# PG Interface Card "OPC-G1-PG"

Thank you for purchasing this PG interface card "OPC-G1-PG." Installing this card to your FRENIC-MEGA enables speed control with speed sensor and pulse train input.

Note
- Installing this card disables pulse train inputs to the inverter's terminal [X7].
- The FRENIC-MEGA has three option connection ports--A-, B-, and C-ports. Connect this PG interface card to the C-port. Do not connect it to any other port.

1. Check that:

(1) A PG interface card and two screws (M3 × 8) are contained in the package.

(2) The PG interface card is not damaged during transportation--no defective devices, dents or warps.

(3) The model name "OPC-G1-PG/SY" is printed on the back of the PG interface card as shown in Figure 2. (The "PG/SY" on the front is a short name, as shown in Figure 1.)

If you suspect the product is not working properly or if you have any questions about your product, contact the shop where you bought the product or your local Fuji branch office.

Figure 1   Front of Card

Figure 2   Back of Card
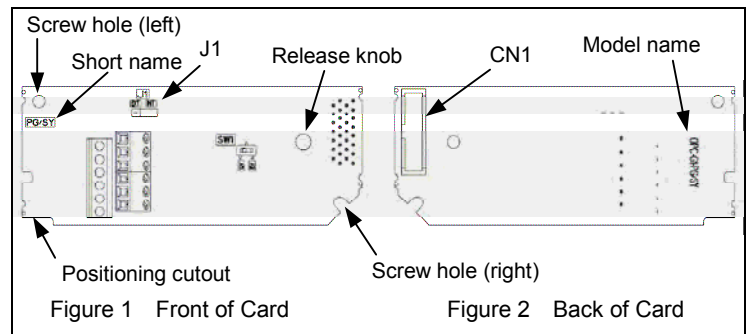
2. Installation

⚠ WARNING

Before starting installation and wiring, turn OFF the power and wait at least five minutes for inverters with a capacity of 22 kW or below, or at least ten minutes for inverters with a capacity of 30 kW or above. Make sure that the LED monitor and charging lamp are turned OFF. Further, make sure, using a multimeter or a similar instrument, that the DC link bus voltage between the terminals P(+) and N(-) has dropped to the safe level (+25 VDC or below).

Otherwise, electric shock could occur.

(1) Remove the front cover from the inverter and expose the control printed circuit board (control PCB). As shown in Figure 3, the PG interface card can be connected to the C-port (CN6) only.

📖 To remove the front cover, refer to the FRENIC-MEGA Instruction Manual, Section 2.3. For inverters with a capacity of 30 kW or above, open also the keypad enclosure.

(2) Insert connector CN1 on the back of the PG interface card (Figure 2) into the C-port (CN6) on the inverter's control PCB. Then tighten the two screws that come with the card. (Figure 4)

Note Check that the positioning cutout (Figure 1) is fitted on the tab (① in Figure 4) and connector CN1 is fully inserted (② in Figure 4). Figure 5 shows the PG interface card correctly mounted. Do not connect the PG interface card to the ports other than C-port. Doing so may damage the card.

(3) Perform wiring on the PG interface card.

📖 Refer to Section 3 "Wiring."

(4) Put the front cover back into place.

📖 To put back the front cover, refer to the FRENIC-MEGA Instruction Manual, Section 2.3. For inverters with a capacity of 30 kW or above, close also the keypad enclosure.
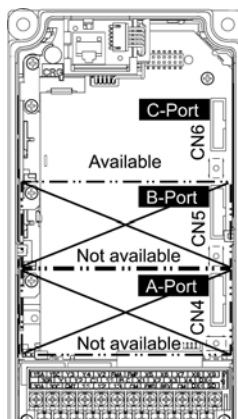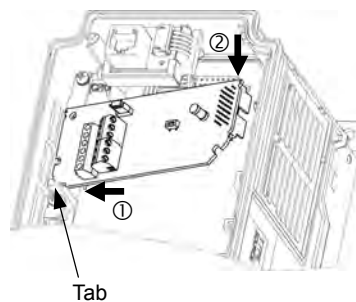

