



Technical Note

C2000/C2000 Plus/CH2000 – Positioning via the CMC-EIP01/02

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History

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1 Introduction

1.1 Description

The positioning function (P2P) of the C2000 has been significantly improved starting with firmware version V2.06.01 released in 2020 week 37. There are a number of different sources that can be used to control the drive in P2P such as: Digital inputs, Communication cards via addresses 60xx*1, Pulse train and the Built-in PLC.

This technical note will explain how to control the C2000, C2000 Plus, and CH2000 in P2P positioning via an Ethernet card installed on Slot 1 of the drive

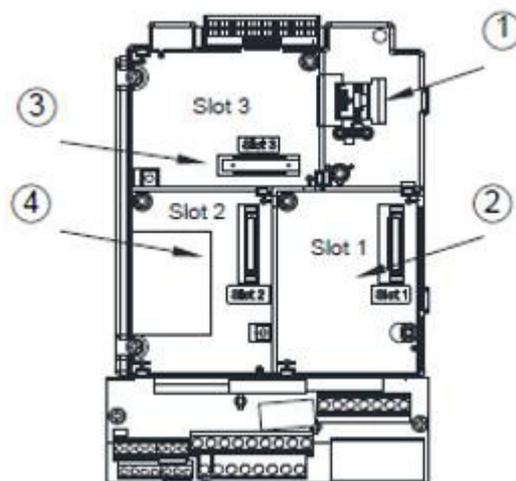


Figure 1.1 Card slots locations of the C2000

Positioning via the CMC-EIP01 or CMC-EIP02 card is supported only with the 60xx addresses. You can enable the 60xx addresses by setting pr09-30=1. The CMC-EIP cards can be used for Ethernet IP and Modbus TCP communication.

This technical note should be used together with the latest drive user manual available on the Delta IABG Download Center.

1.2 Requirements

Positioning is only supported when the following conditions are met:

- Drive models and firmware:

Drive	Firmware Version
C2000	V2.06.01 or newer
C2000 Plus	V3.06.01 or newer
CH2000	V2.06.01 or newer

- Induction motor or Permanent magnet motor
- An encoder is mounted on the motor axis
- An encoder card (EMC-PG0xx) is installed in Slot 2 of the drive
- An Ethernet IP communication card is installed in Slot 1 of the drive

Card	Firmware Version
CMC-EIP01	V2.04 or newer
CMC-EIP02	V1.00 or newer

Before starting any tests with positioning you must make sure that the drive is running properly in FOCPG mode (pr00-11=3 or 4).

One quick way to do it is to set pr00-04=21 to monitor the motor position on the keypad and run the drive-in velocity mode (pr00-10=0). Check the behavior of the motor at very low speeds and also at zero speed. In FOCPG the motor should be able to develop full torque even at 0Hz.

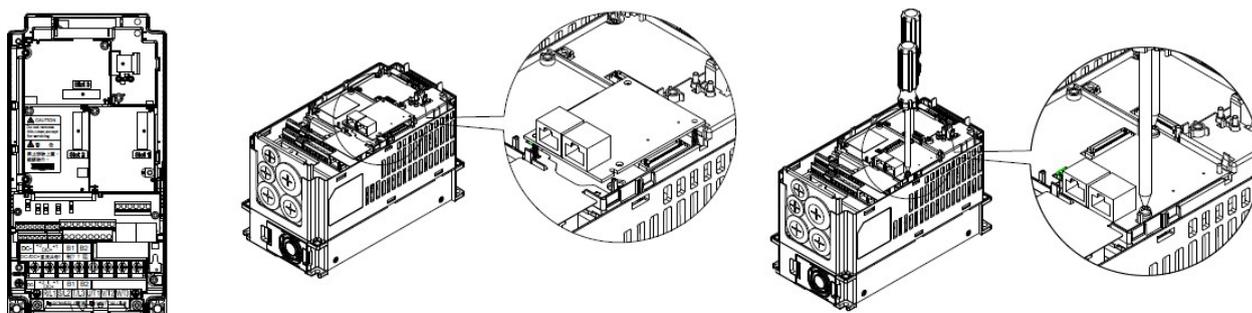
This application note will not explain how to configure the drive in FOCPG mode. Please consult the user manual and/or corresponding application notes for that.

2 Connecting and configuring the optional cards

The optional cards are not hot-swappable. This means that before connecting the CMC-EIP01/CMC-EIP02 or EMC-PG0xX you have to first shut off the power supply to the AC motor drive. This needs to be done in order to avoid any damage to the drive control board or to the communication card.

