



# Product Solutions Announcement

Delta Industrial Automation Global Solution Center



Product	AMD	Type	VFD-C2000	Security Level	<input checked="" type="checkbox"/> General <input type="checkbox"/> High <input type="checkbox"/> Top
				No.	N/A
Issued by	Global SC	Author	John Zuo	Release Date	11 <sup>th</sup> Feb. 2014

## P2P Test based on PLC built-in in C2000

### Devices and tools:

Inverter: VFD007C23A, Firmware V1.04 (D13305)

C2000 Optional Card: EMC-PG01U

PM motor: ECMA-C30602ES

HMI:DOP-B10E615

### Operation Steps:

1. Wiring the power line of ECMA-C3 with C2000 UVW Ports based on Red(U) White(V) Black(W).
2. Set correct parameters 01-00, 01-01 and 01-02 based on PM you are using.
3. Key in the following parameters:

Pr. no	Definition	Setting value
05-33	IM or PM motor choice	1
05-34	PM motor rated current (A)	1.55
05-35	PM motor rated power (kw)	0.20
05-36	PM motor rated speed (rpm)	3000
05-37	PM magnetic roles	10
05-38	PM Inertia ( $E^{-4}$ kg-m <sup>2</sup> )	0.2

4. Set 05-00=5 for PM motor auto-tuning.

05-33 to 05-37 must be set before PM motor auto-tuning. However, 05-38 has nothing to do with auto-tuning but for automatical bandwidth in ASR.

**5. Check the following parameters after PM motor auto-tuning.**

05-39 stator resistance, 05-40 PM Ld, 05-41 PM Lq and 05-43 PM Ke

**6. Set parameters about encoder:**

10-00	Encoder types	2
10-01	Pulse Encoder PPR	2500
10-02	Encoder operation modes	1

**7. Set 05-00=4 for PM magnetic angle detecting.**

The angle would be set into 05-42 automatically after the magnetic angle detecting. And for ECMA series motor, 05-42 will be  $0^{\circ}$  or  $360^{\circ}$  because of the setting in factory. Hence, if the motor is ECMA, we can cancel the magnetic angle detecting but set 05-42=0 directly.

**8. Set 00-11=4 for PM FOCPG control mode.**

**9. Repower the inverter.**

Since ECMA use the ABZ encoder, the rotor magnetic information can be obtained only at the power-on time. So after the necessary parameters setting, we should repower inverter and makes PG can obtain the rotor magnetic information in case of fly run based on wrong magnetic information.

**10. Set Pr11-00=2 for inertia auto-tuning (After tuning over, 11-00 will be 0 automatically):**

- Keep empty load first.
- Set speed command= $\frac{2}{3}$ \*rated speed of motor (05-36).
- Set acceleration and deceleration time is 1s or 1.5s.
- Forward and reverse in turn until 11-01 is stable. And then press stop, the tuning is over.
- Connect the load, and repeat the inertia auto-tuning procedures again. If the inertia auto-tuning is OK, the loading inertia result is better. If the loading inertia not OK, we must input the 11-01 inertia by hand based on the tuning result in empty load.

**11. Enable ASR bandwidth adjustment automatically function.**

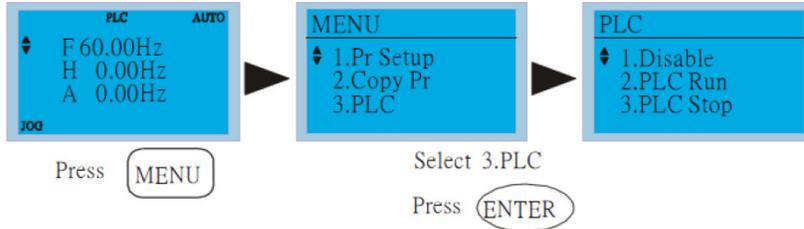
- If we keep Pr11-00=0, we just disable the ASR bandwidth adjustment automatically. And we only can use Pr11-06 to Pr11-11 and the PI ASR will be invariable during running.
- If we set Pr11-00=1, we enable the ASR bandwidth adjustment automatically, and we can use Pr11-03 to Pr11-05 (no Pr11-06 to Pr11-11 anymore), and Pr11-03 to Pr11-05 can

make real ASR PI changed automatically based on practical current situation. This is more flexible for practical commissioning.

