

# **FBs-CBCANH**

# **Operation Manual**

# Frequency Converter Control – ABB example

PLC1.ir

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Version	Date	Author	Description
V1.0	2017/05/24	Curtis Li	Draft
V1.1	2017/07/18	Curtis Li	Revised function block
V1.2	2017/07/19	Edison Lin	English version
V1.3	2017/08/04	Edison Lin	Modified the block ladders and example
V1.4	2017/11/01	Curtis Li	Add SDO task and NMT Task

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## 1. Document purpose

This manual aims to provide a quick follow-through guide for using CBCANH to control a frequency converter. The well-known ABB is used as the reference example.

# 2. System Configuration

# 2.1 EDS

Use Load EDS button to import the electronic data sheet (EDS) for a specific slave device. Multiple imports are supported.

Setup	
Read	CAN Baud Rate : 250K V Node ID : PLC V Comm Status :
Write	TXPDO(4) RXPDO(4) Misc. AutoSDO SDO Task NMT Task
Load EDS	No.         COB-ID         Size         Info         Note           1         180h         4         R3440~R3443         0.1
Config File	atti Load EDS file
New	Recent File List:
Open	↓ package \ABB \EDS \ACS355_5090_FCAN01_appl1.050_Scalar.EDS
Save	✓ OK X Cancel
Save As	
Comm. Port Setup	Timeout Time: 1500 mS
	Restore Default Set Default



# 2.2 File operations

Use Open, Save, and Save As button to work on the CBCANH configuration file for the convenience of duplication and maintenance.



betup						
Read	CAN Baud Rate : 250K 👻 Node ID : PLC 👻 Comm Status : 🌑					
Write	TXPDO(4) RXPDO(4) Misc. AutoSDO SDO Task NMT Task					
	No. COB-ID Size Info Note					
Load EDS	off Open Recent Files					
Config File	Recent File List:					
New	C:\Users\pcchenwu\Desktop\FBs_CBCANH\ABB.chcfg					
Open	Cancel					
Save						
Save As						
Comm. Port Setup	Timeout Time: 1500 mS					
Close	Restore Default Set Default					

# Figure 2 Import from a chcfg configuration file

Setup			
Read	CAN Baud Rate : 250K	<b>311</b> 另存新檔	
Write	TXPDO(4) RXPDO(4)	<ul> <li></li></ul>	<ul> <li>✓ 4y 搜尋 tmp</li> <li>8== ✓ (2)</li> </ul>
Load EDS	No. COB-ID 1 180h	★ 我的最更 ▲ 名稱 ▲	修改日期 類型
Config File	3 380h 4 480h	▲ SkyDrive ▶ 下載 =	2017/6/16 下午 0 檔案資料夾
New		■ 桌面 3 最近的位置	
Save		i№ 192.168.0.241 ]} allinone	
Save As		> 煤體極	
Comm. Port Setup	Timeout Time	● 音樂 ▼ < 檔案名稱(N): template	III
Close		存榴類型①: CANopen Config (*.chcfg)	
		▲ 陽藏資料夾	存檔(5) 取消

Figure 3 Export to a chcfg configuration file

2.3 Current configuration operations

Use Read button to read the current configuration from the CBCANH for further reviewing or editing; Use Write button to save the configuration result to the CBCANH.

#### 2.4 AutoSDO

Maximum 30 groups are supported, each of which can be configured up to 12 SDO operations. Each group can have a unique node ID or share the same node ID if more operations are needed. AutoSDO will be executed sequentially during power on or through the block ladder AUTOSDO\_CTRL provided by Fatek.

Read	CAN Baud Rate	e: 250K 👻	Node	ID: PLC 🔻	Comm Stat
Write	TXPDO(4) R	XPDO(4) Misc.	AutoSDO	SDO Task NMT Task	
	No.	Node ID	Status	Count	
Load EDS	1	1	ON	12	
Config File	2	1	ON	3	
New					
Open					
Save					
Save As					
Comm. Port Setup					
				Destars Default	Cat Dafa
Close				Restore Default	Set Defau

Figure 4 Different groups with the same node ID is possible

AutoSDO supports two modes, including WR(write) and MR(monitor). WR is a SDO operation which writes a given length of data (8/16/32 bits) into a slave device, e.g. PDO mapping or any preset value. MR is a SDO operation which reads data from a slave device and compares it with the expected data. A

mask will be used to do a logical AND with the data read, which makes the bit comparison possible.