2.1 Connecting the Ethernet card

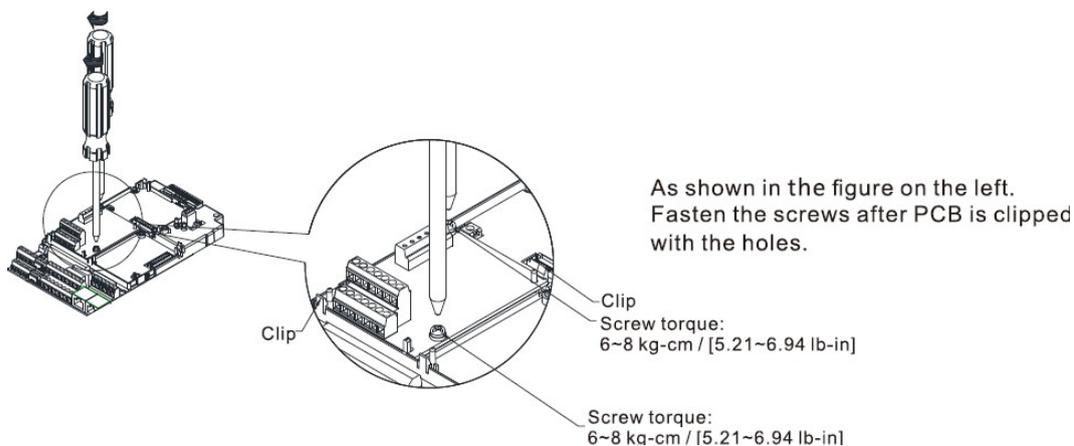
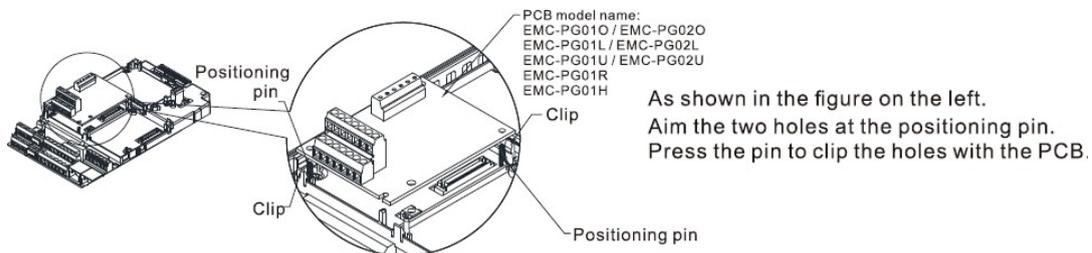
- Place the insulation spacer into the positioning pin at Slot 1, and line up the two holes on the PCB at the positioning pin. Press the pin to clip the holes on the PCB
- Ensure the PCB is securely placed, and then fix the screws with 6–8 kg-cm of torque (5.21–6.94 lb-in.).



Check the parameters below to make sure that the card is properly installed and that the correct firmware is being used:

Parameter	Setting	Description
09-60	5	Communication card identification
09-61	516 (V2.04)	Firmware version of communication card

2.2 Connecting the Encoder card



Check the parameter below to make sure that the card is properly installed and that the correct firmware is being used:

Parameter	Setting	Description
10-43	xx.xx	Encoder card identification

For more information on how to wire the encoder to the card you can check the latest drive user manual

2.3 Setting the IP address

The drive must have an IP address which is unique on the network

Changing the IP address can be done in two ways:

1. Via DCISoft
2. Via the drive parameters

2.3.1 DCISoft

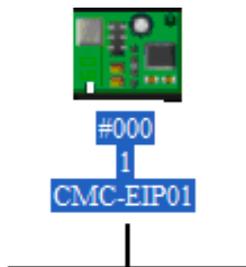
For DCISoft needed to download the software DCISoft

After downloading open the program

1. Open DCISoft
2. Click on search



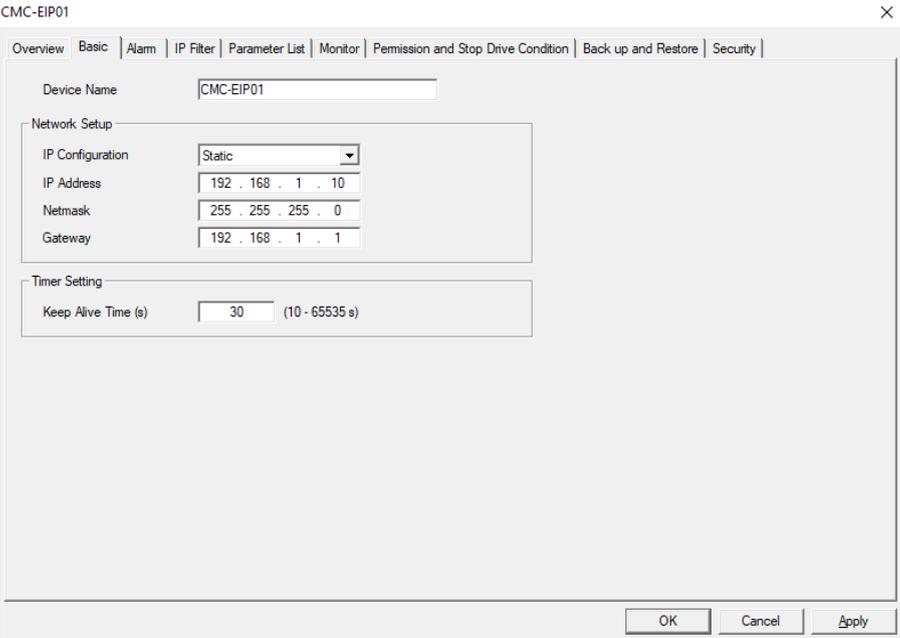
3. Double click on the CMC-EIP01



4. Click on Basic



5. Change the IP address.



The screenshot shows a configuration window titled "CMC-EIP01" with a close button (X) in the top right corner. The window has a tabbed interface with the following tabs: Overview, Basic, Alarm, IP Filter, Parameter List, Monitor, Permission and Stop Drive Condition, Back up and Restore, and Security. The "Basic" tab is selected. The "Device Name" field contains "CMC-EIP01". The "Network Setup" section includes a dropdown menu for "IP Configuration" set to "Static", and input fields for "IP Address" (192 . 168 . 1 . 10), "Netmask" (255 . 255 . 255 . 0), and "Gateway" (192 . 168 . 1 . 1). The "Timer Setting" section includes a "Keep Alive Time (s)" field set to "30" with a range of "(10 - 65535 s)". At the bottom right, there are three buttons: "OK", "Cancel", and "Apply".