Figure 3   In the case of 0.4 kW

① Fit the positioning cutout of the card over the tab on the inverter to determine the mounting position.
② Insert connector CN1 on the card into the C-port (CN6) on the inverter's control PCB.
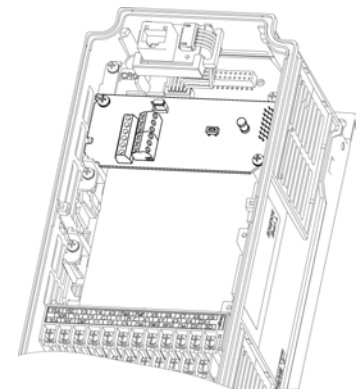
Figure 4   Mounting PG Interface Card

Figure 5   Mounting Completed

3. Wiring

> ⚠ **WARNING**
>
> In general, the covers of the control signal wires are not specifically designed to withstand a high voltage (i.e., reinforced insulation is not applied). Therefore, if a control signal wire comes into direct contact with a live conductor of the main circuit, the insulation of the cover might break down, which would expose the signal wire to a high voltage of the main circuit. Make sure that the control signal wires will not come into contact with live conductors of the main circuit.
>
> **Failure to observe this precaution could cause electric shock or an accident.**

> ⚠ **CAUTION**
>
> Noise may be emitted from the inverter, motor and wires.
> Take appropriate measures to prevent the nearby sensors and devices from malfunctioning due to such noise.
>
> **An accident could occur.**

