YASKAWA

YASKAWA AC Drive-Option Card

Encoder Type (EnDat)
Installation Manual

Type PG-F3

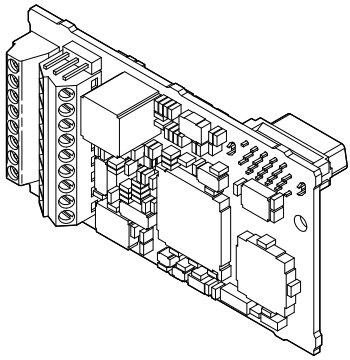
To properly use the product, read this manual thoroughly and retain for easy reference, inspection, and maintenance. Ensure the end user receives this manual.

安川インバータ オプションカード

エンコーダタイプ（EnDat用）
取扱説明書

形式 PG-F3

製品を安全にお使い頂くために，本書を必ずお読みください。
また，本書をお手元に保管していただくとともに，最終的に本製品をご使用になるユーザー様のお手元に確実に届けられるよう，お取り計らい願います。



MANUAL NO. TOBP C730600 51A

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Table of Contents

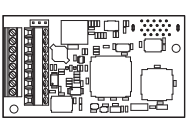
1 Preface

Yaskawa manufactures products used as components in a wide variety of industrial systems and equipment. The selection and application of Yaskawa products remain the responsibility of the equipment manufacturer or end user. Yaskawa accepts no responsibility for the way its products are incorporated into the final system design. Under no circumstances should any Yaskawa product be incorporated into any product or design as the exclusive or sole safety control. Without exception, all controls should be designed to detect faults dynamically and fail safely under all circumstances. All systems or equipment designed to incorporate a product manufactured by Yaskawa must be supplied to the end user with appropriate warnings and instructions as to the safe use and operation of that part. Any warnings provided by Yaskawa must be promptly provided to the end user. Yaskawa offers an express warranty only as to the quality of its products in conforming to standards and specifications published in the Yaskawa manual. NO OTHER WARRANTY, EXPRESS OR IMPLIED, IS OFFERED. Yaskawa assumes no liability for any personal injury, property damage, losses, or claims arising from misapplication of its products.

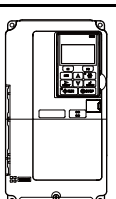
◆ Applicable Documentation

This instruction manual has been written for the items listed below. Use this option card for its intended purpose only.

Option Card

	**YASKAWA AC Drive-Option Card** **Encoder Type (EnDat) : PG-F3 Installation Manual (this book)** **Document Number: TOBP C730600 51**
	Read this manual first. It contains information required to install the option card and set up related drive parameters.

Drive

	Refer to the manual of the drive this option card is being used with. The manual for the drive covers basic installation, wiring, operation procedures, functions, troubleshooting, and maintenance information. It also includes important information on parameter settings and how to tune the drive. To obtain instruction manuals for Yaskawa products access these sites: Europe: http://www.yaskawa.eu.com Japan: http://www.e-mechatronics.com Other areas: contact a Yaskawa representative.

◆ Registered Trademarks

- Company names and product names listed in this manual are the registered trademarks of those companies.

◆ Supplemental Safety Information

Read and understand this manual before installing, operating or servicing this option unit.

The option unit must be installed according to this manual and local codes.

The following conventions are used to indicate safety messages in this manual. Failure to heed these messages could result in serious or possibly even fatal injury or damage to the products or to related equipment and systems.

⚠ DANGER

Indicates a hazardous situation, which, if not avoided, will result in death or serious injury.

⚠ WARNING

Indicates a hazardous situation, which, if not avoided, could result in death or serious injury.

⚠ CAUTION

Indicates a hazardous situation, which, if not avoided, could result in minor or moderate injury.

NOTICE

Indicates an equipment damage message.

■ General Safety

General Precautions

- The diagrams in this section may include option units and drives without covers or safety shields to illustrate details. Be sure to reinstall covers or shields before operating any devices. The option board should be used according to the instructions described in this manual.
- Any illustrations, photographs, or examples used in this manual are provided as examples only and may not apply to all products to which this manual is applicable.
- The products and specifications described in this manual or the content and presentation of the manual may be changed without notice to improve the product and/or the manual.
- When ordering a new copy of the manual due to damage or loss, contact your Yaskawa representative or the nearest Yaskawa sales office and provide the manual number shown on the front cover.

⚠ DANGER

Heed the safety messages in this manual.

Failure to comply will result in death or serious injury.

The operating company is responsible for any injuries or equipment damage resulting from failure to heed the warnings in this manual.

NOTICE

Do not expose the option unit to halogen group disinfectants or DOP gas.

Failure to comply may cause damage to the electrical components in the option unit.

