



Brushless DC Motor Control

Installation, Maintenance and Parts Manual



DORNER MFG. CORP.
P.O. Box 20 • 975 Cottonwood Ave.
Hartland, WI 53029-0020 USA

INSIDE THE USA
TEL: 1-800-397-8664
FAX: 1-800-369-2440

OUTSIDE THE USA
TEL: 262-367-7600
FAX: 262-367-5827

For other service manuals visit our website at:
www.dorner.com/service_manuals.asp

Table of Contents

Introduction	2	For Remote ON/OFF Signal:	11
Warnings – General Safety	3	External Input Signals.....	12
Product Description	4	Input Signal Connection Terminals	12
Brushless DC Motor Control	4	Operation.....	13
Specifications	5	Controller Setup	13
2200 Light Load Gearmotors.....	5	Setting Speed Acceleration and Deceleration.....	13
2200 and 3200 Standard Load Gearmotors	5	Set Motor Direction	15
2200 Standard Load 90° Gearmotors.....	5	Displaying the Conveyor Belt Speed.....	15
Controllers	5	Setting Speed While Motor is Running.....	17
Installation	6	Switching the Signal Method	
Required Tools.....	6	to Remote Signal (If Required).....	17
Conveyor Mounting.....	6	Notes	18
Stand Mounting.....	7	Service Parts.....	19
Wiring	7	Brushless DC Motor Control.....	19
For 1 Phase (115 Volt) Controllers:	8	Return Policy.....	20
For 3 Phase (230 Volt) Controllers:	9		

Introduction

CAUTION


Some illustrations may show guards removed. DO NOT operate equipment without guards.

Upon receipt of shipment:

- Compare shipment with packing slip. Contact factory regarding discrepancies.
- Inspect packages for shipping damage. Contact carrier regarding damage.
- Accessories may be shipped loose. See accessory instructions for installation.

The Dorner Limited Warranty applies.

Dorner reserves the right to make changes at any time without notice or obligation.

Dorner has convenient, pre-configured kits of Key Service Parts for all conveyor products. These time saving kits are easy to order, designed for fast installation, and guarantee you will have what you need when you need it. Key Parts and Kits are marked in the Service Parts section of this manual with the Performance Parts Kits logo .

Warnings – General Safety

WARNING

The safety alert symbol, black triangle with white exclamation, is used to alert you to potential personal injury hazards.

DANGER



SEVERE HAZARD!

KEEP OFF CONVEYORS. Climbing, sitting, walking or riding on conveyor will cause severe injury.

DANGER



EXPLOSION HAZARD!

- **DO NOT OPERATE CONVEYORS IN AN EXPLOSIVE ENVIRONMENT.** The electric gearmotor generates heat and could ignite combustible vapors.
- Failure to comply will result in death or serious injury.

WARNING

Controller must be properly grounded. Failure to properly ground controller may cause injury to personnel.

DANGER



SEVERE HAZARD!

Hazardous voltage will cause severe injury or death. **LOCKOUT POWER BEFORE WIRING.**

WARNING



SEVERE HAZARD!

Exposed moving parts can cause severe injury. **DO NOT ATTEMPT ADJUSTMENTS WITH CONVEYOR RUNNING.** LOCK OUT POWER before removing guards or performing maintenance.

WARNING



SEVERE HAZARD!

- Dorner cannot control the physical installation and application of conveyors. Taking protective measures is the responsibility of the user.
- When conveyors are used in conjunction with other equipment or as part of a multiple conveyor system, **CHECK FOR POTENTIAL PINCH POINTS** and other mechanical hazards before system start-up.
- Failure to comply could result in serious injury.

Product Description

Brushless DC Motor Control

Dorner's Brushless DC Motor Control (**Figure 1**) are DC motor speed controllers for Standard and Heavy Load VFD gearmotors.

Typical Components

- 1 Mode indicator LEDs
The illuminating LED indicates the current operation mode.
 - MNTR: Monitor mode
 - F/R: Direction setting mode
 - LO/RE: Digital operator/external input signal setting mode
 - PRGM: Data setting mode
- 2 Unit display LEDs
The illuminating LED indicates the current display unit.
 - r/min: Speed of motor or gearhead output shaft
 - m/min: Conveyor transfer speed
 - %: Load factor
- 3 RUN = Start the motor operation.
- 4 STOP = Stop the motor.
- 5 ON/OFF Power Switch.
- 6 Use these keys to switch the mode or set data.
 - Switch the operation mode
 - Move to the next item or increase the value
 - Move to the previous item or decrease the value
 - Confirm the data
- 7 Display
- 8 ALARM LED: A red light will come on when an alarm is generated.
- 9 RUN LED: A green light stays on during operation.

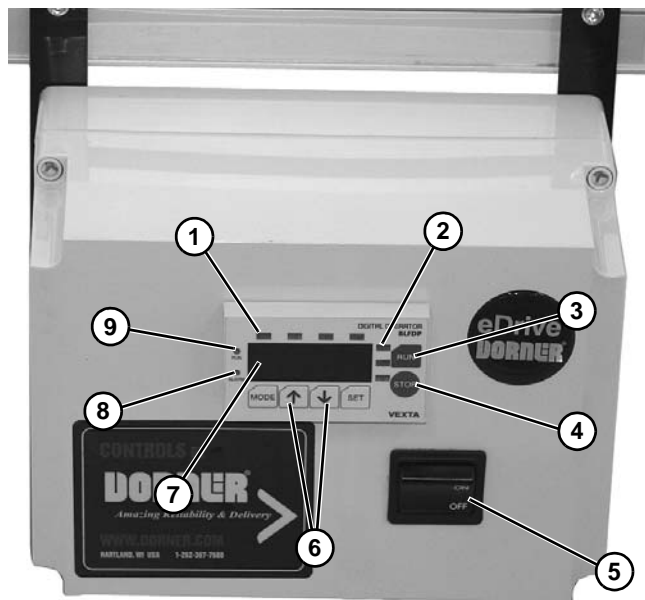


Figure 1

NOTE

For additional information, refer to the Oriental Motor Operating Manual shipped with your controller. See Specifications table for models.

2200 Light Load Gearmotors

Dorner Model Number	Max RPM*	Type	HP	Kw	FLA	In-lbs	N-m
62M050PLBDDEN	60	A	0.083	0.060	See Control	76	8.6
62M020PLBDDEN	150	A	0.083	0.060	See Control	31	3.6
62M015PLBDDEN	200	A	0.083	0.060	See Control	23	2.7

2200 and 3200 Standard Load Gearmotors

Dorner Model Number	Max RPM*	Type	HP	Kw	FLA	In-lbs	N-m
62M050PSBDDEN	60	B	0.25	0.200	See Control	240	28
62M020PSBDDEN	150	B	0.25	0.200	See Control	103	11.7
62M015PSBDDEN	300	B	0.25	0.200	See Control	52	5.9

2200 Standard Load 90° Gearmotors

Dorner Model Number	Max RPM*	Type	HP	Kw	FLA	In-lbs	N-m
62M060ESBDDEN	50	B	0.25	0.200	See Control	106	12.4
62M040ESBDDEN	75	B	0.25	0.200	See Control	123	14.3
62M020ESBDDEN	150	B	0.25	0.200	See Control	89	10.4
62M010ESBDDEN	300	B	0.25	0.200	See Control	49	5.7
62M005ESBDDEN	600	B	0.25	0.200	See Control	25	2.9

Controllers

Dorner Model Number	Input Volt	Input Phase	Input Hz	Max Input Amps	Output	Max Watts	Reversing	Type
63MBD11B60	115	1	60	4.5	BDC	60	Yes	A
63MBD23B60	230	3	60	1.5	BDC	60	Yes	A
63MBD11B200	115	1	60	8.8	BDC	200	Yes	B
63MBD23B200	230	3	60	3.4	BDC	200	Yes	B

