



FRENIC-MEGA

デジタル入カウンタフェースカード
Digital Input Interface Card
"OPC-G1-DI"

デジタル出カウンタフェースカード
Digital Output Interface Card
"OPC-G1-DO"

日本語

ENGLISH

English Version

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Preface

Thank you for purchasing our digital interface card(s).

This instruction manual describes the digital input interface card "OPC-G1-DI" and the digital output interface card "OPC-G1-DO" designed for the FRENIC-MEGA series of inverters. For descriptions of the former, refer to Chapter 2 "DIGITAL INPUT INTERFACE CARD"; for the latter, refer to Chapter 3 "DIGITAL OUTPUT INTERFACE CARD." Chapters 1, 4, and 5 are common to both cards.

Mounting the digital input interface card on your FRENIC-MEGA makes it possible to specify frequency commands with binary code (8, 12, 15, or 16 bits) or BCD (4-bit Binary Coded Decimal) code.

Mounting the digital output interface card on your FRENIC-MEGA enables monitoring with 8-bit binary code.

Each of the digital input interface card and the digital output interface card can be connected to any one of the three option connection ports (A-, B-, and C-ports) on the FRENIC-MEGA. Concurrent use of both cards provides a digital input/output interface.

This instruction manual does not contain inverter handling instructions. Read through this instruction manual in conjunction with the FRENIC-MEGA Instruction Manual and be familiar with proper handling and operation of this product. Improper handling might result in incorrect operation, a short life, or even a failure of this product.

Keep this manual in a safe place.

CAUTION

- Read through this instruction manual and be familiar with the digital interface card(s) before proceeding with installation, connections (wiring), operation, or maintenance and inspection.
- Improper handling might result in incorrect operation, a short life, or even a failure of this product as well as the motor.
- Deliver this manual to the end user of this product. Keep this manual in a safe place until this product is discarded.

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■ Safety precautions

Read this manual thoroughly before proceeding with installation, connections (wiring), operation, or maintenance and inspection. Ensure you have sound knowledge of the device and familiarize yourself with all safety information and precautions before proceeding to operate the inverter.

Safety precautions are classified into the following two categories in this manual.

 WARNING	Failure to heed the information indicated by this symbol may lead to dangerous conditions, possibly resulting in death or serious bodily injuries.
 CAUTION	Failure to heed the information indicated by this symbol may lead to dangerous conditions, possibly resulting in minor or light bodily injuries and/or substantial property damage.

Failure to heed the information contained under the CAUTION title can also result in serious consequences. These safety precautions are of utmost importance and must be observed at all times.

Installation and wiring

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).
- Qualified electricians should carry out wiring.
Otherwise, an electric shock could occur.

CAUTION

- Do not use the product that is damaged or lacking parts.
Doing so could cause a fire, an accident, or injuries.
- Prevent lint, paper fibers, sawdust, dust, metallic chips, or other foreign materials from getting into the inverter and the option.
Otherwise, a fire or an accident might result.
- Incorrect handling in installation/removal jobs could cause a failure.
A failure might result.
- Noise may be emitted from the inverter, motor and wires. Implement appropriate measure to prevent the nearby sensors and devices from malfunctioning due to such noise.
Otherwise, an accident could occur.

Operation

WARNING

- Be sure to install the front cover before turning the inverter's power ON. Do not remove the cover when the inverter power is ON.
Otherwise, an electric shock could occur.
- Do not operate switches with wet hands.
Doing so could cause an electric shock.
- If you configure the function codes wrongly or without completely understanding FRENIC-MEGA Instruction Manual and the FRENIC-MEGA User's Manual, the motor may rotate with a torque or at a speed not permitted for the machine. Confirm and adjust the setting of the function codes before running the inverter.
Otherwise, an accident could occur.

Maintenance and inspection, and parts replacement

WARNING

- Before proceeding to the maintenance/inspection jobs, 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, an electric shock could occur.
- Maintenance, inspection, and parts replacement should be made only by qualified persons.
- Take off the watch, rings and other metallic objects before starting work.
- Use insulated tools.
Otherwise, an electric shock or injuries could occur.

Disposal

CAUTION

- Treat the interface card(s) as an industrial waste when disposing of it.
Otherwise injuries could occur.

Others

WARNING

- Never modify the interface card(s).
Doing so could cause an electric shock or injuries.

Icons

The following icons are used throughout this manual.



This icon indicates information which, if not heeded, can result in the product not operating to full efficiency, as well as information concerning incorrect operations and settings which can result in accidents.



This icon indicates information that can prove handy when performing certain settings or operations.



This icon indicates a reference to more detailed information.

Table of Contents

Preface	i
■ Safety precautions	i
Chapter 1 BEFORE USING THIS OPTION	1-1
1.1 Acceptance Inspection	1-1
1.2 Applicable Inverters	1-2
1.3 Operating Environment	1-2
1.4 Installation and Removal of the Interface Card	1-2
1.4.1 Installing the interface card	1-3
1.4.2 Removing the interface card	1-4
1.5 Wiring	1-5
Chapter 2 DIGITAL INPUT INTERFACE CARD	2-1
2.1 Terminal Allocation and Symbol Diagram	2-1
2.2 Connection Diagram	2-1
2.3 Terminal Functions	2-2
2.4 Electrical Specifications	2-2
2.5 Input Interface	2-3
2.5.1 Switching between SINK and SOURCE for digital input terminals ([11] to [116])	2-3
2.5.2 Connection diagrams for SINK/SOURCE input modes	2-3
2.5.3 Precaution on the use of a contact relay	2-3
2.6 Configuring Inverter's Function Codes	2-4
2.7 Details of Function Codes	2-5
Chapter 3 DIGITAL OUTPUT INTERFACE CARD	3-1
3.1 Terminal Allocation and Symbol Diagram	3-1
3.2 Connection Diagram	3-1
3.3 Terminal Functions	3-2
3.4 Electrical Specifications	3-2
3.5 Output Interface	3-2
3.6 Configuring Inverter's Function Code	3-3
3.7 Details of Function Code	3-4
Chapter 4 I/O CHECKING	4-1
Chapter 5 PROTECTIVE FUNCTION	5-1

Chapter 1 BEFORE USING THIS OPTION

1.1 Acceptance Inspection

Unpack the package and check the following:

- (1) An interface card, two screws (M3 × 8), and the Digital Input Interface Card/Digital Output Interface Card Instruction Manual (this manual) are contained in the package.
- (2) The interface card is not damaged during transportation--no defective parts, dents or warps.
- (3) The following model name is printed on the interface card.
 - Digital input interface card: "OPC-G1-DI" (See Figure 1.1.)
 - Digital output interface card: "OPC-G1-DO" (See Figure 1.2.)

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.

