CANopen Master Utility

Warranty

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1. Introduction

For CANopen master devices, ICP DAS provide a friendly CANopen master utility tool to help users to test and setting CANopen slave devices easily. This utility tool can be thought as a simply CANopen master tool for controlling CANopen devices on the CANopen network. It provides several functions, such as NMT protocol, SYNC protocol, EMCY protocol, SDO protocol, PDO protocol, and so forth. The operation principle will be addressed in the following section.

🧭 CANopen Master Utility		
Module AddNode Load EDS A	bout	
	NMT SYNC EMCY SDO RxPDO TxPDO	

Figure 1.1 CANopen Master Utility

2. About CPMUtility

The CANopen master utility (CPMUtility.exe) now supports WinCE5.0/ CE6.0/XPe and Win2K/XP/Vista/7 with 32-bit system. In CE5.0/CE6.0/XPe, there are I-8123W and I-87123, in Windows 32-bit system, there are PISO-CPM100(U), I-7565-CPM and PISO-CAN/PEX-CAN/PCM-CAN CPM Library (the firmware and driver of all above CANopen master products need version 2.00 later).

The new version CPMUtility (v2.00 later) is different from the old version (v1.xx). This document is only for the new version CPMUtility. About the old, please refer to the web:

http://ftp.icpdas.com/pub/cd/fieldbus_cd/canopen/master/piso-cpm100/oldver.

The version information of the CPMUtility can be checked in the about dialog as the figure 2.1.



3. Features

1. Auto-scan all the CANopen master that the CPMUtility has supported.

- 2. Auto-scan all the CANopen slave devices on the CANopen network.
- 3. Support EDS file.
- 4. Dynamic PDO object setting easily.
- 5. Node Guarding Event and Heartbeat Event detection.
- 6. EMCY message receiving.
- 7. Maximum 5 SYNC message producers per CANopen master.
- 8. Support I-8123W, I-87123, PISO-CPM100(U), I-7565-CPM and PISO-CAN/ PEX-CAN/PCM-CAN CPM Library for version 2.00 later.
- 9. Support OS: WinCE5.0/CE6.0/XPe and Win2K/XP/Vista/7 32-bit system.

4. Start CPMUtility

4.1. Module

The first step after executing the CPMUtility, users need to click the "Module" item on the toolbar. Then the utility will show all the CANopen master devices that the utility has supported now on the host device (such as PC or WinPAC).

		NMT	SYNC	EMCY SDO	RxPDO Txl
Ø	Initial Master	5			
	Total Module	Baud rate		Config	Status
E	ioard 1: CPM100U	10 k bps 20 k bps 50 k bps 125 k bps 250 k bps 500 k bps 800 k bps 1000 k bps	 		

Users can select the CANopen master and baud rate that want to be activated and click the">" button. Then the CANopen master device will be initialized with the communication baud rate and list on the "Config Status" list.



If users want to remove the activated CANopen master device, users just select the CANopen master on the "Config Status" list and click the "<" button.

4.2. Add Node & Load EDS

After initializing the CANopen master device, users can click "Add Node" or "Load EDS" item to add CANopen slaves to the master.



When users use "Add Node", the master will scan its CANopen network first and list all the slaves at "Total Node" list on the network. Then users can select which slaves want to use and click ">" to add.



If users use "Load EDS" function, it will list 127 nodes for selecting. When users select a node and click ">", it will pop up a windows for select the node's EDS file.



If users want to remove the CANopen slave which has been added, users just select the node in the "Add Node" list and click the "<" button.

The following picture is the main form after adding slaves. In this example, there are two slaves shown on the tree view list. There are 7 parts, Master, Node, SYNC, EMCY, SDO, RxPDO, and TxPDO below.