Perform wiring properly, referring to the "Terminal Allocation and Symbol Diagram," "Terminal Specifications," and "Internal Block Diagram" shown below.
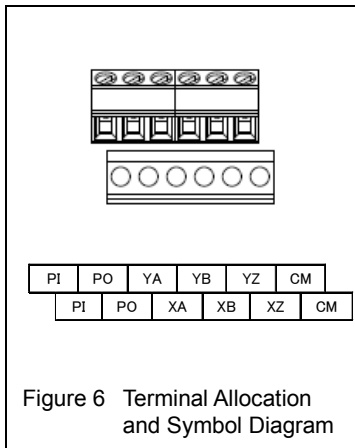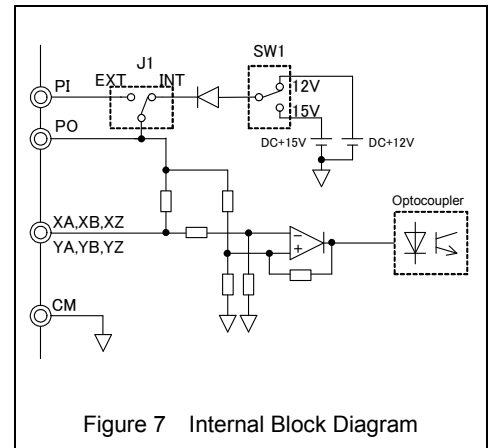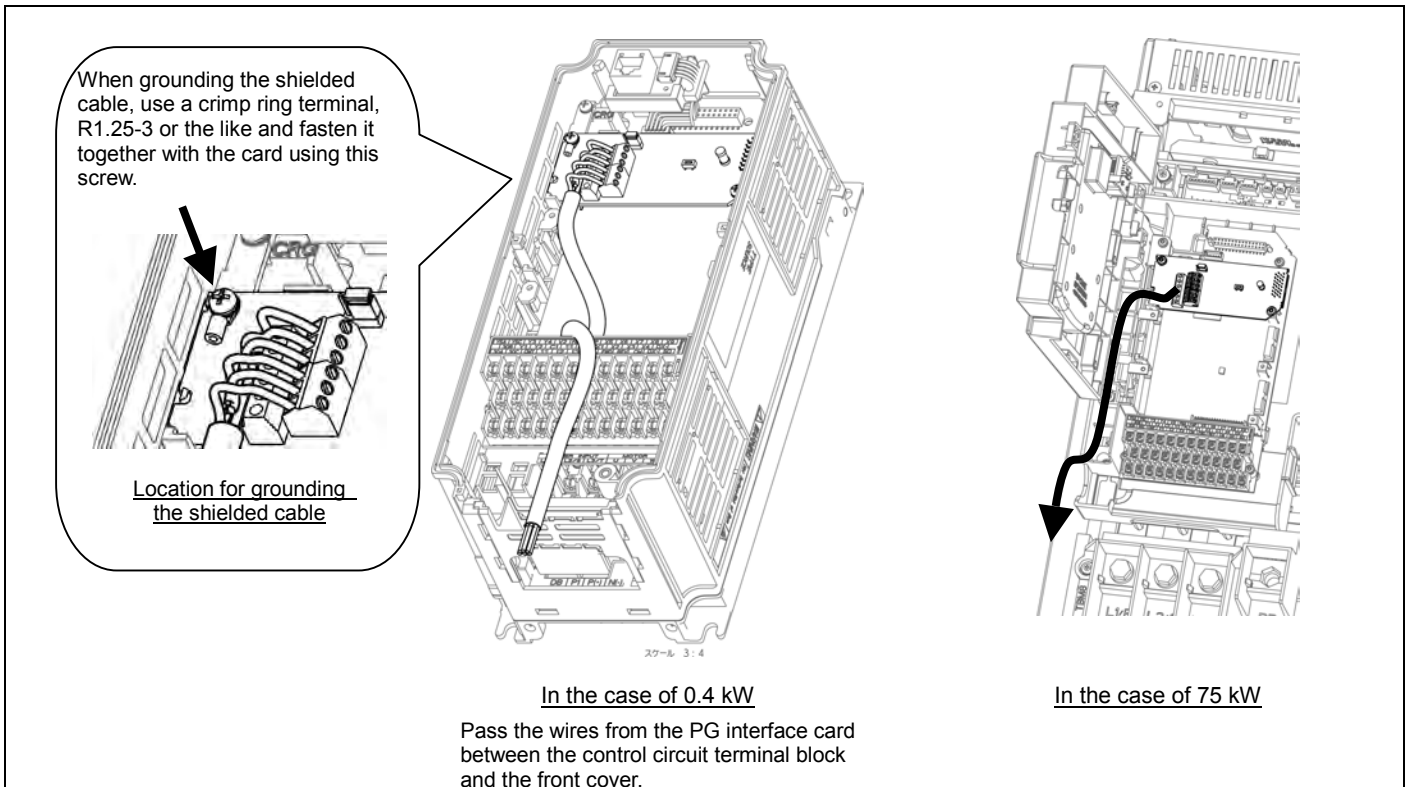

| PI | PO | YA | YB | YZ | CM |
| PI | PO | XA | XB | XZ | CM |

Figure 6   Terminal Allocation and Symbol Diagram

Table 1   Terminal Specifications

Terminal Size	M2
Tightening Torque	0.22 to 0.25 N·m
Recommended Wire Gauge*	AWG16 to 26
Wire strip length	5 mm

* Insulated wires with allowable temperature of 105ºC (UL-listed) are recommended.

Figure 7   Internal Block Diagram

Note To prevent malfunctioning due to noise, separate the wires for the PG interface card as far apart as possible from those for the main circuits. Also, inside the inverter, bundle and fix the wires for the PG interface card so that they do not come into direct contact with live parts of the main circuits (for example, the main circuit terminal block).

When grounding the shielded cable, use a crimp ring terminal, R1.25-3 or the like and fasten it together with the card using this screw.

Location for grounding the shielded cable

In the case of 0.4 kW

Pass the wires from the PG interface card between the control circuit terminal block and the front cover.

