work principle is similar to that for AV13.
AV24	PKW1_ SEND	Task identity (request to the inverter).
AV25	PKW2_ SEND	Basic parameter address (request to the inverter).
AV26	PKW3_ SEND	Parameter value (MSBs) (request to the inverter).
AV27	PKW4_ SEND	Parameter value (LSBs) (request to the inverter).
AV28	PKW1_RECEIVE	Response identity (response from the inverter).

Instance ID	Object name	Description
AV29	PKW2_RECEIVE	Basic parameter address (response from the inverter).
AV30	PKW3_RECEIVE	Parameter value (MSBs) or error code (response from the inverter).
AV31	PKW4_RECEIVE	Parameter value (LSBs) (response from the inverter).

These analog value objects enable you to set given parameters, monitor state values, send control commands, monitor running states, and read and write inverter function codes.

8.4.1 Setting given parameters

Setting given parameters is related to objects AV1~AV11, corresponding to function codes P15.02~P15.12, which are listed in table 10. Setting the given parameters of types 0~18 can be implemented by setting the current value properties of objects AV1~AV11. For example, if you want to set the given frequency of the inverter through PZD3 (corresponding to P15.03), set the frequency setting method (if the current frequency setting uses frequency-A command, frequency-A command selects BACnet communication setting method). That is, if you set P00.09=0, P00.06=9, and P15.03=1 and 5000 is written to the current value property of AV2, the given frequency of the inverter is set to 50.00Hz.

Note: Before setting values through objects AV1~AV11, set function codes for function selection. In the preceding example, the written value of AV2 becomes the set frequency only after you set P15.03=1 to select the set frequency.

Table 10 GD300-16 given values

Function code	Word	Value range	Default value
P15.02	PZD2 receiving	0: Invalid 1: Set frequency 2: PID1 reference source 1; range (0~1000; 1000 corresponds to 100.0%) 3: PID1 feedback source 1; range (0~1000; 1000 corresponds to 100.0%)	0
P15.03	PZD3 receiving		0
P15.04	PZD4 receiving		0

Function code	Word	Value range	Default value
P15.05	PZD5 receiving	4: Set torque value 5: Set value of the upper limit frequency in forward rotation 6: Set value of the upper limit frequency in reverse rotation 7: Electromotion torque upper limit 8: Braking torque upper limit 9: Virtual input terminal command 10: Virtual output terminal command 11: Set voltage value 12: Set AO value 1 13: Set AO value 2 14: PID1 reference source 2; range (0~1000; 1000 corresponds to 100.0%) 15: PID1 feedback source 2; range (0~1000; 1000 corresponds to 100.0%) 16: PID2 reference source 1; range (0~1000; 1000 corresponds to 100.0%) 17: PID2 feedback source 1; range (0~1000; 1000 corresponds to 100.0%) 18: Inlet sump water level; range (0~1000; 1000 corresponds to 100.0%) 19~20: Reserved	0
P15.06	PZD6 receiving		0
P15.07	PZD7 receiving		0
P15.08	PZD8 receiving		0
P15.09	PZD9 receiving		0
P15.10	PZD10 receiving		0
P15.11	PZD11 receiving		0
P15.12	PZD12 receiving		0

8.4.2 Monitoring state values

Monitoring state values is related to objects AV13~AV23, corresponding to function codes P15.13~P15.23, which are listed in table 11. The current values of types 0~25 can be monitored by the current value properties of objects AV13~AV23, but you need to set the value of a function code in P15.13~P15.23 to a corresponding type. For example, if you want to query the running frequency of the inverter through PZD2 (corresponding to P15.13), set P15.13=1 (running frequency). Check the current value property of AV13, whose value is the current running frequency.

Note: Before reading values from objects AV13~AV23, set function codes for

function selection. In the preceding example, the read value of AV13 becomes the running frequency only after you set P15.13=1 to select the running frequency. Functions of types 0~25 can be set for objects AV13~AV23.

