



AMERICAN
CONTROL
ELECTRONICS

LGD Series

USER MANUAL

LGD400-1.5
LGD400-10
LGD410-1.5
LGD410-10
LGD430-1.5
LGD430-10
LGD440-1.5
LGD440-10



Dear Valued Consumer:

Congratulations on your purchase of the **LGD Series** drive. This User Manual was created for you to get the most out of your new device and assist with the initial setup. Please visit www.americancontrolelectronics.com to learn more about our other drives.

Thank you for choosing **American Control Electronics®!**

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Safety First!

SAFETY WARNINGS



Text in gray boxes denote important safety tips or warnings. Please read these instructions carefully before performing any of the procedures contained in this manual.

- **DO NOT INSTALL, REMOVE, OR REWIRE THIS EQUIPMENT WITH POWER APPLIED.** Have a qualified electrical technician install, adjust and service this equipment. Follow the National Electrical Code and all other applicable electrical and safety codes, including the provisions of the Occupational Safety and Health Act (OSHA), when installing equipment.
- Reduce the chance of an electrical fire, shock, or explosion by using proper grounding techniques, over-current protection, thermal protection, and enclosure. Follow sound maintenance procedures.



It is possible for a drive to run at full speed as a result of a component failure. AMERICAN CONTROL ELECTRONICS® (ACE) strongly recommends the installation of a master switch in the main power input to stop the drive in an emergency.

Circuit potentials are at 115 VAC or 230 VAC above earth ground. Avoid direct contact with the printed circuit board or with circuit elements to prevent the risk of serious injury or fatality. Use a non-metallic screwdriver for adjusting the calibration trim pots. Use approved personal protection equipment and insulated tools if working on this drive with power applied.

Table of Contents

Section 1. Specifications	1
Section 2. Dimensions	3
Section 3. Installation	9
Chassis Drives	9
Mounting	9
Heat Sinking	10
Speed Adjust Potentiometer	11
Wiring	12
Shielding Guidelines	12
Line Fusing.....	13
Connections	15
Cased Drives	18
Mounting (NEMA 1 Enclosures)	18
Mounting (NEMA 4X Enclosures).....	19
Heat Sinking.....	20
Wiring.....	21
Line Fusing.....	21
Connections	22
Section 4. Operation	24
Before Applying Power	24
Select Switches	25
Input Voltage Select (SW501, SW502)	25
Armature Voltage Select (SW503)	25
Operation Modes	26
Speed Mode	26
Torque Mode	26
Startup.....	28
LGD400-1.5 and LGD400-10	28
LGD410-1.5, LGD410-10, LGD440-1.5, and LGD440-10.....	28
LGD430-1.5 and LGD430-10	29

Starting and Stopping Methods	30
Line Starting and Stopping	30
Dynamic Braking	31
Inhibit Terminals	33
Decelerating to Minimum Speed	35
Section 5. Calibration	36
Minimum Speed (MIN SPD)	37
Maximum Speed (MAX SPD)	37
Torque (TORQUE)	38
IR Compensation (IR COMP)	39
Acceleration (ACCEL)	41
Deceleration (DECEL)	41
Torque Mode Calibration	42
Section 6. Application Notes	43
Multiple Fixed Speeds	43
Adjustable Speeds Using Potentiometers In Series	44
Independent Adjustable Speeds	45
RUN/JOG Switch - Inhibit Connection	46
RUN/JOG Switch - Potentiometer Connection	47
Leader-Follower Application	48
Single Speed Potentiometer Control Of Multiple Drives	49
Reversing	50
Reversing with a CLD100-1 Controller	51
Section 7. Diagnostic LEDs	52
Section 8. Troubleshooting	53
Before Troubleshooting	53
Section 9. Block Diagrams	56
Section 10. Accessories & Replacement Parts	59
Notes	61
Unconditional Warranty	63

List of Tables

Table 1	Recommended Line Fuse Sizes	14
Table 2	Minimum Recommended Dynamic Brake Resistor Values ...	32

List of Figures

Figure 1	LGD400-1.5 and LGD400-10 Dimensions	3
Figure 2	LGD410-1.5 and LGD410-10 Dimensions	4
Figure 3	LGD430-1.5 and LGD430-10 Dimensions	5
Figure 4	LGD440-1.5 and LGD440-10 Dimensions	6
Figure 5	HSK-0001 Dimensions.....	7
Figure 6	HSK-0002 Dimensions.....	8
Figure 7	Speed Adjust Potentiometer	11
Figure 8	Chassis Drive Connections	16
Figure 9	Analog Input Signal Connections.....	17
Figure 10	Cased Drive Connections	23
Figure 11	Select Switches	25
Figure 12	J503 SPEED/TORQUE Jumper Settings.....	27
Figure 13	J503 SPEED/TORQUE Jumper Location.....	27
Figure 14	Dynamic Brake Wiring with Normally Open Inhibit.....	32
Figure 15	Inhibit Terminals	33
Figure 16	Inhibit Personality Configuration	34
Figure 17	Run/Decelerate to Minimum Speed Switch	35
Figure 18	Recommended TORQUE and IR COMP Settings	40
Figure 19	Multiple Fixed Speeds	43
Figure 20	Adjustable Speeds Using Potentiometers in Series.....	44
Figure 21	Independent Adjustable Speeds.....	45
Figure 22	RUN/JOG Switch - Connection to Inhibit Plug with Normally Open Inhibit set for Zero Mode	46
Figure 23	RUN/JOG Switch - Connection to Speed Adjust Potentiometer	47
Figure 24	Leader-Follower Application	48
Figure 25	Single Speed Potentiometer Control of Multiple Drives.....	49
Figure 26	Reversing Circuit Wiring	50

