

Part Number: AO-001 (UTC000053)

Applicability: F7, G7, GPD515/G5. *Note: The AO-001 (UTC000053) replaces the AO-12B2 (UTC000016), which was exclusive to the GPD515/G5 and not compatible with the F7 or G7.*

Introduction: The Isolated Analog output option board (Figure 1) is mounted on the drive's control board and enables the user to employ precision, isolated analog signals to monitor drive outputs (U1-XX) as indicated in tables 5 and 6.

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 the drive in the "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.

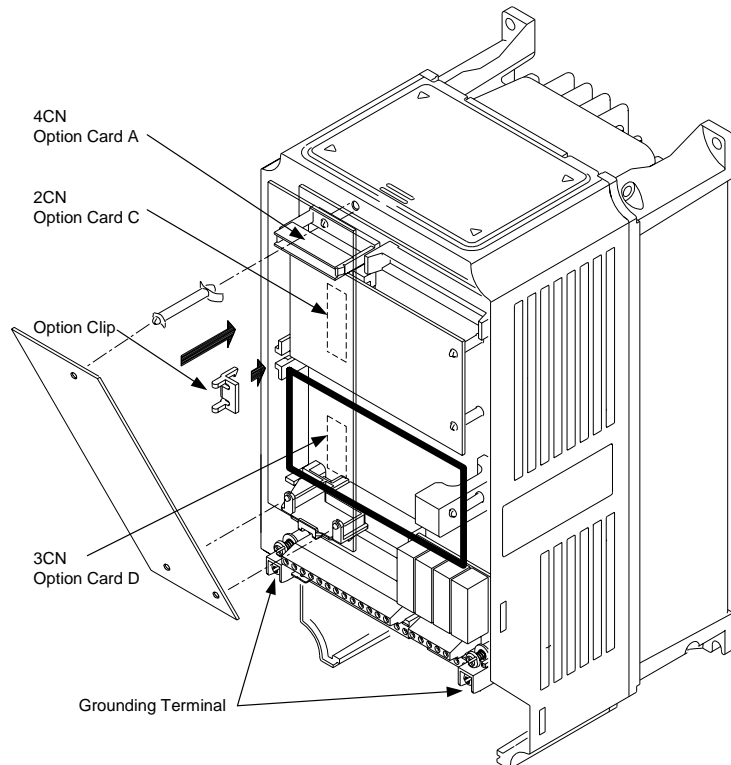
Important:

1. If this option is being installed in a drive with an encoder feedback option card, that card will need to be temporarily removed to allow access to connector 3CN on the drive's control board and TB1 of the AO-001 option card.
2. 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.

Installation and Wiring:

1. Disconnect all electrical power to the drive.
2. Remove the drive's front cover.
3. Check that the "CHARGE" indicator lamp inside the drive is off.
4. Use a voltmeter to verify that the voltage at the incoming power terminals (L1, L2, L3) has been disconnected.
5. **Option Card Installation:** See Figure 2.
 - a) Position the option card above 3CN on the control board and gently press the card into place.
6. **Wiring.** Refer to Figure 3 and Table 2. Make wire connections between the AO-001 card and the drive's control circuit, as well as external monitoring circuits. Observe the following:
 - a) Keep the AO-001 (i.e. control circuit) wiring separate from main circuit input/output wiring. A separate metallic grounded conduit with only the option card's 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.
 - c) Connect the option card ground wire (CBL1) to the drive's ground terminal TB3 (12 for G5).
7. **Adjustment:** The type of output the AO-001 option card will produce is selected with several jumpers and parameters. Refer to Tables 3 and 4 and Figure 3 to select the appropriate output type and scaling. Note: The variable resistors VR1 thru VR4 are factory set and require no further adjustment.
8. Reinstall and secure the drive's front cover.
9. Place this instruction sheet with the drive's technical manual.

