

Part Number: P/N CDR001015

Applicability. F7 and GPD 515/G5 drives.

Introduction. The PG Speed Control Option Card PG-X2 (Figure 1) is mounted on the drive's Control Board and performs speed feedback using the pulse generator (PG) on the motor to correct speed fluctuation caused by motor slip. Motor rotation direction is detected by phase A and phase B PG pulse inputs. The card can be used for flux vector control or V/Hz with PG feedback control.

Receiving. All equipment is tested against defect at the factory. Report any damages or shortages evident when the equipment is received to the commercial carrier who transported the equipment.

Warning: Hazardous voltage can cause severe injury or death. Lock all power sources feeding Drive in "OFF" position.

Caution: This option card uses CMOS IC chips. Use proper electrostatic discharge (ESD) protective procedures when handling the card to prevent I.C. damage or erratic drive operation.

Important:

- If other option cards are to be installed at the Option C or Option D positions (See Figure 2), their installation and wiring should be completed before installation of this option.
- Before installing this option, a technically qualified individual, who is familiar with this type of equipment and the hazards involved, should read this entire installation guide.

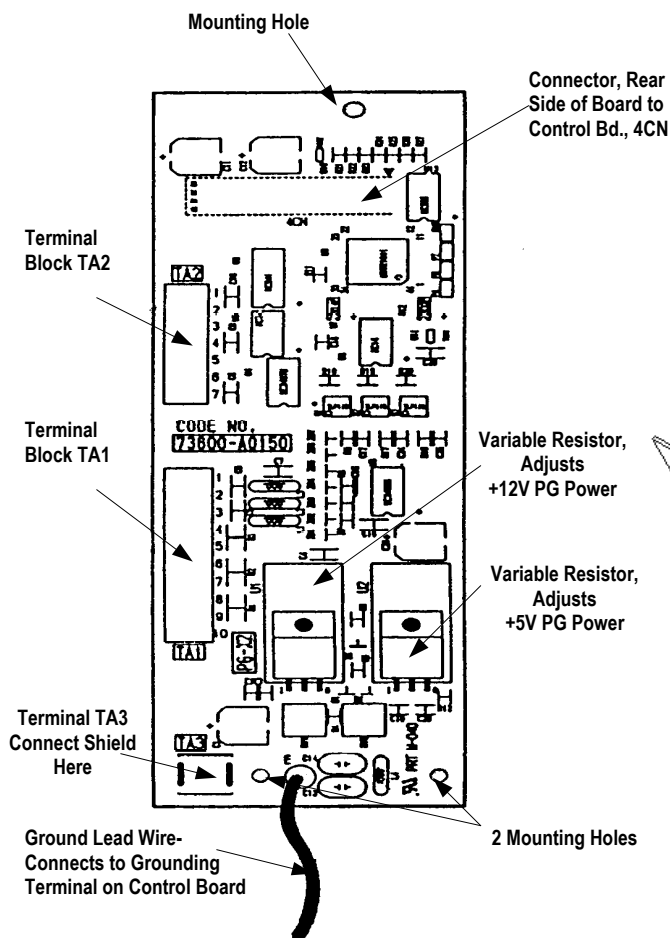


Figure 1. PG Speed Control Card PG-X2

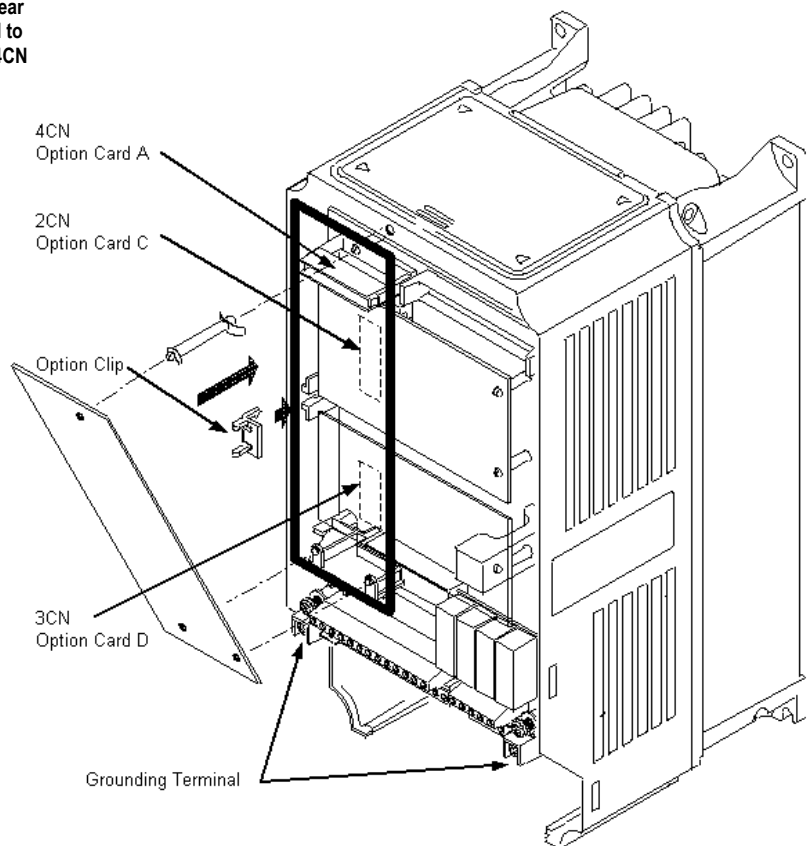


Figure 2. PG-X2 Option Card installation

Installation and Wiring.

1. Remove contents from package. Verify that a mounting spacer (P/N 5RNT41028-9) is included with the card. See Figure 3.
2. Disconnect all electrical power to drive.
3. Remove the drive front cover.
4. Check that the "CHARGE" indicator lamp inside drive is off.
5. Use a voltmeter to verify voltage at incoming power terminals (L1, L2, L3) has been disconnected.
6. Insert the spacer into the mounting hole in the base of the drive, just above the top edge of the control board. See Figure 2.

