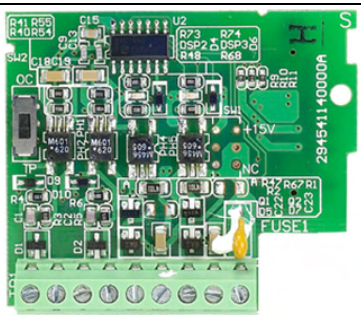
connect to extension card

connect to PC

B.9.5 Speed Feedback Card

EME-PG01



B.10 Fieldbus Modules

B.10.1 DeviceNet Communication Module (CME-DN01)

B.10.1.1 Panel Appearance and Dimensions

1. For RS-485 connection to VFD-E 2. Communication port for connecting DeviceNet network 3. Address selector 4. Baud rate selector 5. Three LED status indicators for monitor. (Refer to the figure below)

Group 13: PG function Parameters for Extension Card

Parameter	Explanation	Settings	Factory Setting	Customer
13.00	PG Input	0: Disabled 1: Single phase 2: Forward/Counterclockwise rotation 3: Reverse/Clockwise rotation	0	
13.01	PG Pulse Range	1 to 20000	600	
13.02	Motor Pole Number (Motor 0)	2 to 10	4	
✓13.03	Proportional Gain (P)	0.0 to 10.0	1.0	
✓13.04	Integral Gain (I)	0.00 to 100.00 sec	1.00	
✓13.05	Speed Control Output Frequency Limit	0.00 to 100.00Hz	10.00	
✓13.06	Speed Feedback Display Filter	0 to 9999 (*2ms)	500	
✓13.07	Detection Time for Feedback Signal Fault	0.0: disabled 0.1 to 10.0 sec	1	
✓13.08	Treatment of the Feedback Signal Fault	0: Warn and RAMP to stop 1: Warn and COAST to stop 2: Warn and keep operation	1	
✓13.09	Speed Feedback Filter	0 to 9999 (*2ms)	16	
13.10	Source of the High-speed Counter	0: PG card 1: PLC (NOT for VFD*E*C models)	Read Only	

Group 13: PG function Parameters for Extension Card

Pulse generator card (PG card) is mainly applied in the detection components of speed control or position control. It usually makes a closed-loop speed control system with encoder. The AC motor drive is used with encoder and PG card to have a complete speed control and position detection system.

Please make sure that the extension card is installed on the AC motor drive correctly before using group 12 parameters. See Appendix B for details.

13.00	PG Input

Factory Setting: 0

Settings	0	Disable PG
	1	Single phase
	2	Forward/Counterclockwise rotation
	3	Reverse/Clockwise rotation

- There are two outputs, 1-phase and 2-phase output, for the encoder output. For the 1-phase output, the encoder output is a group of pulse signal. For the 2-phase output, the encoder can output A and B pulse signals with 90^{o} phase difference. The encoder is defined by the timing of A and B pulses as the following figure. It can not only measure the speed but distinguish motor rotation direction by A and B pulse signals.
- PG card receives A and B pulses from encoder output and sends this feedback signal to the AC motor drive for speed or position control.
- Setting 0: disable PG function.
- Setting 1: for speed/position control but can't distinguish motor rotation direction.
- Setting 2: both for speed control and distinguish motor rotation direction. A phase leads B phase as shown in the following diagram and motor is forward running.
- Setting 3: both for speed control and distinguish motor rotation direction. B phase leads A phase as shown in the following diagram and motor is reverse running.
- Related parameter: Pr.13.01(PG Pulse Range)

When receiving a forward command, motor will rotate in counterclockwise direction (see from output side).

When receiving a reverse command, motor will rotate in clockwise direction (see from output side).

When encoder rotates in clockwise direction (see from input side). At this moment, A phase leads B phase.

13.01	PG Pulse Range	
	Settings 1 to 20000	Factory Setting: 600

- A Pulse Generator (PG) is used as a sensor that provides a feedback signal of the motor speed. This parameter defines the number of pulses for each cycle of the PG control.
- This parameter setting is the resolution of encoder. With the higher resolution, the speed control will be more precise.

13.02	Motor Pole Number (Motor 0)	Unit: 1
	Settings 2 to 10	Factory Setting: 4

- The pole number should be even (can't be odd).