🧖 CANopen Master Utility			
Module AddNode Load EDS Ab	out		
 Board 1: CPM100U: 125 k bps Node: 001 - CAN-3223 SYNC: 0x80 EMCY: 0x81 SDO Object: 0x201 0x301 0x401 0x501 TxPDO Objects: 0x181 0x281 0x381 0x481 Node: 002 - CAN-8423 SYNC: 0x80 EMCY: 0x82 SDO Object: FxPDO Objects: TxPDO Objects: TxPDO Objects: 	NMT SYNC EMCY SDO R Slave State Operational Operational Operational State Image: Comparison of the state Image: Comparison of the state Guard Time 1000 Image: Comparison of the state Image: Comparison of the state Guard Time 1000 Image: Comparison of the state Image: Comparison of the state Set Guarding Protect Image: Comparison of the state Image: Comparison of the state Protect Status None protect NMT protect event list Image: Comparison of the state	Change State Heartbeat Time 1000 Consumer Time 3000 Set Heartbeat Protect	ist

4.3. Master Part

Selecting the Master item such as "Board 1: CPM100U: ..." in the tree list, the right dialog will show all the related driver and firmware version. Users can check the driver or firmware version of their master device if necessary.

🧭 CANopen Master Utility					
Module AddNode Load EDS Al	bout				
■ Node: 001 - CAN-8223 - Node: 001 - CAN-8223 - SYNC: 0x80 - EMCY: 0x81 - SDO Object: - 0x201 - 0x301 - 0x401 - 0x501 ■ TxPDO Objects: - 0x31 - 0x401 - 0x501 ■ TxPDO Objects: - 0x31 - 0x401 - 0x51 ■ TxPDO Objects: - 0x181 - 0x281 - 0x381 - 0x481 ■ Node: 002 - CAN-8423 - SYNC: 0x80 - EMCY: 0x82 - SDO Object: - 0xPDO Objects: - 0xPDO Objects:	NMT SYNC EMCY SDO RxPDO TxPDO PISO-CPM100(U) Firmware 201 PISO-CPM100(U) DII Version: 201 PISO-CM100(U) DII Version: 514				

4.4. Node Part

Selecting the Node item such as "Node: 001 ..." in the tree list, the right dialog will show the NMT service tab of the slave node.

CANopen Master Utility Module AddNode Load EDS Board 1: CPM1000: 125 k bpt CAN-8223	About NMT SYNC EMCY SDO RxPDO TxPDO	
 ■ RACC: 0.401 ■ SVMC: 0.400 ■ EMCY: 0.261 ■ SDO Object: ■ 0.401 ■ 0.501 ■ 0.501 ■ TxPDO Objects: ■ 0.401 ■ 0.501 ■ TxPDO Objects: ■ 0.481 ■ 0.481 ■ Node: 002 - CAN-8423 ■ SYNC: 0.800 ■ EMCY: 0.822 ■ SDO Object: ■ RxPDO Objects: ■ RxPDO Objects: ■ TxPDO Objects: ■ TxPDO Objects: 	Slave State Operational Operational State Change State Guard Time 1000 Heartbeat Time Life Factor Get Guarding Protect Set Heartbeat <li< th=""><th>1000 3000 R Protect</th></li<>	1000 3000 R Protect
	Protect Status Guarding Protect: 1000, 3 NMT protect event list Start Guarding Protect 11:31:16 Node Guarding Fail 11:31:28	
		Clear List

In the NMT service tab, users can get the slave state in "Slave State" text box. And if users want to change the slave state, just select the state combo box and click "Change State" to set it. There are five states, Operational State, Pre-operational State, Stop State, Node Reset, and Communication Reset in state combo box for selects.

Slave State	Operational	
Operational	State 🗸 🗸	Change State

The NMT service tab provides two NMT Error Control protocol, Node Guarding and Heartbeat. Users can click "Set Guarding Protect" button to start Node Guarding protect or click "Set Heartbeat Protect" to start Heartbeat protect. If one of these two protect mechanisms has been used, the protect status will show in the "Protect Status" text box. And if the Node Guarding Event or Heartbeat Event has occurred, the event will store in the "NMT protect event list" list.