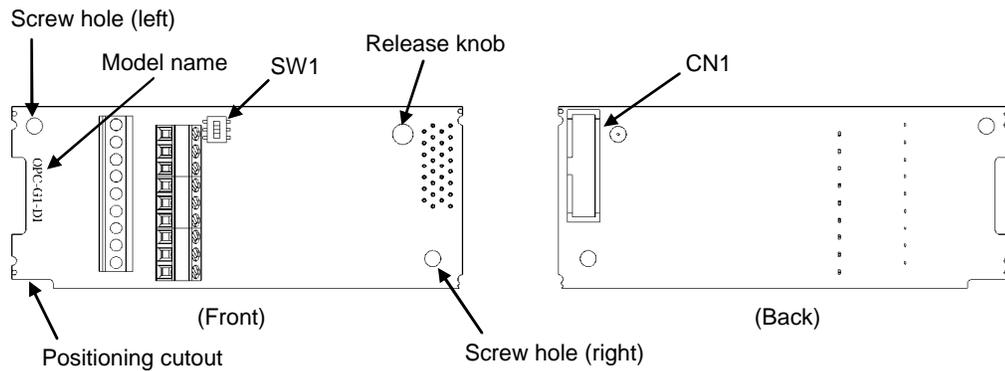


Figure 1.1 Name of Parts on Digital Input Interface Card (OPC-G1-DI)

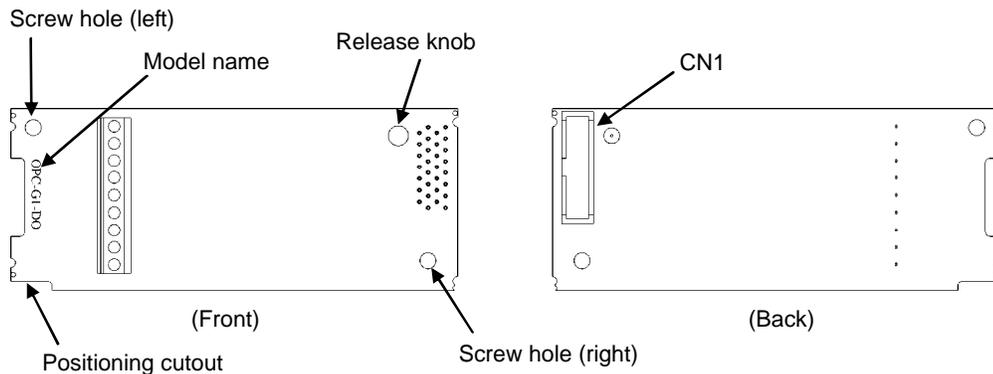


Figure 1.2 Name of Parts on Digital Output Interface Card (OPC-G1-DO)

1.2 Applicable Inverters

This interface card is applicable to the following inverters and ROM version.

Table 1.1 Applicable inverter and ROM version

Series	Inverter type	Applicable motor rating	ROM version
FRENIC-MEGA	FRN□□□G1□-□□□	All capacities	0500 or later

* The boxes □ replace alphabetic letters depending on the nominal applied motor, enclosure, and power supply voltage.

To check the inverter's ROM version, use Menu #5 "Maintenance Information" on the keypad. (Refer to the FRENIC-MEGA Instruction Manual, Chapter 3, Section 3.4.6 "Reading maintenance information.")

Display on LED Monitor	Item	Description
5_ 14	Inverter's ROM version	Shows the inverter's ROM version as a 4-digit code.

1.3 Operating Environment

Install the inverter equipped with this interface card in an environment that satisfies the requirements listed in Table 1.2.

Table 1.2 Environmental Requirements

Item	Specifications
Site location	Indoors
Surrounding temperature	Refer to the FRENIC-MEGA Instruction Manual, Chapter 2.
Relative humidity	5 to 95% (No condensation)
Atmosphere	The inverter must not be exposed to dust, direct sunlight, corrosive gases, flammable gases, oil mist, vapor or water drops. Pollution degree 2 (IEC60664-1) (Note) The atmosphere can contain a small amount of salt. (0.01 mg/cm ² or less per year) The inverter must not be subjected to sudden changes in temperature that will cause condensation to form.
Altitude	1,000 m max.
Atmospheric pressure	86 to 106 kPa
Vibration	Refer to the FRENIC-MEGA Instruction Manual, Chapter 2.

(Note) Do not install the inverter in an environment where it may be exposed to lint, cotton waste or moist dust or dirt which will clog the heat sink of the inverter. If the inverter is to be used in such an environment, install it in a dustproof panel of your system.

1.4 Installation and Removal of the Interface Card

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, an electric shock could occur.

⚠ CAUTION

- Do not use the product that is damaged or lacking parts.
Doing so could cause a fire, an accident, or injuries.
- Prevent lint, paper fibers, sawdust, dust, metallic chips, or other foreign materials from getting into the inverter and the interface card.
Otherwise, a fire or an accident might result.
- Incorrect handling in installation/removal jobs could cause a failure.
A failure might result.

1.4.1 Installing the interface card

Note Before mounting the interface card, perform the wiring for the main circuit terminals and control circuit terminals.

- (1) Remove the front cover from the inverter and expose the control printed circuit board (control PCB). As shown in Figure 1.3, the interface card can be connected to any one of the three option connection ports (A-, B-, and C-ports) of the inverter.

 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 interface card (Figure 1.1 or 1.2) into any of the A-port (CN4), B-port (CN5), and C-port (CN6) on the inverter's control PCB. Then tighten the two screws that come with the card. (Figure 1.5)

Note Check that the positioning cutout (shown in Figures 1.1 and 1.2) is fitted on the tab (① in Figure 1.4) and connector CN1 is fully inserted (② in Figure 1.4). Figure 1.5 shows the interface card correctly mounted.

- (3) Perform wiring on the interface card.

 Refer to Section 1.5 "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.

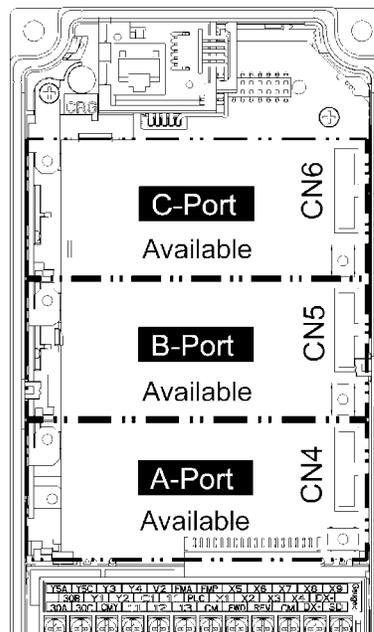
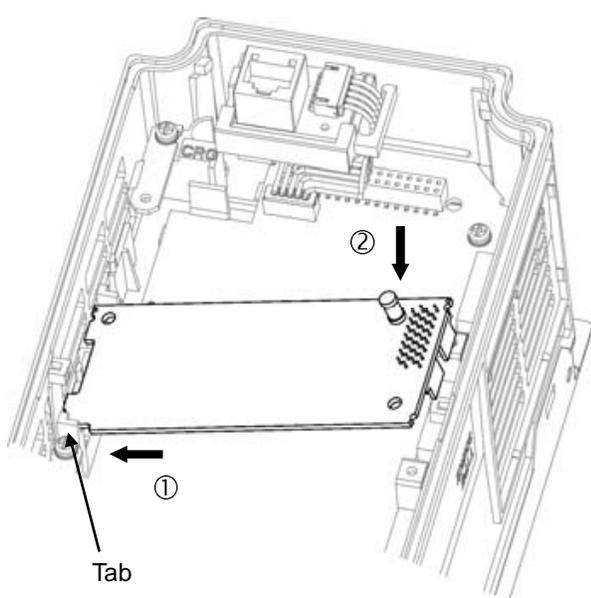


Figure 1.3 In the case of 0.4 kW



- 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 any of the three ports (A-, B- and C-ports) on the inverter's control PCB.

Note: Be sure to follow the order of ① and ②. Inserting CN1 first may lead to insufficient insertion, resulting in a contact failure.