Table 11 GD300-16 actual state values

Function code	Word	Value range	Default value
P15.13	PZD2 sending	0: Invalid 1: Running frequency (*100, Hz) 2: Set frequency (*100，Hz) 3: Bus voltage (*10, V) 4: Output voltage (*1, V) 5: Output current (*10, A) 6: Actual output torque value (*10, %) 7: Actual power value (*10, %) 8: Running rotation speed (*1, RPM) 9: Running linear speed (*1, m/s) 10: Ramp given frequency 11: Fault code 12: AI1 value (*100, V) 13: AI2 value (*100, V) 14: AI3 value (*100, V) 15: Pulse frequency value (*100, kHz) 16: Terminal input state 17: Terminal output state 18: PID1 reference (*100, %) 19: PID1 feedback (*100, %) 20: Motor rated torque 21: Control word 22: PID1 output 23: PID2 reference 24: PID2 feedback 25: PID2 output 26~29: Reserved	0
P15.14	PZD3 sending		0
P15.15	PZD4 sending		0
P15.16	PZD5 sending		0
P15.17	PZD6 sending		0
P15.18	PZD7 sending		0
P15.19	PZD8 sending		0
P15.20	PZD9 sending		0
P15.21	PZD10 sending		0
P15.22	PZD11 sending		0
P15.23	PZD12 sending		0

8.4.3 Sending control commands and monitoring running states

(1) Sending control commands

Sending control commands is related to object AV0. The inverter can be controlled by writing values to the control word bits. Table 12 provides descriptions for the control word bits of GD300-16. If you want to control inverter running, set the given frequency, set P00.01=2 and P00.02=1, and write 1 into the current value property of AV0 to enable forward running or write 5 to enable deceleration to stop.

Table 12 GD300-16 control word bits

Bit	Name	Value	Description
Bit0~Bit7	RUN STATUS BYTE	1	Forward rotation running
		2	Reverse rotation running
		3	Forward rotation jogging
		4	Reverse rotation jogging
		5	Deceleration to stop
		6	Free stop (or emergent stop)
		7	Fault reset
		8	Jogging stopped
		9	Emergent deceleration to stop
Bit8	WIRTE ENABLE	1	Enable the writing function (Mainly for PKW1~PKW4)
Bit9~Bit10	Select motor group	00	MOTOR GROUP 1 SELECTION (Select motor 1)
		01	MOTOR GROUP 2 SELECTION (Select motor 2)
		02	MOTOR GROUP 3 SELECTION (Select motor 3)
		03	MOTOR GROUP 4 SELECTION (Select motor 4)
Bit11	Select torque control	1	Enable torque control
		0	Disable torque control
Bit13	Reserved		

Bit	Name	Value	Description
Bit14	Reserved		
Bit15	Fire signal trigger	1	Valid
		0	Invalid

(2) Monitoring running states

Monitoring running states is related to object AV12. The specified bits in the state word can monitor the inverter running state. Table 13 provides descriptions for the state word bits of GD300-16. If the current value property of AV12 is detected, you can understand the current inverter running state according to the property.

Table 13 GD300-16 state word bits

Bit	Name	Value	Description
0~7	RUN STATUS BYTE	1	Forward rotation running
		2	Reverse rotation running
		3	Stopped
		4	Faulty
		5	In POFF state
		6	In pre-exciting state
8	DC VOLTAGE ESTABLISH	1	Ready for running
		0	Not ready for running
9~10	MOTOR GROUP FEEDBACK	0	Motor 1 feedback
		1	Motor 2 feedback
		2	Motor 3 feedback
		3	Motor 4 feedback
11	MOTOR TYPE FEEDBACK	1	Synchronous motor
		0	Asynchronous motor
12	OVERLOAD ALARM	1	Overload alarm
		0	No overload alarm
13~14	RUN/STOP	0	Keypad control

Bit	Name	Value	Description
	MODE	1	Terminal control
		2	Communication control
		3	Reserved
Bit15	Fire signal trigger	1	Valid
		0	Invalid

8.4.4 Reading and writing inverter function codes

Reading and writing inverter function codes is related to objects AV24~AV31. The current values of AV24~AV27 are request codes while those of AV28~AV31 are inverter response codes.

The current value of AV24 indicates the task identity, whose definition is described in table 14. The current value of AV25 indicates the parameter address (or function code address). For example, for P00.04, if the current value of AV25 is 4, the current values of AV26 and AV27 are invalid during parameter value requesting but indicate the MSBs and LSBs of the modified parameter value during parameter value modification.

