IT3000 DC Power Supply
CANopen Programming Guide

Content

Chapter1 CANopen Introduction

1.1 Introduction of Communication Process

IT-M3600/IT-M3400/IT-M3300 CAN communication is based on CANopen protocol. Connect CAN interface of the instrument 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 as 125kHz, and CAN protocol to DeviceNet. Please refer to the this 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 IT-M insturment shows that the instrument enters the "Rmt" state). Only the instrument enters the remote control mode, the power supply can send and receive messages successfully with PC.

3. Then, IT-M series periodically send TPDO parameters to PC.

4. Users can also send RPTO or SDO message to control instrument 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 Intrduction 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 meassage:

Frame ID	Data (HEX)	Remarks
0601	23 03 30 02 70 17 00 00	Set 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+CAN address. In this context, we will always use the CAN address 01. Here, 0x600 is the constant address of IT-M instrument.

The Frame ID of respond message is 0581, the calculation method: 0x580+CAN address. CAN Address is 01，0x580 is the constant address of IT-M instrument.

The Frame ID of regular report message refer to TPDO addresses instruction.
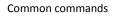
Data (HEX)

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)

TPDO1	0x180+CAN Address	Meter-Voltage(0-3byte)
		Meter-Current(4-7byte)
TPDO2	0x280+CAN Address	Meter-Power(0-3byte)
		Meter-Cap(4-7byte)
TPDO3	0x380+CAN Address	Operation register(0-3byte)
		Question register(4-7byte)
TPDO4	0x480+CAN Address	Null

- Meter-Voltage: voltage measurement value

- Meter-Current: current measurement value

- Meter-Power: power measurement value

- Meter-Cap: capacity measurement value

- Operation register: Operation status register

- Question register: Questionable Status Register

Information of other TPDO indexs:

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 IT-M 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 41 00 00

Hexadecimal value 40 41, low byte 41 in front, and high byte 40 in the back, convert into binary value is 100 0001 0100 0000. The Bit6, Bit8 and Bit14 are set to 1, according to the status information corresponding to bit data, the present state of the instrument is: sense reverse malfunction, output reverse connection protection, and Power down signal, not latched.

Status Information Reference

Status information is shown as follow:

Question register	Bit	Meaning
OV	0	over voltage protection
OC	1	over current protection
OP	2	over power protection
UV	3	under voltage protection
UUT_OT	4	outer over temperature protection
UC	5	unver current (only applicable to source or source/load unit)
SRvs	6	sense reverse malfunction
LINE	7	parallel malfunction
Rvs	8	output reverse connection protection
BUS	9	External control output off
Wdog	10	watchdog protection
OT	11	interior over temperature protection
FAN_FAIL	12	Unknown fault in the instrument
TEMP_SENSE_FAIL	13	Internal temperature sensor failure

AC_LOSS	14	Power down signal, not latched
FLDBK	15	FOLDBACK protection

Operation Register	BIT	Meaning
Priority	0	source/load priority setting
Cal	1	Calibrating
List	2--3	0:idle,1：wtg 2：run 3：end;
CV	4	constant voltage
CC	5	constant current
CW	6	constant power
CR	7	constant resistance
On_Delay	8	input/output on delay
Off_Delay	9	input/output off delay
On	10	input/output on
List_Pause	11	List pause
Source	12	Source mode setting
Load	13	Load mode setting
CC_CR	14	CC Priority CR mode

Chapter3 command Description

The IT-M3600/IT-M3300/IT-M3400 series devices provide CANOpen control commands, and the detailed commands refer to the corresponding *IT-M3000_CANopen Primary-secondary Index InstructionV1.5.xlsx*.