Installation

Required Tools

- 6 mm hex head wrench
- Flat-blade screwdriver
- Phillips screwdriver

Installation Component List (Figure 2):

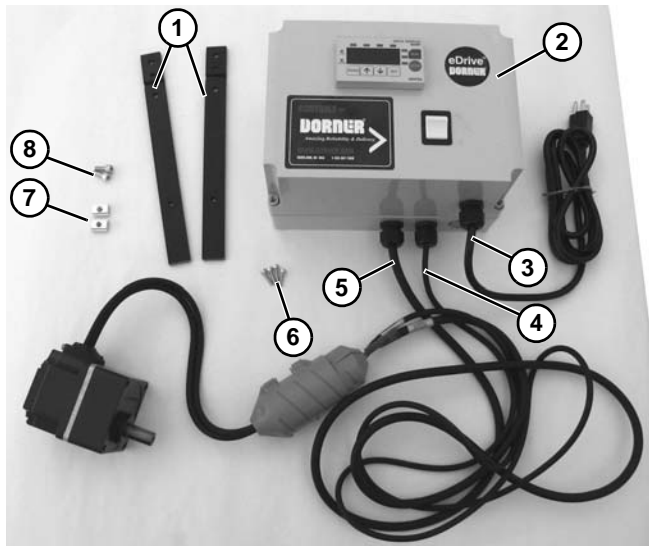


Figure 2

- | | |
|---|----------------------------------|
| 1 | Controller Mounting Bar (2x) |
| 2 | Brushless DC Controller |
| 3 | Motor Power Cord |
| 4 | External Signal Cord |
| 5 | Power Supply Cord |
| 6 | Hex Head Screws, M4 x 16 mm (4x) |
| 7 | T-Bar |
| 8 | Hex Head Screws, M6 x 16 mm (2x) |

Conveyor Mounting

1. Install spring t-nuts (**Figure 3, item 1**) into conveyor t-slot.

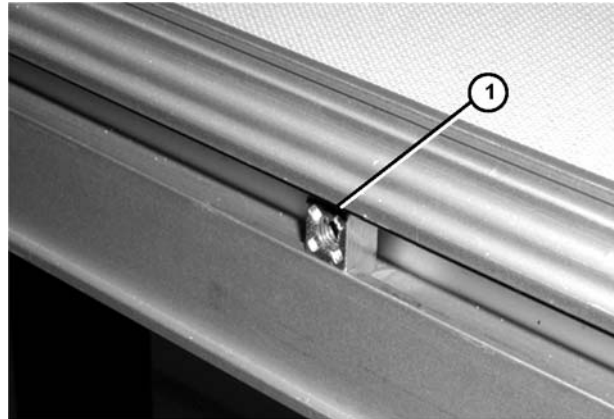


Figure 3

2. Attach controller (**Figure 4, item 1**) to conveyor with screws (**Figure 4, item 2**).

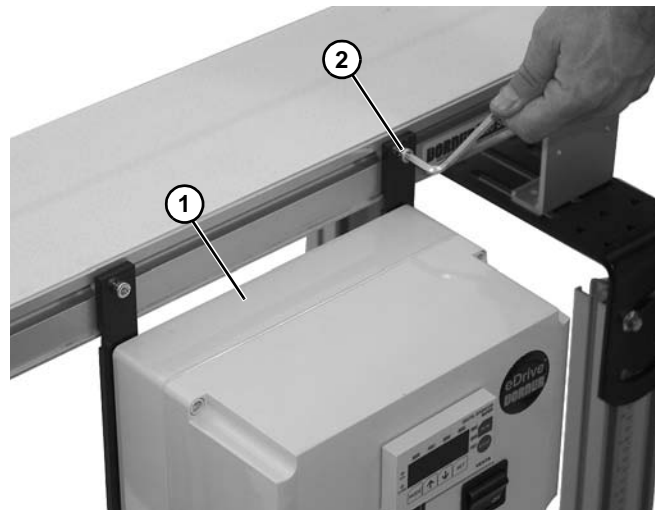


Figure 4

3. Slide controller to its desired mounting location along conveyor and tighten both screws.

Stand Mounting

1. Install spring t-nuts (Figure 5, item 1) into stand t-slot.

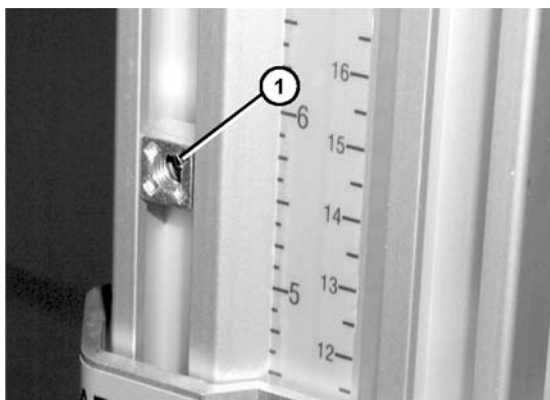


Figure 5

2. Partially thread controller mounting bar (Figure 6, item 1) to lower t-nut with screw (Figure 6, item 2).

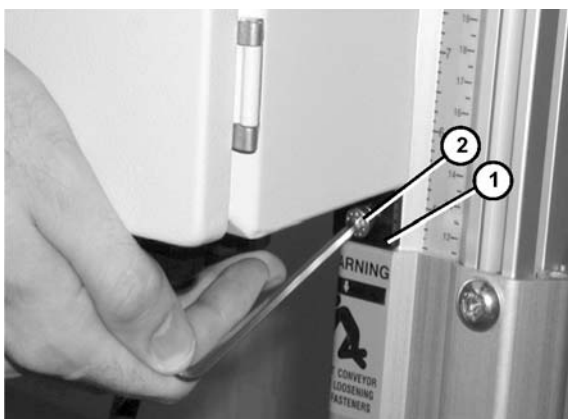


Figure 6

3. Install second spring t-nut into stand t-slot.
4. Partially thread controller mounting bar (Figure 7, item 1) to top t-nut with screw (Figure 7, item 2).

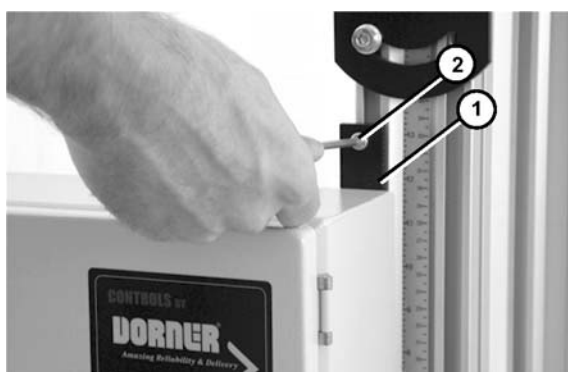


Figure 7

5. Slide controller to its desired mounting location and tighten both screws.

Wiring

⚠ DANGER



SEVERE HAZARD!

Hazardous voltage will cause severe injury or death. **LOCKOUT POWER BEFORE WIRING.**

⚠ WARNING



SEVERE HAZARD!

Exposed moving parts can cause severe injury. **DO NOT ATTEMPT ADJUSTMENTS WITH CONVEYOR RUNNING. LOCK OUT POWER** before removing guards or performing maintenance.

⚠ WARNING

Controller must be properly grounded. Failure to properly ground control box may cause injury to personnel.


NOTE

For additional specific wiring information and schematics, refer to the Oriental Motor Operating Manual shipped with your controller.

Installation

For 1 Phase (115 Volt) Controllers:

⚠ DANGER



SEVERE HAZARD!
Hazardous voltage will cause severe injury or death. **LOCKOUT POWER BEFORE WIRING.**

NOTE
For 115V controllers no wiring is required. Controller is provided with power cord. The steps 1-3 are shown for reference, only if re-wiring is required.