Table 14 AV24 task identity definition

Request (from master device to slave device)	
Request No.	**Function**
0	No task
1	Obtain the parameter value
2	Modify the parameter value (single word) [Modify only RAM]
3	Modify the parameter value (double word) [Modify only RAM]
4	Modify the parameter value (single word) [Modify both RAM and EEPROM]
5	Modify the parameter value (double word) [Modify both RAM and EEPROM]

Note: Currently, neither request 3 nor request 5 is supported.

The current value of AV28 indicates the response signal identity, whose definition is described in table 15. The current value of AV29 indicates the parameter address (or function code address). For example, for P00.04, if the current value of AV29 is 4: During parameter value requesting, if there is no error, the current values of AV30 and AV31 indicate the MSBs and LSBs of the requested parameter value; if there is

an error, AV30 indicates the error code and AV31 is invalid.

During parameter value modification, if there is no error, the current values of AV30 and AV31 indicate the MSBs and LSBs of the modified parameter value; if there is an error, AV30 indicates the error code and AV31 is invalid.

Table 15 AV28 response signal identity definition

Response (from slave device to master device)	
Response No.	**Function**
0	No response
1	Send the parameter value (single word)
2	Send the parameter value (double word)
3	Task execution fails. An error code is returned. The possible errors are as follows: 1: Invalid request 2: Invalid address 3: Setting range exceeded 4: Parameter range exceeded or writing disallowed in current state 5: Factory password denied 6: Communication error 7: Read-only parameter 8: Parameter modification disallowed in running state 9: Password protection
4	No parameter modification permission

For example, if you want to read P00.04, set AV24.present=1 (requesting the parameter value) and AV25.present=4 (P00.04). The response identity can be read from AV28.present. If there is no error, the value of P00.04 can be read from AV30.present (MSBs) and AV31.present (LSBs). AV29.present is the parameter address of P00.04. If you want to modify a parameter, for example, setting P15.02 to 1, set AV24.present=2, AV25.present=3842 (0x0F02), AV26.present (MSBs)=0, and AV27.present (LSBs)=1. The response identity is read from AV28.present. If there is no error, AV30.present (MSBs) and AV31.present (LSBs) are the value of P15.02, and AV29.present is the parameter address of P15.02.

Note: The prerequisite for reading and writing inverter function codes is enabling the writing function in AV0.

9 Device number and IP address

The communication card can properly communicate after communication parameters such as IP address, subnet mask, and device number are set. By default, for any communication card, the device number is 1, IP address is 192.168.0.1, and subnet mask is 255.255.255.0. You can change the IP address and subnet mask as required.

In addition, you can set P15.41 (communication timeout time) to activate communication timeout detection. By default, P15.41 is set to 0, which indicates communication timeout detection is not detected.

9.1 Setting the device number

Each communication card has a unique device number. The device number can be set by P15.38 and P15.39, which correspond to the MSBs and LSBs respectively. The device number must be within the range 0~4194303, which has been limited by the program. The value of P15.38 ranges from 0 to 4194, while the value of P15.39 ranges from 0 to 999. The device number equals (P15.38 * 1000 + P15.39). For example, if P15.38=1 and P15.39=999, the device number is 1999.

9.2 Setting the IP address

Each communication card corresponds to a unique IP address. You can set different network segment IP addresses through P16.01~P16.08. Note that the mapping between IP addresses and subnet masks must be correct.

Appendix 1 Function codes related to BACnet/IP

Function code	Name	Description	Setting range	Default	Modify
P00.01	Command running channel	0: Keypad (LED off) 1: Terminal (LED blinking) 2: Communication (LED on)	0~2	0	○
P00.02	Communication channel	0: MODBUS 1: BACnet 2: Ethernet 3: CAN	0~3	0	○
P00.06	Frequency-A command setting method	0: Keypad 1: AI1 2: AI2	0~11	0	○
P00.07	Frequency-B command setting method	3: AI3 4: High-speed pulse HDI 5: Simple PLC program 6: Multi-step speed running 7: PID control 8: MODBUS communication 9: BACnet communication 10: Ethernet communication 11: Reserved	0~11	2	○
P03.11	Torque setting method	0: Torque control is invalid 1: Keypad (P03.12) 2: AI1	0~10	0	○