Figure 1.4 Mounting the Interface Card (to B-port)

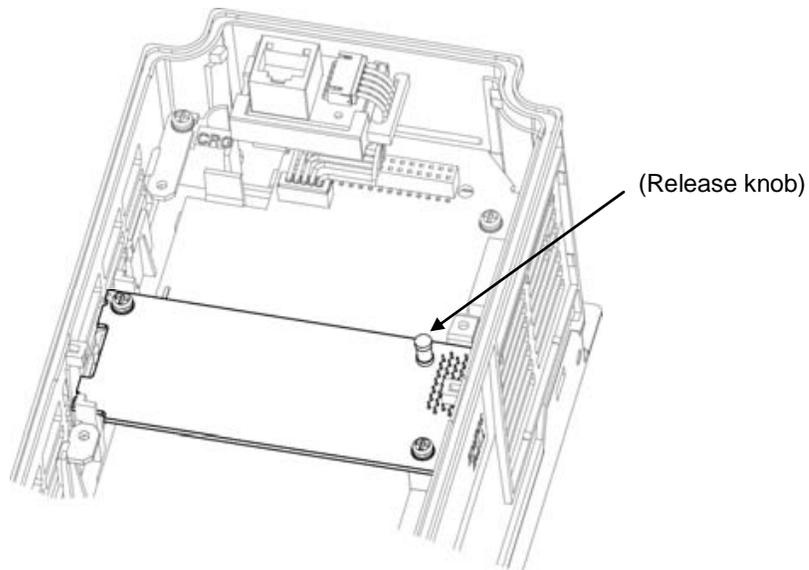


Figure 1.5 Mounting Completed (to B-port)

1.4.2 Removing the interface card

Remove the two screws that secure the interface card and pull the release knob (shown above) to take the card out of the inverter.

1.5 Wiring

⚠ 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).

- Qualified electricians should carry out wiring.

Otherwise, an electric shock could occur.

- 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 an 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 for the interface card observing the precautions below. Refer to the connection diagrams shown in Figure 2.2 (Chapter 2) and Figure 3.2 (Chapter 3), and the wiring examples shown in Figure 1.8.

- (1) Turn the inverter's power OFF.
- (2) Use shielded wires.
- (3) To prevent malfunction due to noise, keep the wiring for the interface card away from the main circuit wiring and other power lines as far as possible. Never install them in the same wire duct.
- (4) Complete wiring before turning the inverter ON.
- (5) See Table 1.3 for the specifications of the terminal block on the interface card.

When using stripped wires (without attaching a crimp terminal), strip the wire end by 5 to 7 mm. (Figure 1.6)
When using a crimp terminal, attach a vinyl-insulated ferrule.

Loosen the terminal screw, insert the wire end into above the metal part of the terminal block, and tighten the screw to fasten it. (Figure 1.7)

Table 1.3 Terminal Specifications

Item	Specifications
Wire size	AWG24 to AWG18 (0.25 to 0.75 mm ²), wire with rated temperature 105°C (UL) recommended
Terminal screw size	M2
Tightening torque	0.22 to 0.25 N·m

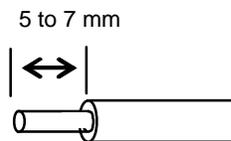


Figure 1.6 Wire End Treatment (For Connection to Terminals on Interface Card)

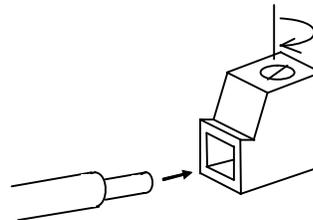


Figure 1.7 Connecting to a Terminal on Interface Card



- Route the wiring of the interface circuit terminals as far from the wiring of the main circuit as possible. Otherwise electric noise may cause malfunctions.
- Fix the interface circuit wires with a cable tie inside the inverter to keep them away from the live parts of the main circuit (such as the terminal block of the main circuit).

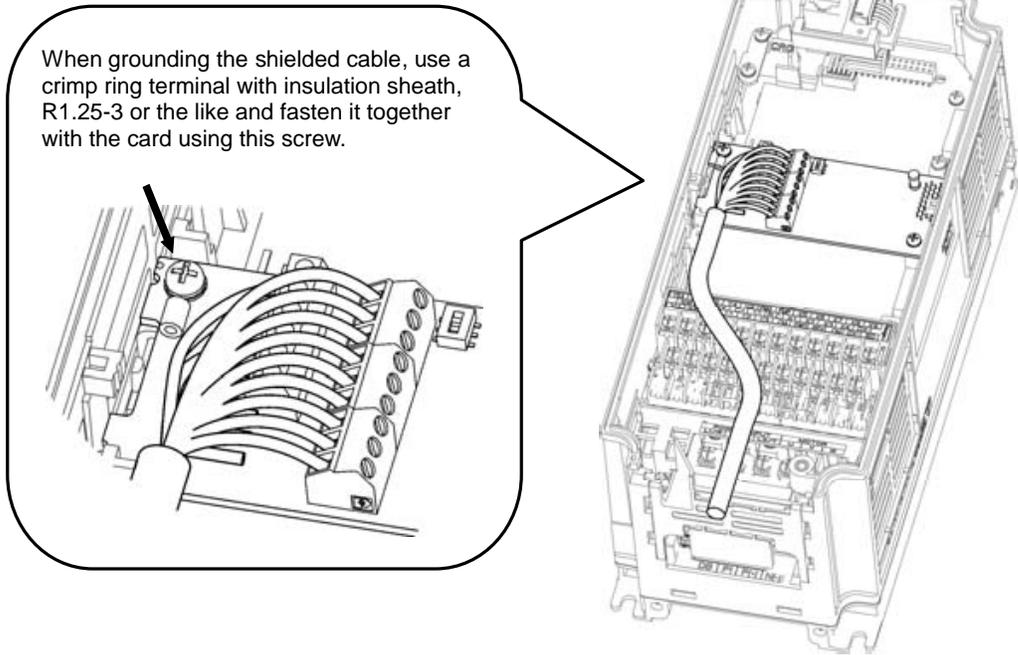
Note

Depending upon the wire type and the number of wires used, the front cover may be lifted by the wires, which impedes normal keypad operation. If it happens, change the wire type or size.

Note

Route the wires, taking care not to let them go over the control PCB, as shown in Figure 1.8. Otherwise, malfunctions may occur.

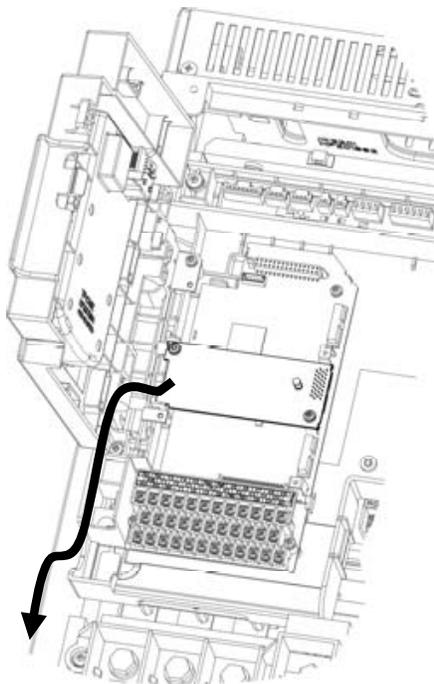
- For inverters with a capacity of 22 kW or below