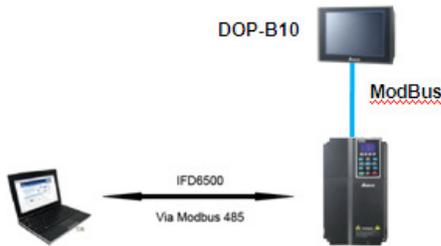
**12.** Giving one frequency command for checking whether FOCPG+PM is OK.

**13.** Open the PLC built-in in C2000.

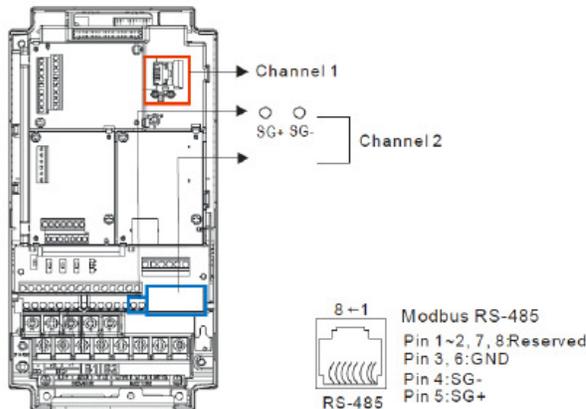
Press menu key on keypad (KPC-CC01) to choose built in PLC function, then, choose “PLC stop” to get PLC function ready.



**14.** Wiring according to the picture below.



C2000 series offer 2 communication ports for PLC program upload and download. Refer to the figure follows for port location. The communication protocol of channel 1 is always 19200, 8, N, 2 RTU. In this case, HMI is to connect with Channel 2, so the PC is to connect with Channel 1.

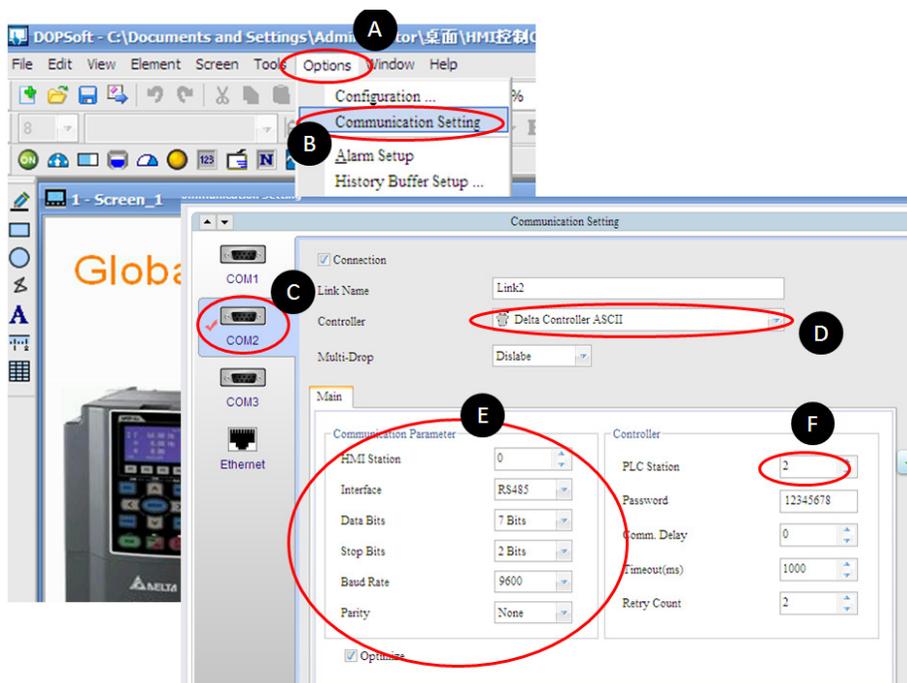


**15.** Open “WPLsoft”, select VFD-C2000 as a PLC model. The channel 2 modbus default protocol of C2000 is 7, N, 2, 9600, station number 2 because of C2000 parameters default setting.