Function code	Name	Description	Setting range	Default	Modify
		3: AI2 4: AI3 5: High-speed pulse HDI 6: Multi-step torque running 7: MODBUS communication 8: BACnet communication 9: Ethernet communication 10: Reserved Note: For values 2, 3, 4, 5, 6, 7, and 9, 100% corresponds to the triple of the motor current.			
P03.14	Setting source of forward-rotation upper limit frequency in torque control	0: Keypad (P03.16) 1: AI1 2: AI2 3: AI3 4: High-speed pulse HDI 5: Multi-step running 6: MODBUS communication 7: BACnet communication 8: Ethernet communication 9: Reserved Note: For values 1, 2, 3, 4, 5, 6, and 8, 100% corresponds to the triple	0~9	0	○
P03.15	Setting source of reverse-rotation upper limit frequency in		0~9	0	○

Function code	Name	Description	Setting range	Default	Modify
	torque control	of the motor current.			
P03.18	Setting source of electromotion torque upper limit	0: Keypad (P03.20) 1: AI1 2: AI2 3: AI3 4: Pulse frequency HDI	0~8	0	○
P03.19	Setting source of braking torque upper limit	5: MODBUS communication 6: BACnet communication 7: Ethernet communication 8: Reserved Note: For values 1, 2, 3, 4, 5, and 7, 100% corresponds to the triple of the motor current.	0~8	0	○
P04.27	Voltage setting channel	0: Keypad (P04.28) 1: AI1 2: AI2 3: AI3 4: HDI 5: Multi-step speed running (in P10) 6: PID 7: MODBUS communication 8: BACnet communication 9: Ethernet communication	0~10	0	○

Function code	Name	Description	Setting range	Default	Modify
		10: Reserved			
P06.01	Y output	0: Invalid 1: Running 2: Forward rotation running 3: Reverse rotation running 4: Jogging 5: Inverter fault 6: FDT1 7: FDT2 8: Frequency arrival 9: Zero speed running 10: Upper limit frequency arrival 11: Lower limit frequency arrival 12: Ready for running 13: Pre-magnetizing 14: Overload alarm 15: Underload alarm 16: Simple PLC stage completion 17: Simple PLC cycle completion 18: Set count value arrival 19: Specified count value arrival 20: External fault valid 21: Length arrival 22: Running time arrival	0~59	0	○
P06.02	HDO output		0~59	0	○
P06.03	Relay RO1 output		0~59	1	○
P06.04	Relay RO2 output		0~59	5	○
P06.05	Relay RO3 output		0~59	0	○
P06.06	Relay RO4 output		0~59	0	○
P06.07	Relay RO5 output		0~59	0	○
P06.08	Relay RO6 output		0~59	0	○
P06.09	Relay RO7 output		0~59	0	○
P06.10	Relay RO8 output		0~59	0	○

Function code	Name	Description	Setting range	Default	Modify
		23: MODBUS communication virtual terminal output 24: BACnet communication virtual terminal output 25: Ethernet communication virtual terminal output 26: DC bus voltage establishment finished 27: Fire mode active state 28: Low PID1 feedback alarm 29: High PID1 feedback alarm 30: PID1 hibernation state 31: Real-time clock fault 32: PID2 start state 33: PID2 stop state 34: Motor A connected to variable frequency 35: Motor A connected to power frequency 36: Motor B connected to variable frequency 37: Motor B connected to power frequency 38: Motor C connected to variable frequency 39: Motor C connected to			

Function code	Name	Description	Setting range	Default	Modify
		power frequency 40: Motor D connected to variable frequency 41: Motor D connected to power frequency 42: Motor E connected to variable frequency 43: Motor E connected to power frequency 44: Motor F connected to variable frequency 45: Motor F connected to power frequency 46: Motor G connected to variable frequency 47: Motor G connected to power frequency 48: Motor H connected to variable frequency 49: Motor H connected to power frequency 50: Standby pressure running indication 51: Inlet sump water shortage indication 52: Alarm output 53~59: Reserved			
P06.32	AO1 output	0: Running frequency 1: Set frequency 2: Ramp given frequency 3: Running rotation speed 4: Output current (relative	0~30	0	○