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

In the case of 0.4 kW

- For inverters with a capacity of 30 kW or above



In the case of 75 kW

Figure 1.8 Examples of Wiring

Chapter 2 DIGITAL INPUT INTERFACE CARD

2.1 Terminal Allocation and Symbol Diagram

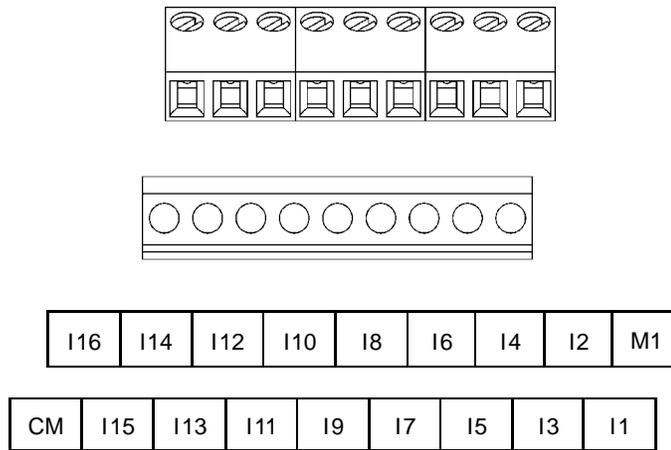


Figure 2.1 Terminal Allocation and Symbol Diagram

2.2 Connection Diagram

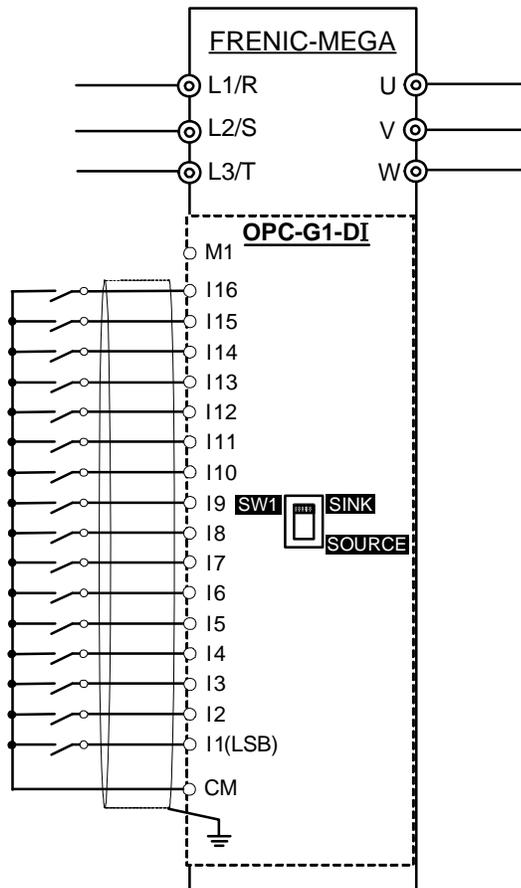


Figure 2.2 Connection Diagram

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2.3 Terminal Functions

Table 2.1 lists terminal symbols, names and functions of the terminals on the digital input interface card.

Table 2.1 Terminals and Their Specifications

Terminal symbol	Name	Functions
[I1] to [I16]	Digital inputs 1 to 16	(1) These digital inputs specify a frequency command according to the settings made by function codes o19 and o20. For details, refer to Section 2.6 "Configuring Inverter's Function Codes." (2) SINK/SOURCE is switchable with the slide switch SW1.
[M1]	External power supply input	Power input terminal from the external device for the interface card (+22 to +27 VDC)
[CM]	Digital common	Common terminal for digital input signals (Equipotent with [CM] terminal of the inverter)

2.4 Electrical Specifications

Table 2.2 lists the electrical specifications for the digital input interface card.

Table 2.2 Electrical Specifications

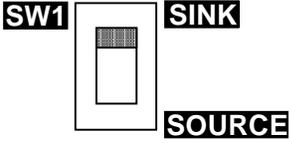
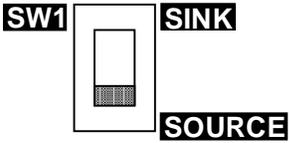
Terminal symbol	Item		Specifications	
			Min.	Max.
[I1] to [I16]	Operating voltage (SINK)	ON level	0 V	2 V
		OFF level	22 V	27 V
	Operating voltage (SOURCE)	ON level	22 V	27 V
		OFF level	0 V	2 V
	Operating current at ON (Input voltage is at 0 V)		2.5 mA	5 mA
	Allowable leakage current at OFF		-	0.5 mA

2.5 Input Interface

2.5.1 Switching between SINK and SOURCE for digital input terminals ([I1] to [I16])

The input mode is switchable between SINK and SOURCE for digital input terminals ([I1] to [I16]) by using the slide switch SW1 on the interface card (Figure 1.1 in Chapter 1). Specify the input mode referring to Table 2.3 below.

Table 2.3 Configuration of Slide Switch SW1

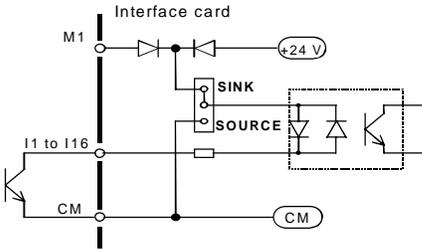
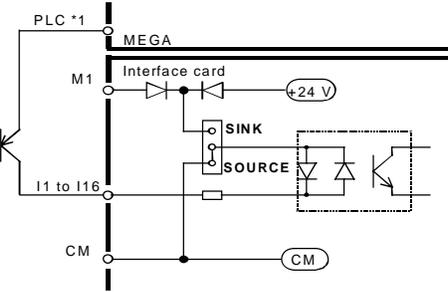
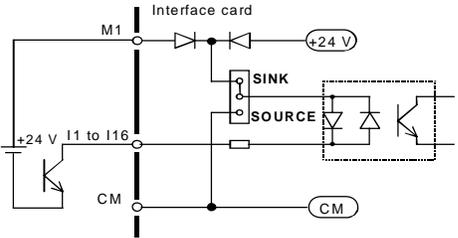
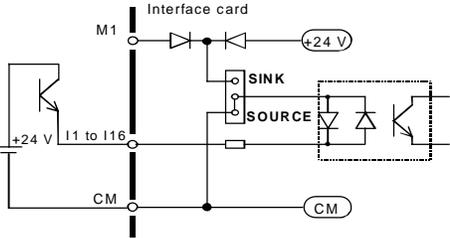
Input mode	Slide switch position
SINK (factory default)	SINK side 
SOURCE	SOURCE side 

Note The inverter also has the slide switch SW1 on the control PCB to specify SINK or SOURCE for the inverter's digital input terminals. Match the setting of SW1 on the interface card with that of the inverter.

2.5.2 Connection diagrams for SINK/SOURCE input modes

Table 2.4 shows connection diagrams for input interface circuits.

Table 2.4 Connections of Input Interface Circuits

Power supply	Connection diagram	
	SINK mode	SOURCE mode
Internal		 <p>*1 The maximum allowable current for terminal [PLC] on the FRENIC-MEGA is 100 mA.</p>
External		

2.5.3 Precaution on the use of a contact relay

To configure input circuits using contact relays, use highly reliable relays.

2.6 Configuring Inverter's Function Codes

To enable frequency command inputs from this interface card, it is required to set function code data of F01 (Frequency Command 1) or C30 (Frequency Command 2) to "11" (Digital input interface card). Also specify the polarity and input mode of the frequency command using function codes o19 (DI polarity) and o20 (DI mode) provided for options, respectively.

Table 2.5 lists function codes and their parameters. The function codes o19 and o20 become available when the digital input interface card is connected to the inverter.

Table 2.5 Function Codes and Parameters

Function code	Name	Data setting range	Change when running *2	Data copy *3	Default setting	Drive control *4		
						V/f	w/o PG	w/ PG
F01 C30	Frequency Command 1 Frequency Command 2	0:  /  keys on keypad 1: Voltage input to terminal [12] 2: Current input to terminal [C1] 3: Sum of voltage and current inputs to terminals [12] and [C1] 5: Voltage input to terminal [V2] 7: Terminal command UP/DOWN control 8:  /  keys on keypad (balanceless-bumpless switching available) 11: Digital input interface card (option) 12: Pulse train input	N	Y	0	Y	Y	Y
o19	DI option (DI polarity)	0: Without polarity 1: With polarity *1	N	Y	0	Y	Y	Y
o20	(DI mode)	0: 8-bit binary frequency command 1: 12-bit binary frequency command 2: 15-bit binary frequency command 3: 16-bit binary frequency command 4: 4-digit BCD frequency command (0 to 99.99 Hz) 5: 4-digit BCD frequency command (0 to 500.0 Hz)	N	Y	0	Y	Y	Y

BCD: Binary Coded Decimal

*1 "Without polarity" when o20 = 4 or 5 (BCD).