1. Open controller by loosening four plastic cover screws (Figure 8, item 1), and removing controller case cover (Figure 8, item 2).

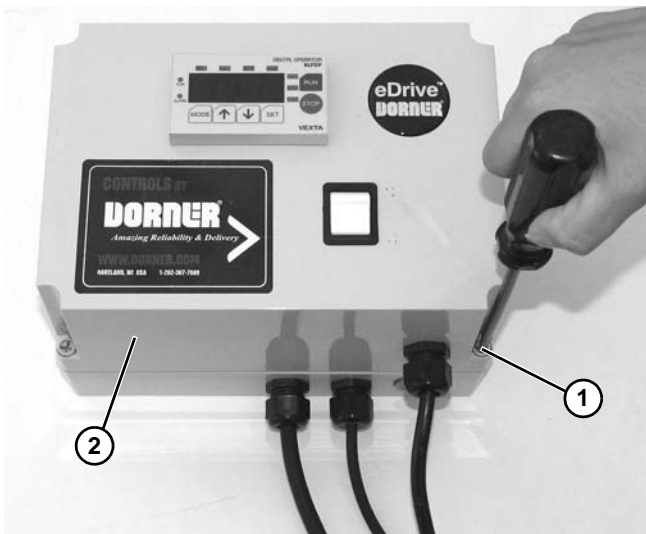


Figure 8

2. Remove controller cover (Figure 9, item 1).

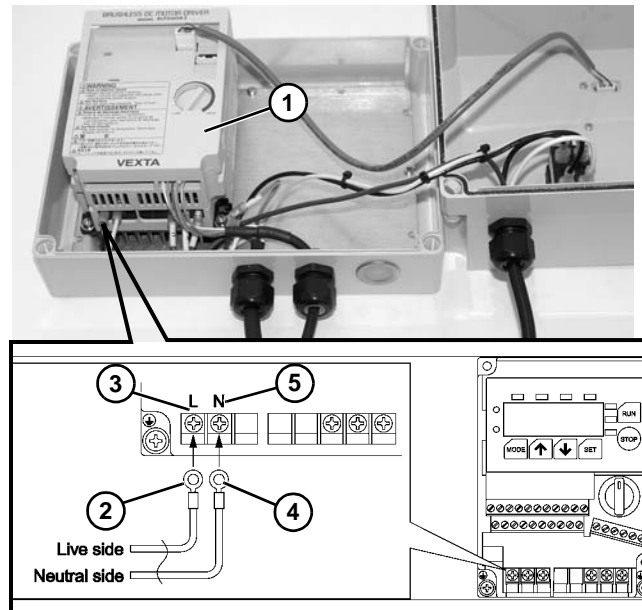


Figure 9

3. Connect black (live side) (Figure 9, item 2) to L (Figure 9, item 3) and white (neutral side) (Figure 9, item 4) to N (Figure 9, item 5) wires on controller.
4. Connect motor plugs (Figure 10, item 1) and (Figure 10, item 2).

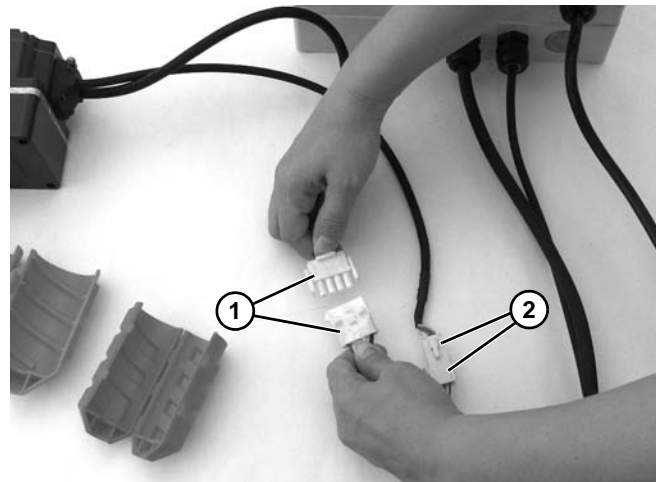


Figure 10

5. Install inner cord cover (Figure 11, item 1).

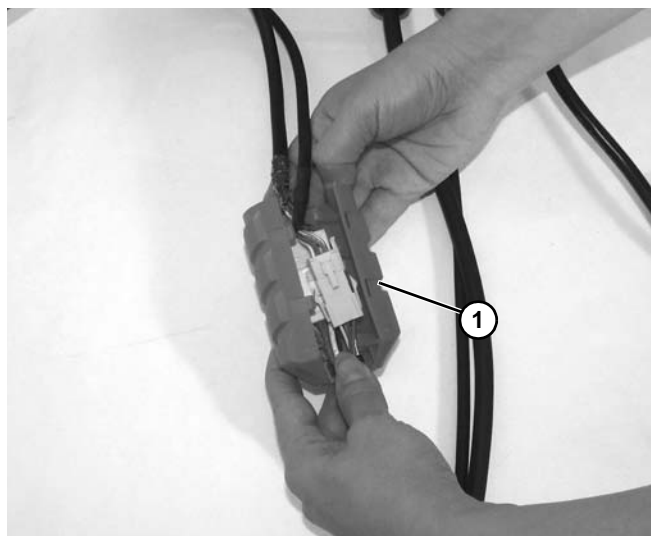


Figure 11

6. Install outer cord cover (Figure 12, item 1) over inner cord cover (Figure 12, item 2).

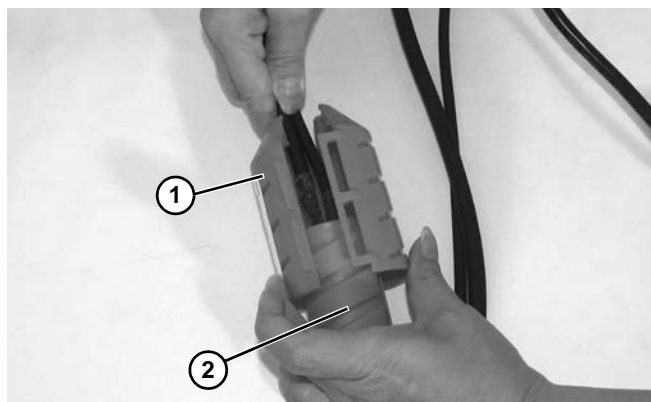


Figure 12

7. Twist covers (Figure 13, item 1) together, as shown.

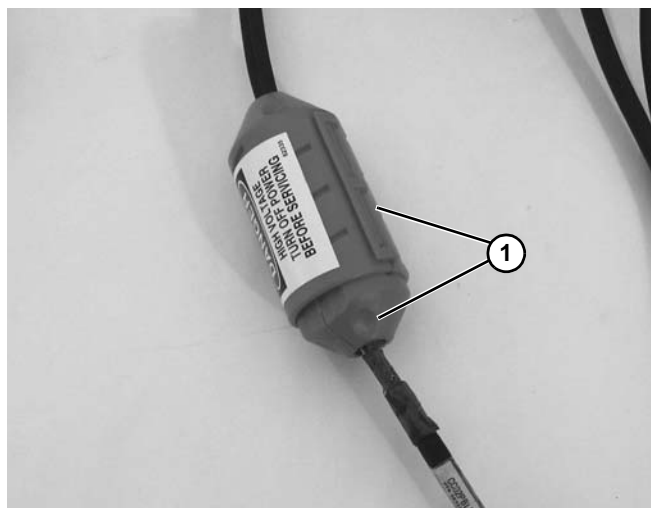


Figure 13

For 3 Phase (230 Volt) Controllers:

⚠ DANGER
SEVERE HAZARD! Hazardous voltage will cause severe injury or death. LOCKOUT POWER BEFORE WIRING.