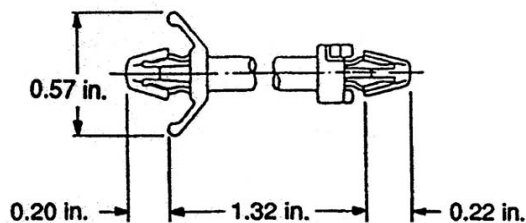


Figure 3. Mounting Spacer

Important: G5 models GPD515C-A003 to –A011 and GPD515C-B001 to –B004 models have two closely spaced mounting holes. Insert the spacer into the hole closest to the control board's connector 7CN. If inserted in the wrong hole, the spacer WILL NOT properly align with the option card's mounting hole.

7. **Circuit Board Installation.** See Figure 2.
 - a) Position the bottom edge of the option card into the mounting bracket on the control board's terminal block. Align two mounting holes in the card with pins on the bracket.
 - b) Then angle the top edge of the card into place, carefully aligning connector 4CN on the back of the card with connector 4CN on the control board. Gently press the card into place until 4CN and the spacer click into place.
 - c) Connect the green ground wire to the grounding terminal on the main control board.
8. **Wiring.** Refer to Figure 4 and Tables 1 & 2.
Make wire connections between the PG-X2 card and encoder as well as any external monitoring circuits. Observe the following:
 - a) Keep PG-X2 (i.e. control circuit) wiring separate from main circuit input/output wiring. A separate metallic grounded conduit with ONLY the PG wiring running through it is preferred.
 - b) To prevent erroneous operation caused by noise interference, use shielded cable for control signal wiring, and limit the distance to 50m (165 feet) or less.

Table 1. Terminal Functions of PG-X2

Terminal Block Symbol	Terminal Pin Number	Functions			
TA1	1	+12V	Power supply for Pulse Generator (PG). Important: Use either +12V or +5V, but never both at same time. +12V, 200mA max. +5V, 200mA Max		
	2	0V			
	3	+5V			
	4	+	A Pulse	PG Signal Inputs RS-422 Level Input	
	5	-			
	6	+	B Pulse		
	7	-			
	8	+	Z Pulse*		
	9	-			
	10	0V	Common terminal		
TA2	1	+	A Pulse	Pulse Monitor Output RS-422 Level Output	
	2	-			
	3	+	B Pulse		
	4	-			
	5	+	Z Pulse*		
	6	-			
	7	SG	Common terminal		
TA3	Shielded Sheath Connection terminal				