Figure 27	Reversing with a CLD100-1	51
Figure 28	Diagnostic LED Locations	52
Figure 29	LGD Series Block Diagram	56
Figure 30	LGD410-1.5, LGD410-10, LGD440-1.5, and LGD440-10 Terminal Block Connections	57
Figure 31	LGD430-1.5 and LGD430-10 Terminal Block Connections	58

Section 1. Specifications

<i>Model</i>	<i>Maximum Armature Current (ADC)</i>	<i>HP Range with 90 VDC Motor</i>	<i>HP Range with 180 VDC Motor</i>	<i>Enclosure</i>
LGD400-1.5	1.5	1/20 - 1/8	1/10 - 1/4	Chassis
LGD410-1.5				NEMA 1
LGD430-1.5				NEMA 1
LGD440-1.5				NEMA 4X
LGD400-10*	10.0	1/8 - 1	1/4 - 2	Chassis
LGD410-10**				NEMA 1
LGD430-10**				NEMA 1
LGD440-10				NEMA 4X

* Heat sink kit part number HSK-0001 must be used when the continuous current output is over 5 amps.

** Heat sink kit part number HSK-0002 must be used when the continuous current output is over 5 amps.

AC Line Voltage	115/230 VAC ± 10% 50/60 Hz, single phase
DC Armature Voltage	
<i>with 115 VAC Line Voltage</i>	0 - 90 VDC
<i>with 230 VAC Line Voltage</i>	0 - 180 VDC
Acceleration Time Range	0.5 - 17 seconds
Deceleration Time Range	coast to a stop - 25 seconds
Analog Input Range (Signal must be isolated; S1 to S2)	0 - 2.5 VDC
Input Impedance (S1 to S2)	>100K ohms
Form Factor	1.37 at base speed
Load Regulation	1% base speed or better
Speed Range	60:1

Vibration

0.5G maximum (0 - 50 Hz)

0.1G maximum (> 50 Hz)

Safety Certifications

UL/cUL Listed Equipment, File # E132235

CSA Certified Component, File # LR41380

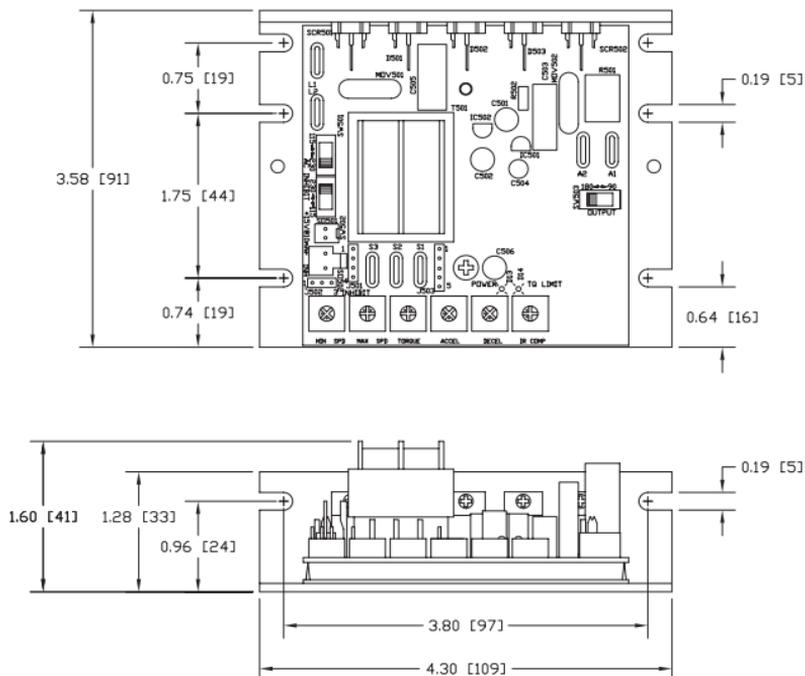
Ambient Temperature Range*Chassis Drive*