6. Click on Apply
7. Look at Overview and see if the IP changes.
8. If it is changed, you can click Ok and close DCISoft

2.3.2 Driver Parameters

When using communication cards that require setting an IP address (eg. CMM-EIP01) it is necessary to follow the rules below in order to be able to save the address:

1. The setting of the first three IP addresses should be the same as the gateway. The fourth digit can be different:

pr09-76 = pr09-84

pr09-77 = pr09-85

pr09-78 = pr09-86

2. After setting the parameters above you need to set pr09-91=2 (i.e. bit1=1)

There are other rules that have to be followed when setting up the IP address. For example:

- The IP address 1 is not allowed to be set to 0, 127, or 224.
- The IP address 4 is not allowed to be set to 0 or 255, such as 192.168.1.255 or 192.168.1.0.
- You can find more information at <https://en.wikipedia.org/wiki/IPv4>

If the setting is not a legal value, the drive will not save it.

2.4 Cyclic Writing to VFD parameters

Extra attention must be given when writing into the drive parameters that are not mentioned in the table below:

Table 1.5.1 – Drive parameters that are not written directly into the EEPROM memory

Parameter	Function
Pr00-10	Control method
Pr00-11	Speed mode selection
Pr00-13	Torque mode select
Pr00-27	User-defined value
Pr01-12	Acceleration time 1
Pr01-13	Deceleration time 1
Pr01-14:	Acceleration time 2
Pr01-15:	Deceleration time 2
Pr01-16:	Acceleration time 3
Pr01-17:	Deceleration time 3
Pr01-18:	Acceleration time 4
Pr01-19:	Deceleration time 4
Pr02-12:	Select MI Conversion Time mode
Pr02-18:	Select MO Conversion Time mode
Pr04-50~Pr04-69:	PLC register parameter 0—19
Pr08-04:	Upper limit of integral control
Pr08-05:	PID output upper limit
Pr10-17:	Electronic gear A
Pr10-18:	Electronic gear B
Pr11-34:	Torque command
Pr11-43:	P2P highest frequency
Pr11-44:	Position control acceleration time
Pr11-45:	Position control deceleration time

It is very easy to exceed the maximum number of EEPROM write times when using a cyclic communication protocol or when using the WPR function block of the onboard PLC. When this happens, a “cF2” fault will appear indicating that the drive is no longer able to read the damaged section of the EEPROM memory.

C/C+/CH - Positioning via the Ethernet Card

For communication protocols we recommend those drive parameters are written via acyclic communication or to use Digital Input function 38:

38	Disable write EEPROM function (Parameters memory disable)	ON: writing to EEPROM is disabled. Changed parameters are not saved after power off.
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It is not mandatory to physically wire the input in order to trigger this function, it is also possible to trigger it by using parameters 02-74 and 02-75.

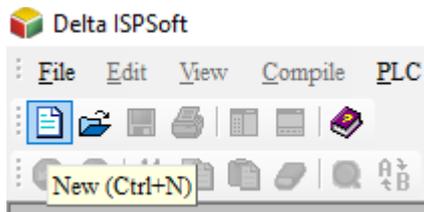
3 Drive Configuration

Set the following parameters:

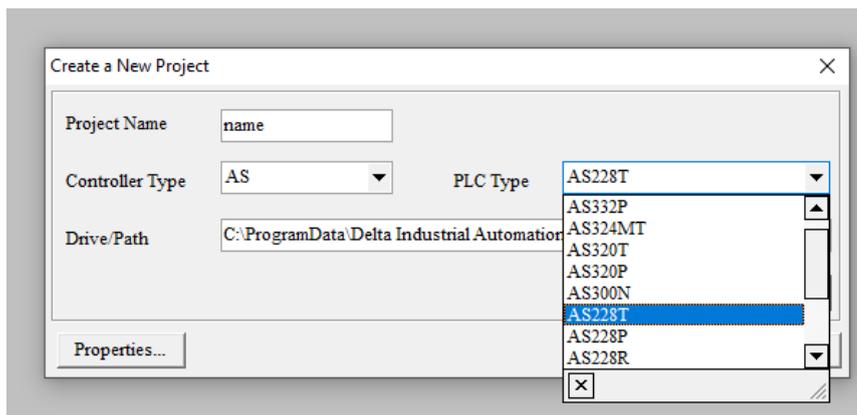
Parameter	Setting	Description
00-10	1	Positioning Mode
00-11	3 or 4	IMFOCPG or PMFOCPG
00-20	8	Master Frequency Command Source (AUTO) / Source Selection of the PID Target
00-21	5	Operation Command Source (AUTO)
11-40	5	Position Control Command Source
00-04	21	Display--> Actual motor position
02-01	47	M11 --> Enable Homing

