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Dual Encoder Feedback Option Card
PG-W2

1. Part Number: PG-W2.

2. Applicability: F7, G7, GPD515/G5.

3. Introduction: The PG-W2 dual encoder feedback option card supports two encoder (pulse train) inputs and one pulse train output. The terms encoder, PG (pulse generator), and pulse train are used interchangeably in this guide. The PG-W2 can be used for the standard software function "Motor 2 Selection" or with several custom (CASE) software titles. The specific custom (CASE) software installed in the drive determines the exact functionality of the two encoder inputs and pulse train output. The PG-W2 card is mounted on the drive's control board as shown in Figure 1. The following example illustrates how the PG-W2 is used in conjunction with Electronic Lineshaft software:

Input 1: Follower encoder used for Electronic Lineshaft control and for vector control of the follower motor.
Input 2: Master encoder (pulse train) source used for Electronic Lineshaft control.
Output: Selectable from either input to be used for other followers.

4. 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.

5. Cautions:

a. Hazardous voltage can cause severe injury or death. Lock all power sources feeding the drive in the "OFF" position.
b. 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.
c. If other option cards are to be installed at the Option C (2CN) or Option D (3CN) positions (See Figure 2), their installation and wiring should be completed before installation of the PG-W2 card.
d. Before installing the PG-W2, a technically qualified individual, who is familiar with this type of equipment and the hazards involved, should read this entire installation guide.