In the case of 75 kW

4. Specifications

4-1. Specifications for pulse train inputs

Item	Specifications
PG output pulse frequency	30 kHz max. (Open collector) 100 kHz max. (Complementary)
PG pulse output circuit	Open collector circuit (Maximum cable length: 20 m) Complementary circuit (Maximum cable length: 100 m)
Input pulse threshold	High level $\geq$ 8 VDC, Low level $\leq$ 3 VDC (For 12 VDC power supply) High level $\geq$ 10 VDC, Low level $\leq$ 3 VDC (For 15 VDC power supply)
PG pulse input current	8 mA or less

4-2. Specifications of applicable PG and PG interface card

Item	Specifications
Encoder pulse resolution	20 to 3000 P/R, A, B and Z phase pulse trains in incremental format
Pulse output circuit	Open collector (Maximum cable length: 20 m) Complementary (Maximum cable length: 100 m)
Input power requirements	High level $\geq$ 8 VDC, Low level $\leq$ 3 VDC (For 12 VDC power supply) High level $\geq$ 10 VDC, Low level $\leq$ 3 VDC (For 15 VDC power supply)
Pulse output current	8 mA or less
PG power supply*	12 VDC $\pm$10%, 120 mA or less, or 15 VDC $\pm$10%, 120 mA or less

* If a power level required by the PG exceeds 120 mA, use an external power supply.

5. Terminal Functions

Table 2 lists terminal specifications.

Table 2   Terminal Specifications

Terminal symbol	Name	Functions
[P1]	External power input*1	Connects external power supply for the PG. +12 VDC $\pm$10% or +15 VDC $\pm$10% (Use the power supply which is 150 mA more than PG current consumption.)
[PO]	Power output to the PG*2	Connects the PG power input. +12 VDC $\pm$10%, 120 mA, or +15 VDC $\pm$10%, 120 mA
[CM]	PG power common	PG power common terminal (equipotent with [CM] terminal of the inverter)
[XA]	A phase pulse input from reference PG	Input terminal for A phase signal fed back from the reference PG
[XB]	B phase pulse input from reference PG	Input terminal for B phase signal fed back from the reference PG
[XZ]	—	Not used.
[YA]	A phase pulse input from slave PG	Input terminal for A phase signal fed back from the slave PG
[YB]	B phase pulse input from slave PG	Input terminal for B phase signal fed back from the slave PG
[YZ]	Z phase pulse input from slave PG	Input terminal for Z phase signal fed back from the slave PG

*1 Use an external power supply if the PG current consumption exceeds 120 mA. When using an external power supply, turn the slide switch J1 shown below to the EXT position.

*2 Turn the internal switch (SW1) to the proper position according to the PG power requirement. The factory default position is "12V."
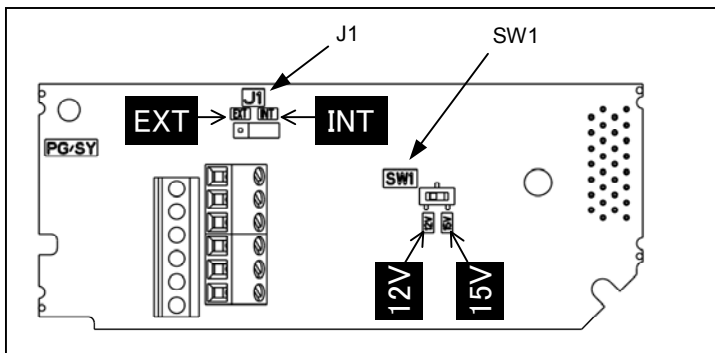
Note To move a switch slider, use a tool with a narrow tip (e.g., tweezers). Be careful not to touch other electronic parts, etc. If the slider is in an ambiguous position, the circuit is unclear whether it is turned ON or OFF and the digital input remains in an undefined state. Be sure to place the slider so that it contacts either side of the switch.

6. Drive Control

📖 For details of PG interface functions available, refer to the FRENIC-MEGA Instruction Manual, Chapter 5, Section 5.2 "Details of Function Codes" or the FRENIC-MEGA User's Manual.

6-1. Pulse train input

This function gives a frequency command to the inverter in pulse train format. Three types of formats are available--pulse train sign/pulse train input, run forward/run reverse pulse train, and 90 degree phase shifted A/B pulse trains. Use [XA] and [XB] terminals for the pulse train frequency command input.

6-1-1. Pulse train input format

Table 3 lists pulse train input formats and operations of this option card.