10°C - 55°C

Cased Drive

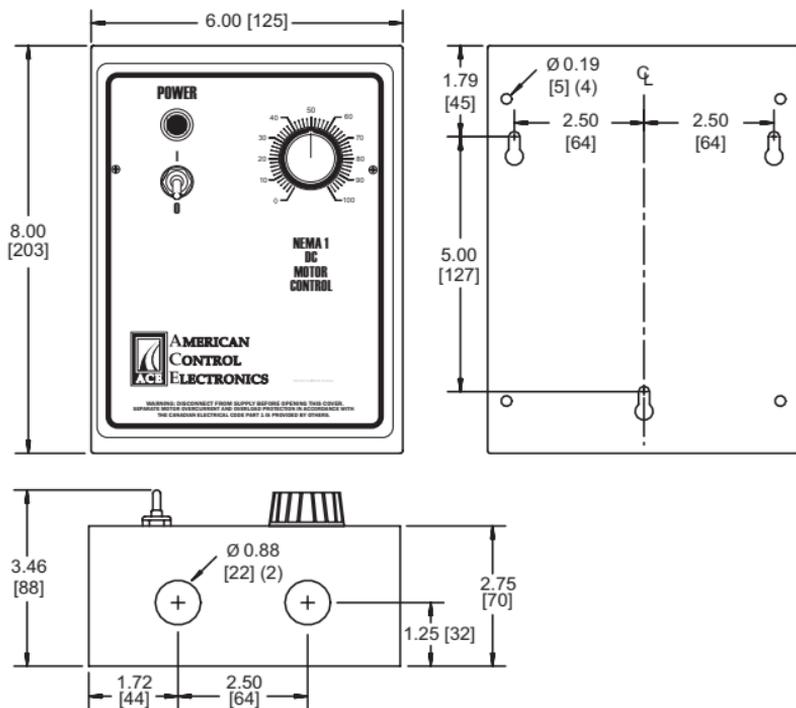
10°C - 40°C

Section 2. Dimensions



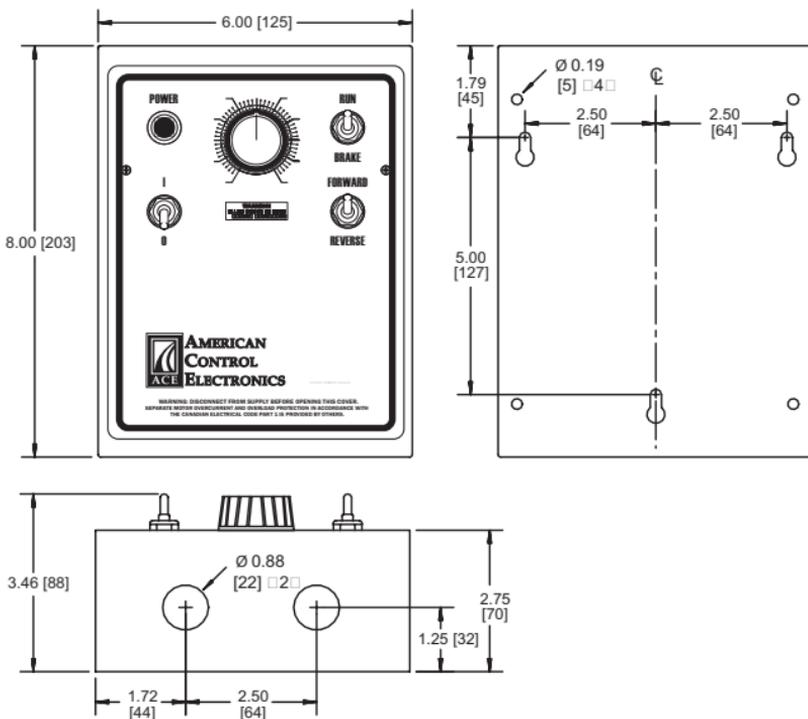
ALL DIMENSIONS IN INCHES [MILLIMETERS]

Figure 1. LGD400-1.5 and LGD400-10 Dimensions



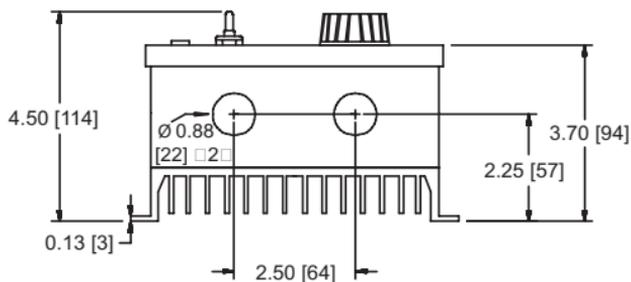
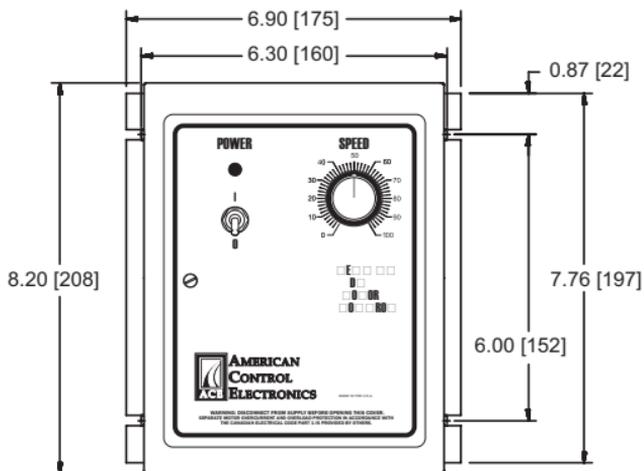
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Figure 2. LGD410-1.5 and LGD410-10 Dimensions



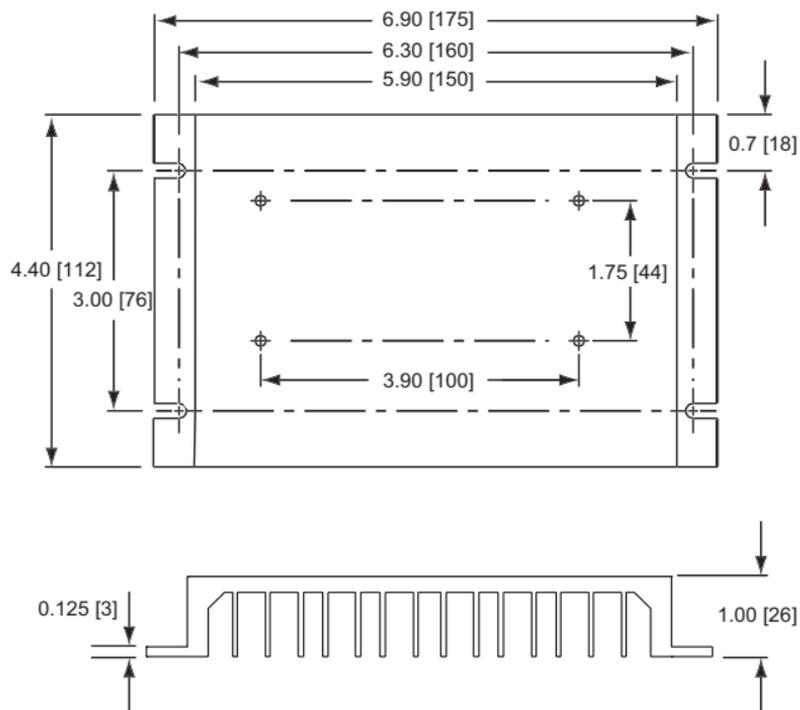
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Figure 3. LGD430-1.5 and LGD430-10 Dimensions