Guard Time 1000		Heartbeat Time	1000
Life Factor	3	Consumer Time	3000
Set Guardi	ing Protect	Set Heartbea	at Protect
Protect Status	Guarding Pro	otect: 1000, 3	

4.5. SYNC Part

In this part, users can send SYNC message and change SYNC ID.



If users want to change the SYNC ID for the node, input the new SYNC ID in the "Cob ID" text box and click "Change New ID" button, the SYNC COB-ID will be updated.

Module AddNode LoadEDS A	bout					
Board 1: CPM100U: 125 k bps	NMT	SYNC	EMCY	SDO	RxPDO	TxPDO
SYNC: 0x99 EMCY: 0x01 SDO Object: RxPDO Objects:	Cob I	ID (Hex)	99		Change Ne	ew ID

Key in the SYNC timer in the "SYNC Timer" text box and times in the "SYNC Times" text box, then click "Send SYNC" to send SYNC message. If the "SYNC Timer" is 0, the SYNC message will be stopped. If the "SYNC Timer" is more than 0, the function will send SYNC message per "SYNC Timer" millisecond until finish the parameter "SYNC Times". When the "SYNC Times" is set to 0, the function will send SYNC message continuously until set "SYNC Timer" to 0. Users can set at most 5 SYNC messages with different SYNC ID per master device to be sent cyclically.



4.6. EMCY Part

The EMCY part can list the EMCY messages and change EMCY ID.

🥬 CANopen Master Utility		
Module AddNode Load EDS Abo	ut	
 Board 1: CPM100U: 125 k bps Node: 001 - CAN-8223 SVNC- 0.40 SDO Object. RxPDO Objects: 0x201 0x301 0x501 TxPDO Objects: 0x181 0x281 0x381 0x381 0x481 0x481 STVC: 0x80 EMCY: 0x82 SDO Object: RxPDO Objects: TxPDO Objects: SDO Object: TxPDO Objects: SDO Object: TxPDO Objects:	NMT SYNC EMCY SDO RxPDO TxPDO Cob ID (Hex) 81 Change New ID EMCY: 01 02 03 04 05 06 07 08 13:08:39 EMCY: 08 07 06 05 04 03 02 01 13:08:49	Clear List

If users want to change the EMCY ID for the node, input the new EMCY ID in the "Cob ID" text box and click "Change New ID" button, the EMCY COB-ID will be updated.

Board 1: CPM100U: 125 k bps - Node: 001 - CAN-8223	NMT	SYNC	EMCY	SDO	RxPDO	TxPDO
SVNC: 0.09 EMCVID:81	Cob 3	ID (Hex)	81		Change Ne	ew ID

All the EMCY message produces from the slave node will be show in the EMCY list.

RxPDO Objects: 	EMCY: 01 02 03 04 05 06 07 08 18:43:20 EMCY: 08 07 06 05 04 03 02 01 18:43:53
- 0x301 - 0x401	
TxPDO Objects:	
0x381 0x481	
Node: 002 - CAN-8423 SYNC: 0x80	
EMCY: 0x82 SDO Object:	

4.7. SDO Part

The SDO Communication page has two functions, "Read Data" and "Write Data". After editing the "Index" and "Sub-index" text box, users can click "Read Data" to read the object data with the index and sub-index object address, or click "Write Data" to write the data of the "Write data" text box to the object. Note that, the data will be parted with space in the "Write data" text box. For example, if the data "1 2" in the "Write data" text box, it will be detected that first data byte is 0x01 and second data byte is 0x02. But if the data "12" in the "Write data" text box, it will be detected to only one data byte 0x12.



4.8. RxPDO Part

The CPM Utility is divided into two forms, Main Form and Child Form, in this part. And the descriptions for these two forms are as below.