Table 3 Pulse Train Input Format and Operations

Pulse input format	Operations*
Pulse train sign/pulse train input	Gives the speed command to the inverter, following the pulse input frequency on the [XB] terminal. Switching the terminal [XA] ON/OFF determines polarity of the speed command.
Run forward/run reverse pulse train	Gives the run forward speed command to the inverter, following the pulse input frequency on the [XB] terminal, if any. Gives the run reverse speed command to the inverter, following the pulse input frequency on the [XA] terminal, if any.
90 degree phase shifted A/B pulse trains	Gives the run forward or run reverse speed command to the inverter, following 90 degree phase shift and frequency information of two pulse inputs on [XA] and [XB] terminals.

* Actual rotation direction of the motor is specified by a combination of the pulse input command polarity and *FWD*/*REV* command in the inverter.

6-1-2. Connection diagram examples

Figure 8 shows the connection diagram example for pulse train input.
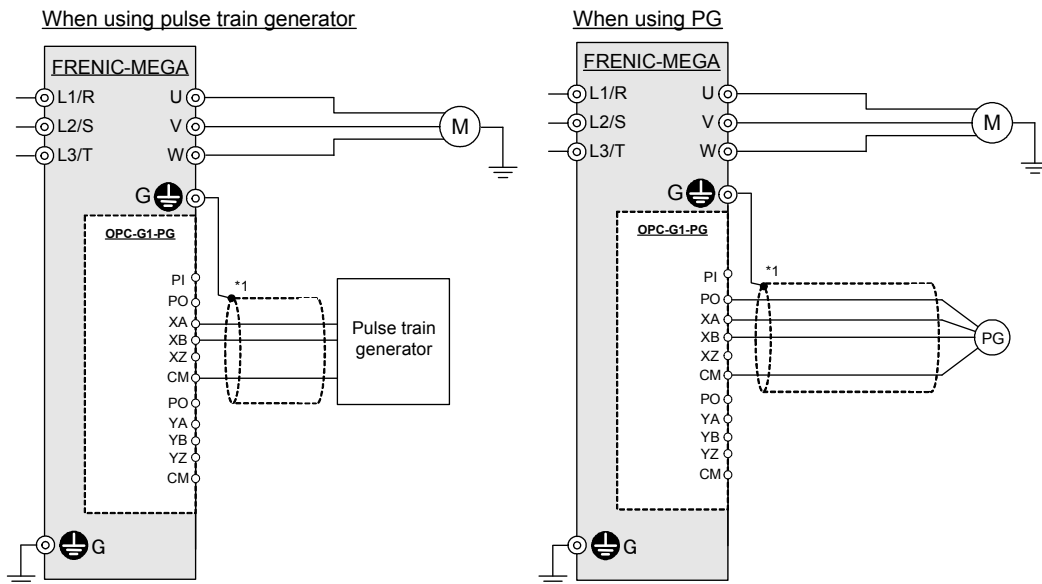
*1 For wiring between the encoder and the inverter, use a shielded cable. Basically, the shielded layer should be grounded. If any malfunction occurs due to noise, however, connecting the shielded layer to the terminal [CM] may reduce the problem.

If the wiring between the encoder and the inverter is long, interference of A- and B-phases may cause encoder signal malfunctions, resulting in abnormal noise or torque pulsation. In such a case, minimizing the wiring length (by reviewing the wiring route) or using a cable with a smaller stray capacitance may reduce the problem.

Figure 8 Connection Diagrams for Pulse Train Input

6-2. Speed control (Vector control with speed sensor)

The inverter detects the motor's rotational speed from PG feedback signals, decomposes the motor drive current into the exciting and torque current components, and controls each of components in vector. The vector control enables speed control with high accuracy and high response. (A recommended motor for this control is a Fuji VG motor exclusively designed for vector control.)

📖 For settings and adjustments of the vector control, refer to FRENIC-MEGA Instruction Manual and FRENIC-MEGA User's Manual.

6-2-1. Control specifications

Table 4 lists the specifications of vector control with speed sensor.