1. Open controller by loosening four plastic cover screws (Figure 14, item 1), and removing controller case cover (Figure 14, item 2).

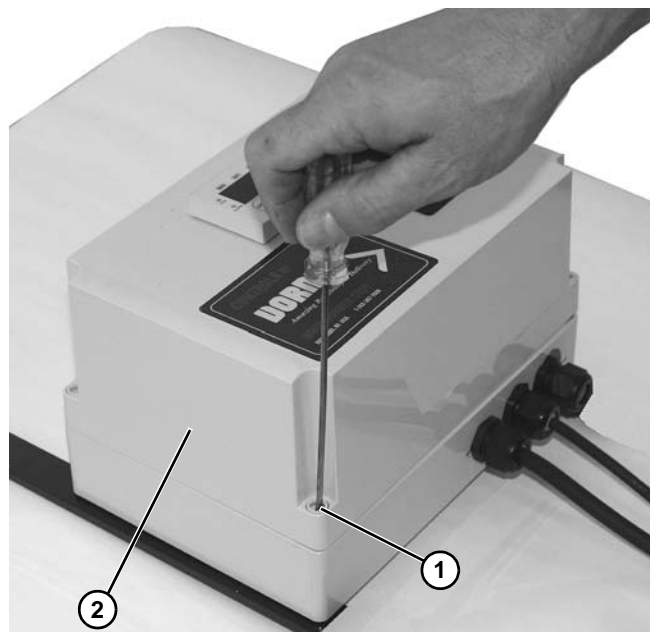


Figure 14

Installation

2. Install four wires (**Figure 15, item 1**) through cord grip opening (**Figure 15, item 2**) in controller assembly.

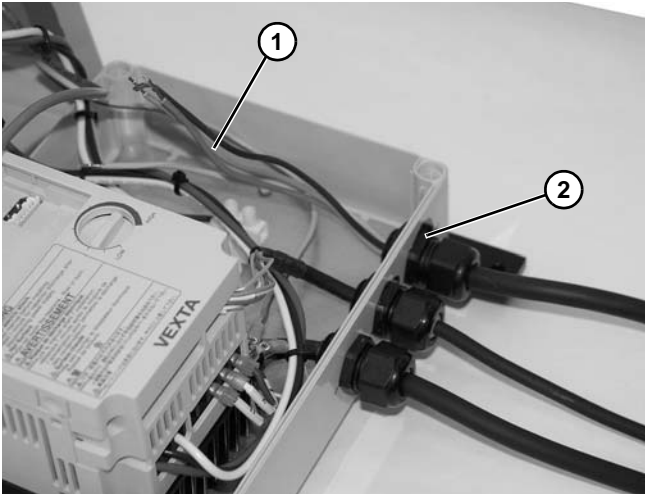


Figure 15

3. Connect black (**Figure 16, item 1**), white (**Figure 16, item 2**), red (**Figure 16, item 3**), and green (**Figure 16, item 4**) wires to mating color wires (**Figure 16, item 5**) on opposite end of wiring connector terminals.

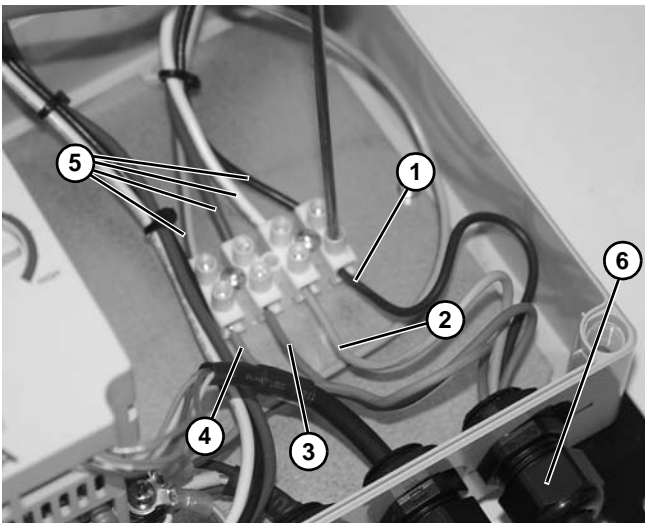


Figure 16

4. Secure wires by tightening grip (**Figure 16, item 6**).
5. Install case cover (**Figure 14, item 2**) with four plastic cover screws (**Figure 14, item 1**).

6. Connect motor plugs (**Figure 17, item 1**) and (**Figure 17, item 2**).

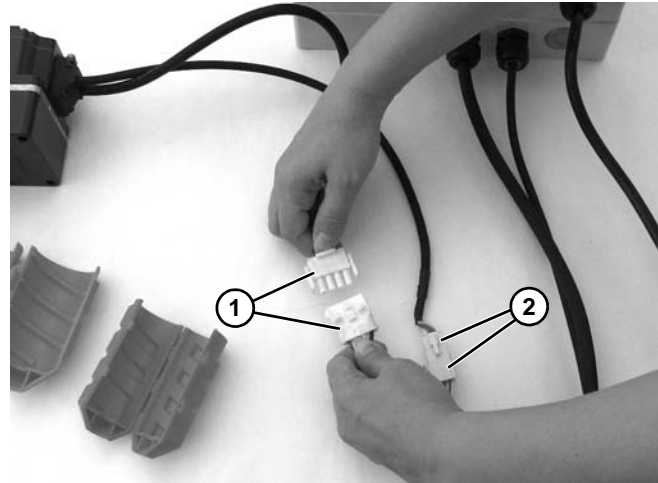


Figure 17

7. Install inner cord cover (**Figure 18, item 1**).

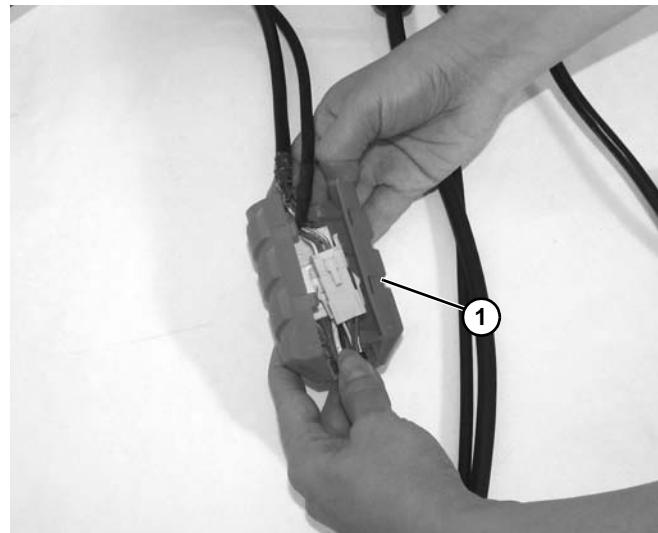


Figure 18

8. Install outer cord cover (**Figure 19, item 1**) over inner cord cover (**Figure 19, item 2**).

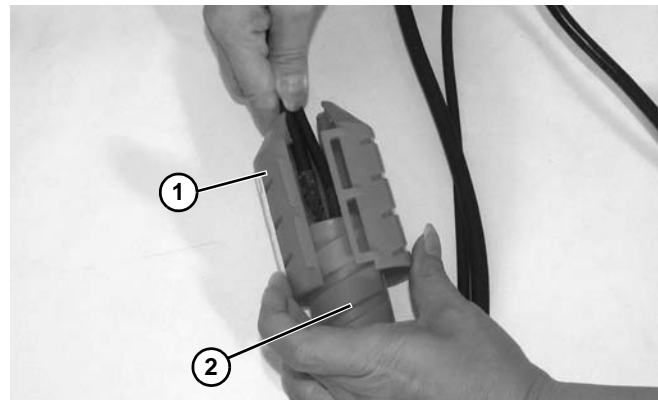


Figure 19

- Twist covers (**Figure 20, item 1**) together, as shown.