*2 Y: Possible, N: Impossible

*3 Y: Possible, N: Impossible

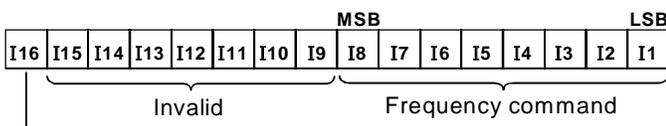
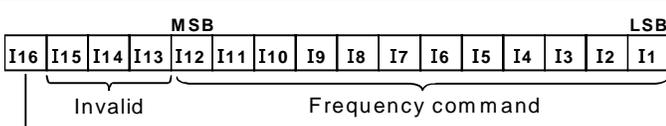
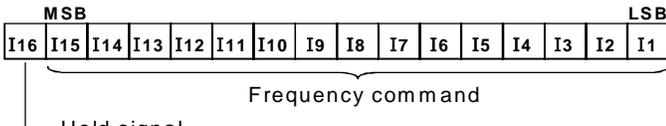
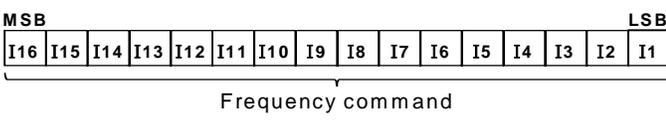
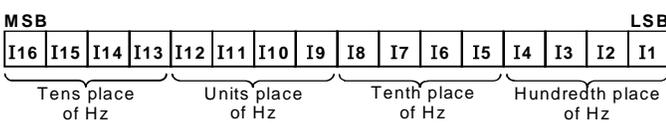
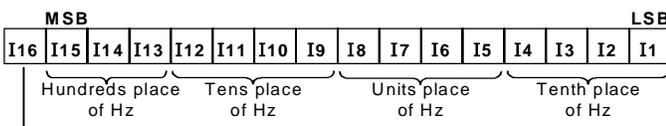
*4 Y: Applicable, N: Not applicable

For details, refer to the FRENIC-MEGA Instruction Manual.

2.7 Details of Function Codes

Table 2.6 shows the configuration of function codes o19 and o20 and the details of the terminal functions. Turning the terminal input OFF or ON sets each bit data to "0" or "1," respectively.

Table 2.6 Details of Function Codes

No.	o19	o20	Input signal name	Terminal function and configuration details
①	0	0	8-bit binary frequency command	 <p>Hold signal When I16 is OFF (0), the interface circuit updates the frequency command according to the input data. When I16 is ON (1), the interface circuit discards the input data and holds the current frequency command.</p> <p>Setting resolution = Maximum frequency × (1/255)</p>
②	0	1	12-bit binary frequency command	 <p>Hold signal When I16 is OFF (0), the interface circuit updates the frequency command according to the input data. When I16 is ON (1), the interface circuit discards the input data and holds the current frequency command.</p> <p>Setting resolution = Maximum frequency × (1/4095)</p>
③	0	2	15-bit binary frequency command	 <p>Hold signal When I16 is OFF (0), the interface circuit updates the frequency command according to the input data. When I16 is ON (1), the interface circuit discards the input data and holds the current frequency command.</p> <p>Setting resolution = Maximum frequency × (1/32767)</p>
④	0	3	16-bit binary frequency command	 <p>Setting resolution = Maximum frequency × (1/65535)</p>
⑤	0, 1	4	4-digit BCD frequency command (0 to 99.99 Hz)	 <p>Frequency can be specified within the range of 0 to 99.99 Hz (Setting resolution = 0.01 Hz). If a frequency command exceeding the maximum frequency is input, the maximum frequency applies.</p>
⑥	0, 1	5	4-digit BCD frequency command (0 to 500.0 Hz)	 <p>Hold signal When I16 is OFF (0), the interface circuit updates the frequency command according to the input data. When I16 is ON (1), the interface circuit discards the input data and holds the current frequency command.</p> <p>Frequency can be specified within the range of 0 to 500.0 Hz. (Setting resolution = 0.1 Hz). If a frequency command exceeding the maximum frequency is input, the maximum frequency applies.</p>

No.	o19	o20	Input signal name	Terminal function and configuration details																																	
⑦	1	0	8-bit binary frequency command	<div style="text-align: center;"> <table border="1" style="margin: auto;"> <tr> <td colspan="8" style="text-align: center;">MSB</td> <td colspan="8" style="text-align: center;">LSB</td> </tr> <tr> <td>I16</td><td>I15</td><td>I14</td><td>I13</td><td>I12</td><td>I11</td><td>I10</td><td>I9</td><td>I8</td><td>I7</td><td>I6</td><td>I5</td><td>I4</td><td>I3</td><td>I2</td><td>I1</td> </tr> </table> </div> <p style="text-align: center;"> Invalid Frequency command </p> <p>Hold signal</p> <p>When I16 is OFF (0), the interface circuit updates the frequency command according to the input data. When I16 is ON (1), the interface circuit discards the input data and holds the current frequency command.</p> <p>Frequency setting range: -(Maximum frequency) to +(Maximum frequency) = -128 to +127</p> <p>Setting resolution = Maximum frequency × (1/127)</p>	MSB								LSB								I16	I15	I14	I13	I12	I11	I10	I9	I8	I7	I6	I5	I4	I3	I2	I1	
MSB								LSB																													
I16	I15	I14	I13	I12	I11	I10	I9	I8	I7	I6	I5	I4	I3	I2	I1																						
⑧	1	1	12-bit binary frequency command	<div style="text-align: center;"> <table border="1" style="margin: auto;"> <tr> <td colspan="8" style="text-align: center;">MSB</td> <td colspan="8" style="text-align: center;">LSB</td> </tr> <tr> <td>I16</td><td>I15</td><td>I14</td><td>I13</td><td>I12</td><td>I11</td><td>I10</td><td>I9</td><td>I8</td><td>I7</td><td>I6</td><td>I5</td><td>I4</td><td>I3</td><td>I2</td><td>I1</td> </tr> </table> </div> <p style="text-align: center;"> Invalid Frequency command </p> <p>Hold signal</p> <p>When I16 is OFF (0), the interface circuit updates the frequency command according to the input data. When I16 is ON (1), the interface circuit discards the input data and holds the current frequency command.</p> <p>Frequency setting range: -(Maximum frequency) to +(Maximum frequency) = -2048 to +2047</p> <p>Setting resolution = Maximum frequency × (1/2047)</p>	MSB								LSB								I16	I15	I14	I13	I12	I11	I10	I9	I8	I7	I6	I5	I4	I3	I2	I1	
MSB								LSB																													
I16	I15	I14	I13	I12	I11	I10	I9	I8	I7	I6	I5	I4	I3	I2	I1																						
⑨	1	2	15-bit binary frequency command	<div style="text-align: center;"> <table border="1" style="margin: auto;"> <tr> <td colspan="15" style="text-align: center;">MSB</td> <td colspan="1" style="text-align: center;">LSB</td> </tr> <tr> <td>I16</td><td>I15</td><td>I14</td><td>I13</td><td>I12</td><td>I11</td><td>I10</td><td>I9</td><td>I8</td><td>I7</td><td>I6</td><td>I5</td><td>I4</td><td>I3</td><td>I2</td><td>I1</td> </tr> </table> </div> <p style="text-align: center;"> Invalid Frequency command </p> <p>Hold signal</p> <p>When I16 is OFF (0), the interface circuit updates the frequency command according to the input data. When I16 is ON (1), the interface circuit discards the input data and holds the current frequency command.</p> <p>Frequency setting range: -(Maximum frequency) to +(Maximum frequency) = -16384 to +16383</p> <p>Setting resolution = Maximum frequency × (1/16383)</p>	MSB															LSB	I16	I15	I14	I13	I12	I11	I10	I9	I8	I7	I6	I5	I4	I3	I2	I1	
MSB															LSB																						
I16	I15	I14	I13	I12	I11	I10	I9	I8	I7	I6	I5	I4	I3	I2	I1																						
⑩	1	3	16-bit binary frequency command	<div style="text-align: center;"> <table border="1" style="margin: auto;"> <tr> <td colspan="16" style="text-align: center;">MSB</td> <td colspan="1" style="text-align: center;">LSB</td> </tr> <tr> <td>I16</td><td>I15</td><td>I14</td><td>I13</td><td>I12</td><td>I11</td><td>I10</td><td>I9</td><td>I8</td><td>I7</td><td>I6</td><td>I5</td><td>I4</td><td>I3</td><td>I2</td><td>I1</td> </tr> </table> </div> <p style="text-align: center;"> Invalid Frequency command </p> <p>Frequency setting range: -(Maximum frequency) to +(Maximum frequency) = -32768 to +32767</p> <p>Setting resolution = Maximum frequency × (1/32767)</p>	MSB																LSB	I16	I15	I14	I13	I12	I11	I10	I9	I8	I7	I6	I5	I4	I3	I2	I1
MSB																LSB																					
I16	I15	I14	I13	I12	I11	I10	I9	I8	I7	I6	I5	I4	I3	I2	I1																						