Main Form

Selecting the "RxPDO Object" item in the tree list and the RxPDO main form will show on the right dialog. In main form, users can click "New PDO" button to add a new RxPDO with the "Cob ID" in the "RxPDO No." RxPDO object or users can click "Remove PDO" button to remove an original RxPDO with the "Cob ID". For example, if users input "333" in "Cob ID" text box and "5" in "RxPDO No." text box then click "New PDO" button. The slave node will add a new RxPDO with COB-ID 0x333 in 5th RxPDO object. And if users input "333" in "Cob ID" text box then click "Remove PDO" button. The COB-ID 0x333 of RxPDO will be removed. Besides, all the RxPDO messages of the slave node will be shown on the "RxPDO Message List" of the main form list.

Child Form

Selecting the "RxPDO COB-ID" item (such as "0x201") in the tree list and the RxPDO child form will show on the right dialog. In child form, users can change COB-ID, Transmission Type, PDO mapping list, and send message for the RxPDO object.

For changing COB-ID, users input a new COB-ID into the "Cob ID" text box such as "444" and click "Change ID" button. The original RxPDO COB-ID 0x201 will be changed to 0x444.

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For setting Transmission Type, users can input number $1 \sim 255$ in the "Transmission Type" text box and click the near "Set" button to change it if the CANopen slave supports this type.

After adding the slave node, users can click every RxPDO COB-ID object in the tree list to check the default RxPDO mapping information. For example, only the 0x201 object has two mapping entry, "6200-01:08" and "6200-02:08", and others are empty. The "6200-01:08" means that the PDO object's first entry is for the object index 0x6200 and sub-index 0x01, and the entry's data length is 0x08 bits. The "6200-02:08" is as above but the sub-index is 0x02. If the default mapping is not satisfy with use, users can use the "Add", "Insert", "Modify", "Del" buttons to change the PDO mapping. For add, insert, modify PDO mapping, users need to select the PDO mapping data in the "Map Object Select" combo box first. But if the mapping data that users want to use is not in the combo box, users can input it in the "Map Object" text box manually. After select or input the mapping data, users can click "Add", "Insert", or "Modify" button to add, insert, or modify the PDO mapping data. And if users want to remove a PDO mapping data from the PDO object, select the mapping data in the "PDO mapping status" list and click "Del" button to remove it.

If users need to send an RxPDO data message, input the data in the "Send Data" text box and click the "Send Data" button to send it. Note that the data length of the send data must equal to the PDO object. For example, the PDO object has two mapping entries and the total data length are 16-bit (2-bytes), so the sending data must has two bytes which is parted with space.

🧭 CANopen Master Utility	
CANopen Master Utility Module AddNode Load EDS Ab Board 1: CPM100U: 125 k bps Node: 001 - CAN-8223 SYNC: 0x80 EMCY: 0x81 SDO Object: RxPDO Object: 0x301 0x301 0x401	out NMT SYNC EMCY SDO RxPDO TxPDO Cob ID (Hex) 201 Change ID PDO Parameter Status Transmission Type 255 Set Transmission Type: 255 Event Timer: Not Support Map Object Select Add > 6200-01-08
- 0x501 - 0x501 - 0x501 - 0x181 - 0x281 - 0x381 - 0x481 - 0x481 - 0x481 - 0x481 - 0x482 - SYNC: 0x80 - EMCY: 0x82 - SDO Object:	6200-01:08 Insert > Map Object (Hex) Bit (Hex) Modify > 6200-02:08 6200 01 08 Del <
	Clear List

4.9. TxPDO Part

The CPM Utility is divided into two forms, Main Form and Child Form, in this part. And the descriptions for these two forms are as below.

Main Form

Selecting the "TxPDO Object" item in the tree list and the TxPDO main form will show on the right dialog. In main form, users can click "New PDO" button to add a new TxPDO with the "Cob ID" in the "TxPDO No." TxPDO object or users can click "Remove PDO" button to remove an original TxPDO with the "Cob ID". For example, if users input "222" in "Cob ID" text box and "5" in "TxPDO No." text box then click "New PDO" button. The slave node will add a new TxPDO with COB-ID 0x222 in 5th TxPDO object. And if users input "222" in "Cob ID" text box then click "Remove PDO" button. The COB-ID 0x222 of TxPDO will be removed. Besides, all the TxPDO messages of the slave node will be shown on the "TxPDO Message List" list of the main form.