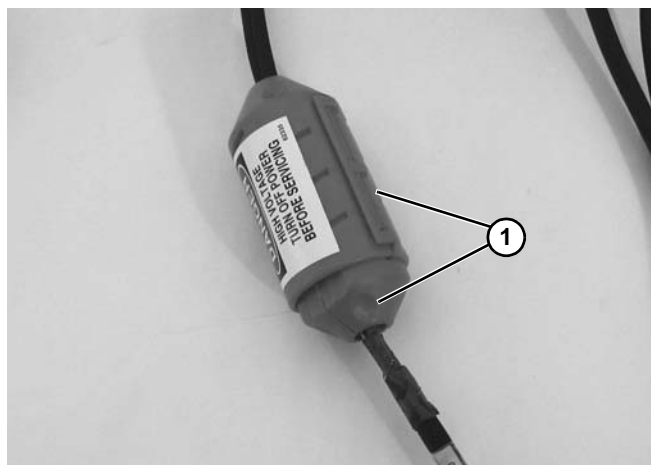


Figure 20

For Remote ON/OFF Signal:

⚠ DANGER
<p style="text-align: center;">SEVERE HAZARD!</p> <p>Hazardous voltage will cause severe injury or death. LOCKOUT POWER BEFORE WIRING.</p>

- Remove access plug (**Figure 21, item 1**).

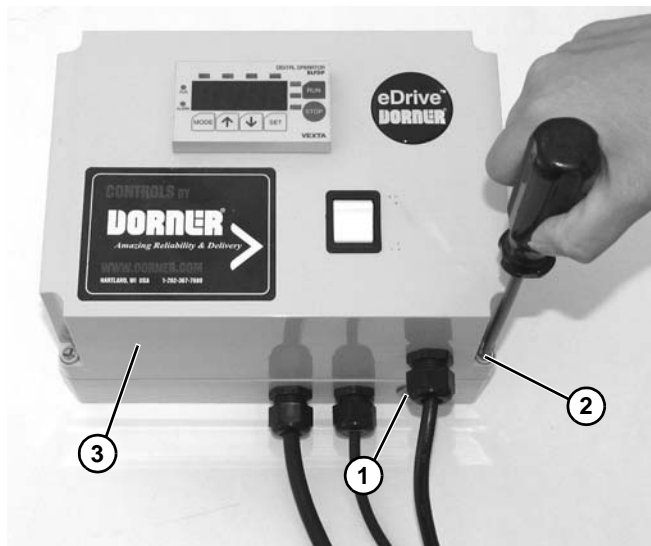


Figure 21

- Open controller by loosening four plastic cover screws (**Figure 21, item 2**), and removing controller case cover (**Figure 21, item 3**).

- Remove controller cover (**Figure 22, item 1**).

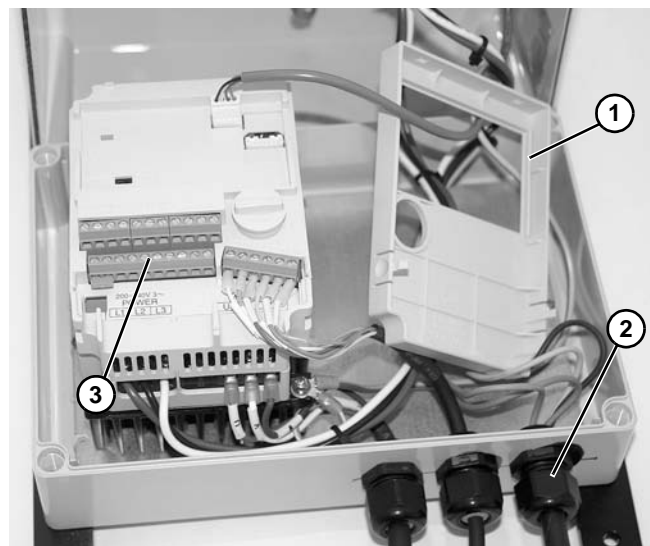


Figure 22

- Install cord grip, not provided (**Figure 22, item 2**).
- Insert external signal wires to terminals (**Figure 22, item 3**). See “External Input Signals” on page 12.
- Be sure to configure controller for remote signals. (See “Switching the Signal Method to Remote Signal (If Required)” on page 17 for details.)

Installation

External Input Signals

External input signals must be set in accordance with the desired application.

Perform the various settings specified below using the digital operator.

Application	Necessary settings
Use input signals connected to terminals X1, X2 and X3	Switch the operation-signal input method to "external input signals" on the digital operator. See "Switching the Signal Method to Remote Signal (If Required)" on page 17.

Input Signal Connection Terminals

Connect the input signals according to the operation method of your system. Dry contact signals are recommended. For solid state signals see Oriental Manual for details.

Terminal Position	Terminal Name	Signal Name	Description	Necessary settings
Lower Stage	C0	IN-COM0	Input signal common	Remove the short bar and connect an external control equipment.
	C1	IN-COM0	Input signal common	-
	X1	CW input	Clockwise rotation	Set the operation-signal input method to "external input signals" on the digital operator.
	X2	CCW input	Counterclockwise rotation	

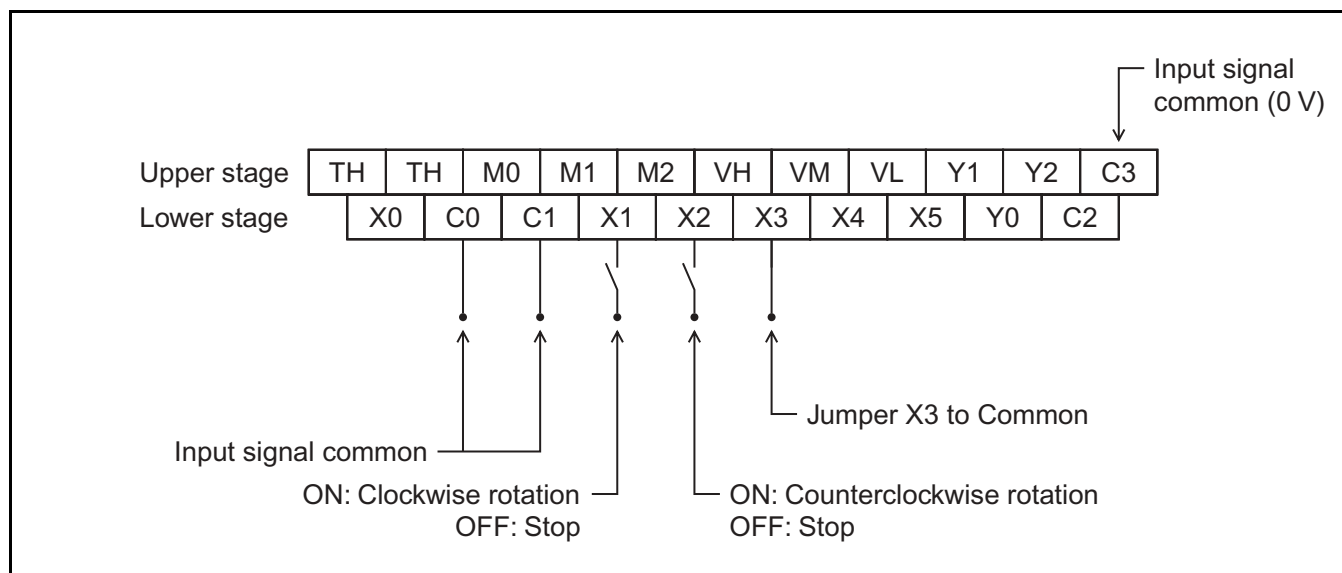



Figure 23

Controller Setup

⚠ DANGER

<p style="text-align: center;">SEVERE HAZARD!</p> <p>Hazardous voltage will cause severe injury or death. LOCKOUT POWER BEFORE WIRING.</p>