Chapter 3 DIGITAL OUTPUT INTERFACE CARD

3.1 Terminal Allocation and Symbol Diagram

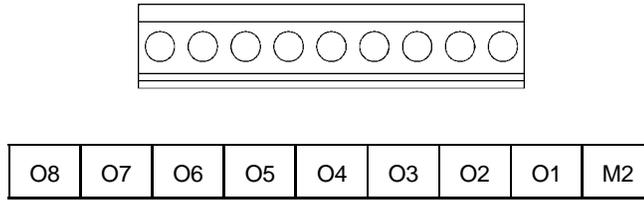


Figure 3.1 Terminal Allocation and Symbol Diagram

3.2 Connection Diagram

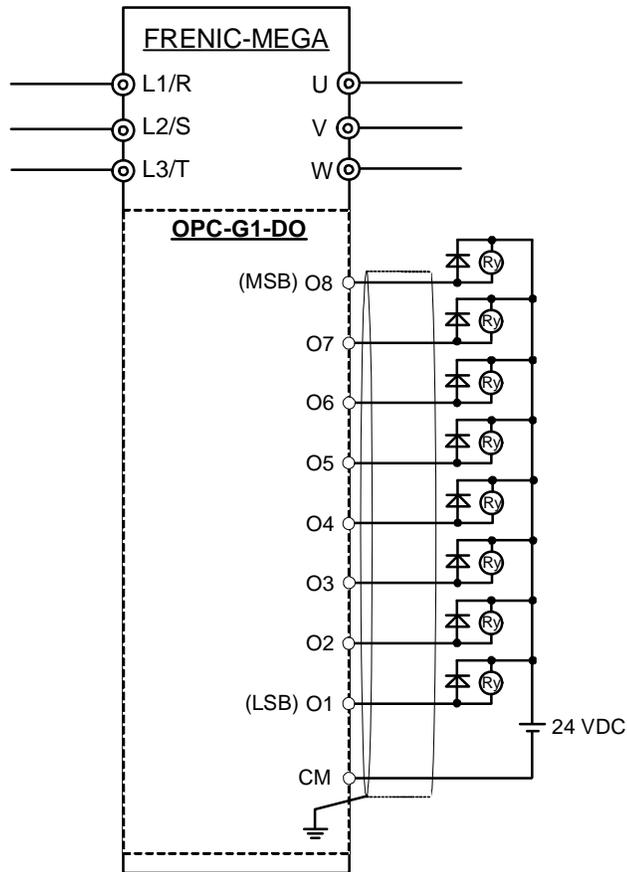


Figure 3.2 Connection Diagram

ENGLISH

3.3 Terminal Functions

Table 3.1 lists terminal symbols, names and functions of the terminals on the digital output interface card.

Table 3.1 Terminals and Their Specifications

Terminal symbol	Name	Functions
[O1] to [O8]	Transistor outputs 1 to 8	These digital terminals output various status (e.g., output frequency, output current) specified by function code o21 as an 8-bit parallel signal.
[M2]	Transistor output common	Common terminal for transistor output signals. This terminal is electrically isolated from terminals [CM], [11]s, and [CMY].

3.4 Electrical Specifications

Table 3.2 lists the electrical specifications for the digital output interface card.

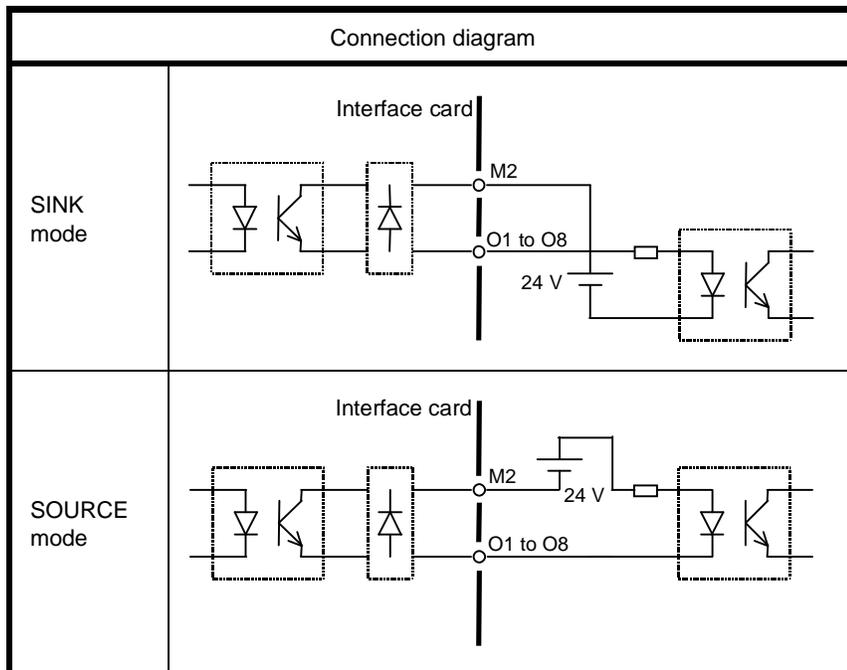
Table 3.2 Electrical Specifications

Terminal symbol	Item		Specifications
			Max.
[O1] to [O8]	Operating voltage	ON level	2 V
		OFF level	27 V
	Source current at ON		50 mA
	Leakage current at OFF		0.1 mA

3.5 Output Interface

Table 3.3 shows connection diagrams for output interface circuits.

Table 3.3 Connections of Output Interface Circuits



3.6 Configuring Inverter's Function Code

Function code o21 (DO mode selection) provided for options specifies the item to be monitored by digital signals of this digital output interface card.

Table 3.4 lists the function code and its parameters. The function code o21 becomes available when the digital output interface card is connected to the inverter.