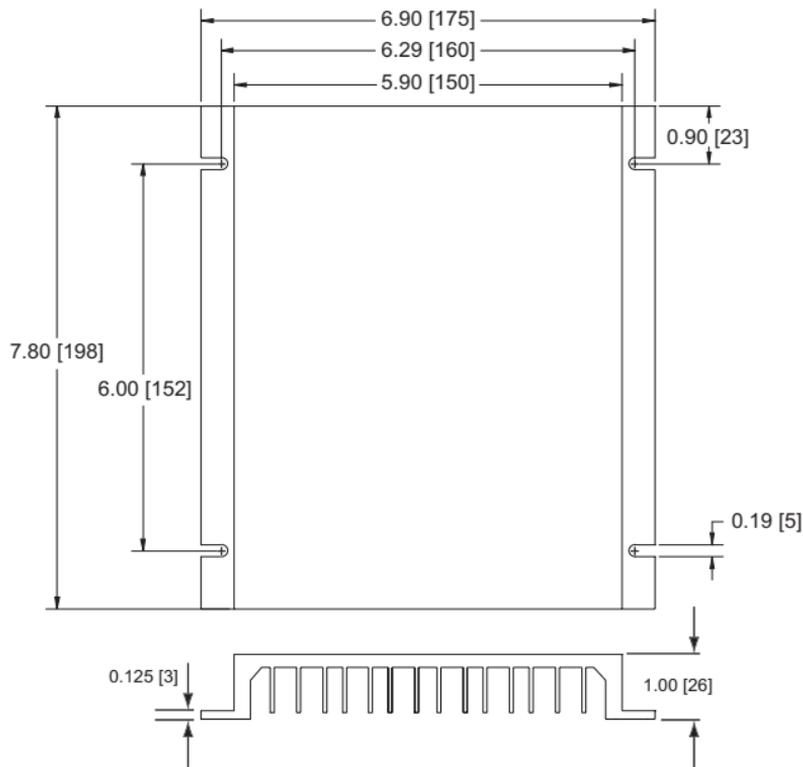
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Figure 4. LGD440-1.5 and LGD440-10 Dimensions



ALL DIMENSIONS IN INCHES [MILLIMETERS]

Figure 5. HSK-0001 Dimensions



ALL DIMENSIONS IN INCHES [MILLIMETERS]

Figure 6. HSK-002 Dimensions

Section 3. Installation



Do not install, rewire, or remove this control with input power applied. Failure to heed this warning may result in fire, explosion, or serious injury. Make sure you read and understand the Safety Precautions on page i before attempting to install this product.

Chassis Drives

Mounting

- Drive components are sensitive to electrostatic discharge. Avoid direct contact with the circuit board. Hold the drive by the chassis or heat sink only.
- Protect the drive from dirt, moisture, and accidental contact.
- Provide sufficient room for access to the terminals and calibration trim pots.
- Mount the drive away from heat sources. Operate the drive within the specified ambient operating temperature range.
- Prevent loose connections by avoiding excessive vibration of the drive.
- Mount the drive with its board in either a horizontal or vertical plane. Eight 0.19" (5 mm) wide slots in the chassis accept #8 pan head screws. Fasten either the large base or the narrow flange of the chassis to the subplate.
- The chassis should be earth grounded. Use a star washer beneath the head of at least one of the mounting screws to penetrate the anodized surface and to reach bare metal.

Heat Sinking

The LGD series drive LGD400-10 requires an additional heat sink when the continuous armature current is above 5 amps. Use ACE heat sink kit part number HSK-0001. All other chassis drives have sufficient heat sinking in their basic configuration. Use a thermally conductive heat sink compound (such as Dow Corning® 340 Heat Sink Compound) between the chassis and the heat sink surface for optimum heat transfer.

Speed Adjust Potentiometer



Be sure that the potentiometer tabs do not make contact with the potentiometer's body. Grounding the input will cause damage to the drive.

Mount the speed adjust potentiometer through a 0.38 in. (10 mm) hole with the hardware provided (Figure 7). Install the circular insulating disk between the panel and the 10K ohm speed adjust potentiometer.

Twist the speed adjust potentiometer wires to avoid picking up unwanted electrical noise. If the speed adjust potentiometer wires are longer than 18 in. (46 cm), use shielded cable. Keep the speed adjust potentiometer wires separate from power leads (L1, L2, A1, A2).

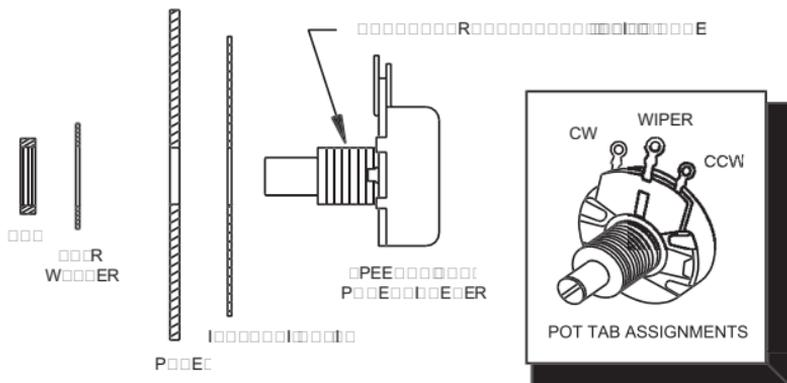


Figure 7. Speed Adjust Potentiometer

Wiring



Do not install, rewire, or remove this control with input power applied. Failure to heed this warning may result in fire, explosion, or serious injury.