Mew Auto	SDO N	lode					
🔽 Enabled	No.	Mode	Index	Sub Index	Data	Mask	Status
Node ID:		M ASCm	ndEdit				
		Com	mand				
			Operati	on:	Write	•	
			Object	Index (Hex):	1600		
			Sub Ind	lex (Hex):	1		
			Data Si	ze (Bits):	32	•	
			Data (H	ex)			
			604000	010			
			Status	Code (Hex):	0000000	0	
					🗸 ОК	X Cancel	
					[	🗸 ок	X Cancel

Figure 5 AutoSDO WR setup

MR is a SDO operation which monitors the value of a specific object dictionary index. As shown in the Figure 6, the following equation must satisfy for a monitoring operation to succeed.

LOGICAL\_AND(UPLOADED DATA, 000FH) == 0007H

Mew Autos	DO Node	
V Enabled	No. Mode Index Sub Index Da	ta Mask Status
Node ID:	ASCmdEdit	
	Command	
	Operation: Mo	onitor 👻
	Object Index (Hex): 60	41
	Sub Index (Hex): 00	00
	Data Size (Bits): 16	· ·
	Data (Hex)	lask (Hex)
	0007	000E
	Status Code (Hex): 00	000000
		K Sancel
		Curicer
		V OK X Cancel

Figure 6 AutoSDO MR setup

# 2.5 SDO Task

SDO task makes it possible that SDO operations can be done by accessing registers of PLC. Adding a new SDO task is completed, by configuring it with index and sub-index of a specific node, operation mode, type and start address of corresponding PLC registers, in SDO task page. After the setup is finished, accessing the corresponding PLC registers is the same as accessing SDO data. Maximum 32 operations are supported.

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SDO Task	
Description	
Node ID:	1 -
Mode:	Read 👻
Object Index (Hex):	1600
SubIndex (Hex):	1
Data Size (Bits):	32 🗸
Status code (Hex):	0000000
<ul> <li>✓</li> </ul>	OK X Cancel

Figure 7 SDO task setup

As shown in Figure 7, SDO task supports two modes, including read and write. Both of them support data access in three variant data length (8/16/32 bits). Status code shows the result of execution, either success or error code is returned.

	Setup					1 .			
	Read	CA	N Baud R	late: 1M	•	Node	ID: 127	•	Comm Status
	Write	T	KPDO(1)	RXPDO(1)	Misc.	AutoSDO	SDO Task	NMT Task	
			No.	Node ID	Index	Sub Index	Mode	Comment	Status
	Load EDS		1	3	1600	0000	Write	D0~1	0
			2	3	1600	0002	Read	D2~3	0
I	Config File								
	New								
	Open								
	Save								
	Save As								
	Comm. Port Setup		Start Ad	dress: D 🔹	• 0				
							Resto	re Default	Set Default

Figure 8 SDO task page

If the operation mode is read, the data accessed from slaves is put into the corresponding PLC registers. If the operation mode is write, the data which is about to be transmitted is put into the corresponding PLC registers. As shown in Figure 8, each SDO task occupies two PLC registers regardless of the data size.

#### 2.6 NMT Task

NMT task makes it possible that NMT commands can be done by accessing registers of PLC. Adding a new NMT task is completed, by configuring it with target node, NMT command, type and start address of corresponding PLC registers, in NMT task page. After the setup is finished, accessing the corresponding PLC registers is the same as executing NMT command. Maximum 32 operations are supported

-	NMT Task			x
	Description			1
	Node ID:	1	•	
	Command:	None	•	
	Status code :	None		
		🗸 ок	X Cancel	
				J

Figure 9 NMT task setup

The NMT task setup page is shown in Figure 9. Besides the same NMT commands that NMT Services has, NMT task has one additional command named "none". NMT command "none" has no default command and used in the situation when the operation is decided sometime later. Status code shows the result of execution, either success or error code is returned.

Setup					
Read	CAN Baud R	ate : 1M	▼ Node ID : 127	•	Comm Status : 🔵
Write	TXPDO(1)	RXPDO(1)	Misc. AutoSDO SDO Task	NMT Task	
	No.	Node ID	Command	Comment	Status
Load EDS	1	3	Start Remote	R0	0
	2	4	Enter PRE_OPERATIONAL	R1	<b>Ø</b>
Config File					
New					
Open					
Save					
Save As					
Comm. Port Setup	Start Ad	dress: R 🔻	0		
Lose			Rest	ore Default	Set Default

Figure 10 NMT task page

As shown in Figure 10, each NMT task occupies one PLC register. The Most Significant Byte(MSB) of corresponding PLC register stores NMT command, while the Least Significant Byte(LSB) of corresponding PLC register is used to trigger command and store the result of execution. The corresponding value of NMT command, as shown in Table 1, is filled into MSB. The value filled into LSB to trigger command is shown in Table 2.