Table 1. Specifications	
Parameter	Value
Output Resolution	11 bit + sign (1/2048)
Output Current	4 to 20mA (Isolated) 0 to 20mA (Isolated)
Output Voltage	-10VDC to +10VDC (Isolated)



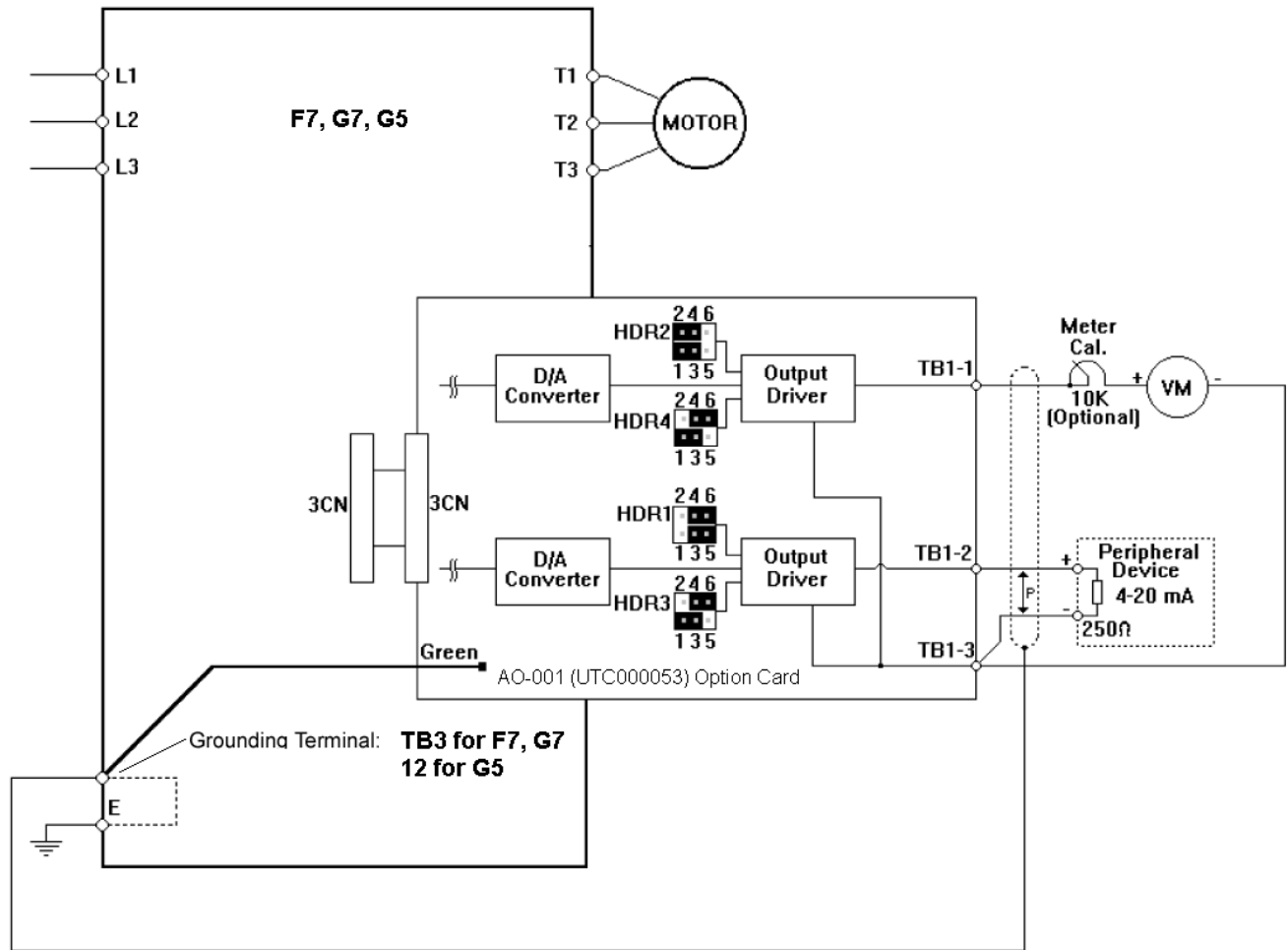


Figure 3. AO-001 Interconnection Diagram

Table 2. Terminal Functions of the AO-001

Terminal	Functions	Signal Level
TB1-1	Analog Signal Output Channel 1	4-20mA, 0-20mA, 0-10VDC or +/- 10VDC ⁽¹⁾
TB1-2	Analog Signal Output Channel 2	
TB1-3	Output Common	0V

(1) See step 7 above and tables 3 and 4 below for instructions on changing the signal type.