Circuit potentials are at 115 or 230 VAC above ground. To prevent the risk of injury or fatality, avoid direct contact with the printed circuit board or with circuit elements.

Do not disconnect any of the motor leads from the drive unless power is removed or the drive is disabled. Opening any one motor lead while the drive is running may destroy the drive.

- Use 18 - 24 AWG wire for logic wiring. Use 14 - 16 AWG wire for AC line and motor wiring.

Shielding Guidelines



Under no circumstances should power and logic level leads be bundled together. Induced voltage can cause unpredictable behavior in any electronic device, including motor controls.

As a general rule, AMERICAN CONTROL ELECTRONICS® (ACE) recommends shielding of all conductors. If it is not practical to shield power conductors, ACE recommends shielding all logic-level leads. If shielding of all logic-level leads is not practical, the user should twist all logic leads with themselves to minimize induced noise.

It may be necessary to earth ground the shielded cable. If noise is produced by devices other than the drive, ground the shield at the drive end. If noise is generated by a device on the drive, ground the shield at the end away from the drive. Do not ground both ends of the shield.

Shielding Guidelines (continued)

If the drive continues to pick up noise after grounding the shield, it may be necessary to add AC line filtering devices, or to mount the drive in a less noisy environment.

Logic wires from other input devices, such as motion controllers and PLL velocity controllers, must be separated from power lines in the same manner as the logic I/O on this drive.

Line Fusing

ACE drives should be fused for protection. Use fast acting fuses rated for 250 VAC or higher and 150% of maximum armature current. Fuse HOT L1 only when the line voltage is 115 VAC. Fuse both L1 and L2 when the line voltage is 230 VAC. Table 1 on page 14 lists the recommended line fuse sizes.

Table 1. Recommended Line Fuse Sizes

<i>90 VDC Motor Horsepower</i>	<i>180 VDC Motor Horsepower</i>	<i>Maximum DC Armature Current (amps)</i>	<i>AC Line Fuse Size (amps)</i>
<i>1/20</i>	<i>1/10</i>	<i>0.5</i>	<i>1</i>
<i>1/15</i>	<i>1/8</i>	<i>0.8</i>	<i>1.5</i>
<i>1/8</i>	<i>1/4</i>	<i>1.5</i>	<i>3</i>
<i>1/6</i>	<i>1/3</i>	<i>1.7</i>	<i>3</i>
<i>1/4</i>	<i>1/2</i>	<i>2.5</i>	<i>5</i>
<i>1/3</i>	<i>3/4</i>	<i>3.5</i>	<i>8</i>
<i>1/2</i>	<i>1</i>	<i>5.0</i>	<i>10</i>
<i>3/4</i>	<i>1 ½</i>	<i>7.5</i>	<i>15</i>
<i>1</i>	<i>2</i>	<i>10</i>	<i>15</i>

ACE offers fuse kits. See Section 10: Accessories and Replacement Parts on page 59 for fuse kit part numbers.

Connections



Do not connect this equipment with power applied. Failure to heed this warning may result in fire, explosion, or serious injury.

ACE strongly recommends the installation of a master power switch in the voltage input line, as shown in Figure 8 (page 16).

The switch contacts should be rated at a minimum of 200% of motor nameplate current and 250 volts.

Power Input

Connect the AC line power leads to terminals L1 and L2. ACE recommends the use of a single-throw, double-pole master power switch. The switch should be rated at a minimum of 250 volts and 200% of motor current. Refer to Figure 8 on page 16.

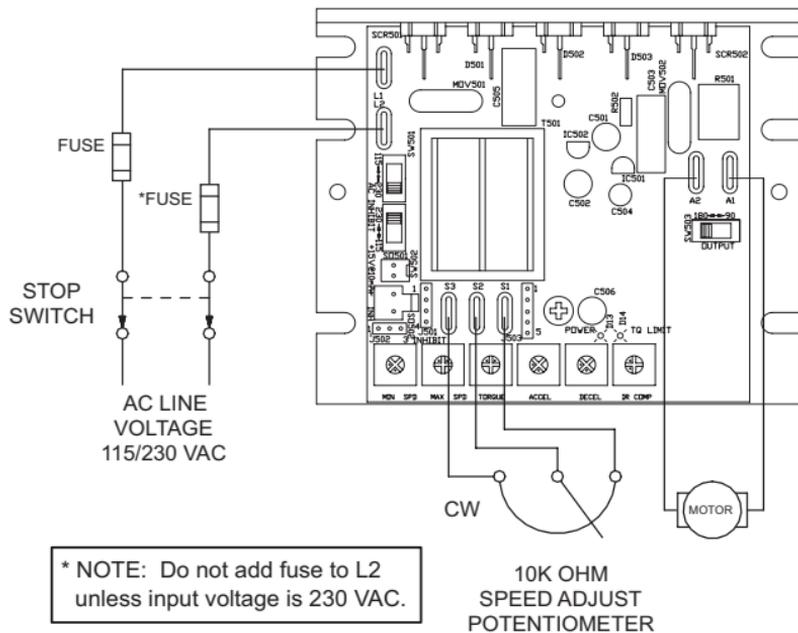
Motor

ACE drives supply motor armature voltage from A1 and A2 terminals, where A1 is positive with respect to A2. If the motor does not spin in the desired direction, remove power and reverse the A1 and A2 connections.