Table 3.4 Function Code and Parameters

Function code	Name	Data setting range	Change when running *1	Data copy *2	Default setting	Drive control *3		
						V/f	w/o PG	w/ PG
o21	DO option (DO mode selection)	0: Output frequency (before slip compensation) 1: Output frequency (after slip compensation) 2: Output current 3: Output voltage 4: Output torque 5: Load factor 6: Input power 7: PID feedback amount 8: PG feedback value 9: DC link bus voltage 13: Motor output 15: PID command (SV) 16: PID output (MV)	Y	Y	0	Y	Y	Y

*1 Y: Possible, N: Impossible

*2 Y: Possible, N: Impossible

*3 Y: Applicable, N: Not applicable

For details, refer to the FRENIC-MEGA Instruction Manual.

3.7 Details of Function Code

Table 3.5 shows the configuration of function code o21 and the details of the terminal functions. Turning the terminal output OFF or ON sets each bit data to "0" or "1," respectively.

Table 3.5 Details of Function Code

Function code	Data	Output signal name	Terminal function and configuration details								
o21	0	Output frequency (before slip compensation)	<div style="text-align: center;"> MSB LSB <table border="1" style="margin: auto;"> <tr> <td>08</td><td>07</td><td>06</td><td>05</td><td>04</td><td>03</td><td>02</td><td>01</td> </tr> </table> </div> Terminal output = (Output frequency/Maximum frequency) × 255	08	07	06	05	04	03	02	01
	08	07	06	05	04	03	02	01			
	1	Output frequency (after slip compensation)	<div style="text-align: center;"> MSB LSB <table border="1" style="margin: auto;"> <tr> <td>08</td><td>07</td><td>06</td><td>05</td><td>04</td><td>03</td><td>02</td><td>01</td> </tr> </table> </div> Terminal output = (Output frequency/Maximum frequency) × 255	08	07	06	05	04	03	02	01
	08	07	06	05	04	03	02	01			
	2	Output current	<div style="text-align: center;"> MSB LSB <table border="1" style="margin: auto;"> <tr> <td>08</td><td>07</td><td>06</td><td>05</td><td>04</td><td>03</td><td>02</td><td>01</td> </tr> </table> </div> Terminal output = (Output current/(Inverter rated output current × 2)) × 255	08	07	06	05	04	03	02	01
	08	07	06	05	04	03	02	01			
	3	Output voltage	<div style="text-align: center;"> MSB LSB <table border="1" style="margin: auto;"> <tr> <td>08</td><td>07</td><td>06</td><td>05</td><td>04</td><td>03</td><td>02</td><td>01</td> </tr> </table> </div> Terminal output = (Output voltage/250 V) × 255, for 200 V class series = (Output voltage/500 V) × 255, for 400 V class series	08	07	06	05	04	03	02	01
	08	07	06	05	04	03	02	01			
4	Output torque	<div style="text-align: center;"> MSB LSB <table border="1" style="margin: auto;"> <tr> <td>08</td><td>07</td><td>06</td><td>05</td><td>04</td><td>03</td><td>02</td><td>01</td> </tr> </table> </div> Terminal output = (Output torque/(Motor rated torque × 2)) × 255	08	07	06	05	04	03	02	01	
08	07	06	05	04	03	02	01				
5	Load factor	<div style="text-align: center;"> MSB LSB <table border="1" style="margin: auto;"> <tr> <td>08</td><td>07</td><td>06</td><td>05</td><td>04</td><td>03</td><td>02</td><td>01</td> </tr> </table> </div> Terminal output = (Load factor/(Motor rated load × 2)) × 255	08	07	06	05	04	03	02	01	
08	07	06	05	04	03	02	01				
6	Input power	<div style="text-align: center;"> MSB LSB <table border="1" style="margin: auto;"> <tr> <td>08</td><td>07</td><td>06</td><td>05</td><td>04</td><td>03</td><td>02</td><td>01</td> </tr> </table> </div> Terminal output = (Input power/ (Inverter rated output × 2)) × 255	08	07	06	05	04	03	02	01	
08	07	06	05	04	03	02	01				
7	PID feedback amount	<div style="text-align: center;"> MSB LSB <table border="1" style="margin: auto;"> <tr> <td>08</td><td>07</td><td>06</td><td>05</td><td>04</td><td>03</td><td>02</td><td>01</td> </tr> </table> </div> Terminal output = (PID feedback amount/100% of feedback amount) × 255	08	07	06	05	04	03	02	01	
08	07	06	05	04	03	02	01				

Function code	Data	Output signal name	Terminal function and configuration details								
o21	8	PG feedback value	<div style="text-align: center;"> MSB LSB <table border="1" style="margin: auto;"> <tr> <td>08</td><td>07</td><td>06</td><td>05</td><td>04</td><td>03</td><td>02</td><td>01</td> </tr> </table> </div> Terminal output = (PG feedback value/100% of synchronous speed at maximum frequency) × 255	08	07	06	05	04	03	02	01
	08	07	06	05	04	03	02	01			
	9	DC link bus voltage	<div style="text-align: center;"> MSB LSB <table border="1" style="margin: auto;"> <tr> <td>08</td><td>07</td><td>06</td><td>05</td><td>04</td><td>03</td><td>02</td><td>01</td> </tr> </table> </div> Terminal output = (DC link bus voltage/500 V) × 255, for 200 V class series = (DC link bus voltage/1000 V) × 255, for 400 V class series	08	07	06	05	04	03	02	01
	08	07	06	05	04	03	02	01			
	13	Motor output	<div style="text-align: center;"> MSB LSB <table border="1" style="margin: auto;"> <tr> <td>08</td><td>07</td><td>06</td><td>05</td><td>04</td><td>03</td><td>02</td><td>01</td> </tr> </table> </div> Terminal output = (Motor output/(Motor rated output × 2)) × 255	08	07	06	05	04	03	02	01
08	07	06	05	04	03	02	01				
15	PID command (SV)	<div style="text-align: center;"> MSB LSB <table border="1" style="margin: auto;"> <tr> <td>08</td><td>07</td><td>06</td><td>05</td><td>04</td><td>03</td><td>02</td><td>01</td> </tr> </table> </div> Terminal output = (PID command/100% of feedback value) × 255	08	07	06	05	04	03	02	01	
08	07	06	05	04	03	02	01				
16	PID output (MV)	<div style="text-align: center;"> MSB LSB <table border="1" style="margin: auto;"> <tr> <td>08</td><td>07</td><td>06</td><td>05</td><td>04</td><td>03</td><td>02</td><td>01</td> </tr> </table> </div> Terminal output = (PID output/Maximum frequency) × 255	08	07	06	05	04	03	02	01	
08	07	06	05	04	03	02	01				

Chapter 4 I/O CHECKING

Using Menu #4 "I/O Checking" in FRENIC-MEGA program mode displays the I/O status of external signals on the LED monitor of the keypad.