	NMT Command	Value
None		0
	Start Remote	1
	Enter Pre-Operational	2
	Reset Node	3
	Reset Communication	4
	Stop	5

Table 1 Corresponding values of NMT commands

Status Code	Description
0001h	Successful
0002h	Failed
Other Values	Trigger Command

#### Table 2 Corresponding values of status codes

For example, to execute NMT command "Start Remote" through NMT task, one should set the content of corresponding PLC register as value shown below:

#### 0103H

After execution, status code returns the result. If it works successfully, the content of corresponding PLC register should be the same as value shown below:

#### 0101H

# 2.7 PDO setup

Refer to section 6.2.1.2 and 6.2.1.3 in the CBCANH user manual.

# 2.8 SYNC time

Refer to section 6.2.1.4 in the CBCANH user manual.

#### 2.9 Auto. Start Remote

Refer to section 6.2.1.4 in the CBCANH user manual

#### 3. Ladder program design notes

- 1) Use provided block ladders for CBCANH control
  - AUTOSDO\_CTRL

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As shown in Figure 11, it is a calling block which provides an alternative way to execute AutoSDO groups in the ladder program. As shown in Figure 12, it could be wrapped in a sub-function in order to be triggered in the program.

BLOCKS:001:AUTOSDO_CTRL	

Figure 11 CBCANH-specific block ladder - AUTOSDO\_CTRL

N000		65 LBL INITAS					
N001	СР_		DO_CTRL				
N009		68RTS					

Figure 12 Sub-function including AUTOSDO\_CTRL block ladder

#### - CMR

As shown in Figure 13, it is a block ladder used to update a certain set of PLC registers which maps to configured RPDOs to the CBCANH. Place only one of it in the bottom of the main ladder program and make sure the corresponding reserved registers have been set as intended. The number of registers to be transmitted is filled into R3116, and the start address is filled into R3106.

N000					-	EN_	S :	08.MOV	1
							D:	R3116	
N001						EN	5:	-08.MOV	] ]
							D:	R3106	
NOO2	—СР—	-199.TXTDF BLOCKS:00	1:CMR			. (			

Figure 13 CBCANH-specific block ladder – CMR

2) A drive can be put into the Operation enabled state using AutoSDO, but be careful not to let a RPDO which maps to the control word(0x6040) affects the state and lead to an undesired initiation result. Use of the reserved PLC register M1924 is recommended for initialization when boot up.

# 4. Velocity control of a ABB frequency converter

4.1 Overview

This example has two parts. First part demonstrates how to turn on a motor by loading EDS to get pre-defined PDO configuration. Second part demonstrates how to control the velocity of motor by changing pre-defined PDO configuration by accessing the object dictionary. The setup overview is shown in Table 3.

Configuration item	Status
AutoSDO group	1
AutoSDO operations	3
EDS	Yes
TPDO	1 for status word
RPDO	1 for velocity and control word
CBCANH node ID	127

ABB node ID	3
Communication baud	1Mbps

Table 3 Setup overview in example

#### 4.2 Turn on a motor

## 4.2.1 ABB frequency converter configuration

Refer to the velocity control setup in the ABB frequency converter user manual in p.61. To demonstrate the function of SDO task and NMT task, the pre-defined PDO configuration in the object dictionary is used in this example. The drive parameter 5104 is set to 0. Refer to the user manual for more details. The PDO mapping should be the same as shown in Figure 14.

PDO	Word 1
Rx PDO1	6040h Control word <sup>1)</sup>
Tx PDO1	6041h Status word <sup>1)</sup>

Figure 14 PDO mapping

# 4.2.2 Load EDS and configuration

As shown in Figure 15 and 16, the node ID of the ABB has to be configured additionally because an EDS file does not provide parameter values.