Do not pack the option unit in wooden materials that have been fumigated or sterilized.

Do not sterilize the entire package after the product is packed.

2 Product Overview

◆ Regarding this Product

The pulse generator option card PG-F3 uses rotary encoder EnDat2.1/01 and EnDat2.2/01 by HEIDENHAIN.

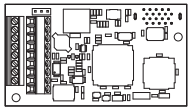
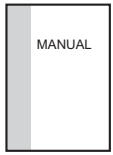
When installed to the control board, the drive uses the feedback signal from the encoder to detect motor speed. PG-F3 allows the drive to maintain constant motor speed by adjusting the output frequency in response to any changes to the load.

PG-F3 has a maximum input frequency of 50 kHz. Do not allow the input frequency for PG-F3 to exceed 50 kHz when operating the drive.

PG-F3 requires that the drive use Closed Loop Vector Control for PM to operate the motor. For detail, refer to the manual of the drive this option card is being used with.

◆ Checking Package Contents

Table 1 Items Included with this Option Card

Package Contents	Option Card	Lead Line (for grounding)	Screws (M3)	Manual (this book)
–				
Number of Items	1	1	3	1

- Inspect the Option Card for damage. If the Option Card appears damaged upon receipt, contact the shipper immediately.
- Verify receipt of the correct model by checking the model number printed on the Name plate of the Option Card. (see ***Figure 1***)
- If you have received the wrong model or the Option Card does not function properly, contact your supplier.

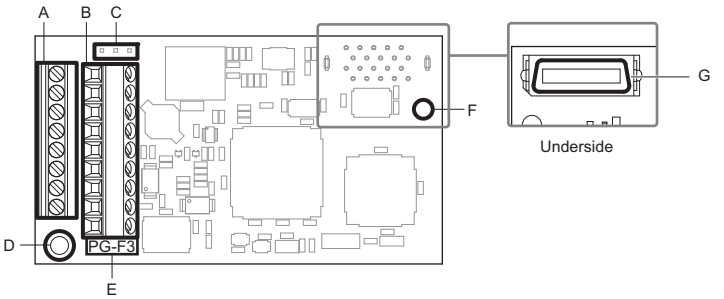
◆ Tools Required for Installation

A Phillips screwdriver PH1 (#1) is needed to install this option card.

Additionally a straight-edge screwdriver (blade depth: 0.4 mm, width: 2.5 mm) will be needed to wire the terminal block.

3 Option Card Components

◆ Option Card



A – Terminal block TB1
B – Terminal block TB2
C – Jumper for encoder power supply voltage (CN3)
D – Ground terminal (installation hole)
E – Model number
F – Installation hole
G – Connector (CN5)

Figure 1 Option Card

◆ Terminal Block

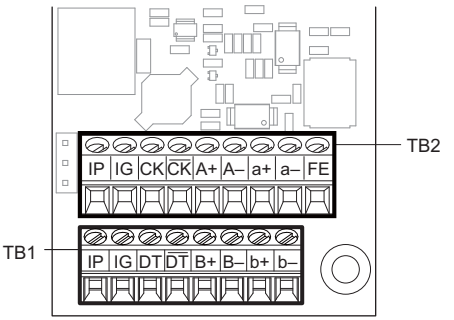


Figure 2 Terminal Block

4 Electrical Installation

◆ Safety Messages

⚠ DANGER

Electric Shock Hazard

Power to the drive must be shut off when installing this option card.

Even though the power has been shut off, voltage still remains in the drive's DC bus. Wait before removing the front cover once the drive has been turned off.
The CHARGE light on the drive will go out after voltage in the DC bus drops below 50 V, at which point it is safe to remove the front cover.

Due to the risk of electric shock, be sure that all LEDs have gone out and that the DC bus voltage has reached a safe level prior to performing any work on the drive.

⚠ WARNING

Electrical Shock Hazard

Do not allow unqualified personnel to perform work on the drive.

Failure to comply could result in death or serious injury.

Maintenance, inspection, and replacement of parts must be performed only by authorized personnel familiar with installation, adjustment and maintenance of AC drives and Option Cards.

NOTICE

Damage to Equipment

Observe proper electrostatic discharge procedures (ESD) when handling the option unit, drive, and circuit boards

Failure to comply may result in ESD damage to circuitry.

Never shut the power off while the drive is outputting voltage.

Failure to comply may cause the application to operate incorrectly or damage the drive.

Do not operate damaged equipment.

Failure to comply may cause further damage to the equipment.
Do not connect or operate any equipment with visible damage or missing parts.