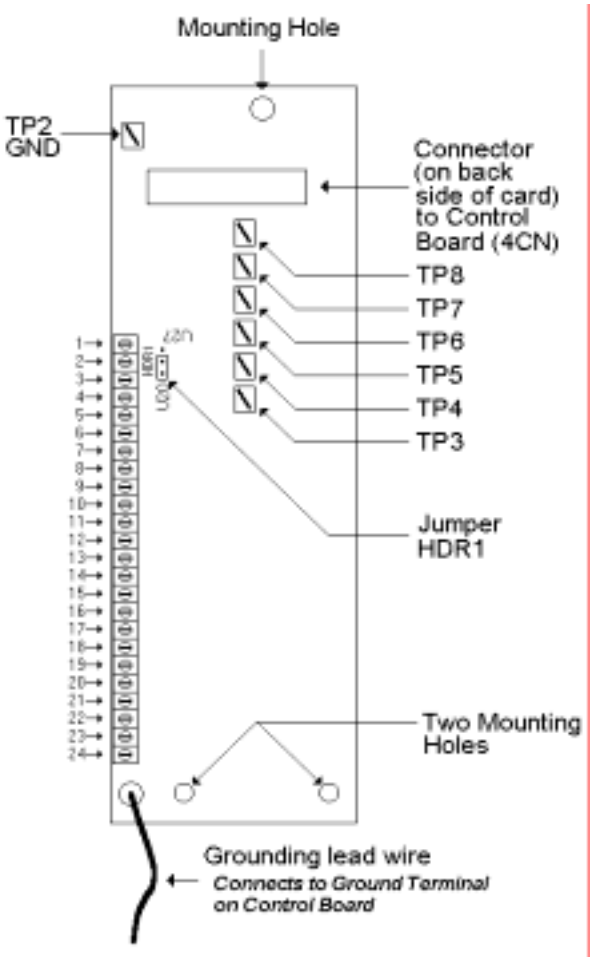


Figure 1. PG-W2 Dual Encoder Feedback Card

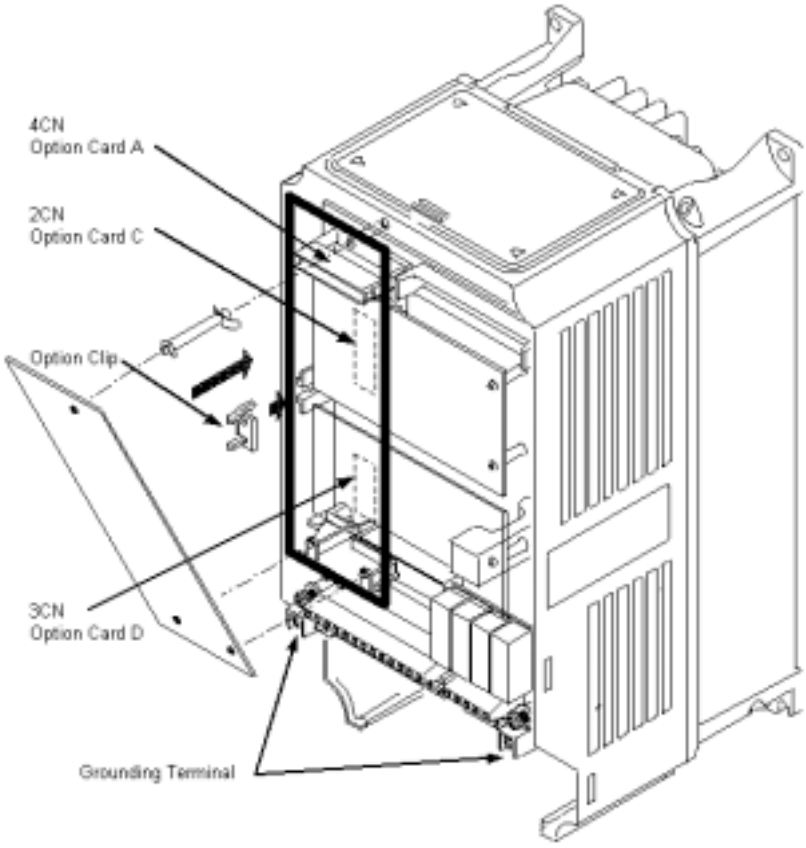


Figure 2. PG-W2 Option Card installation

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6. Precautions and Preliminary Installation:

a. Remove contents from package. Verify that a mounting spacer is included with the card. See Figure 3.
b. Disconnect all electrical power to the drive.
c. Remove the drive's front cover.
d. Check that the "CHARGE" indicator lamp inside the drive is off.
e. Use a voltmeter to verify voltage at incoming power terminals (L1, L2, L3) has been disconnected.
f. 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.
g. **Note:** When re-installing the cover, please take care not to pinch any of the encoder wires.
h. **Important:** GPD 515/G5 models 20P2 to 22P2 and 40P2 to 41P5 have two closely spaced mounting holes. Insert the spacer into the hole closest to the control board's connector 4CN. If inserted in the wrong hole, the spacer WILL NOT properly align with the PG-W2's mounting hole.

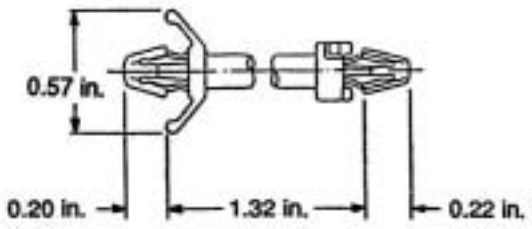


Figure 3. Mounting Spacer

7. PG-W2 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 the two mounting holes in the card with the pins on the bracket.
b. 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 card. Gently press the card into place until 4CN and the spacer click into place.

8. Wiring: Refer to Figure 4 and Tables 1 & 2. Make wire connections between the PG-W2 card and the encoder, the master drive, and/or external monitoring circuits. Observe the following:

a. The need for the marker Z (C) channel depends on the installed custom (CASE) software. Standard software does not use the marker pulse.
b. Keep the PG-W2 (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.
c. To prevent erroneous operation caused by noise interference, use shielded cable for control signal wiring, and limit the distance between the encoder and drive to 50 meters (165 feet) or less.
d. The recommended cable is twisted pair, 22 AWG, 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-W2 card are terminals 9, 16, & 23.
e. Strip back insulation for a distance of 0.22 inches on wire leads connected to the PG-W2 terminals.
f. Connect the option card ground wire (TP1) to the drive's ground terminal TB3 (12 for G5).

9. Jumper Setting: The PG-W2 contains a jumper HDR1 (see Figure 1). The correct position of the jumper is software specific. Please refer to the installed software manual for details.

10. Cover: Reinstall and secure the drive front's front cover.

11. Programming: The programming of the drive will vary depending upon which software is loaded into the drive. The last 5 digits of the software number can be viewed in monitor U1-14.

12. Start-up: Refer to Section 2 in the drive's technical manual and the custom software instruction sheet for testing and start-up information.

13. IG Storage: Place this installation guide with the drive's technical manual.

Table 1. Terminal Functions			
Terminal Number	**Terminal Description**	**Terminal Function**	
1	+12VDC	Power Supply for Encoder (PG) +12VDC, 200mA Maximum	
2	0VDC		
3	A1+	A Channel	Encoder Input 1 Line Driver Signal Level
4	A1-		
5	B1+	B Channel	
6	B1-		
7	Z1+	Z (C) Channel	
8	Z1-		
9	Shield	Shield Drain for Encoder Wiring. Same as Terminals 16, 23.	
10	A2+	A Channel	Encoder Input 2 Line Driver Signal Level
11	A2-		
12	B2+	B Channel	
13	B2-		
14	Z2+	Z (C) Channel	
15	Z2-		
16	Shield	Shield Drain for Encoder Wiring. Same as Terminals 9, 23.	
17	AM+	A Channel	Pulse Monitor Output RS-422 Signal Level
18	AM-		
19	BM+	B Channel	
20	BM-		
21	ZM+	Z (C) Channel	
22	ZM-		
23	Shield	Shield Drain for Encoder Wiring. Same as Terminals 9, 16.	
24	IG5	Pulse Monitor Terminals 17-22 Isolated Common	