4 IPSoft settings HWCONFIG

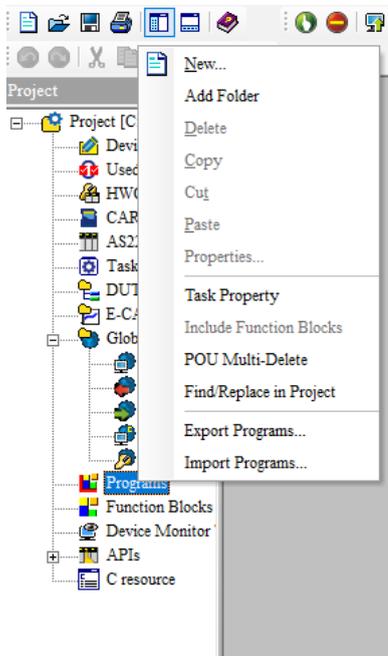
1. Open a new program



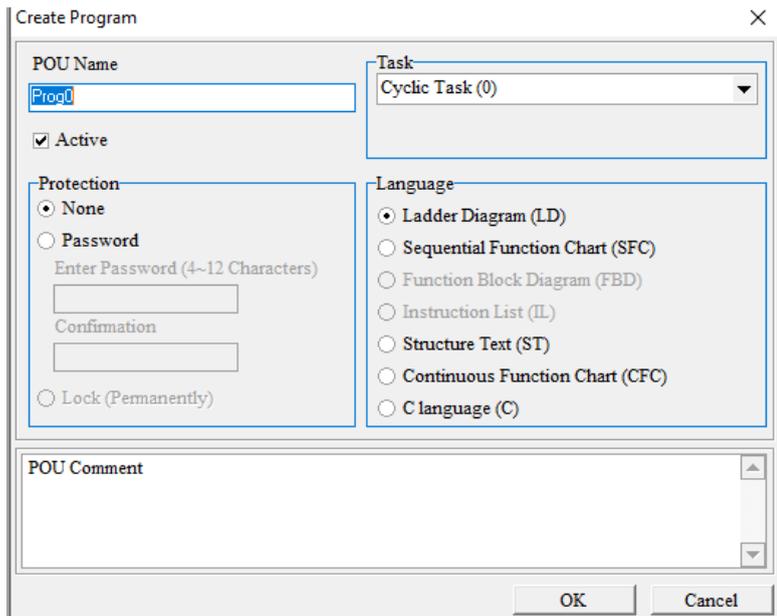
2. Choose the right settings for your PLC and controller type if choose the right one press ok



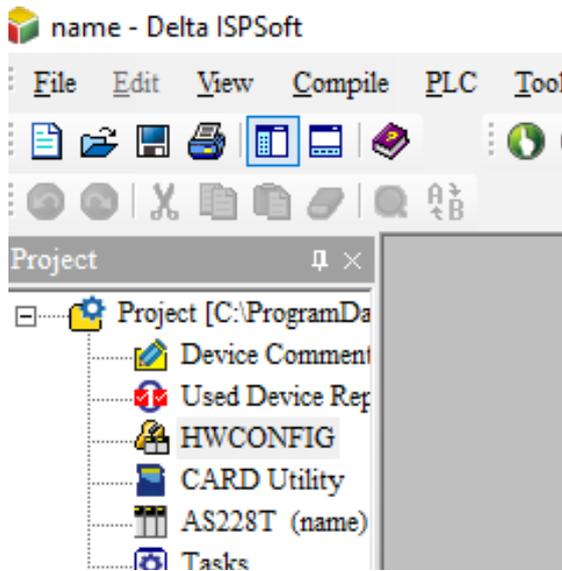
3. Go to Programs right click and make a new program