⚠ WARNING

<p style="text-align: center;">SEVERE HAZARD!</p> <p>Exposed moving parts can cause severe injury. DO NOT ATTEMPT ADJUSTMENTS WITH CONVEYOR RUNNING. LOCK OUT POWER before removing guards or performing maintenance.</p>

NOTE
<p><i>For additional information or desired settings other than listed, refer to information provided by controller manufacturer.</i></p>

When purchased with a gearmotor, Dorner configures Variable Speed VFD Controllers as follows:

- Acceleration and Deceleration, 0.5 sec
- Direction = Forward
- Speed = 0 rpm
- Remote Signal = Local (Lo)

Proceed with the following steps to change these configurations:

NOTE
<p><i>The controller is capable of storing several speed configurations of speed programs. The following instructions are for programming one only. For further details, see the controller manual.</i></p>

Setting Speed Acceleration and Deceleration

1. Press MODE to switch to the data setting mode. The PRGM LED (Figure 24, item 1) will illuminate and “SPd” (Figure 24, item 2) will be displayed.

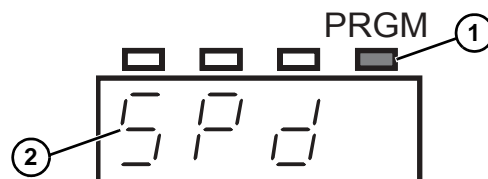


Figure 24

2. Press SET (Figure 25, item 1). “P. no1” (Figure 25, item 2) will be displayed.

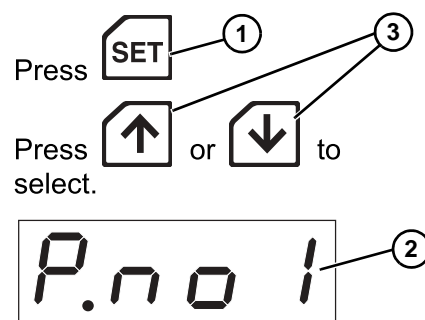


Figure 25

3. Press SET (Figure 25, item 1). Press up or down (Figure 25, item 3) until “SPd1” (Figure 26, item 1) is displayed. Press set (Figure 26, item 2) again. “SPd1” (Figure 26, item 1) will blink and correct speed (Figure 26, item 3) will be displayed.

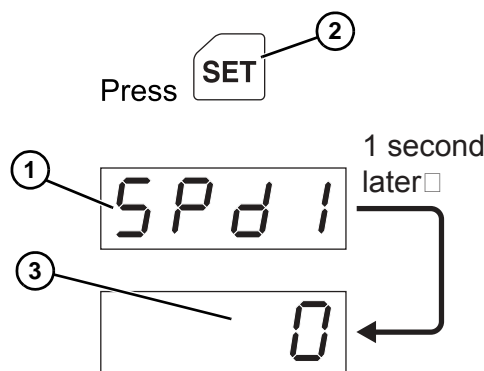


Figure 26

Operation

NOTE

Minimum Speed = 100 rpm
Maximum Speed = 3000 rpm

4. Press up or down (**Figure 27, item 1**) to change the speed (e.g., 1000 r/min) (**Figure 27, item 2**). Pressing and holding the key for 3 seconds or more will increase or decrease the value successively.

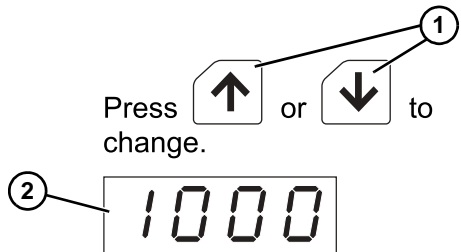


Figure 27

5. After the speed has been changed, press SET (**Figure 28, item 1**) to confirm the new setting. The display will blink and show “Acc1” (**Figure 28, item 2**), after which the acceleration time (**Figure 28, item 3**) will be displayed

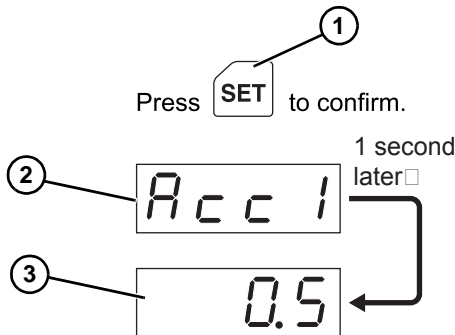


Figure 28

6. Press up or down (**Figure 29, item 1**) to change the acceleration time (e.g., 5.0) (**Figure 29, item 2**). Pressing and holding the key for 3 seconds or more will increase or decrease the value successively

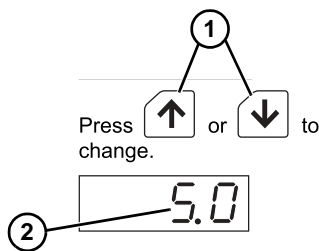


Figure 29

7. After the acceleration time has been changed, press SET (**Figure 30, item 1**) to confirm the new setting. The display will blink and show “dEc1” (**Figure 30, item 2**), after which the deceleration time (**Figure 30, item 3**) will be displayed.

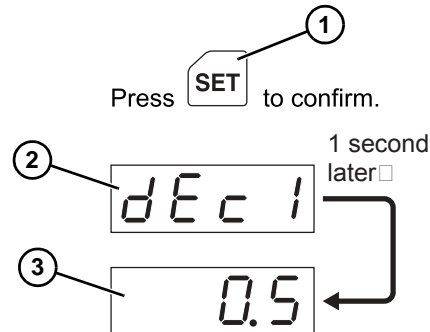


Figure 30

8. Press up or down (**Figure 31, item 1**) to change the deceleration time (e.g., 5.0) (**Figure 31, item 2**). Pressing and holding the key for 3 seconds or more will increase or decrease the value successively.

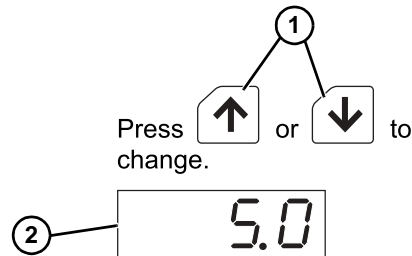


Figure 31

9. After the deceleration time has been changed, press SET (**Figure 32, item 1**) to confirm the new setting. The display will blink.

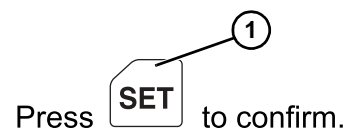


Figure 32

10. Press MODE to switch to the monitor mode.

Set Motor Direction

The initial setting is “For” (clockwise).

1. Press MODE to switch to the direction setting mode.
The F/R LED (**Figure 33, item 1**) will illuminate.

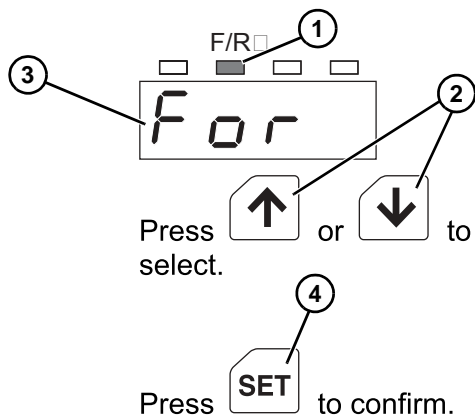


Figure 33

2. Press up or down (**Figure 33, item 2**) to select a desired direction. “For” (**Figure 33, item 3**): Clockwise or “rEv”: Counterclockwise.
3. Press SET (**Figure 33, item 4**) to confirm the selection.
The display will blink.

