

IT7900P AC/DC Power Supply CANOPEN Programming Guide

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Chapter1 CANOpen Introduction

1.1 Introduction of Communication Process

IT7900P CAN communication is based on CANopen protocol. Connect CAN interface of the IT7900P rear panel to CAN analysis tool, configure CAN interface information in the menu before start CAN communication. For example, set CAN address as 01, baudrate and CAN protocol. Please refer to the IT7900P series user manual.

1. PC sends startup message to power supply.
2. After the power supply receives the startup message, it switches to the remote control mode (at this time, the front panel of IT7900P shows that the instrument enters the remote state). Only the instrument enters the remote control mode, the power supply can send and receive messages successfully with PC.
3. Then, IT7900P periodically send TPDO parameters to PC.
4. Users can also send RPTO or SDO message to control IT7900P by PC.

If users want to switch to local working mode, send stop message to instrument. The following sections will describe the specific interactive and setup messages in detail.

1.2 Introduction of CAN Format

Different CAN analysis tools have different requirements and fields, please refer to the specific CAN tool. Some main fields in different tools are explained below for your reference.

In common CAN tools, users need to focus on Frame ID and DATA (Hex) of CAN message. For example, send voltage setting message:

Frame ID	Data (HEX)	Remarks
0601	23 03 30 02 00 00 5C 43	Single phase voltage set to 220V the transfer type of TPD01 to 254

Frame ID

There are four kinds of **Frame ID**. When send commands, the Frame ID is 0000 or 0601, and 0000 is the Frame ID for enable or disable the CAN communication, this command no response.

0601 is the Frame ID for communication command, every command has a respond message. Calculation method of Frame ID: $0x600 + \text{CAN address}$. In this context, we will always use the CAN address 01. Here, 0x600 is the constant address of IT7900P.

The Frame ID of respond message is 0581, the calculation method: $0x580 + \text{CAN address}$. CAN Address is 01, 0x580 is the constant address of IT7900P.

The Frame ID of regular report message refer to TPDO addresses instruction.

Data (HEX)

Different functions correspond to different messages and different parameter values. Please refer to the command introduction in the following chapters for details.

The response message for setting command and querying command is different. If the setting command is executed normally, the response message beginning with 60 will be returned, and if the command is executed incorrectly, the response message beginning with 80 will be returned. The response message of query command is beginning with 43.

For other CAN tools' setting, take an example of CANPro analysis tool:

- Node ID: Node ID: hexadecimal 0x01
- Object Index: Main Index
- Object Sub-Index: Sub-Index
- Transfer Type: Default Expedited
- Size Indicator: Default Indicated
- Bytes Not Data: Bytes Not Data: Invalid bytes, if data type is "int", 4 bytes, Bytes Not Data is 0. If data type is "char", one byte, Bytes Not Data is 3.
- SDO Data SDO: SDO data message

Chapter2 Common commands

2.1 Enable CAN

In this context, we will always use the address 01.

In the following message, high byte 01 means to startup CAN communication and switch the instrument to remote control mode, low byte 01 means the address of the instrument.

The instrument will not response to this startup message, but it will periodically send TPDO parameters to PC, like voltage, current, power, etc.

Frame ID	Data (HEX)
00000000	01 01

2.2 Disable CAN

Send stop message can exit CAN communication status. High byte 02 means disable CAN communication. Low byte 01 means the address of the instrument.

After the instrument receives the stop message, it will switch to local mode and not report any message to PC.

Frame ID	Data (HEX)
00000000	02 01

2.3 Regular Report the Message

After CAN start, the TPDO instrument starts to send related parameters to PC, details are as follows:

Frame ID	Data (HEX)	Remarks
00000181	00 00 40 40 00 00 E0 40	Report the message

Remarks: Frame ID=0x180+CAN address (Here is 0x01), 0x180 is the address of instrument TPDO1, the real value is 181.

Other TPDO addresses are as follows:

Name	Address	Data (HEX)
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TPDO1	0x180+CAN Address	V_rms(0-3byte) I_rms(4-7byte)
TPDO2	0x280+CAN Address	P_rms(0-3byte) oper_reg(4-5byte) state_reg(byte6)
TPDO3	0x380+CAN Address	ques_reg(byte0 - byte1)
TPDO4	0x480+CAN Address	Null

- V_rms: Average voltage value
- I_rms: Average current value
- P_rms: Average power value
- oper_reg: Operation status register
- state_reg: Standard status register
- ques_reg: Questionable Status Register

Information of other TPDO indexes:

Name	Index	Sub-index	Function description
TPDO1	0x1800	0x02	Set the transmission type
TPDO1	0x1800	0x05	Set time period (ms)
TPDO2	0x1801	0x02	Set the transmission type
TPDO2	0x1801	0x05	Set time period (ms)
TPDO3	0x1802	0x02	Set the transmission type
TPDO3	0x1802	0x05	Set time period (ms)
TPDO4	0x1803	0x02	Set the transmission type
TPDO4	0x1803	0x05	Set time period (ms)

2.4 Modify Time Period

There are four timers for IT6000 instrument, TPDO1, TPDO2, TPDO3, TPDO4. The value of each timer needs to be set separately. The default four timer cycles of the machine are all 1000ms. Users can turn off the timer reporting function or modify the timer reporting cycle time according to demands.

Modify TPDO reporting cycle function

If users want to modify reporting cycle function, then they need to do two steps. Here we take an example of TPDO1, same for other TPDO.

1. Set the transmission type of TPDO1 to 254

Sending message:

Frame ID	Data (HEX)	Remarks
0601	2F 00 18 02 FE 00 00 00	Set the transmission type of TPDO1 to 254

Response message:

Frame ID	Data (HEX)	Remarks
0581	60 00 18 02 00 00 00 00	Respond message

- Red: 0x1800 is the primary index of TPDO1 (0x1800 is TPDO1).
- Green: 0x02 is the sub-index of TPDO1 (0x02 means transmission type)
- Orange: 0x00FE is setting value, means the transmission type is timer type, one byte.