Connect a DC motor to terminals A1 and A2 as shown in Figure 8 on page 16. Ensure that the motor voltage rating is consistent with the drive's output voltage.

Speed Adjust Potentiometer

Use a 10K ohm, 1/4 W potentiometer for speed control. Connect the counter-clockwise end of the potentiometer to S1, the wiper to S2, and the clockwise end to S3. If the potentiometer works inversely of the desired functionality (e.g. to increase motor speed you must turn the potentiometer counterclockwise), power off the drive and swap the S1 and S3 connections. Refer to Figure 8 on page 16.



* NOTE: Do not add fuse to L2 unless input voltage is 230 VAC.

Figure 8. Chassis Drive Connections

Analog Input Signal

Instead of using a speed adjust potentiometer, the drive may be wired to follow an analog input voltage signal that is isolated from earth ground (Figure 9). Connect the signal common (-) to S1. Connect the signal input (+) to S2. Make no connection to S3. A potentiometer can be used to scale the analog input voltage. An interface device, such as ACE model ISO202-1, may be used to scale and isolate an analog input voltage.

An analog input voltage range of 0–2.5 VDC is required to produce an armature voltage range of 0–90 VDC with 115 VAC line voltage, or 0–180 VDC with 230 VAC line voltage.

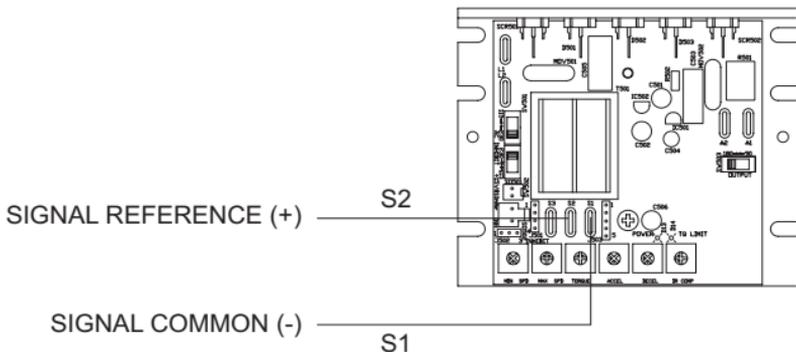


Figure 9. Analog Input Signal Connections

Cased Drives



Do not install, rewire, or remove this control with input power applied. Failure to heed this warning may result in fire, explosion, or serious injury. Make sure you read and understand the Safety Precautions on page i before attempting to install this product.

Mounting (NEMA 1 Enclosures)

NEMA 1 cased drives come with two 0.88 inch (22 mm) conduit holes at the bottom of the case. The units may be vertically wall mounted or horizontally bench mounted using the three keyholes on the back of the case.

1. For access to the keyholes and the terminal strip, remove the two screws from the front of the case by turning them counterclockwise. Grasp the front cover and pull it straight out.
2. Install the mounting screws in the three keyholes.
3. Set the POWER switch to the OFF position before applying the AC line voltage.
4. Install conduit hardware through the conduit holes at the bottom of the case. Connect external wiring to the terminal block.
5. Reinstall the front cover. Avoid pinching any wires between the front cover and the case.
6. Reinstall the two screws on the front cover. Turn the screws clockwise to tighten.

Mounting (NEMA 4X Enclosures)

NEMA 4X cased drives come with two 0.88 inch (22 mm) conduit knockout holes at the bottom of the case. The units may be vertically wall mounted using the four 0.19 inch (5 mm) slotted holes on the attached heat sink. For motor loads less than 5 ADC, the drive may be bench mounted horizontally or operated without mounting.

1. Install the mounting screws.
2. For access to the terminal strip, turn the slotted screw on the front cover counterclockwise until it is free from the case. The right side of the cover is hinged to the case. Pull the slotted screw to open the case.
3. Carefully remove the conduit knockouts by tapping them into the case and twisting them off with pliers.
4. Set the POWER switch to the OFF position before applying the AC line voltage.
5. Install conduit hardware through the 0.88 inch (22 mm) knockout holes. Connect external wiring to the terminal block.
6. Grasp the slotted screw and tilt the front cover back into place. Avoid pinching any wires between the front cover and the case.
7. Turn the slotted screw clockwise until tight to secure the front cover.

Heat Sinking

The LGD series drives LGD410-10 and LGD430-10 require an additional heat sink when the continuous armature current is above 5 amps. Use ACE heat sink kit part number HSK-0002. All other cased drives have sufficient heat sinking in their basic configurations. Use a thermally conductive heat sink compound (such as Dow Corning® 340 Heat Sink Compound) between the back of the case and heat sink surface for optimum heat transfer.

Wiring



Do not install, rewire, or remove this control with input power applied. Failure to heed this warning may result in fire, explosion, or serious injury.

Circuit potentials are at 115 or 230 VAC above ground. To prevent the risk of injury or fatality, avoid direct contact with the printed circuit board or with circuit elements.

Do not disconnect any of the motor leads from the drive unless power is removed or the drive is disabled. Opening any one motor lead while the drive is running may destroy the drive.

- Use 18 - 24 AWG wire for logic wiring. Use 14 - 16 AWG wire for AC line and motor wiring.

Line Fusing

Models LGD410-10, LGD430-10 and LGD440-10 are preinstalled with 15 amp fuses. Models LGD410-1.5, LGD430-1.5 and LGD440-1.5 are preinstalled with 3 amp fuses.

Preinstalled line fuses are rated at or close to maximum horsepower. If the horsepower rating of the motor being used is less than the maximum horsepower rating of the drive, the line fuse may have to be replaced with a lower rated one. Fuses should be rated for 250 VAC or higher and approximately 150% of the maximum armature current. Refer to Table 1 on page 14 for recommended fuse values.