Table 3. Adjustment of Output Signal Scaling

Drive	Terminal	Gain Parameter ⁽¹⁾	Setting Range	Increment	Factory Setting	Remarks
F7/G7	TB1-1	F4-02	0.0-1000.0%	0.1%	100%	20mA / 100% or 10VDC / 100% ⁽²⁾
	TB1-2	F4-04	0.0-1000.0%	0.1%	50%	
GPD 515/G5	TB1-1	F4-02	0.00 to 2.50	0.01	1.00	
	TB1-2	F4-04	0.00 to 2.50	0.01	0.50	

(1) A gain of 0.5 will set 12mA (5VDC) = 100%; a gain of 2.0 will set 20mA (10VDC) = 50%.

(2) Maximum output signal level is 21.6mA or +11VDC.

Table 4. Output Signal Type Configuration

Channel	TB1 Terminals	Signal Type	Jumper	Positions
1	1 (+)	Current (4-20mA) ⁽¹⁾	HDR2	3-5 & 4-6
			HDR4	1-3 & 4-6
	3 (-)	Current (0-20mA)	HDR2	3-5 & 4-6
			HDR4	3-4 & 5-6
2	2 (+)	Voltage (0-10VDC or +/- 10VDC) ⁽²⁾	HDR2	1-3 & 2-4
			HDR4	1-3 & 4-6
	3 (-)	Current (4-20mA) ⁽¹⁾	HDR1	3-5 & 4-6
			HDR3	1-3 & 4-6
		Current (0-20mA)	HDR1	3-5 & 4-6
			HDR3	3-4 & 5-6
		Voltage (0-10VDC or +/- 10VDC) ⁽²⁾	HDR1	1-3 & 2-4
			HDR3	1-3 & 4-6

(1) Factory default jumper settings.

(2) F7 / G7: Selectable by setting drive parameters F4-07 (TB1-1) and F4-08 (TB1-2).

GPD515/G5: Selectable by setting of drive parameter H4-07.

Table 5. Selecting the Monitored Output (GPD515/G5)

Terminal	Parameter	Set Value	Control Method ⁽¹⁾	Output Monitor	Scaling
TB1-1 or TB1-2	F4-01 or F4-03	1	0, 1, 2, 3	Frequency Reference	10V/100%
		2	0, 1, 2, 3	Output Frequency	10V/100%
		3	0, 1, 2, 3	Output Current	10V/drive rated current
		5	1, 2, 3	Motor Speed	10V/100%
		6	0, 1, 2, 3	Output Voltage	10V/200VAC (400VAC)
		7	0, 1, 2, 3	DC Bus Voltage	10V/400VDC (800VDC)
		8	0, 1, 2, 3	Output Power (kW)	10V/100%
		9	2, 3	Torque Reference	10V/100%
		15	0, 1, 2, 3	Terminal 13 Input	10V/10V
		16	0, 1, 2, 3	Terminal 14 Input	10V/10V (20mA)
		17	0, 1, 2, 3	Terminal 16 Input	10V/10V
		18	0, 1, 2, 3	Motor Secondary Current (Iq)	10V/motor rated current
		19	2, 3	Motor Exciting Current (Id)	10V/motor rated current
		20	0, 1, 2, 3	Output Frequency After Soft-Start (SFS)	10V/100%
		21	1, 3	ASR Input	10V/100%
		22	1, 3	ASR Output	10V/motor rated current
		23	1, 3	Speed Deviation / Speed Regulator Input	10V/100%
		24	0, 1, 2, 3	PID Feedback	10V/100%
26	2, 3	Output Voltage Reference (Vq)	10V/230V (460V)		
27	2, 3	Output Voltage Reference (Vd)	10V/230V (460V)		