* Not required for normal operation

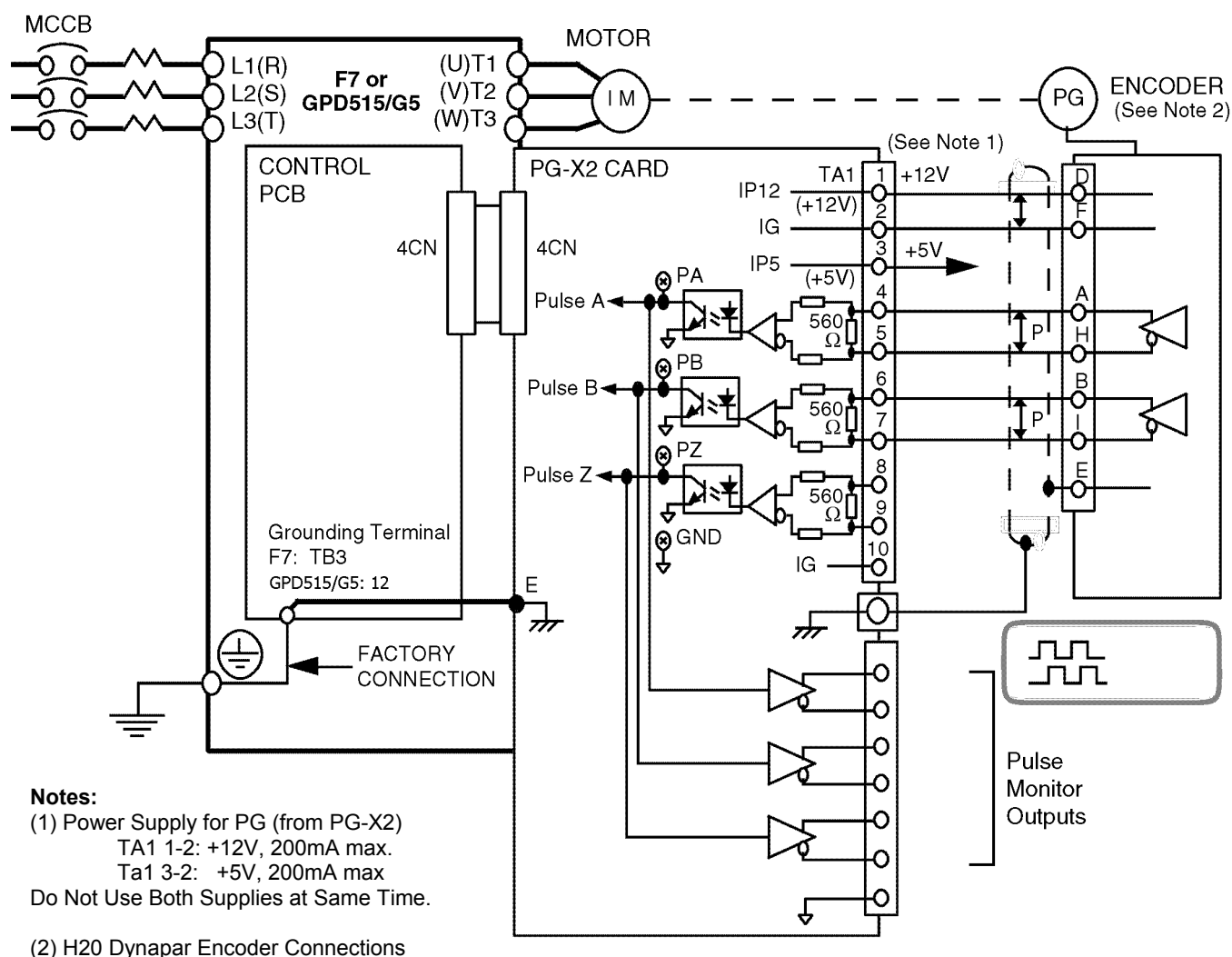


Figure 4. Typical PG-X2 Interconnection Diagram

- c) Recommended cable is twisted pair, 22AWG, with overall shield, such as Belden 9504. Refer to “Electrical Installation” in the drive technical manual for further information on use of shielded cable. The shielded sheath connection points on the PG-X2 card are terminal TA3.
- d) Strip back insulation for a distance of 0.22 in. on wire leads connected to the PG-X2 terminals.