Displaying the Conveyor Belt Speed

While the motor is operating, the speed of the motor output shaft is displayed on the digital operator. To show the speed of the conveyor belt (speed ft/minute), set the gear ratio to the conveyor gear ratio in use.

1. Calculate the conveyor gear ratio using the formula below:

$$\text{Conveyor gear ratio} = \frac{(\text{Gearhead Ratio}) \times (\text{Drive Sprocket Teeth})}{(4.28 \text{ Factor}) \times (\text{Pulley Dia.}) \times (3.14) \times (\text{Driven Sprocket Teeth})}$$

- where:
- Gearhead ratio = ratio of inline or 90 degree gearbox
- Pulley diameter = Diameter of Drive Pulley (Ft)
 - 2200 Series = 0.104
 - 3200 Series = 0.25
 - 2200 Precision Move End Drive Series = 0.125
 - 2200 Precision Move Mid Drive Series = 0.167
 - 3200 Precision Move End Drive Series = 0.275
 - 2200 Modular Belt Series = 0.125
 - 5300 Modular Belt Series = 0.325
 - 5200 Modular Belt Series = 0.325
- Drive Sprocket Teeth = Number of teeth on sprocket connected to gearmotor. Note: For all side drives = 1.
- Driven Sprocket Teeth = Number of teeth on sprocket connected to conveyor shaft. Note: For all side drives = 1.

NOTE

To convert the display to meters/min., enter all pulley diameters in meters and omit the 4.28 division factor in the equation.

- Example:
 - 2200 Series Conveyor with a 62M015PLBDDEN Gearmotor and a light load bottom mount with a 44 tooth pulley on the gearmotor and a 22 tooth pulley on the conveyor.

- Conveyor gear ratio =

$$\frac{(\text{Gearhead Ratio}) \times (\text{Drive Sprocket Teeth})}{(4.28 \text{ Factor}) \times (\text{Pulley Dia.}) \times (3.14) \times (\text{Driven Sprocket Teeth})}$$

$$\frac{(15) \times (44)}{(4.28) \times (0.104) \times (3.14) \times (22)}$$

- Conveyor gear ratio = 21.5

Operation

2. Press MODE to switch to the data setting mode. The PRGM LED (Figure 34, item 1) will illuminate and “SPd” (Figure 34, item 2) will be displayed.

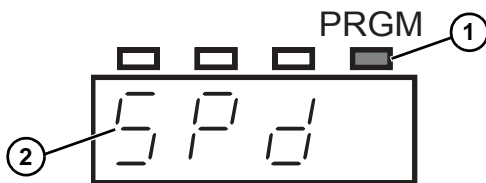


Figure 34

3. Press up (Figure 35, item 1) to select “Gr-r”(Figure 35, item 2) (gear ratio), and then press SET (Figure 35, item 3).

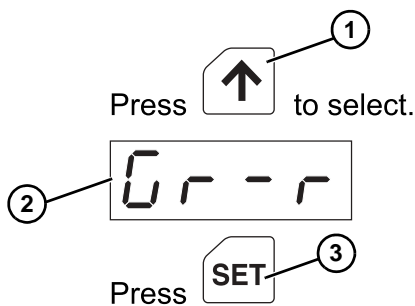


Figure 35

4. Press up or down (Figure 36, item 1) to select the speed display mode “cv” (Figure 36, item 2), and then press SET (Figure 36, item 3):

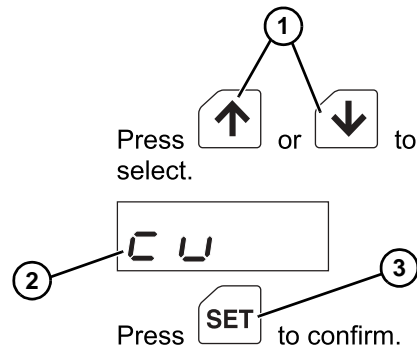


Figure 36

- cv: Conveyor transfer speed display (the m/min LED will illuminate).
5. Press up or down (Figure 37, item 1) to change the conveyor gear ratio (e.g., 100 (Figure 37, item 2)). Pressing and holding the key for 3 seconds or more will increase or decrease the value successively.

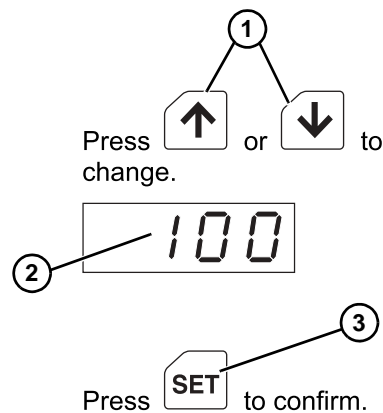


Figure 37

6. After the gear ratio has been changed, press SET (Figure 37, item 3) to confirm the new setting.
7. Press MODE to switch to the monitor mode. The r/min LED or m/min LED will illuminate according to the specified display mode.

Setting Speed While Motor is Running

1. While the motor is running, press MODE (Figure 38, item 1) with the display showing the speed (e.g., 1000 r/min) (Figure 38, item 2). The MNTR LED (Figure 38, item 3) will blink.

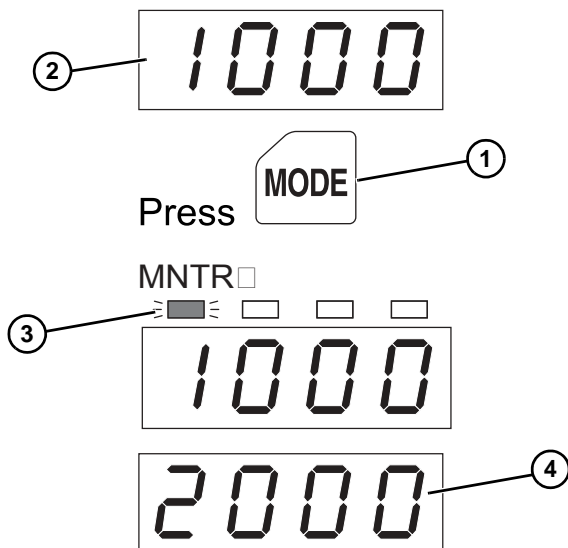


Figure 38

2. Press up or down (Figure 39, item 1) to change motor speed and set operation data to write the current speed to (e.g., SPd1) (Figure 39, item 2).

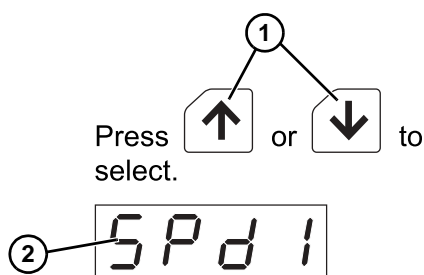


Figure 39

3. Press SET (Figure 40, item 1). The new speed will be set to the operation data digitally.

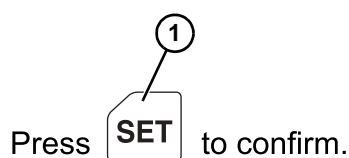


Figure 40

Switching the Signal Method to Remote Signal (If Required)

1. Turn on the power.
2. Set the operation method to "Remote".

The initial setting is "Lo" (digital operator).

- a. Press MODE to switch to the digital operator/external input signal setting mode. The LO/RE LED (Figure 41, item 1) will illuminate.