M Module Configuration	
Setup	CAN Baud Rate : 250K ▼ Node ID : 127 ▼ Comm Status :
Read	
Write	TXPDO(1) RXPDO(1) Misc. AutoSDO SDO Task NMT Task
Load EDS	No. COB-ID Size Info Note
Config File	Load EDS !
New	
Open	Please remember to set COB-ID of PDOs
Save	確定
Save As	
	Tenerul Tenu 1500 an
Comm. Port Setup	
Close	Restore Default Set Default
	Figure 15 Load EDS
TXPDO #1 Setting	Figure 15 Load EDS
TXPDO #1 Setting	Figure 15 Load EDS
COB ID Assign	Figure 15 Load EDS
COB ID Assign Slave Node ID: S PDO No.: 1	Figure 15 Load EDS
COB ID Assign Slave Node ID: PDO No.: 1	Figure 15 Load EDS
COB ID Assign Slave Node ID: PDO No.: 1 CobId(Hex): 193b	Figure 15 Load EDS
COB ID Assign Slave Node ID: PDO No.: 1 CobId(Hex): 183h	Figure 15 Load EDS
COB ID Assign Slave Node ID: PDO No.: 1 CobId(Hex): 183h	Figure 15 Load EDS
COB ID Assign Slave Node ID: PDO No.: CobId(Hex): 183h Size: (register)	Figure 15 Load EDS
COB ID Assign COB ID Assign Slave Node ID: PDO No.: 1 CobId(Hex): 183h Size: (register) 1	Figure 15 Load EDS
COB ID Assign COB ID Assign Slave Node ID: PDO No.: 1 CobId(Hex): 183h Size: (register) 1 Note: (Maximum 30 Bytes)	Figure 15 Load EDS
COB ID Assign COB ID Assign Slave Node ID: PDO No.: 1 CobId(Hex): 183h Size: (register) 1 Note: (Maximum 30 Bytes)	Figure 15 Load EDS
TXPDO #1 Setting COB ID Assign Slave Node ID: PDO No.: 1 CobId(Hex): 183h Size: (register) 1 Note: (Maximum 30 Bytes)	Figure 15 Load EDS

Figure 16 Fill node ID in PDOs



	CAN Baud Rate :	1M	~	Node ID :	127	$\sim$	
--	-----------------	----	---	-----------	-----	--------	--

#### 4.2.4 Misc setting

The same as defined in the EDS file.

TXPDO(1) RXPDO(1) Misc.	AutoSDO	SDO Task NMT Task	
HeartBeat Cycle Time: 0 Guard Time: 0	mS mS	Parameter Zone Size : 0 Start Address : R 0	
Sync. Master Sync. Time: 0	ms	V Auto, Start Remote	5

Figure 17 Misc setting after loading EDS

## 4.2.5 AutoSDO

Plan the AutoSDO operations in accordance with the information as shown in the Figure 18.

Control word:

- Reset the fieldbus communication fault (if active).
  - 47Eh (1150 decimal) -> READY TO SWITCH ON
  - 47Fh (1151 decimal) -> OPERATING (Speed mode) or

C7Fh (3199 decimal) -> OPERATING (Torque mode)

Figure 18 ABB Control Word

AutoSDO	Node 0				- Serve		
Enabled	No.	Mode	Index	Sub Index	Data	Mask	Status
Node ID:	1	WR	6040	0000	047E	-	0
3 👻	2	MR	6041	0000	1231	FFFF	<b>Q</b>
	3	WR	6040	0000	047F	-	0
						🗸 ок	X Cancel

#### Figure 19 Result of the AutoSDO configuration

The execution sequence expanded from Figure 19:

- 1) Write 0x47E to 0x6040:00 of the ABB with node ID as 3 in order to put the device in the READY TO SWITCH ON state.
- Monitor the value of 0x6041:00 of the ABB by comparing it with LOGICAL\_AND(0x1231, 0xFFFF)
- When 0x6041:00 has the correct value, write 0x47F to the ABB to put the device in the OPERATING state.

# 4.2.6 Configuration complete

Use Write button to save the result of the configuration to the CBCANH.

etup	
Read	CAN Baud Rate : 1M  Vode ID : 127 Comm Status :
Write	TXPDO(1) RXPDO(1) Misc. AutoSDO SDO Task NMT Task
	No. COB-ID Size Info Note
Load EDS	1 183h 1 R3440 3.1
Config File	Information
New	Write Configuration OK I
Open	Wite coningulation or :
Save	確定
Save As	
Comm. Port Setup	Timeout Time: 1500 mS
	Restore Default Set Default

# Figure 20 Write back the configuration to the CBCANH

# 4.2.7 Example ladder program



#### Figure 21 Example program for turning on a motor

### 4.2.8 Operation steps

- 1) Configure the CBCANH and the ABB
- 2) Run the PLC program
- AutoSDO executes immediately once CBCANH turns on. Therefore, power on ABB first and then the CBCANH. AutoSDO could be redone by triggering block ladder AUTOSDO\_CTRL
- 4) The motor turns on

## 4.3 Velocity control

To control velocity, modifying the PDO mapping is necessary. The modified PDO mapping should be the same as Figure shown below. To modify the PDO mapping, follow the following steps.