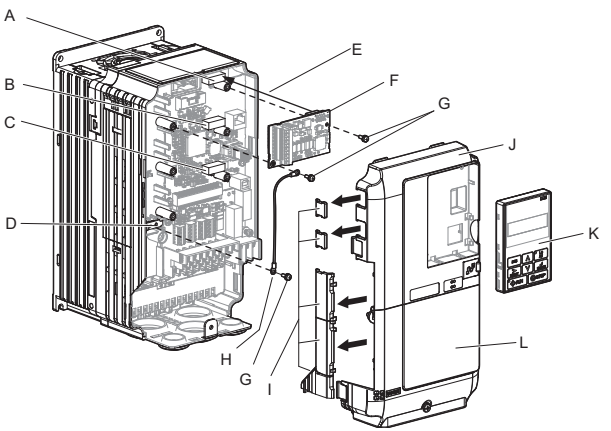
Properly connect all pins and connectors.

Failure to comply may prevent proper operation and possibly damage equipment.

◆ Installing the Option Card

Insert the option card into the CN5-C connectors located on the drive's control board. See the drive manual for directions on removing the front cover.

1. Shut off power to the drive, wait the appropriate amount of time for voltage to dissipate, then remove the operator and front cover.
2. Insert the CN5 connector on the option card into the matching CN5 connector on the drive, then fasten it into place using one of the screws included with the option card.



A – Connector CN5-C
B – Connector CN5-B
C – Connector CN5-A
D – Drive grounding terminal (FE)
E – Insert connector CN5 here
F – Option card
G – Mounting screw
H – Lead line
I – Use wire cutters to create an opening for cable lines
J – Front cover
K – Digital operator
L – Terminal cover

Figure 3 Installing an Option Card

3. Connect the lead line using one of the screws to the ground terminal.

Note: There are only two screw holes on the drive for ground terminals. If three option cards are connected, two of the lead lines will need to share the same ground terminal.

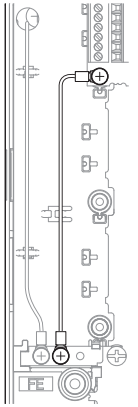
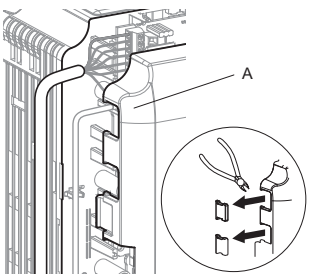
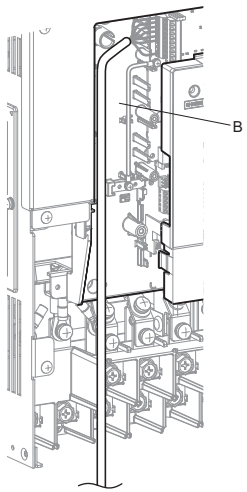


Figure 4 Connecting the Ground Terminal

4. Wire the option card to the terminal block on the option card.

For wiring instructions, see ***Interface Circuit on page 15***.
If the wiring does not fit easily into the drive, cut an opening through the left side of the front cover and allow the wires to protrude of the drive. Any sharp edges along the opening should be filed down to minimize damage to encoder wiring.
There is no need to cut an opening in the front cover if the wires fit inside the drive.





A – Wires should pass through the access hold provided on the left side of the front cover.

B – Use the open space provided inside the drive to route option card wiring.

Figure 5 Wiring space

5. Place the front cover back onto the drive as it was before.

Note: **1.** Take care when wiring the option card so that the front cover easily fits back onto the drive. Make sure a cable is not caught between the front cover and the drive when putting the cover back on.
2. The drive will not be used as NEMA Type1 if there is any exposed wiring outside the enclosure.

◆ Connection Diagram

Refer to ***Figure 6*** when wiring the terminal block on the option card.

- Connect the encoder and PG-F3 using the HEIDENHAIN 17-pin cable.
- Wiring length over 10 m requires two connections to both IP and IG.

A detailed description of the option board terminals can be found in ***Terminal Functions on page 16***.