Function code	Name	Description	Setting range	Default	Modify
P06.33	AO2 output	to the inverter) 5: Output current (relative to the motor) 6: Output voltage 7: Output power 8: Set torque value 9: Output torque 10: AI1 input value 11: AI2 input value 12: AI3 input value 13: High speed pulse HDI input value 14: MODBUS communication set value 1 15: MODBUS communication set value 2 16: BACnet communication set value 1 17: BACnet communication set value 2 18: Ethernet communication set value 1 19: Ethernet communication set value 2 20: Reserved 21: Reserved	0~30	0	○
P06.34	HDO output		0~30	0	○

Function code	Name	Description	Setting range	Default	Modify
		22: Torque current (relative to the motor rated current) 23: Ramp given frequency (with sign) 24: PID1 output 25: PID2 output 26: PID1 reference 27: PID1 feedback 28: PID2 reference 29: PID2 feedback 30: Reserved			
P07.27	Current fault type	0: No fault 1: OUt1 2: OUt2 3: OUt3 4: OC1 5: OC2 6: OC3 7: OV1 8: OV2 9: OV3 10: UV 11: OL1 12: OL2 13: SPI 14: SPO 15: OH1 16: OH2 17: EF 18: CE	0~37		●
P07.28	Previous fault type				●
P07.29	Previous 2 fault type				●
P07.30	Previous 3 fault type				●
P07.31	Previous 4 fault type				●
P07.32	Previous 5 fault type				●

Function code	Name	Description	Setting range	Default	Modify
		19: ItE 20: tE 21: EEP 22: PIDE 23: bCE 24: END 25: OL3 26: PCE 27: UPE 28: DNE 29: E-DP 30: E-NET 31: E-CAN 32: ETH1 33: ETH2 34: dEu 35: STo 36: LL 37: TI-E 38: E-bac			
P09.05	PID1 reference source 1	0: P09.07 1: P09.08 2: AI1 3: AI2 4: AI3 5: HDI 6: Multi-step speed 7: MODBUS 8: BACnet 9: Ethernet 10: Reserved	0~10	0	○

Function code	Name	Description	Setting range	Default	Modify
P09.06	PID1 reference source 2	0: P09.07 1: P09.08 2: AI1 3: AI2 4: AI3 5: HDI 6: Multi-step speed 7: MODBUS 8: BACnet 9: Ethernet 10: Reserved	0~10	0	○
P09.10	PID1 feedback source 1	0: AI1 1: AI2 2: AI3 3: HDI 4: MODBUS 5: BACnet 6: Ethernet 7: Reserved	0~7	0	○
P09.11	PID1 feedback source 2	0: AI1 1: AI2 2: AI3 3: HDI 4: MODBUS 5: BACnet 6: Ethernet 7: Reserved	0~7	0	○

Function code	Name	Description	Setting range	Default	Modify
P22.39	Inlet sump water level signal input	0: No input 1: Digital input 2: AI1 3: AI2 4: AI3 5: MODBUS 6: BACnet	0~6	0	○
P15.02	PZD2 receiving	0: Invalid 1: Set frequency 2: PID1 reference source 1; range (0~1000; 1000 corresponds to 100.0%) 3: PID1 feedback source 1; range (0~1000; 1000 corresponds to 100.0%) 4: Set torque value 5: Set value of the upper limit frequency in forward rotation 6: Set value of the upper limit frequency in reverse rotation 7: Electromotion torque upper limit 8: Braking torque upper limit	0~20	0	○
P15.03	PZD3 receiving		0~20	0	○
P15.04	PZD4 receiving		0~20	0	○
P15.05	PZD5 receiving		0~20	0	○
P15.06	PZD6 receiving		0~20	0	○
P15.07	PZD7 receiving		0~20	0	○
P15.08	PZD8 receiving		0~20	0	○
P15.09	PZD9 receiving		0~20	0	○
P15.10	PZD10 receiving		0~20	0	○
P15.11	PZD11 receiving		0~20	0	○