Terminal Symbol	Terminal Screw	Clamping Torque Lb-in (N-m)	Wire Range AWG (mm ²)
TA1, TA2	M2	1.8 to 2.2 (0.22 to 0.25)	26 to 16 (Stranded: 0.14 to 1) Solid: 0.14 to 1.5)

9. **Adjustment.** The +12V and +5V outputs of the PG-X2 card are factory adjusted and should not need correction at time of installation.
10. Reinstall and secure Drive cover.
11. **Programming.** Table 3 lists all drive parameters related to PG speed control operation. Ensure that all of these parameters are programmed to meet the requirements of the application.
12. Refer to Section 2 in the drive's technical manual for testing and start-up information.
13. Place this instruction sheet with the drive technical manual.

14. Application.

If the PG's power requirement is 200mA or greater, provide a separate power supply source as shown in Figure 5. If the momentary power loss ride thru function of the drive is to be used, include a backup capacitor in the PG power wiring or take other necessary precautions.

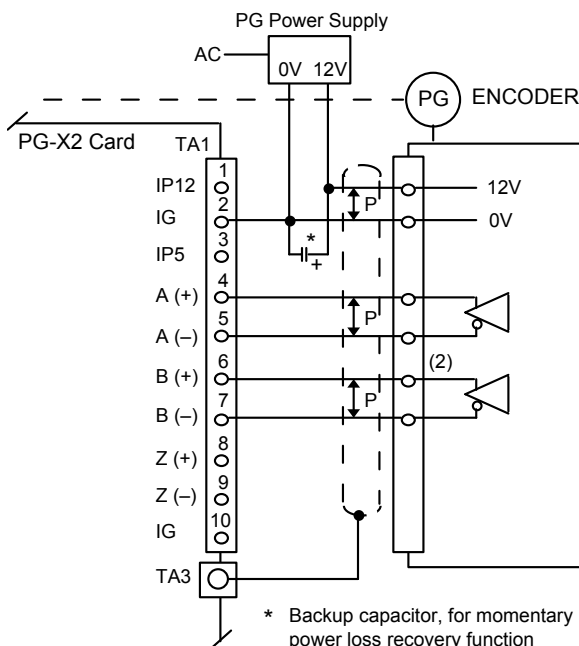


Figure 5. Using Separate PG Power Supply

The maximum frequency of PG output pulses that can be detected by the PG-X2 card is 300 kHz. Find the output frequency of the pulse generator, f_{PG} (Hz), according to the following formula:

$$f_{PG} \text{ (Hz)} = \frac{\text{Motor rotation speed (RPM) at max. frequency output}}{60} \times \text{Encoder PPR (Pulses/Rev)} \times 1.2$$

Signal type / level requirements. The type of signal that the PG-X2 card requires from the pulse generator is of the "line driver" and "quadrature" types. As shown in Figure 6, line driver signals include both a primary signal (Signal A+) and its complement (Signal A-). The complement is a signal that is the inverse of the primary signal. This scheme is used to improve the noise immunity of the speed feedback circuit.

NOTE: All signals shown were taken in relation to power supply common, Pin 2 of the PG-W2 card.

A quadrature signal is one that lags the primary signal by 90 electrical degrees (1/2 of a pulse). The purpose of this is so that the drive can detect the direction of the motor shaft. As shown in Figure 6, for "forward" rotation (C.C.W.), signal A+ will lead signal B+ by 90°. The quadrature signal has its own complement.

If one of the four signals is missing, the drive cannot accurately detect pulse generator speed or direction.