Table 2. Terminal and Wire Specifications			
Terminal Symbol	**Terminal Screw**	**Clamping Torque Lb-in (N-m)**	**Wire Range AWG (mm^2)**
J1, J2	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)

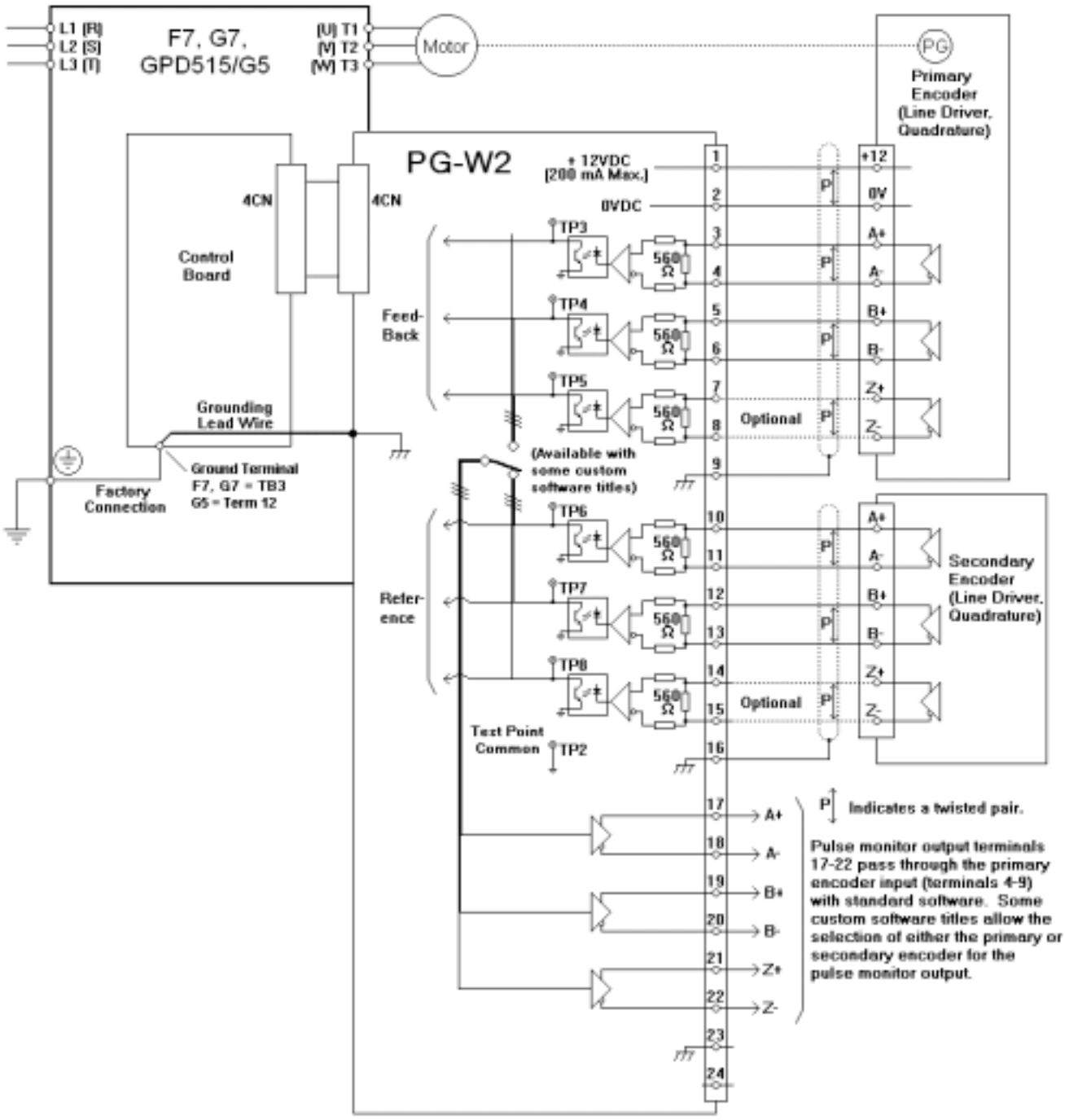


Figure 4. PG-W2 Interconnection Diagram

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14. Master Encoder: If the master pulse reference source is an encoder, the PG-W2's power supply can be utilized to power that encoder. However, if the current draw from the PG-W2's power supply exceeds 200mA, provide a separate power supply 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.