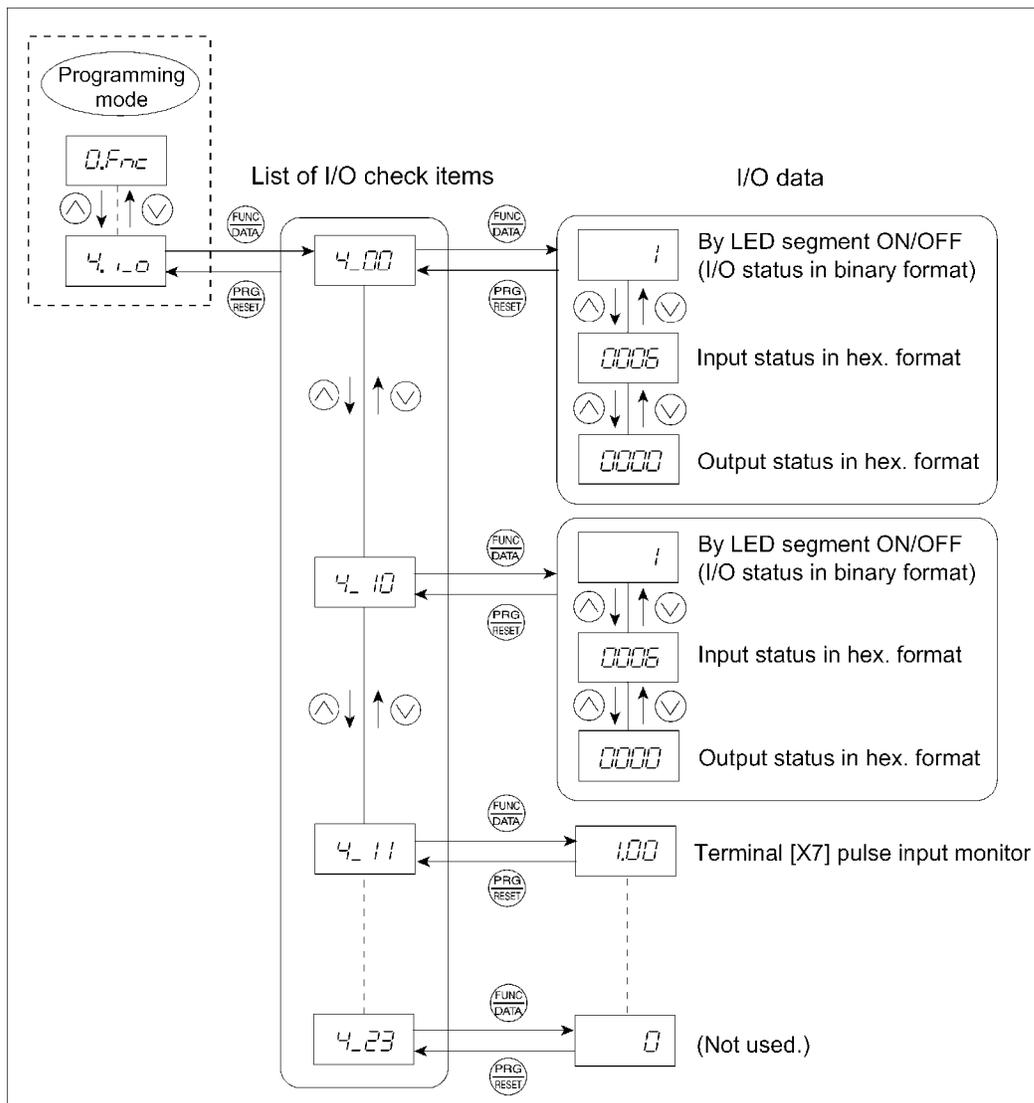


Figure 4.1 Menu Transition in Menu #4 "I/O Checking"

Basic key operation

To check the status of the I/O signals, set function code E52 to "2" (Full-menu mode) beforehand.

- (1) Turn the inverter ON. It automatically enters Running mode. In that mode, press the key to switch to Programming mode. The function selection menu appears.
- (2) Use the and keys to display "I/O Checking" (4_1_0).
- (3) Press the key to proceed to a list of I/O check items (e.g. 4_00).
- (4) Use the and keys to display "Option control circuit terminal (I/O)" (4_10), then press the key.
The corresponding I/O check data appears. Using the and keys switches the display method between the segment display and hexadecimal display.
- (5) Press the key to return to the list of I/O check items. Press the key again to return to the menu.

For details of Menu #4 "I/O Checking," refer to the FRENIC-MEGA Instruction Manual, Chapter 3, Section 3.4 "Programming Mode."

The I/O status of the digital interface card(s) can be displayed with ON/OFF of the LED segment or in hexadecimal.

Signals are assigned to the LED segments as shown below.

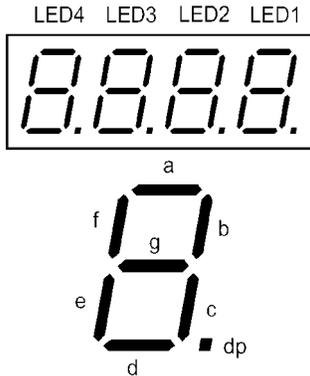


Table 4.1 Display with ON/OFF of LED Segments

Segment	LED4	LED3	LED2	LED1
a	—	O1	I9	I1
b	—	O2	I10	I2
c	—	O3	I11	I3
d	—	O4	I12	I4
e	—	O5	I13	I5
f	—	O6	I14	I6
g	—	O7	I15	I7
dp	—	O8	I16	I8

Table 4.2 Segment Display for I/O Signal Status in Hexadecimal

LED number		LED4				LED3				LED2				LED1										
Bit		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0							
Input terminal		I16	I15	I14	I13	I12	I11	I10	I9	I8	I7	I6	I5	I4	I3	I2	I1							
Output terminal		-	-	-	-	-	-	-	-	O8	O7	O6	O5	O4	O3	O2	O1							
Example (Input terminal)	Binary	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1							
	Hexa- decimal on the LED monitor	<table style="margin: auto;"> <thead> <tr> <th>LED4</th><th>LED3</th><th>LED2</th><th>LED1</th></tr> </thead> <tbody> <tr> <td style="border: 1px solid black; padding: 5px;">0</td> <td style="border: 1px solid black; padding: 5px;">0</td> <td style="border: 1px solid black; padding: 5px;">0</td> <td style="border: 1px solid black; padding: 5px;">5</td> </tr> </tbody> </table>																LED4	LED3	LED2	LED1	0	0	0
LED4	LED3	LED2	LED1																					
0	0	0	5																					

ENGLISH

Chapter 5 PROTECTIVE FUNCTION

Option communications error (E_r-4)

Problem A communications error occurred between the digital interface card(s) and the inverter.

Possible Causes	What to Check and Suggested Measures
(1) There is a problem with the connection between the interface card and the inverter.	Check whether the connector on the interface card is firmly engaged with that of the inverter. → Reload the interface card into the inverter.
(2) Strong electrical noise.	Check whether appropriate noise control measures have been implemented (e.g. correct grounding and routing of signal wires, communications cables, and main circuit wires). → Implement noise control measures.
(3) Two or more interface cards of the same type are mounted.	Check whether two or more interface cards of the same type are mounted. → Limit the number of interface cards of the same type on an inverter to only one.



When no o code is displayed even if a digital interface card is mounted, check whether the connector on the interface card is firmly engaged with that of the inverter. In this case, E_r-4 does not appear.

デジタル入カインタフェースカード / Digital Input Interface Card
"OPC-G1-DI"

デジタル出カインタフェースカード / Digital Output Interface Card
"OPC-G1-DO"

取扱説明書 / Instruction Manual

First Edition, November 2007

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The purpose of this manual is to provide accurate information in the handling, setting up and operating of the digital input interface card and digital output interface card for the FRENIC-MEGA series of inverters. Please feel free to send your comments regarding any errors or omissions you may have found, or any suggestions you may have for generally improving the manual.

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富士電機株式会社

パワーレ機器事業本部 ドライブ事業部
〒141-0032 東京都品川区大崎一丁目11番2号
(ゲートシティ大崎イーストタワー)

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〒513-8633 三重県鈴鹿市南玉垣町5520番地

技術相談窓口 TEL:0120-128-220 FAX:0120-128-230

Fuji Electric Co., Ltd.

Gate City Ohsaki, East Tower, 11-2, Osaki 1-chome,
Shinagawa-ku, Tokyo, 141-0032, Japan

Phone: +81 3 5435 7283 Fax: +81 3 5435 7425

URL <http://www.fujielectric.com/>