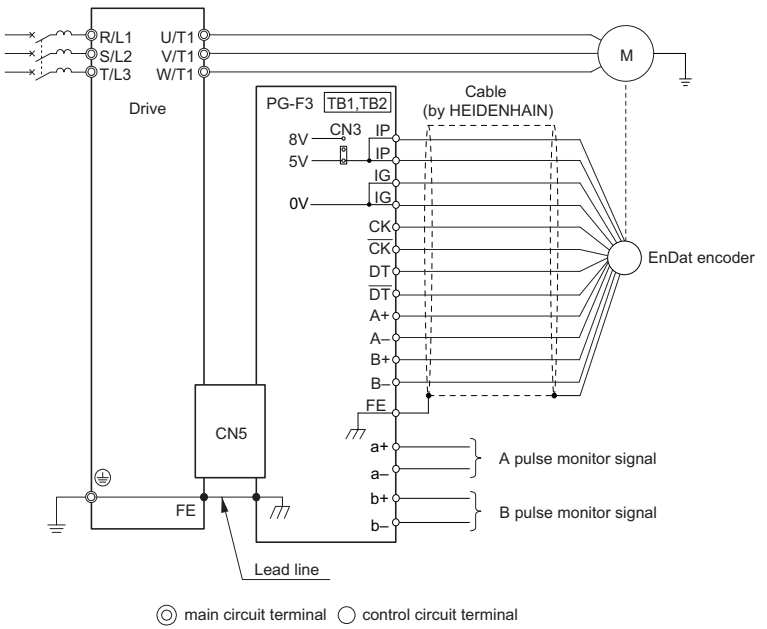


Figure 6 Wiring the Option Card and PG

Take the following steps to prevent erroneous operation caused by noise interference:

- Use shielded wire for the signal lines.
- Make sure that control lines to the option card, main circuit wiring, and power lines are separated from one another.
- The shield should be grounded on both the encoder side as well as the drive side. If noise problems arise in the encoder signal, try grounding only one end of the signal line, or removing the ground connection on both ends.

■ Interface Circuit

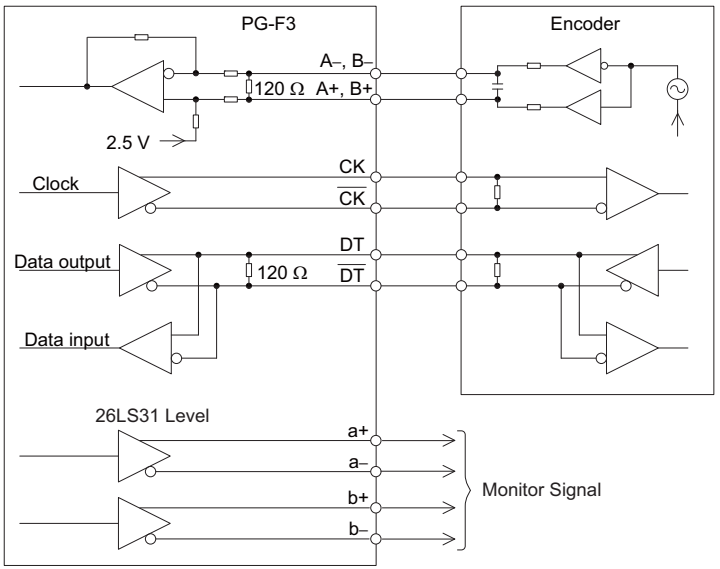
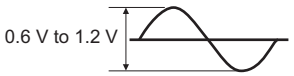
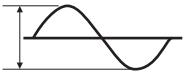


Figure 7 The Interface Circuit

◆ Terminal Functions

Table 2 Terminal Functions

Terminal Block	Terminal	Function	Description	Specifications
TB1	IP	Encoder power supply	Supplies power to the encoder.	• Jumper with terminal CN3 to select the power supply voltage, 8 V or 5 V. • Voltage range: 5 V ±5%, 330 mA 8 V ±10%, 150 mA **Note:** Number of connections to terminals IP and IG differs by wiring length when the power supply is set for +5 V ±5%. • Up to 10 m: One or two connections to both IP and IG. • 10 to 20 m: Two connections to both IP and IG.
	IG	Encoder power supply common		
	DT	Comm. data signal I/O	Reads and processes encoder data.	Signal level: RS-485 protocol
	$\overline{DT}$	Inverse comm. data signal I/O		
	B+	B pulse signal input	Input for the B pulse sine-wave from the encoder.	• Max. input frequency: 50 kHz • Input signal differential: B+ - B– 
	B–	Inverse B pulse signal input		
	b+	B pulse monitor signal output	Outputs a ratio of the B pulse frequency.	• Output method: Line driver • Output voltage: RS-422 level • Possible resolution: 1/n Set F1-06 to monitor the pulse signal. Varies by drive models.
	b–	Inverse B pulse monitor signal output		

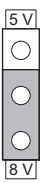
Terminal Block	Terminal	Function	Description	Specifications
TB2	IP	Encoder power supply	Supplies power to the encoder.	Connects to terminal IP on the option card.
	IG	Encoder power supply common		Connects to terminal IG on the option card.
	CK	Comm. clock signal output	Outputs the comm. clock signal to the encoder.	Signal level: RS-485 protocol
	$\overline{CK}$	Inverse comm. clock signal output		
	A+	A pulse signal input	Input for the A pulse sine-wave from the encoder.	• Max. input frequency: 50 kHz • Input signal differential: A+ - A– 0.6 V to 1.2 V 
	A–	Inverse A pulse signal input		
	a+	A pulse monitor signal output	Outputs a ratio of the A pulse frequency.	• Output method: Line driver • Output voltage: RS-422 level • Possible resolution ratio: 1/n Set F1-06 to monitor the pulse signal. Varies by drive models.
	a–	Inverse A pulse monitor signal output		
	FE	Ground	Ground terminal for shielded cable.	Used for grounding shielded line.