🍻 CANopen Master Utility		
Module AddNode Load EDS Abo	out	
 Board 1: CPM100U: 125 k bps Node: 001 - CAN-8223 SYNC: 0x80 EMCY: 0x81 SDO Object: 0x201 0x301 0x401 0x501 IXPDO Objects: 0x221 0x281 0x381 0x481 Node: 002 - CAN-8423 SYNC: 0x80 EMCY: 0x82 SDO Object: RxPDO Objects: TxPDO Objects: 	NMT SYNC EMCY SDO RxPDO TxPDO Cob ID (Hex) 222 RxPDO No. 5 New PDO R TxPDO Message List Remote 181: OK: 00 00 01:18:26 Remote 181: OK: 76 AB 01:18:50	move PDO

Child Form

Selecting the "TxPDO COB-ID" item (such as "0x181") in the tree list and the TxPDO child form will show on the right dialog. In child form, users can change COB-ID, Transmission Type, Event Timer, PDO mapping list, and send message for the TxPDO object.

For changing COB-ID, users input a new COB-ID into the "Cob ID" text box such as "234" and click "Change ID" button, the original TxPDO COB-ID 0x181 will be changed to 0x234.

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For setting Transmission Type, users can input number $1 \sim 255$ in the "Transmission Type" text box and click the near "Set" button to change it if the CANopen slave supports this type.

If the CANopen slave supports the Event Timer function, users can input the timer value (1 \sim 65535) in the "Event Timer" text box and click the near "Set" button to set it.

After adding the slave node, users can click every TxPDO COB-ID object in the tree list to check the default TxPDO mapping information. For example, only the 0x181 object has two mapping entries, "6000-01:08" and "6000-02:08", and the others are empty. The "6000-01:08" means that the PDO object's first entry is for the object index 0x6000 and sub-index 0x01, and the entry's data length is 0x08 bits. The "6000-02:08" is as above but the sub-index is 0x02. If the default mapping is not satisfy with use, users can use the "Add", "Insert", "Modify", "Del" buttons to change the PDO mapping. For add, insert, modify PDO mapping, users need to select the PDO mapping data in the "Map Object Select" combo box first. If the mapping data that users want to use does not exist in the combo box, users can input it in the "Map Object" text box manually. After selecting or inputting the mapping data, users can click "Add", "Insert", or "Modify" button to add, insert, or modify the PDO mapping data. And if users want to remove a PDO mapping data from the PDO object, select the mapping data in the "PDO mapping status" list and click "Del" button to remove it.

If users want to get a TxPDO data message, need to click the "Remote Data" button to send a remote PDO message, and then the TxPDO message will be shown on the data list when the CANopen master received it.

Module AddNode Load EDS A	bout
 Board 1: CPM100U: 125 k bps Node: 001 - CAN-8223 SYNC: 0x80 EMCY: 0x81 SDO Object: RxPDO Objects: 0x201 0x401 0x501 TxPDO Objects: 0x281 0x281 0x281 0x281 0x281 0x281 0x481 	NMT SYNC EMCY SDO RxPDO TxPDO Cob ID (Hex) 181 Change ID PDO Parameter Status Transmission Type 255 Set Transmission Type: 255 Event Timer 0 Set Set Map Object Select Add > 6000-01:08 6000-02:08 Map Object (Hex) Bit (Hex) Modify > 6000-02:08 Goodown 01 08 Del Output
- SYNC: 0x80 - EMCY: 0x82 - SDO Object: ⊕- RxPDO Objects: ⊕- TxPDO Objects:	Remote Data Remote 181: OK: 00 00 01:18:26 Remote 181: OK: 76 AB 01:18:50