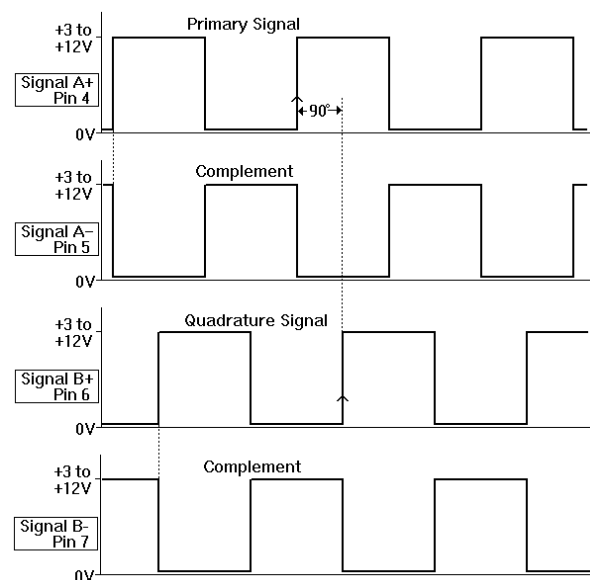


Figure 6. Pulse Generator Signals – Forward Direction

Table 3. F7 and GPD 515/G5 PG Speed Control Parameter List

Digital Operator Function Group	Digital Operator Display	Parameter No.	Parameter Name	Setting Range	Factory Setting	Change During Operation (2)	Data Selection	Control Method (3)			
								V/f Control	V/f w/PG Fdbk	Open loop Vector	Flux Vector
PG Option Setup	PG Pulse/Rev	F1-01	PG Constant	0 to 60000	1024	X		X	O	X	O
	PG Fdbk Loss Sel	F1-02	Operation at PG open Circuit	0 to 3	1	X		X	O	X	O
	PG Overspeed Sel	F1-03	Operation selection at overspeed	0 to 3	1	X	0: Ramp to Stop 1: Coast to Stop 2: Fast-Stop 3: Alarm Only	X	O	X	O
	PG Deviation Sel	F1-04	Operation selection at deviation	0 to 3	3	X		X	O	X	O
	PG Rotation Sel	F1-05	PG rotation	0,1	0	X	0: Fwd=CCW 1: Fwd=CW	X	O	X	O
	PG Ramp P/I Sel	F1-07	Integral value during accel/decel enable/disable	0,1	0	X	0: Disabled 1: Enable	X	O	X	X
	PG Overspeed Level	F1-08	PG overspeed detection level	0 to 120%	115%	X		X	O	X	O
	PG Overspeed Time	F1-09	PG overspeed detection delay	0 to 2.0s	1.0s	X		X	O	X	O
	PG Deviation Level	F1-10	Excessive speed deviation detection level	0 to 50%	10%	X		X	O	X	O
	PG Deviation Time	F1-11	Excessive speed deviation detection delay time	0 to 10s	0.5s	X		X	O	X	O
	PG# Gear Teeth 1	F1-12	No. of gear teeth 1	0 to 1000	0	X		X	O	X	X
	PG# Gear Teeth 2	F1-13	No. of gear teeth 2	0 to 1000	0	X		X	O	X	X
	PGO Detect Time	F1-14	PGO detection time	0 to 10s	2sec	X		X	O	X	O
	Speed Detection Filter Selection (F7 only)	F1-15	Speed detection filter selection	0, 1	1	X	0: No moving AVG 1: 2 moving AVG	X	O	X	O
ASR Tuning (1)	ASR P Gain 1	C5-01	ASR proportional gain 1	0 to 300.00	0.00	O		X	O	X	O
	ASR I Time 1	C5-02	ASR integral time 1	0 to 10.000s	0.00s	O		X	O	X	O
	ASR P Time 2	C5-03	ASR proportional gain 2	0 to 300.00	0.00	O		X	O	X	O
	ASR I Time 2	C5-04	ASR integral time 2	0 to 10.000s	0.00s	O		X	O	X	O
	ASR Limit	C5-05	ASR Limit	0.0 to 20%	0.0%	X		X	O	X	X
	ASR Delay Time	C5-06	ASR primary delay time	0.000 to 0.500s	0.000s	X		X	X	X	O
	ASR Gain SW Freq	C5-07	ASR switching freq	0.0 to 400.00Hz	0.0Hz	X		X	X	X	O
	ASR Integral Limit (F7 Only)	C5-08	ASR Integral limit	0 to 400%	400%	X		X	X	X	O

(1) ASR – Automatic Speed Regulator
(2) O = Enable, X = Disable
(3) O = Setting enable, X = Setting disable