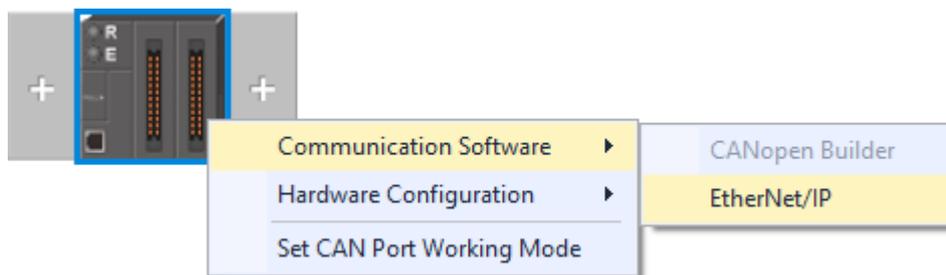
- 4. If this screen open press Ok



- 5. Open HWCONFIG double click on it

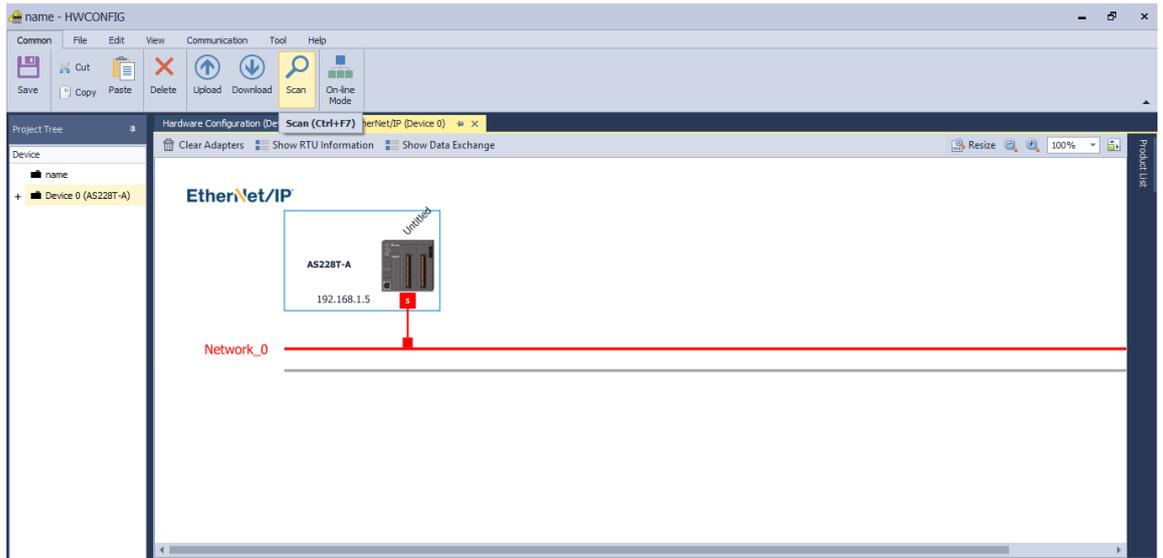


- 6. Right-click on the PLC and open Ethernet/IP

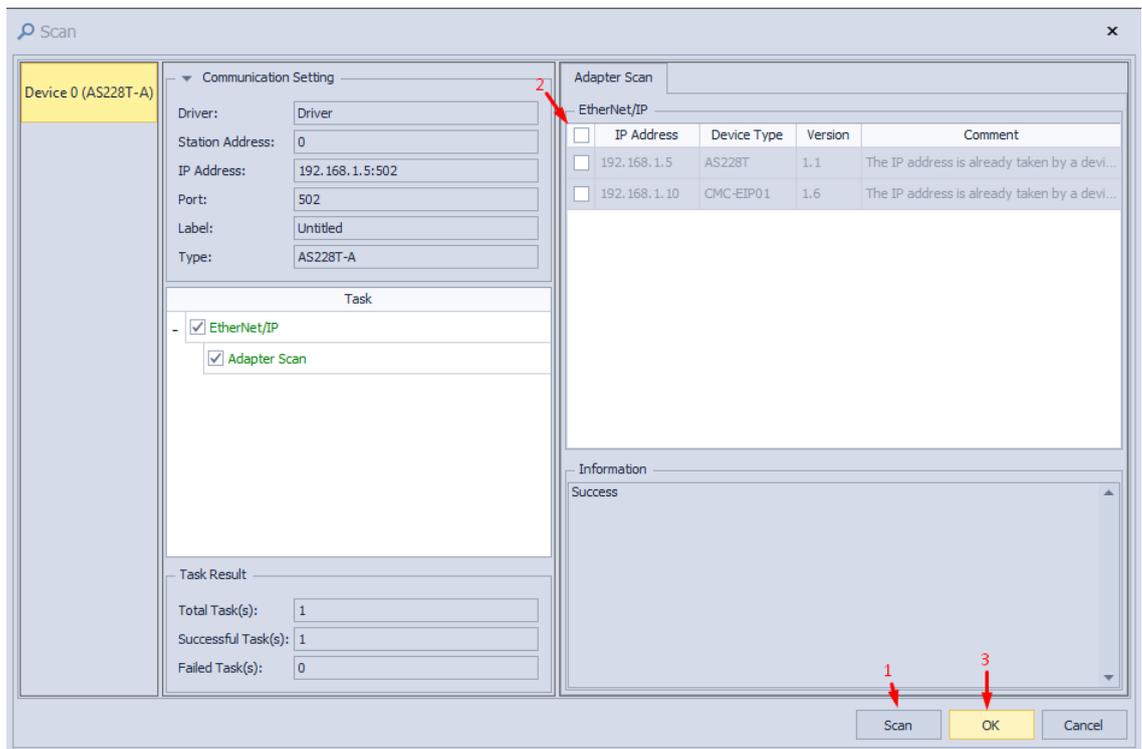


----- 6b ON ISP SOFT, click on tools--comm setting and select driver!!!-----

7. Scan for the C2000 you connect earlier



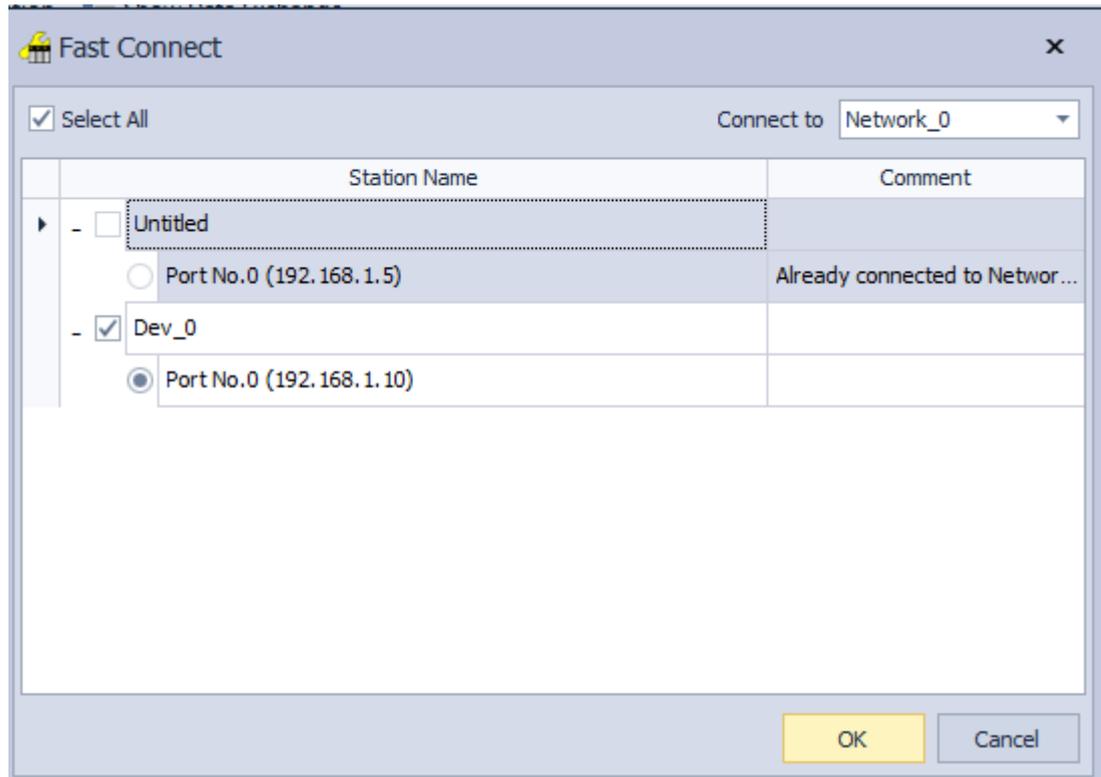
8. Scan and connect the driver what is visible at