15. Maximum Input Frequency: The maximum input frequency of the PG-W2 card is 300kHz. To find the output frequency of the encoder (PG) in Hertz, use the following formula. Please make sure a 20% safety margin is built-in.

$$f_{PG}\ (Hz) = \frac{\text{Maximum Motor Speed (RPM)}}{60} \times \text{Encoder PPR (Pulses/Rev)}$$

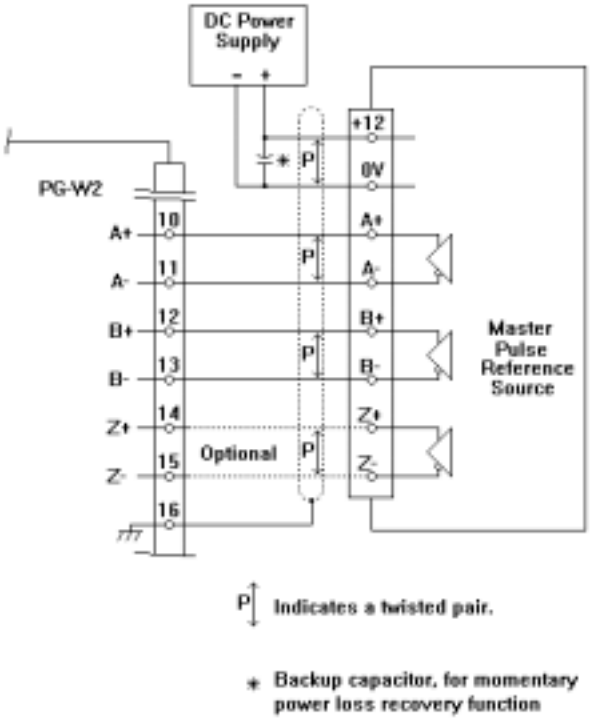


Figure 5. Using a Separate Encoder Power Supply

16. Signal Type / Level Requirements: The PG-W2 card requires a "quadrature line driver with compliments" signal type from the encoder (pulse generator). As shown in Figure 6, line driver signals include both a primary signal (Signal A+) and it's compliment (Signal A-). The compliment is the inverse of the primary signal. This scheme is used to improve the noise immunity of the system. The encoder output signal voltage should be between +5VDC and +12VDC. An "open collector" signal type WILL NOT work with 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 encoder rotation. As shown in Figure 6, for "forward" rotation of the encoder, signal A+ will lead signal B+ by 90^{o}.

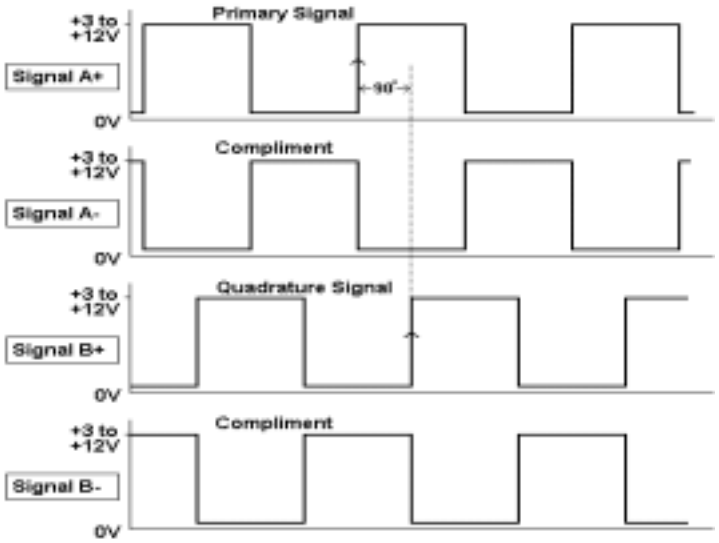
If any one of the four signals is missing, the drive cannot accurately measure the encoder rotation speed or direction.

17. Viewing Signals With An Oscilloscope: The PG-W2 option card has test points that can be used to connect an oscilloscope. Figure 1 shows the locations of the test points on the PG-W2 card. Test points TP3 through TP8 are after the compliment is subtracted out and the signals are buffered through the opto-isolators. See Figure 4. The voltage level on all test points varies between 0 and +5VDC (TTL).

Caution: Always use an un-grounded oscilloscope so no noise is introduced into the common.

Table 3. PG-W2 Test Points

Test Point	Description
TP2	Although labeled GND, it is NOT earth ground. This test point should only be used in conjunction with test points TP3 through TP8.
TP3	Input 1 Channel A (Terminals 3 & 4)
TP4	Input 1 Channel B (Terminals 5 & 6)
TP5	Input 1 Channel Z (Terminals 7 & 8)
TP6	Input 2 Channel A (Terminals 10 & 11)
TP7	Input 2 Channel B (Terminals 12 & 13)
TP8	Input 2 Channel Z (Terminals 14 & 15)



Note: All signals shown are in relation to power supply common, Terminal 2 of the PG-W2.

Figure 6. Encoder (PG) Signals – Forward Direction