_			
	PDO	Word 1	Word 2
	Rx PDO1	6040h Control word <sup>1)</sup>	6042h Target velocity <sup>1)</sup>
	Tx PDO1	6041h Status word <sup>1)</sup>	

Figure 22 Modified PDO mapping

# 4.3.1 Modify PDO configuration

Modify RPDO size from 1 to 2, as shown in the figure below.

ani R)	(PDO #1 Setting	)	x	
CO	B ID Assign			
	Slave Node ID: PDO No.:	3 • 1 •		
	CobId(Hex):	203h		
5	Size: (register)	Transmissio Async	n Type:	
[	Note: (Maximum 30	) Bytes)		
	🗸 ОК	X Cano	cel	

# 4.3.2 Add SDO task

In the object dictionary, index 1600H stores the information on the mappings of first RPDO. Sub-index 0 defines the number of effective mapping of objects, and sub-index 2 represents the second mapped application object. Therefore, Four SDO tasks are created to modify and read data in these two sub-indexes, as shown in Figure 23.

	Nede TD		0. h 7. d		C	<b>C</b> 1-1
NO.	Node ID	Index	Sub Index	Mode	Comment	Stati
1	3	1600	0000	Write	D0~1	
2	3	1600	0002	Write	D2~3	
3	3	1600	0000	Read	D4~5	
4	3	1600	0002	Read	D6~7	

Figure 23 SDO task setup

# 4.3.3 Add NMT task

The PDO mapping can be modified only if ABB frequency converter is in pre-operational NMT state. Therefore, we need a NMT task to change its NMT state. As shown in Figure 24.

ТХ	PDO(4)	RXPDO(4)	Misc. AutoSDO	SDO Task	NMT Task		
	No.	Node ID	Comman	d	Comment	: Statu	s
	1	3	None		RO		
	Start Add	dress: R 👻	0				

#### Figure 24 NMT task setup

# 4.3.4 Configuration complete

Use Write button to save the result of the configuration to the CBCANH.

# 4.3.5 Example ladder program

Trigger M3 ~ M7 sequentially to complete RPDO mapping modification. If ABB drive shows error after RPDO mapping modification, clear the error and redo AutoSDO. After finishing the process, velocity value could be updated through PDO, which is by changing value in R3201.

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			-		
M5					08D.MOV
					EN 5. 1014550120
	1. A.	1. A.			. D: D2
After finishin	a PPDO mannin	a modificatio	n change th	e number of ado	nted PPDO mannings to 2
Triggered by M	5.	ig mourricacio	n, change en	e number of add	pred krbo mappings to 2.
M6					
					EN 3 . 2
					. D: D0
	1				
Make ABB drive	enter operat	ional NMT sta	te. Triggere	d by M7.	
MZ					
— <u>I</u> †I—					ENS: 259
					D: RO
				•	
Register size	to send	•			· · · ·
					ENS: 08.MOV_2
					D : 83116
	1.1	•		•	. Kaite
Register addre	ss to send fr	om			
legister addre	ss to send fr	om			
Register addre	ss to send fr	om			08 MOV
Register addre	ss to send fr	om	·		EN 5 : 08.MOV
Register addre	ss to send fr	om	· · · ·		EN 5 : 08.MOV 3200 D : R3106
Register addre	ss to send fr	om	· · ·		EN- S : 08.MOV 3200 D : R3106
Register addre	ss to send fr	om .		· · ·	EN- S: 08.MOV 3200 D: R3106
Register addre	ss to send fr	om	· · ·		EN 5 : 08.MOV D : R3106
Register addre	ss to send fr	om Ider used to s	ynchronize t	he commands to	EN S : 08.MOV D : R3106 the CBCANH
Register addre	ss to send fr	om Ider used to s	ynchronize t	he commands to	EN 5 : 08.MOV D : R3106 the CBCANH

Figure 25 Example program for turning on and controlling velocity of a motor

4.3.6 Operation steps

1) Configure the CBCANH and the ABB

- 2) Run the PLC program
- Power on ABB first and then the CBCANH. AutoSDO could be redone by triggering block ladder AUTOSDO\_CTRL
- 4) The motor turns on
- 5) Control velocity and observe