Connections



Do not connect this equipment with power applied. Failure to heed this warning may result in fire, explosion, or serious injury.

Power Input

Connect the AC line power leads to screw terminals 1 (L1) and 2 (L2 115) if using a 115 VAC line or to terminals 1 (L1) and 3 (L2 230) if using a 230 VAC line. Refer to Figure 10, page 23.

Motor

ACE drives supply motor voltage from A1 and A2 terminals, where A1 is positive with respect to A2. If the motor does not spin in the desired direction, remove power and reverse the A1 and A2 connections.

Connect a DC motor to screw terminals 5 (A1) and 4 (A2) as shown in Figure 10 on page 23. Ensure that the motor voltage rating is consistent with the drive's output voltage.

Analog Input Signal

Instead of using the speed adjust potentiometer on the front cover, the drive may be wired to follow an analog input voltage signal that is isolated from earth ground. See page 17 for details and wiring.

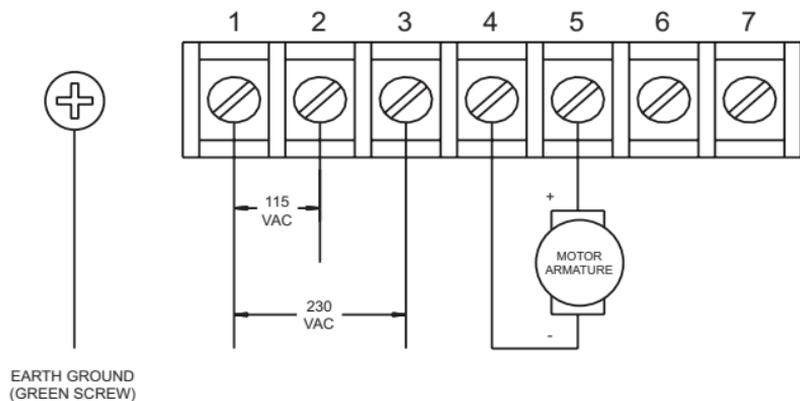


Figure 10. Cased Drive Connections

Section 4. Operation



Change voltage switch settings only when the drive is disconnected from AC line voltage. Make sure both switches are set to their correct position. If the switches are improperly set to a lower voltage position, the motor will not run at full voltage and may cause damage to the transformer. If the switches are improperly set to a higher voltage position, the motor will overspeed, which may cause motor damage, or result in bodily injury or loss of life.

Dangerous voltages exist on the drive when it is powered. BE ALERT. High voltages can cause serious or fatal injury. For your safety, use personal protective equipment (PPE) when operating this drive.

If the motor or drive does not perform as described, disconnect the AC line voltage immediately. Refer to the Troubleshooting section, page 53, for further assistance.

Before Applying Power

1. Verify that no foreign conductive material is present on the printed circuit board.
2. Ensure that all switches and jumpers are properly set.

Select Switches

Input Voltage Select (SW501, SW502)

Set the input voltage select switches SW501 and SW502 to either 115 or 230 to match the AC line voltage. See Figure 11.

Armature Voltage Select (SW503)

Set the armature voltage select switch SW503 to either 90 or 180 to match the maximum armature voltage. See Figure 11.

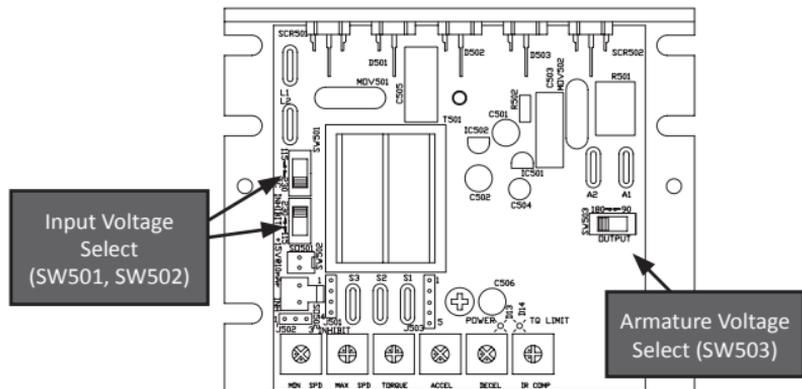


Figure 11. Select Switches

Operation Modes



MAX SPD and TORQUE trim pots must be recalibrated everytime the drive is switched between SPEED and TORQUE mode.

Speed Mode

In Speed Mode, the external potentiometer adjusts the speed (voltage) of the motor. The on-board MAX SPD trim pot sets the maximum speed of the motor. The on-board TORQUE trim pot sets the maximum torque available. The drive comes factory calibrated for speed mode.

To run the drive in Speed Mode, jumper pins 2 & 3 and pins 4 & 5 on J503. See Figure 12 and Figure 13 on page 27 for jumper settings and location.

Torque Mode

In Torque Mode, the external potentiometer adjusts the torque (current) of the motor. The on-board MAX SPD trim pot sets the maximum torque available. The on-board TORQUE trim pot sets the maximum speed of the motor.

To run the drive in Torque Mode, jumper pins 1 & 2 and pins 3 & 4 on J503.

See Figure 12 and Figure 13 on page 27 for jumper settings and location.