Function code	Name	Description	Setting range	Default	Modify
P15.12	PZD12 receiving	9: Virtual input terminal command 10: Virtual output terminal command 11: Set voltage value 12: Set AO value 1 13: Set AO value 2 14: PID1 reference source 2; range (0~1000; 1000 corresponds to 100.0%) 15: PID1 feedback source 2; range (0~1000; 1000 corresponds to 100.0%) 16: PID2 reference source 1; range (0~1000; 1000 corresponds to 100.0%) 17: PID2 feedback source 1; range (0~1000; 1000 corresponds to 100.0%) 18: Inlet sump water level; range (0~1000; 1000 corresponds to 100.0%) 19~20: Reserved	0~20	0	○
P15.13	PZD2 sending	0: Invalid 1: Running frequency (*100, Hz) 2: Set frequency (*100，Hz)	0~29	0	○
P15.14	PZD3 sending		0~29	0	○
P15.15	PZD4 sending		0~29	0	○

Function code	Name	Description	Setting range	Default	Modify
P15.16	PZD5 sending	3: Bus voltage (*10, V) 4: Output voltage (*1, V) 5: Output current (*10, A) 6: Actual output torque value (*10, %) 7: Actual power value (*10, %) 8: Running rotation speed (*1, RPM) 9: Running linear speed (*1, m/s) 10: Ramp given frequency 11: Fault code 12: AI1 value (*100, V) 13: AI2 value (*100, V) 14: AI3 value (*100, V) 15: Pulse frequency value (*100, kHz) 16: Terminal input state 17: Terminal output state 18: PID1 reference (*100, %) 19: PID1 feedback (*100, %) 20: Motor rated torque 21: Control word 22: PID1 output 23: PID2 reference 24: PID2 feedback 25: PID2 output 26~29: Reserved	0~29	0	○
P15.17	PZD6 sending		0~29	0	○
P15.18	PZD7 sending		0~29	0	○
P15.19	PZD8 sending		0~29	0	○
P15.20	PZD9 sending		0~29	0	○
P15.21	PZD10 sending		0~29	0	○
P15.22	PZD11 sending		0~29	0	○

Function code	Name	Description	Setting range	Default	Modify
P15.38	Device number MSBs	Unique BACnet device number, ranging 0~4194303	0~4194	0	◎
P15.39	Device number LSBs		0~999	1	◎
P15.40	“I-Am” service selection	0: sent during power on 1: sent continuously	0~1	0	○
P15.41	BACnet communication timeout fault time	0.1~180.0s 0.0: invalid	0.0~180.0	0.0s	○
P16.00	Ethernet communication speed setting	0: Self-adapting 1: 100M full duplex 2: 100M half duplex 3: 10M full duplex 4: 10M half duplex	0~4	0	◎
P16.01	IP address 1	0~255	0~255	192	◎
P16.02	IP address 2	0~255	0~255	168	◎
P16.03	IP address 3	0~255	0~255	0	◎
P16.04	IP address 4	0~255	0~255	1	◎
P16.05	Subnet mask 1	0~255	0~255	255	◎
P16.06	Subnet mask 2	0~255	0~255	255	◎
P16.07	Subnet mask 3	0~255	0~255	255	◎
P16.08	Subnet mask 4	0~255	0~255	0	◎
P16.09	Gateway 1	0~255	0~255	192	◎
P16.10	Gateway 2	0~255	0~255	168	◎
P16.11	Gateway 3	0~255	0~255	1	◎
P16.12	Gateway 4	0~255	0~255	1	◎

Service line:86-755-86312859 Website:www.invt.com

The products are owned by **Shenzhen INVT Electric Co.,Ltd.**
Two companies are commissioned to manufacture: (For product code, refer to the 2nd/3rd place of S/N on the name plate.)

Shenzhen INVT Electric Co., Ltd. (origin code: 01)
Address: INVT Guangming Technology Building, Songbai Road, Matian, Guangming District,Shenzhen, China

INVT Power Electronics (Suzhou) Co., Ltd. (origin code: 06)
Address: 1# Kunlun Mountain Road, Science&Technology Town, Gaoxin District, Suzhou, Jiangsu, China

Industrial Automation: ■Frequency Inverter ■Servo & Motion Control ■Motor & Electric Spindle ■PLC
■HMI ■Intelligent Elevator Control System ■Traction Drive

Electric Power: ■SVG ■Solar Inverter ■UPS ■Online Energy Management System

66001-00493

201811 (V1.2)