13.03	Proportional Gain (P)	Unit: 0.01
	Settings 0.0 to 10.0	Factory Setting: 1.0

- This parameter is used to set the gain (P) when using PG for the closed-loop speed control.
- The proportional gain is mainly used to eliminate the error. The large proportional gain(P) will get the faster response to decrease the error. Too large proportional gain will cause large overshoot and oscillation and decrease the stable.

This parameter can be used to set the proportional gain (P) to decide the response speed. With large proportional gain, it will get faster response. Too large proportional gain may cause system oscillation. With small proportional gain, it will get slower response.

13.04	Integral Gain (I)	Unit: 0.01
Settings	0.00 to 100.00 sec	Factory Setting: 1.00
	0.00 Disable	

The integral controller is used to eliminate the error during stable system. The integral control doesn't stop working until error is 0. The integral is acted by the integral time. The smaller integral time is set, the stronger integral action will be. It is helpful to reduce overshoot and oscillation to make a stable system. At this moment, the decreasing error will be slow. The integral control is often used with other two controls to become PI controller or PID controller.

This parameter is used to set the integral time of I controller. When the integral time is long, it will have small gain of I controller, the slower response and bad external control. When the integral time is short, it will have large gain of I controller, the faster response and rapid external control.

When the integral time is too small, it may cause system oscillation.

When it is set to 0.0, the integral function is disabled.

13.05	Speed Control Output Frequency Limit	Unit: Hz
Settings	0.00 to 100.00Hz	Factory Setting: 10.00

This parameter is used to limit the max. output frequency.

From the following PG speed diagram, output frequency (H) = frequency command (F) + speed detection value via PG feedback. With the speed change of motor load, the speed change will be sent to drive via PG card to change the output frequency. So this parameter can be used to decrease the speed change of motor load.

13.06	Speed Feedback Display Filter	Unit: 2ms
Settings	0 to 9999 (*2ms)	Factory Setting: 500

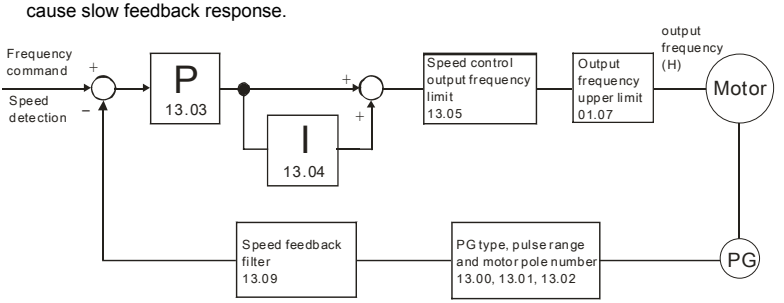
When Pr.0.04 is set to 14, its display will be updated regularly. This update time is set by Pr.13.06.

With the large setting in Pr.13.06, it can slow the response speed to prevent the blinking of digital number on the digital keypad. Too large setting may cause the delay of RPM value via PG card.

Related parameter: Pr.00.04(Content of Multi-function Display)

13.09	Speed Feedback Filter	Unit: 2ms
	Settings 0 to 9999 (*2ms)	Factory Setting: 16

This parameter is the filter time from the speed feedback to the PG card. Too large setting may cause slow feedback response.



PG feedback speed control

13.07	Time for Feedback Signal Fault	Unit: second
	Settings 0.1 to 10.0 sec	Factory Setting: 1.0
	0.0 Disabled	

This parameter defines the time during which the PID feedback must be abnormal before a warning (see Pr.13.08) is given. It also can be modified according to the system feedback signal time.

If this parameter is set to 0.0, the system would not detect any abnormality signal.

Related parameter: Pr.13.08(Treatment of the Feedback Signal Fault)

13.08	Treatment of the Feedback Signal Fault	
		Factory Setting: 1
Settings	0	Warn and RAMP to stop
	1	Warn and COAST to stop
	2	Warn and keep operating

- AC motor drive action when the feedback signals (analog PID feedback or PG (encoder) feedback) are abnormal.
- Setting Pr.13.08 to 0: When the feedback signal fault occurs, it will display “PGEr” on the digital keypad and the stop to 0Hz by Pr.01.10/Pr.01.12 setting.
- Setting Pr.13.08 to 1: When the feedback signal fault occurs, it will display “PGEr” on the digital keypad and the motor will free run to stop.
- Setting Pr.13.08 to 2: When the feedback signal fault occurs, it will display “PGEr” on the digital keypad and the motor will keep running.
- It needs to press “RESET” to clear the warning message “PGEr” displayed on the keypad.