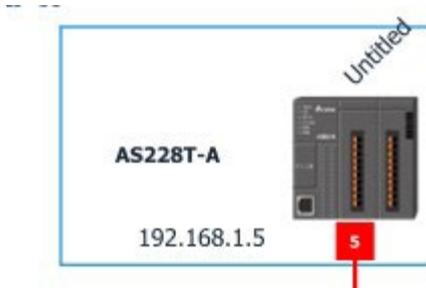
9. Right-click on the screen and click on fast connect



10. Press ok to connect everything



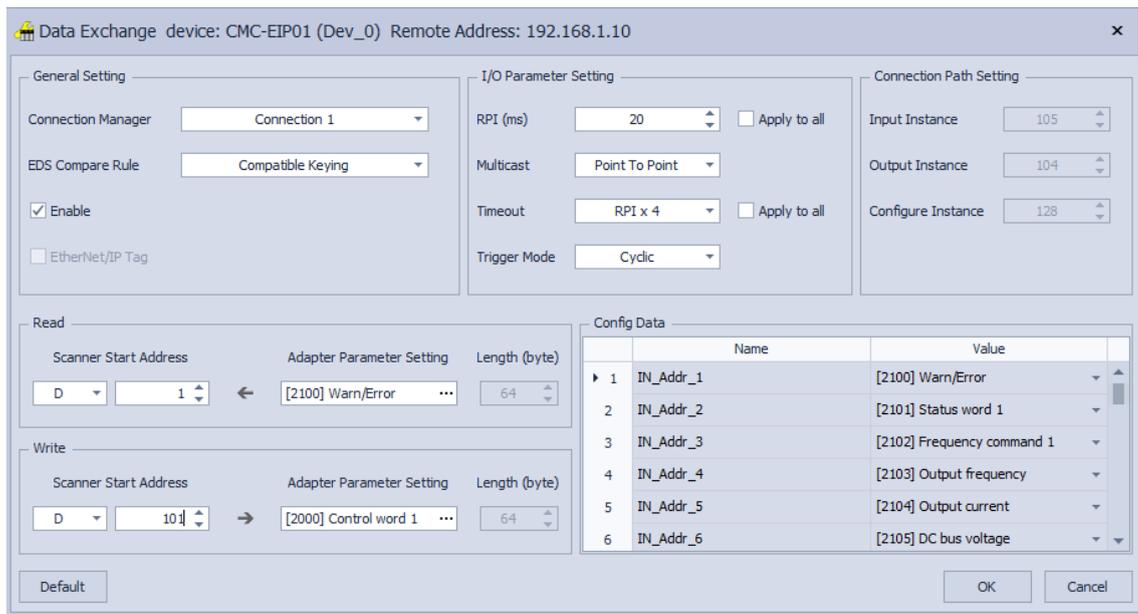
11. Double click on the PLC there will open the edit area



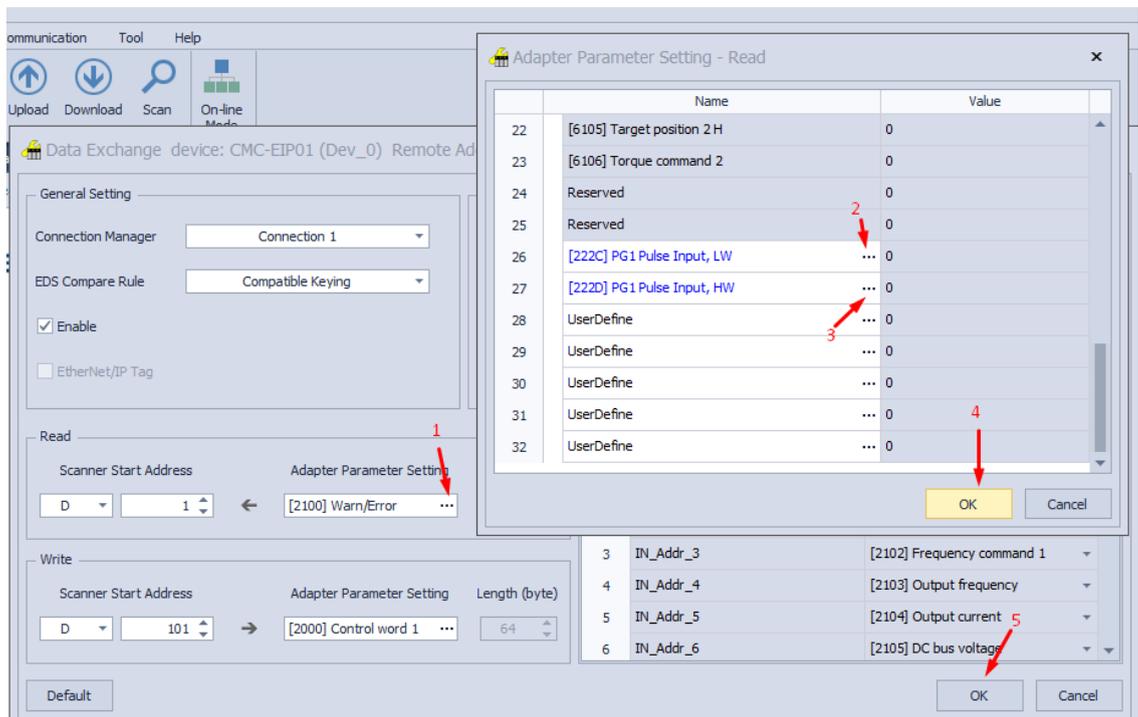
12. Double click on the device and will open the Remote address