◆ Setting the Voltage for the Encoder Power Supply

Jumper CN3 determines the voltage for the encoder power supply. The voltage level is set by the positioning the jumper as shown below.

NOTICE: *Setting the incorrect voltage can damage the encoder. Make sure the jumper is positioned properly to supply the correct voltage for the encoder being used.*

Table 3 Encoder Power Supply Voltage (IP)

Voltage Level	5.0 V ± 5% (default)	8.0 V ± 5%
Jumper		

◆ Encoder Signal Output and Option Card Settings

The motor rotation direction is determined by the pulse that leads. A signal with leading A pulse is considered as rotation in Forward direction (counter-clockwise when from the load side).

NOTICE: *Make sure that the option card and encoder have been set correctly to ensure that the motor operates as expected.*

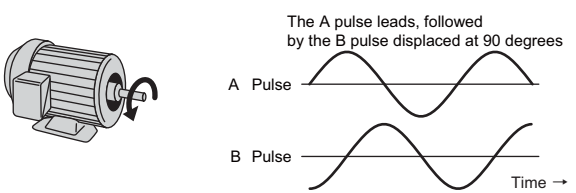


Figure 8 Displacement of A and B Pulses

Connect the encoder outputs to the option card, then manually rotate the motor shaft a bit while monitoring the speed feedback with U1-50.

If U1-50 shows the forward direction as being the opposite of what is desired, then set parameter F1-05 to 1 to switch the direction of how the option card reads pulses from the encoder output.

◆ Encoder Cables

Connect PG-F3 and the encoder using a HEIDENHAIN 17-pin cable.

For cables longer than 10 m, the signal “Sensor Up” must be connected to terminal IP on the PG-F3 option card, and “Sensor 0 V” must be connected to terminal IG.

Table 4 Encoder Cable Specification

Option Card	Encoder Cable	
Terminal	**Color**	**Encoder Side**
IP	Brown/Green	Up
	Blue	Sensor Up
IG	White/Green	0V
	White	Sensor 0V
CK	Purple	CLOCK
$\overline{\text{CK}}$	Yellow	$\overline{\text{CLOCK}}$
DT	Gray	DATA
$\overline{\text{DT}}$	Pink	$\overline{\text{DATA}}$
A+	Green/Black	A+
A–	Yellow/Black	A–
B+	Blue/Black	B+
B–	Red/Black	B–

◆ Wire Gauges and Tightening Torque

Wire gauge specifications are listed below in ***Table 5***.
Yaskawa recommends using crimp terminals for easy of wiring and to ensure proper connection. Crimp terminal specifications can be found in ***Table 6***.

Table 5 Wire Gauges and Tightening Torque

Terminal SignalINo.l	Screw Size	Tightening Torque (N·m)	Bare Cable		Wiring Gauges with Crimp Terminals		Wire Type
			Possible Gauges mm^2 (AWG)	Recommended Gauges mm^2 (AWG)	Possible Gauges mm^2 (AWG)	Recommended Gauges mm^2 (AWG)	
a+, a–, b+, b–, FE	M2	0.22 to 0.25	Stranded wire: 0.25 to 1.0 (24 to 17) Single line:0.25 to 1.5 (24 to16)	0.75 (18)	0.25 to 0.5 (24 to 20)	0.5 (20)	Shielded twisted pair, etc.
IP, IG, DT $\overline{DT}$, B+, B– CK, $\overline{CK}$, A+, A–			*<1>*		–	–	–

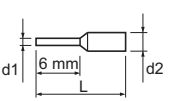
<1> Use HEIDENHAIN 17-pin Cable. Refer to ***Encoder Cables on page 19*** to for detail.

■ Crimp Terminals

Yaskawa recommends using CRIMPFOX ZA-3 by Phoenix Contact to crimp the terminal ends.

NOTICE: *Wire ends should be properly trimmed so no wire extends out from the crimp terminals.*

Table 6 Crimp Terminal Sizes

	Wire Gauge mm^2 (AWG)	Model	L (mm)	d1 (mm)	d2 (mm)	Manufacturer
	0.25 (24)	AI 0.25 - 6YE	10.5	0.8	2	Phoenix Contact
	0.34 (22)	AI 0.34 - 6TQ	10.5	0.8	2	
	0.5 (20)	AI 0.5 - 6WH	14	1.1	2.5	

◆ Wiring Procedure

When wiring the option card, wire ends should be prepared as shown in ***Figure 9***. See ***Wire Gauges and Tightening Torque on page 20*** to make sure that the proper tightening torque is applied to each terminal end.