Pr. NO.	Definition	Value	Remark
09-00	Communication Address	1	Value of each drive should be unique
09-01	Transmission	9.6	Kbits/s
09-04	Communication Protocol	1	Namely 7 N 2 Protocol ASCII
09-35	PLC built-in address	2 <sup>A</sup>	Value should be different from 09-00
11-43	P2P Maximum Fre.	10.00 <sup>B</sup>	HZ
11-44	P2P Acc. Time	1.00 <sup>B</sup>	s
11-45	P2P Dec. Time	1.00 <sup>B</sup>	s
00-40	Homing Mode Choice	3(for ORG & Z) <sup>C</sup>	Homing Sensor is ORG and look for Z
00-41	Homing First Speed	8.00 <sup>C</sup>	HZ
00-42	Homing Second Speed	2.00 <sup>C</sup>	HZ
02-01	MI1 Definition	46(ORG) <sup>C</sup>	

- A. Please refer to this address when you use the PLC built-in function.
- B. P2P frequency, Acc. Time and Dec. time must be set in 11-43 11-44 11-45 even if you are using the PLC inside. Hence, I suggest we set them before.
- C. Homing Configuration like Homing Mode, Homing Speed and ORG MI definition must be set before PLC running since PLC program only can enable Homing but not very convenient to set them.

## 16. Setting HMI Communication Protocol.



- A. Choosing Options in DOP soft.
- B. Choosing Communication Setting in Options.
- C. Choosing COM2 in this case. Because I connect HMI to C2000 by COM2.
- D. The controller must be Delta Controller ASCII.
- E. The communication parameters must be the same as C2000 Pr09-01 Pr09-04 namely 7 N 2 9600 ASCII. HMI address should be different with C2000 PLC address.
- F. C2000 PLC address must be the same as Pr09-35 namely 2.

17. Making the PLC Program and HMI Program. Please kindly refer to the “P2P for PLC inside C2000”.Dvp, and “P2P for PLC inside C2000”.Dps.

18. Download them to PLC inside C2000 and HMI.

Global Solution Center\_Position & Homing Mode



Global Solution Center\_Jog Mode



## FAQ:

### 1. How to choose Absolute Position or Incremental Position?

After V9.020 d12294, the absolute position and incremental position can be chosen by M1050 in the PLC inside C2000. When M1050=OFF, it is incremental position, when M1050=ON, it is absolute position.

### 2. How to understand H222C, H222D?

After V9.020 d12294, H222C H222D are the 32bit pulse record registers for PG pulse. So in the P2P mode, we can use H222C H222D to record the current pulses information. The absolute position also is based on H222C H222D to determine the position displacement. (H222C is low 16 bit, H222D is high 16 bit).

E.g. when H222C H222D are 10000 Pulses, if we give the absolute position command is 20000 pulses, the motor will run only 10000 pulses. Hence, H222C H222D are very important for P2P absolute position. H222C H222D can be reset when it is servo off in the Speed Mode. H222C H222D will never be reset even if it is servo off in the Position Mode.

Besides, H222C H222D will be reset when we finish Homing Mode in C2000.

3. Why can't M1064 M1070 be ON even if Position or Homing is finished sometimes in C2000?

M1064 is the position target reached relay, M1070 is the Homing Finished relay.

Normally, when we finish the position, no matter Absolute or Incremental, M1064 must be ON.

When we finish the Homing, M1070 must be ON.

Sometimes, M1064 M1070 can't be ON because the position bandwidth APR is not strong and the pulses error will be there, so MCU can't judge whether position target or Homing is already finished or not. So we can increase APR bandwidth 11-03~11-05 or 11-06 11-08 11-10. In this case, the bandwidth 11-03=11-04=11-05=80HZ, and M1064 M1070 worked very well.

4. Can we give D1060 K3 for P2P and Homing Mode together?

D1060 is 1 is for P2P mode namely Position Mode.

D1060 is 3 is for Homing mode.

Hence, if you want to take Homing, please ensure D1060 is 3, and if you want to take P2P, please ensure D1060 is 1. In a word, we can't only give D1060 K3 for realizing P2P and Homing together, they have different D1060 definition. We must recognize it in our PLC program.

Besides, when you finish Homing, if you want to go back P2P, you must make D1060 is 1 and you must servo off, then servo on for ensuring the P2P position precision.