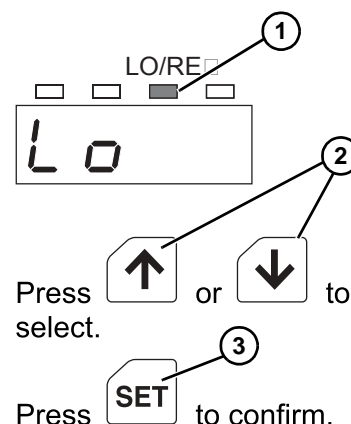



Figure 41

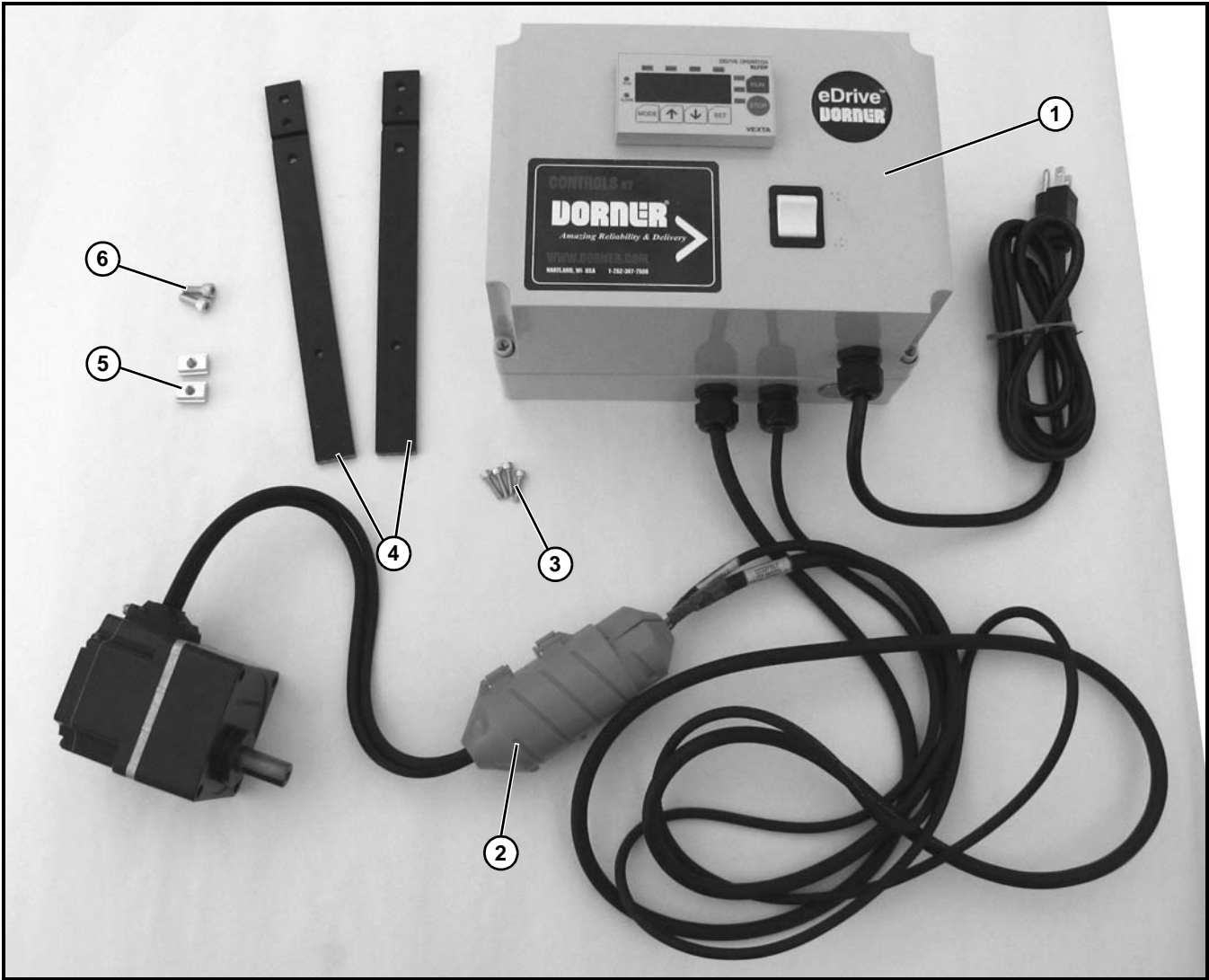
- b. Press up or down (Figure 41, item 2) select to select "RE" (remote operator).
- c. Press SET (Figure 41, item 3) to confirm the selection. The display will blink.

Notes

NOTE

For replacement parts other than those shown in this section, contact an authorized Dorner Service Center or the factory. Key Service Parts and Kits are identified by the Performance Parts Kits logo . Dorner recommends keeping these parts on hand.

Brushless DC Motor Control



Item	Part Number	Description
1	63MBD11B60	Controller, 115 Volts, 60 Watts
	63MBD23B60	Controller, 230 Volts, 60 Watts
	63MBD11B200	Controller, 115 Volts, 200 Watts
	63MBD23B200	Controller, 230 Volts, 200 Watts
2	807-2190	Cord Cover
3	920416M	Socket Head Screws, M4-0.70x16 (x4)
4	350292	Mounting Bars (x2)
5	639971MK10	T-Bar, Single Drop-In (x10)
6	920616M	Socket Head Screws, M6-1.00x16 (x2)

Return Policy

Returns must have prior written factory authorization or they will not be accepted. Items that are returned to Dorner without authorization will not be credited nor returned to the original sender. When calling for authorization, please have the following information ready for the Dorner factory representative or your local distributor:

1. Name and address of customer.
2. Dorner part number(s) of item(s) being returned.
3. Reason for return.
4. Customer's original order number used when ordering the item(s).
5. Dorner or distributor invoice number (if available, part serial number).

A representative will discuss action to be taken on the returned items and provide a Returned Goods Authorization (RMA) number for reference. RMA will automatically close 30 days after being issued. To get credit, items must be new and undamaged. There will be a return charge on all items returned for credit, where Dorner was not at fault. It is the customer's responsibility to prevent damage during return shipping. Damaged or modified items will not be accepted. The customer is responsible for return freight.

	Product Type								
	Standard Products								Engineered to order parts
Product Line	Conveyors	Gearmotors & Mounting Packages	Support Stands	Accessories	Spare Parts (non-belt)	Spare Belts - Standard Flat Fabric	Spare Belts - Cleated & Specialty Fabric	Spare Belts - Plastic Chain	All equipment and parts
1100	30% return fee for all products except: 50% return fee for conveyors with modular belt, cleated belt or specialty belts						non-returnable		case-by-case
2200									
2200 Modular Belt									
2200 Precision Move									
2300									
2300 Modular Belt									
3200									
3200 LPZ									
3200 Precision Move									
4100									
5200									
5300									
6200									
Controls									
7200 / 7300	50% return fee for all products								
7350	non-returnable								
7360									
7400									
7600									

Returns will not be accepted after 60 days from original invoice date. The return charge covers inspection, cleaning, disassembly, disposal and reissuing of components to inventory. If a replacement is needed prior to evaluation of returned item, a purchase order must be issued. Credit (if any) is issued only after return and evaluation is complete.

Dorner has representatives throughout the world. Contact Dorner for the name of your local representative. Our Customer Service Team will gladly help with your questions on Dorner products.

For a copy of Dorner's Warranty, contact factory, distributor, service center or visit our website at www.dorner.com.

For replacement parts, contact an authorized Dorner Service Center or the factory.



Dorner Mfg. Corp. reserves the right to change or discontinue products without notice. All products and services are covered in accordance with our standard warranty. All rights reserved. © Dorner Mfg. Corp. 2012

DORNER MFG. CORP.

975 Cottonwood Ave., PO Box 20
Hartland, WI 53029-0020 USA
TEL 1-800-397-8664 (USA)
FAX 1-800-369-2440 (USA)
Internet: www.dorner.com

Outside the USA:
TEL 1-262-367-7600
FAX 1-262-367-5827