Take particular precautions to ensure that each cable is properly connected, and that wire covering has not been accidentally inserted into the terminals.

NOTICE: *Insulation or tape may be required to ensure that shielded lines do not come into contact with other wiring. Insufficient insulation may cause a short circuit that can damage the option card and the drive.*

NOTICE: *Follow the tightening torque specifications in this manual for all terminal screws. Failing to do so may keep the drive from functioning properly and could damage the terminal block.*

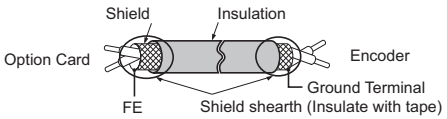


Figure 9 Treating Terminal Ends for Shielded Line

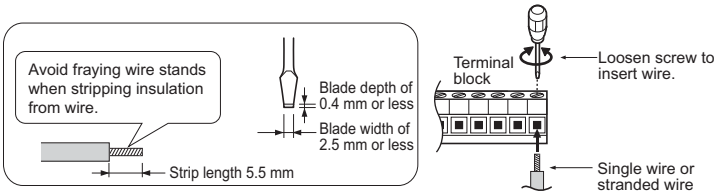


Figure 10 Terminal Block Wiring

5 Related Parameters

The following parameters are used to set up the drive for operation with an encoder option card.
Set parameters as needed. Instructions on how to set parameters can be found in the instruction manual for the drive the option card is connected to.

Table 7 Related Parameters

No.	Parameter	Description	Setting Range	Default
F1-01 <1>	PG 1 Pulse Setting	Sets the pulses to be read from the encoder.	<2>	<2>
F1-02	PG Feedback Loss (PGo) Operation Selection	0: Ramp to stop (decelerates at time set to C1-02) 1: Coast to stop 2: Fast Stop (decelerates at the time set to C1-09) 3: Continue running	0 to 3	1
F1-03	PG Overspeed (oS) Operation Selection	0: Ramp to stop (decelerates at time set to C1-02) 1: Coast to stop 2: Fast Stop (decelerates at the time set to C1-09) 3: Continue running 4: No alarm display	<2>	1
F1-04	PG Deviation (dEv) Operation Selection	0: Ramp to stop (decelerates at time set to C1-02) 1: Coast to stop 2: Fast Stop (decelerates at the time set to C1-09) 3: Continue running	0 to 3	<2>
F1-05	PG 1 Rotation	0: Forward = A pulse leads 1: Forward = B pulse leads	0, 1	<2>
F1-06	PG 1 Ratio for PG Pulse Monitor	Sets the division ratio for the pulses output from the encoder.	<2>	1
F1-08	PG Overspeed (oS) Level	Sets the level for detecting overspeed (oS). Set as a percentage of the maximum output frequency.	0 to 120	115
F1-09	Overspeed (oS) Detection Time	Sets the time required for the motor to exceed the the level set in F1-08 to trigger a fault.	0.0 to 2.0	0.0
F1-10	Excessive Speed Deviation Detection (dEv) Level	Sets the degree of speed deviation to trigger a dEv fault. Set as a percentage of the maximum output frequency.	0 to 50	10
F1-11	Excessive Speed Deviation Detection (DEv) Time	Sets the time required a speed deviation situation to trigger a fault.	0.0 to 10.0	0.5
F1-14	PG Disconnect (PGo) Detection Time	Sets the time in seconds for encoder disconnect to be detected.	0.0 to 10.0	2.0
F1-18	Reverse Rotation detection for PG 1 (dv3)	0: Disabled n: Number of times a dv3 situation must be detected to trigger a fault.	0 to 10	10

No.	Parameter	Description	Setting Range	Default
F1-19	Reverse Rotation detection for PG 1 (dv4)	0: Disabled n: Number of times a dv4 situation must be detected to trigger a fault.	0 to 5000	128
F1-20	PG Option Disconnection detection 1	0: Disabled 1: Enabled	0,1	1
F1-29	dEv Detection Condition Selection	0: After speed reference, SFS output and motor speed have matched once. 1: After speed reference, SFS output have matched once. 2: Always during Run	0 to 2	2
F1-48	Speed Feedback Resolution	Used to decrease the speed feeback signal resoslution to resolve vibration/oscillation problems at stop. Set as number of bits that are neglected.	0 to 2	0
F1-51	PGoH Detection Level	Set the level for detecting PG Hardware Fault (PGoH). Set a percentage of $\sqrt{\text{Sin}\theta^2 + \text{Cos}\theta^2}$.	1 to 100	80

<1> The input frequency from the encoder can be calculated as follows:

$$\text{Operation at max. output frequency} = \frac{\text{Motor speed at maximum frequency output (r/min)}}{60} \times \text{PG rating (p/rev)}$$

<2> Varies by drive models.