<input checked="" type="checkbox"/>	Enable	EIP Tag	Product Name	Name	IP Address	Scanner Start Address / EIP Tag	Direction	Adapter Start Address / EIP Tag / Parameter	Length (byte)
1	<input checked="" type="checkbox"/>		CMC-EIP01	Dev_0	192.168.1.10	D0	←	[2100] Warn/Error	64
						D0	→	[2000] Control word 1	64

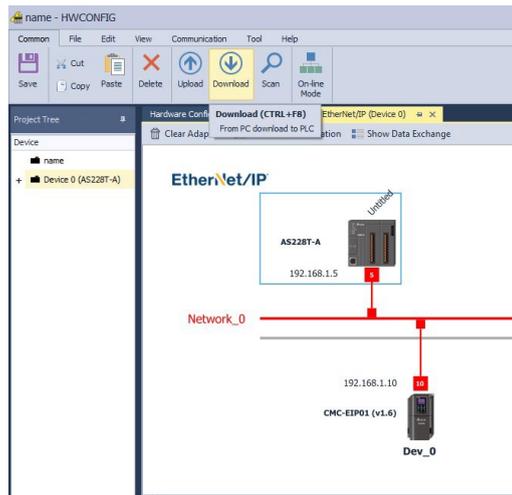
13. Set the read address to 1 and write address to 101.



14. Go to the "UserDefine" parameters of the "Read" section and select the Motor Actual Position registers 222C (Low Word) and 222D (High Word).



15. Download the data to the driver and PLC



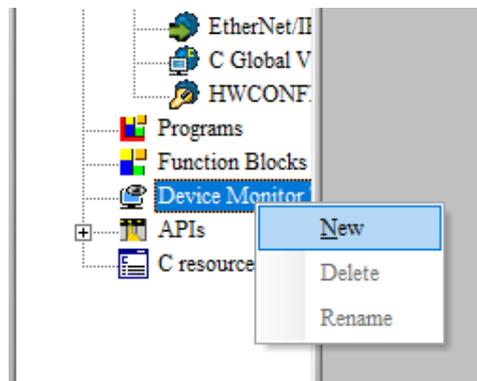
16. Close HWCONFIG



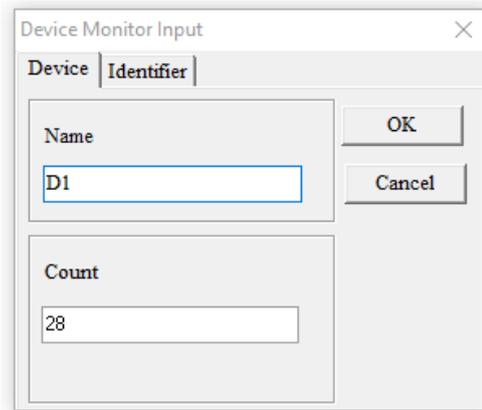
17. Setting the value of your speed and acceleration on the driver look at the Cyclic Writing table for the parameters to set these

4.1 P2P with AS PLC

1. Open Device monitor by making a new one



- Click on the table add D1 count 28 and add D101 Count 12



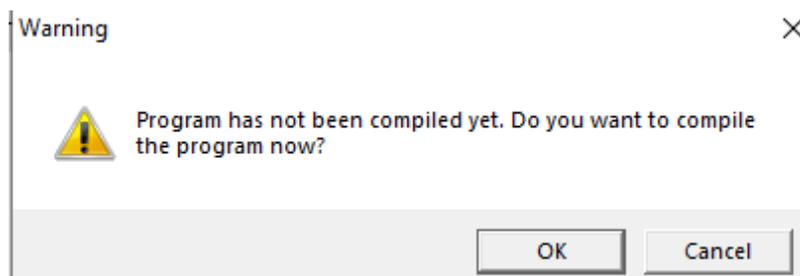
After doing this you get this table

Object	Identifiers	Device Name	Status	Data Type	Value (16bits)	Value (32bits)	Float	Radix	Comment...
		D12						Signed Deci	
		D13						Signed Deci	
		D14						Signed Deci	
		D15						Signed Deci	
		D16						Signed Deci	
		D17						Signed Deci	
		D18						Signed Deci	
		D19						Signed Deci	
		D20						Signed Deci	
		D21						Signed Deci	
		D22						Signed Deci	
		D23						Signed Deci	
		D24						Signed Deci	
		D25						Signed Deci	
		D26						Signed Deci	
		D27						Signed Deci	
		D28						Signed Deci	
		D101						Signed Deci	
		D102						Signed Deci	
		D103						Signed Deci	
		D104						Signed Deci	
		D105						Signed Deci	
		D106						Signed Deci	
		D107						Signed Deci	
		D108						Signed Deci	
		D109						Signed Deci	
		D110						Signed Deci	
		D111						Signed Deci	
		D112						Signed Deci	

- Go online mode



- Warning press OK



- Set D112 register 6007h is speed limit (0.01 hz)
- Set D105 Bit 7 for servo on and Bit 0 for moving to the position (6000h Control Word 2)
128 1

It depends if you wanted to go to the fixed point or going up with the amount of the value you set at D109 if you want to that point, set Bit 2 also on 1 if you want to increase with that amount set 0. For every time you want to set a new value you need to reset the 0 bit to 0 for moving the next value or position

Reset

Enter Present Value

Value Ranges
Decimal: -32768 ~ 32767
Hexadecimal: 16#0 ~ 16#FFFF
Binary: 2#0 ~ 2#1111111111111111

Bits
16 32 64 STRING

Present Value 16#80 OK

Device Name D105 Cancel

Symbol Name Hide Binary Mode

15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0

□ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □

128 (Dec)

Set for rotation with a certain amount.