(1) Output available only when using one of the listed control methods (A1-02 setting):

0: V/Hz Mode, 1: V/Hz with Encoder (PG), 2: Open Loop Vector, 3: Closed Loop Flux Vector

Table 6. Selecting the Monitored Output (F7, G7)

Terminal	Parameter	Set Value	Control Method ⁽¹⁾	Output Monitor	Scaling
TB1-1 or TB1-2	F4-01 or F4-03	1	0,1,2,3,4	Frequency Reference	10V: Maximum output frequency (0 ~ ± 10V possible)
		2	0,1,2,3,4	Output Frequency	10V: Maximum output frequency (0 ~ ± 10V possible)
		3	0,1,2,3,4	Output Current	10V: Drive rated output current (0 ~ 10V, absolute value)
		5	1,2,3,4	Motor Speed	10V: Maximum output frequency (0 ~ ± 10V possible)
		6	0,1,2,3,4	Output Voltage	10V: 200VAC (400VAC)
		7	0,1,2,3,4	DC Bus Voltage	10V: 400VDC (800VDC)
		8	0,1,2,3,4	Output Power	10V: Drive capacity kW (0 ~ ± 10V possible)
		9	2,3,4	Torque Reference	10V: Motor rated torque (0 ~ ± 10V possible)
		15	0,1,2,3,4	Terminal A1 Input	10V: 100% (at 10V input) (0 ~ ± 10V possible)
		16	0,1,2,3,4	Terminal A2 Input	10V: 100% (at 10V input) (0 ~ ± 10V possible)
		17	0,1,2,3,4	Terminal A3 Input	10V: 100% (at 10V input) (0 ~ ± 10V possible)
		18	0,1,2,3,4	Motor Secondary Current (Iq)	10V: Motor rated secondary current (0 ~ ± 10V possible)
		19	2,3,4	Motor Excitation Current (Id)	10V: Motor rated secondary current (0 ~ ± 10V possible)
		20	0,1,2,3,4	Output Frequency after Soft-Starter (SFS)	10V: Maximum output frequency (0 ~ ± 10V possible)
		21	1,3,4	ASR Input	10V: Maximum output frequency (0 ~ ± 10V possible)
		22	1,3,4	ASR Output	10V: Motor rated secondary current (0 ~ ± 10V possible)
		24	0,1,2,3,4	PID Feedback	10V: Maximum output frequency (0 ~ ± 10V possible)
		26	2,3,4	Output Voltage Reference (Vq)	10V: 200VAC (400VAC) (0 ~ ± 10V possible)
		27	2,3,4	Output Voltage Reference (Vd)	10V: 200VAC (400VAC) (0 ~ ± 10V possible)
		32	2,3,4	ACR (q) Output	10V: 100% (0 ~ ± 10V possible)
		33	2,3,4	ACR (d) Output	10V: 100% (0 ~ ± 10V possible)
		36	0,1,2,3,4	PID Input (Error)	10V: 100% (0 ~ ± 10V possible)
		37	0,1,2,3,4	PID Output	10V: Maximum output frequency (0 ~ ± 10V possible)
		38	0,1,2,3,4	PID Setpoint	10V: Maximum output frequency
		42 ⁽²⁾	4	Estimated Motor Flux	10V: Rated motor flux
43 ⁽²⁾	4	Motor Flux Current Compensation	10V: Motor rated secondary current (0 ~ ± 10V possible)		
44	3,4	ASR Output without Filter	10V: Motor rated secondary current (0 ~ ± 10V possible)		
45	3,4	Feed Forward Control Output	10V: Motor rated secondary current (0 ~ ± 10V possible)		

(1) Output available only when using one of the listed control methods (A1-02 setting):

0: V/Hz, 1: V/Hz with Encoder (PG), 2: Open Loop Vector, 3: Closed Loop Flux vector, 4: Open Loop Vector 2 ⁽²⁾

(2) G7 only.