Table 4   Specifications of Speed Control

Item		Specifications	Remarks
Control specifications *1	Maximum output frequency	25 to 200 Hz *2	When a VG motor（1024 P/R）is connected.
	Speed control range	Minimum speed : Base speed = 1 : 1500 (For 4-pole motors: 1 to 1500 r/min)	
	Speed control accuracy	Analog setting: ±0.2% or less of maximum frequency (at 25 ±10°C) Digital setting: ±0.01% or less of maximum frequency (at -10 to +50°C)	

*1 Specified values of the motor controllability will greatly vary depending on the pulse resolution, P/R (Pulses/Revolution). The recommended P/R is 1024 or more.

*2 If the output frequency exceeds 200 Hz, the inverter trips with the alarm *0s*.

6-2-2. Connection diagram examples

Figure 9 shows the connection diagram example for speed control.
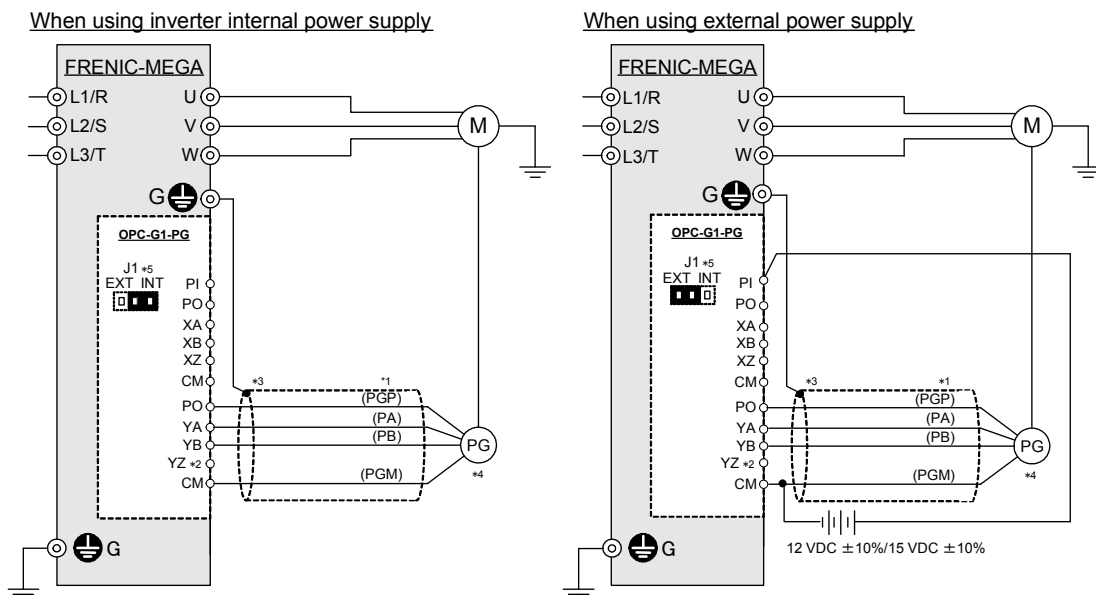
*1 When a Fuji VG motor exclusively designed for vector control is connected, the signal names in parentheses ( ) apply.

*2 The terminal [YZ] is not used for control. If the PG issues Z phase outputs, there is no need to connect the PG wire to this terminal.

*3 For wiring between the PG and the inverter, use a shielded cable. Basically, the shielded layer should be grounded. If any malfunction occurs due to noise, however, connecting the shielded layer to the terminal [CM] may reduce the problem.
If the wiring between the PG and the inverter is long, interference of A- and B-phases may cause PG signal malfunctions, resulting in abnormal noise or torque pulsation. In such a case, minimizing the wiring length (by reviewing the wiring route) or using a cable with a smaller stray capacitance may reduce the problem.

*4 The terminal SS of the VG motor should be opened.

*5 When using the inverter internal power supply, turn the slide switch J1 on the PG interface card to the INT position; when using an external power supply, to the EXT position.

Figure 9   Connection Diagrams for Speed Control

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