Enter Present Value

Value Ranges
Decimal: -32768 ~ 32767
Hexadecimal: 16#0 ~ 16#FFFF
Binary: 2#0 ~ 2#1111111111111111

Bits
16 32 64 STRING

Present Value 16#81 OK

Device Name D105 Cancel

Symbol Name Hide Binary Mode

15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0

□ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □

129 (Dec)

Set for a certain position.

Enter Present Value

Value Ranges
Decimal: -32768 ~ 32767
Hexadecimal: 16#0 ~ 16#FFFF
Binary: 2#0 ~ 2#1111111111111111

Bits
16 32 64 STRING

Present Value 16#85 OK

Device Name D105 Cancel

Symbol Name Hide Binary Mode

15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0

□ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □

133 (Dec)

You always need to reset to go to a certain position or amount.

4.2 60xx addresses for homing and positioning.

Address	Attribute	Bit	Value	Speed mode	Position mode	Home mode
6000h	RW	0	0	fcmd = 0	None	Stop Home
			1	fcmd=Fset(Fpid)	POScmd = POSset	Excute Home Once
		1	0	FWD run command	Change when drive stops	
			1	REV run command	Immediate change	
		2	0		Absolute movement	
			1		Relative movement	
		3	0	drive runs till target speed reaches	driver runs till target position reaches	Continue to return home
			1	Drive stops by declaration setting	Lock (drive stops at current position by declaration setting)	Drive stops at current position by declaration setting
		4	0	driver runs till target speed reaches		
			1	Frequency stops at current frequency		
		5	0	JOG OFF	JOG OFF	JOG OFF
			1	JOG ON	JOG ON	JOG ON
		6	0	None	None	None
			1	Quick stop	Quick stop	Quick stop
		7	0	Servo OFF	Servo OFF	Servo OFF
			1	Servo ON	Servo ON	Servo ON
		8-11	0000	Main speed	Main position	
			0001			
			1111	1st - 15 th speed and frequency selection	1st - 15th position selection	
		12-13	00	1st Acceleration time	1st Acceleration time	
			01	2nd Acceleration time	2nd Acceleration time	
			10	3th Acceleration time	3th Acceleration time	
			11	4th Acceleration time	4th Acceleration time	
		14	0	Multi step command not allowed	Multi step command not allowed	
1	Multi step command allowed		Multi step command allowed			
15	1	Clear error code	Clear error code			
6001h	RW	x	x	0 speedmode	1 position mode	3 homing mode
6002h	RW	x	x	Speed command	Profile velocity	
6003h	RW	x	x			
6004h	RW	x	x		Position command	
6005h	RW	x	x			
Address	Attribute	Bit	Value	Speed mode	Position mode	Home mode
6100h	R	0	0	Frequency command not reached	Position command not reached	Zero command unfinished
			1	Frequency command arrival	Position command reached	Zero command completed
		1	0	FWD	FWD	FWD
			1	REV	REV	REV
		2	0	No warning	No warning	No warning
			1	Warning occurred	Warning occurred	Warning occurred
		3	0	No error	No error	No error
			1	Error occurred	Error occurred	Error occurred
		5	0	None	None	None
			1	JOG	JOG	JOG
		6	0	None	None	None
			1	On Quick stop	On Quick stop	On Quick stop
		7	0	PWM OFF	PWM OFF	PWM OFF
			1	PWM ON	PWM ON	PWM ON
		8	0	Ready OFF	Ready OFF	Ready OFF
			1	Ready ON	Ready ON	Ready ON
6101h	R	x	x	0 speedmode	1 position mode	3 home mode
6102h	R	x	x	Actual output	Actual output	Actual output
6103h	R	x	x			
6104h	R	x	x			
6105h	R	x	x	Actual Position	Actual Position	Actual Position

5 Limit switches for Upper and Lower limit

For the use of the limit switches there are some parameters with are:

↗	11-56	Software Positive Limit	Default: 30000
		Settings -30000–30000 revolutions	
↗	11-57	Software Positive Limit	Default: 0
		Settings Refer to Pr.10-01 setting	
↗	11-58	Software Negative Limit	Default: -30000
		Settings -30000–30000 revolutions	
↗	11-59	Software Negative Limit	Default: 0
		Settings Refer to Pr.10-01 setting	

For using the limit switches you can set the limits to the max of revolutions you wanted to make with the motor.

If you want to make use of it you need to set Bit 2 on 1 for making use of the Software limit function on Pr: 11-60

	11-60	Position Control Bit	Default: 00Ah
		Settings bit0: Enable position memory function	
		bit1: The pulse per revolution at load side counts by ppr	
		bit2: Enable software limit function	
		bit3: Enable hardware limit function	

6 Testing

1. Home first the driver

You can do that to set the switch Pr. 02-01 to 47 to enable home.

2. Set the value of D109 of your testing value.
3. Setting D105 to bit 7 or 128 for ready making the test.
4. Setting D105 to bit 7 and 1 or 129 for testing.

For Relative movement you also set bit2 before bit 1 for testing or 133