2. Modify TPDO1 reporting cycle time is 100ms.

Sending message:

Frame ID	Data (HEX)	Remarks
0601	2B 00 18 05 64 00 00 00	Set the time period of TPDO1(ms)

Response message:

Frame ID	Data (HEX)	Remarks
0581	60 00 18 05 00 00 00 00	Respond message

- Red: 0x1800 is the primary index of TPDO1 (0x1800 is TPDO1).
- Green: 0x05 is the sub-index of TPDO1 (0x05 means timer cycle)
- Orange: 0x6400 is setting value, it means timer cycle is 100ms, two bytes.

3. After completing the above settings, timer cycle of TPDO1 reporting function has changed to 100ms.

Turn OFF reporting cycle function

If users want to turn off reporting cycle function, the method is similar as “modify reporting cycle function”. That is modifying the timer cycle as 0ms.

1. Set the transmission type of TPDO1 to 254

Sending message:

Frame ID	Data (HEX)	Remarks
0601	2F 00 18 02 FE 00 00 00	Set the transmission type of TPDO1 to 254

Response message:

Frame ID	Data (HEX)	Remarks
0581	60 00 18 02 00 00 00 00	Respond message

2. Modify TPDO1 timer cycle as 0ms.

Sending message:

Frame ID	Data (HEX)	Remarks
0601	2B 00 18 05 00 00 00 00	Set the time period of TPDO1(ms)

Response message:

Frame ID	Data (HEX)	Remarks
0581	60 00 18 05 00 00 00 00	Respond message

- Red: 0x1800 is the primary index of TPDO1 (0x1800 is TPDO1).
 - Green: 0x05 is the sub-index of TPDO1 (0x05 means timer cycle)
 - Orange: 0x0000 is setting value, it means timer cycle is 0ms, two bytes.
3. After modifying the timer cycle of TPDO1, the reporting cycle function with Frame ID 0x181 will be turned off, and the other TPDO2, TPDO3, and TPDO4 can be turned off in the same way.

Turn ON reporting cycle function

If users want to turn on reporting cycle function again, they need to disable CAN communication, then enable it again. After starting up CAN communication, the reporting cycle function will be working automatically.

2.5 Message Reference of Register

Regular Report Message

The register status information will be included in the regular report message by CAN communication, the information as follow:

Name	Address	Data (HEX)
TPDO1	0x180+CAN Address	V_rms(0-3byte) I_rms(4-7byte)
TPDO2	0x280+CAN Address	P_rms(0-3byte) oper_reg(4-5byte) state_reg(byte6)
TPDO3	0x380+CAN Address	ques_reg(byte0 - byte1)
TPDO4	0x480+CAN Address	Null

For example, the regular report message of TPDO2 is dc 00 00 00
40 01 00 00

Hexadecimal value 01 40, low byte 41 in front, and high byte 40 in the back, convert into binary value is 0001 0100 0000. The Bit6 and Bit8 are set to 1, according to the status information corresponding to bit data, the present state of the instrument is: running state is forward CV, and output state is ON.

Query Status Register Message

when the command is sent to read the status register, operation register, or questionable status register. The last four bytes of the response message are the hexadecimal values, with the low byte first and the high byte last. It needs to be converted into a binary value and determined according to the corresponding bit data.

For example, the response message of status register is 43 02 30
01 11 08 00 00.

Status Information Reference

Status information is shown as follow:

Operation Status Bit	bit	Description
ACQ-WTG	0	0, no meaning, to be defined.
ARB-WTG	1	ARB waiting trigger
DLOG-WTG	2	0, no meaning, to be defined.
ACQ-Active	3	0, no meaning, to be defined.
ARB-Active	4	ARB has triggered, executing.
DLOG-Active	5	0, no meaning, to be defined.
ON/OFF	6	ON/OFF state, on:1, off:0.
CC	7	Current working mode: CC mode,

Operation Status Bit	bit	Description
		plus current.
CV	8	Current working mode: CV mode, plus voltage.
CW	9	Current working mode: CW mode, plus power.
CR	10	Current working mode: CR mode.
CC-	11	0, no meaning, to be defined.
CP-	12	0, no meaning, to be defined.
CAL	13	Calibration state, executing: 1, unexecuted: 0.
Priority	14	Working priority, CV: 0, CC: 1.

Standard status register	bit	Description
OPC	0	Operation completed
NU	1	0, no meaning, to be defined.
QYE	2	Query Error
DDE	3	Device-specific Error
EXE	4	Execution Error
CME	5	A command syntax error occurred.
NU	6	0, no meaning, to be defined.
PON	7	Power On, enable:1, disable: 0.

Questionable Status Register	bit	Description
OV	0	Overvoltage Protection
OC+	1	Positive Overcurrent Protection
OC-	2	Negative Overcurrent Protection
OP+	3	Positive Overpower Protection
OP-	4	Negative Overpower Protection
UV	5	Undervoltage Protection
OT	6	Over Temperature Protection
UC	7	Undercurrent Protection
Errsense	8	Sense Fault
Share	9	Current sharing fault
Rvs	10	The output is reversed
INH	11	Externally inhibited output
PS	12	Fault protection bit (protect shutdown)
OSC	13	Loop oscillation failure
hardware	14	Unknown internal fault of the instrument (Hardware)

Chapter3 Command Description

The IT7900P series devices provide CANOpen control commands, and the detailed commands refer to the corresponding *IT7900P_CANOpen Primary-secondary Index InstructionV1.0.xlsx*.