6 Troubleshooting

◆ Error Codes Displayed on the Drive Operator

The table below lists the various fault codes related to the option card and pulse generator. Further detail on various faults can be found in the instruction manual for the drive.

- Make sure the encoder cable is properly connected.
- Check the cables between the encoder and the option card.
- Make sure the option card is properly installed to the drive.

Table 8 Fault Display

Digital Operator Display		Fault Name
dEv	dEv	Speed Deviation (for Control Mode with PG)
		The deviation between the speed reference and speed feedback is greater than the setting in F1-10 for longer than the time set to F1-11.
Cause		**Possible Solution**
Load is too heavy.		Reduce the load.
Acceleration and deceleration times are set too short. / Acceleration and deceleration ramps are set too large.		Increase the acceleration and deceleration times (C1-01 through C1-08). / Decrease the acceleration and deceleration ramps (C1-01 through C1-08)
The load is locked up.		Check the machine.
Parameters are not set appropriately.		Check the settings of parameters F1-10 and F1-11.
Motor brake engaged.		Ensure the motor brake releases properly.
Brake control sequence is incorrect.		Correct the brake control sequence and then verify that the brake has been released.

Digital Operator Display		Fault Name
dv3	dv3	Inversion Detection
		The torque reference and acceleration are in opposite directions from one another (one is in reverse and the other is forward) while at the same time the speed reference and actual motor speed differ by over 30% for the number of pulses set to F1-18.
Cause		**Possible Solution**
E5-11 is not set properly.		Set parameter E5-11 in accordance with the Δθ value printed on the motor nameplate.
An external force on the load side has caused the motor to move.		• Make sure the motor is rotating in the right direction. • Look for any problems on the load side that might be causing the motor to rotate in the opposite direction.
Noise interference along the encoder cable affecting the A or B pulse.		Rewire the encoder and make sure all lines including shielded line are properly connected.
Encoder is disconnected, not wired properly, or the option card or encoder itself is damaged.		
Rotational direction for the encoder set to F1-05 is the opposite of the order of the motor lines.		Make sure motor lines for each phase (U, V, W) are connected properly.
Digital Operator Display		**Fault Name**
dv4	dv4	Inversion Prevention Detection
		Pulses indicate that the motor is rotating in the opposite direction of the speed reference. Set the number of pulses to trigger inverse detection to F1-19.
Cause		**Possible Solution**
E5-11 is not set properly.		• Set parameter E5-11 in accordance with the Δθ value printed on the motor nameplate. • If the problem continues after cycling power, then replace either the option card or the encoder itself. Replacing the encoder or changing the application and perform Encoder Home Position Tuning.
Noise interference along the encoder cable affecting the A or B pulses.		• Make sure the motor is rotating in the right direction. • Look for any problems on the load side that might be causing the motor to rotate in the opposite direction.
Encoder is disconnected, not wired properly, or the option card or encoder itself is damaged.		• Rewire the encoder and maker sure all lines including shielded line are properly connected. • If the problem continues after cycling power, then replace either the option card or the encoder itself.
Digital Operator Display		**Fault Name**
oFA00	oFA00	Non-Compatible Option Card at CN5-A
Cause		**Possible Solution**
Non-compatible option card connected to port CN5-A.		Switch the power off and reconnect the option card. See note <1>.

Digital Operator Display		Fault Name
oFb00	oFb00	Non-Compatible Option Card at CN5-B
Cause		**Possible Solution**
Non-compatible option card connected to port CN5-B.		Switch the power off and reconnect the option card. See note <I>.
Digital Operator Display		**Fault Name**
oFC01	oFC01	Option Card Connection Error at CN5-C
Cause		**Possible Solution**
Problem with the option card code for the card connected to CN5-C. (Option card is damaged.)		Switch the power off and reconnect the option card.
Digital Operator Display		**Fault Name**
oFC50	oFC50	Encoder Option AD Conversion Error Error with the A/D conversion level (VCC level), or A/D conversion timed out.
Cause		**Possible Solution**
The option card is damaged.		Replace the option card
Digital Operator Display		**Fault Name**
oFC51	oFC51	Encoder Option Analog Circuit Error Incorrect signal level (+2.5 V signal)
Cause		**Possible Solution**
The option card is damaged.		Replace the option card
Digital Operator Display		**Fault Name**
oFC52	oFC52	Encoder Comm. Timeout Signal encoder timed out waiting to receive data
Cause		**Possible Solution**
Encoder cable wiring is wrong.		Correct the wiring.
Encoder cable is disconnected.		Reconnect the cable.
Digital Operator Display		**Fault Name**
oFC53	oFC53	Encoder Comm. Data Error Serial encoder CRC checksum error
Cause		**Possible Solution**
Encoder cable wiring is wrong.		Correct the wiring.
Encoder cable is disconnected.		Reconnect the cable.