NOTE

The digital keypad is optional. Please refer to Appendix B for details. When using without this optional keypad, the FAULT LED will be ON once there is error messages or warning messages from the external terminals.

13.10	Source of the High-speed Counter (NOT for VFD*E*C models)	
		Factory Display: 0 (Read only)
Settings	0	PG card
	1	PLC

- This parameter reads the high-speed counter of the drive to use on PG card or PLC.

D.4.6 The Features and Functions of Counter

Features:

Item	16 bits counters	32 bits counters	
Type	General	General	High speed
Count direction	Count up	Count up/down	
Settings	0~32,767	-2,147,483,648~+2,147,483,647	
Designate for constant	Constant K or data register D	Constant K or data register D (2 for designated)	
Present value change	Counter will stop when attaining settings	Counter will keep on counting when attaining settings	
Output contact	When count attains settings, contact will be On and latched.	When count up attains settings, contact will be On and latched. When count down attains settings, contact will reset to Off.	
Reset action	The present value will reset to 0 when RST command is executed and contact will reset to Off.		
Present register	16 bits	32 bits	
Contact action	After scanning, act together.	After scanning, act together.	Act immediately when count attains. It has no relation with scan period.

Functions:

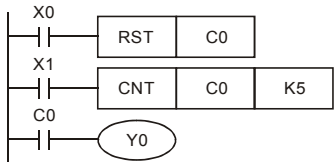
When pulse input signal of counter is from Off to On, the present value of counter equals to settings and output coil is On. Settings are decimal system and data register D can also be used as settings.

16-bit counters C0~C7:

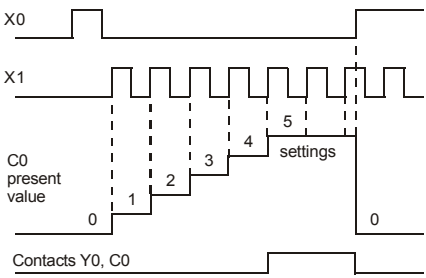
1. Setting range of 16-bit counter is K0~K32,767. (K0 is the same as K1. output contact will be On immediately at the first count.
2. General counter will be clear when PLC is power loss. If counter is latched, it will remember the value before power loss and keep on counting when power on after power loss.
3. If using MOV command, WPLSoft to send a value, which is large than setting to C0, register, at the next time that X1 is from Off to On, C0 counter contact will be On and present value will be set to the same as settings.
4. The setting of counter can use constant K or register D (not includes special data register D1000~D1044) to be indirect setting.
5. If using constant K to be setting, it can only be positive number but if setting is data register D, it can be positive/negative number. The next number that counter counts up from 32,767 is -32,768.

Example:

```
LD    X0
RST   C0
LD    X1
CNT   C0  K5
LD    C0
OUT   Y0
```



1. When X0=On, RST command is executed, C0 reset to 0 and output contact reset to Off.
2. When X1 is from Off to On, counter will count up (add 1).
3. When counter C0 attains settings K5, C0 contact is On and C0 = setting =K5. C0 won't accept X1 trigger signal and C0 remains K5.



32-bit high-speed addition/subtraction counter C235:

1. Setting range of 32-bit high-speed addition/subtraction counter is : K-2,147,483,648~K2,147,483,647.
2. The settings can be positive / negative numbers by using constant K or data register D (special data register D1000~D1044 is not included). If using data register D, the setting will occupy two continuous data register.

The total band width of high-speed counter that VFD-E supports is up to 30kHz and 500kHz for pulse input.

D.4.7 Register Types

There are two types of register which sorts by characters in the following:

1. General register : The data in register will be cleared to 0 when PLC switches from RUN to STOP or power is off.
2. Special register : Each special register has the special definition and purpose. It is used to save system status, error messages, monitor state.