Digital Operator Display		Fault Name
oFC54	oFC54	Encoder Error
		Alarm reading EnDat absolute position data from encoder (OR flag from EnDat error for overvoltage, undervoltage, etc.)
Cause		**Possible Solution**
Power supply to encoder is wired incorrectly.		Correct the wiring.
PG-F3 power supply circuit is damaged.		Replace the option card.
Digital Operator Display		**Fault Name**
oPE02	oPE02	Parameter Range Setting Error
		Use U1-18 to find parameters set outside range.
Cause		**Possible Solutions**
Paramerters were set outside the possible range.		Set parameters to the proper values. **Note:** When multiple errors occur at the same time, other errors are given preceedance over oPE02.
Digital Operator Display		**Fault Name**
oPE06	oPE06	Control Method Selection Error
		Correct the setting for the control method.
Cause		**Possible Solutions**
A control mode has been selected that requires an option card to be installed, but no encoder is installed (A1-02 = 7).		• Connect an option card. • Correct the value set to A1-02.
Digital Operator Display		**Fault Name**
oS	oS	Overspeed
		The motor speed feedback exceeded the F1-08 setting.
Cause		**Possible Solutions**
Overshoot is occurring.		Increase the settings for C5-01 and reduce C5-02.
Inappropriate parameter settings.		Check the setting for the overspeed detection level and the overspeed detection time (F1-08 and F1-09).
Digital Operator Display		**Fault Name**
PGo	PGo	PG Disconnect
		Detected when no signals received for a time longer than setting in F1-14.
Cause		**Possible Solutions**
Encoder cable is disconnected.		Reconnect the cable.
Encoder cable wiring is wrong.		Correct the wiring.
Encoder does not have enough power.		Make sure the correct power supply is properly connected to the encoder.
Brake control sequence is incorrect.		Correct the brake control sequence and then verify that the brake has been released.

Digital Operator Display		Fault Name
PGoH	PGoH	PG Hardware Fault
		Encoder cable has become disconnected.
Cause		**Possible Solutions**
Encoder cable is disconnected.		Reconnect the cable.

<1> Depending the type of option card, only a certain number of cards may be connected at the same time. Refer to table below. More details can be found in the option card section of the drive instruction manual.

Table 9 Option Card Installation

Option Card	Connector	Number of Cards Possible
AI-A3, DI-A3, SI-C3, SI-N3, SI-P3, SI-S3 <2>	CN5-A	1
AO-A3, DO-A3	CN5-A, B, C	1
PG-B3, PG-X3	CN5-B, C	2 <3>
PG-F3	CN5-C	1

<2> The AI-A3, DI-A3 option can also be installed to option ports CN5-B and CN5-C, but are then used for monitoring purposes only. Input levels are then displayed in U1-17, U1-21 to U1-23. Here, the option cards cannot be used to set the frequency reference or replace the drive analog input with higher resolution inputs.

<3> If only PG-B3/PG-X3 option card is connected to the drive, use the CN5-C connector. If two PG-B3/PG-X3 option cards are connected, use both CN5-B and CN5-C.

7 Specifications

◆ Specifications

Table 10 Option Card Specifications

Option Card	PG-F3
Encoder Type	EnDat 2.1/01, EnDat 2.2/01 (HEIDENHAIN) ECN1313 (EnDat 2.1/01, EnDat 2.2/01) ECN113 (EnDat 2.1/01, EnDat 2.2/01) ECN413 (EnDat 2.1/01, EnDat 2.2/01)
Multi-turn	Not available
Encoder Wiring Length	20 m max. Wiring length over 10 m requires two connections to both IP and IG.
Encoder Power Supply	Output voltage: 5 V ± 5%, 8 V ± 10% Max. Output Current: 200 mA
Compatible Control Modes	Closed Loop Vector for PM motors
Maximum Input Frequency	50 kHz
Pulse Monitor Output	Monitor for A and B pulse output Matches RS-422 Level
Encoder Disconnect Detection	Software detection
Ambient Temperature	–10°C to 50°C
Humidity	95% RH or less with no condensation
Storage Temperature	–20°C to 60°C allowed for short-term transport of the product
Area of Use	Indoor (free of corrosive gas, airborne particles, etc.)
Altitude	1000 m or less

◆ Revision History

The revision dates and numbers of the revised manuals are given on the bottom of the back cover.

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YASKAWA AC Drive-Option Card

Encoder Type (EnDat)

Installation Manual

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