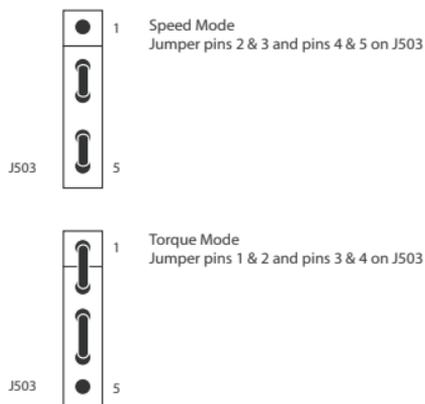


Figure 12. J503 SPEED/TORQUE Jumper Settings

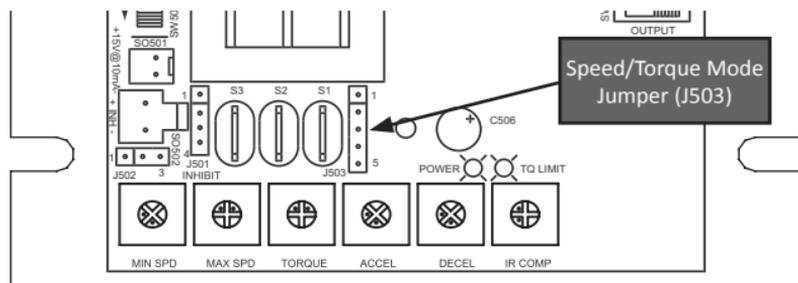


Figure 13. J503 SPEED/TORQUE Jumper Location

Startup

LGD400-1.5 and LGD400-10

1. Turn the speed adjust potentiometer full counterclockwise (CCW) or set the input voltage signal to minimum.
2. Apply AC line voltage.
3. Slowly advance the speed adjust potentiometer clockwise (CW) or increase the input voltage signal. The motor slowly accelerates as the potentiometer is turned CW or as the input voltage signal is increased. Continue until the desired speed is reached.
4. Remove AC line voltage from the drive to coast the motor to a stop.

LGD410-1.5, LGD410-10, LGD440-1.5, and LGD440-10

1. Turn the speed adjust potentiometer to “0” (full CCW) or set the input voltage signal to minimum.
2. Set the POWER switch to the ON position.
3. Slowly advance the speed adjust potentiometer clockwise (CW) or increase the input voltage signal. The motor slowly accelerates as the potentiometer is turned CW or as the input voltage signal is increased. Continue until the desired speed is reached.
4. Set the POWER switch to the OFF position to coast the motor to a stop.

LGD430-1.5 and LGD430-10



Do not change the FORWARD / REVERSE switch while the motor is running. The motor must come to a complete stop before reversing. Changing motor direction before allowing the motor to completely stop will cause excessively high current to flow in the armature circuit, and will damage the drive and/or motor.

1. Set the RUN/BRAKE switch to the BRAKE position.
2. Turn the speed adjust potentiometer to “0” (full CCW) or set the input voltage signal to minimum.
3. Set the POWER switch to the ON position.
4. Set the FORWARD/REVERSE switch to the desired direction of rotation.
5. Set the RUN/BRAKE switch to the RUN position.
6. Slowly advance the speed adjust potentiometer clockwise (CW) or increase the input voltage signal. The motor slowly accelerates as the potentiometer is turned CW or as the input voltage signal is increased. Continue until the desired speed is reached.
7. To reverse direction:
 - a. Set the RUN/BRAKE switch to the BRAKE position.
 - b. **Wait for the motor to come to a complete stop.**
 - c. Set the FORWARD/REVERSE switch to the desired direction of rotation.
 - d. Set the RUN/BRAKE switch to the RUN position.
8. To brake the motor, set the RUN/BRAKE switch to the BRAKE position. To coast the motor to a stop, set the POWER switch to the OFF position.

Starting and Stopping Methods



Dynamic braking, coasting to a stop, or decelerating to minimum speed is recommended for frequent starts and stops. Do not use any of these methods for emergency stopping. They may not stop a drive that is malfunctioning. Removing AC line power (both lines) is the only acceptable method for emergency stopping.

For this reason, ACE strongly recommends installing an emergency stop switch on both AC line inputs (see Figure 8 on page 16).

Frequent starting and stopping can produce high torque. This may cause damage to motors, especially gearmotors that are not properly sized for the application.

Automatic Restart Upon Power Restoration

All drives automatically run to set speed when power is applied and the inhibit is not active.

Line Starting and Stopping

Line starting and stopping (applying and removing AC line voltage) is recommended for infrequent starting and stopping of a drive only. When AC line voltage is applied to the drive, the motor accelerates to the speed set by the speed adjust potentiometer or analog signal. When AC line voltage is removed, the motor coasts to a stop.

Dynamic Braking



Wait for the motor to completely stop before switching back to RUN. This will prevent high armature currents from damaging the motor or drive.

Dynamic braking may be used to rapidly stop a motor (Figure 14 on page 32). For the RUN/BRAKE switch, use a two pole, two position switch rated for at least the armature voltage rating and 150% of the armature current rating. For the dynamic brake resistor, use a 40 watt minimum, high power, wirewound resistor.

Sizing the dynamic brake resistor depends on load inertia, motor voltage, and braking time. Use a lower-value, higher-wattage dynamic brake resistor to stop a motor more rapidly. Refer to Table 2 on page 32 for recommended dynamic brake resistor sizes.

Note: Models LGD430-1.5 and LGD430-10 incorporate dynamic braking in their designs.

Table 2. Minimum Recommended Dynamic Brake Resistor Values

<i>Motor Armature Voltage</i>	<i>Dynamic Brake Resistor Value</i>
90 VDC	15 ohms
180 VDC	30 ohms

For motors rated 1/17 horsepower and lower, a brake resistor is not necessary since the armature resistance is high enough to stop the motor without demagnetization. Replace the dynamic brake with 12-gauge wire.

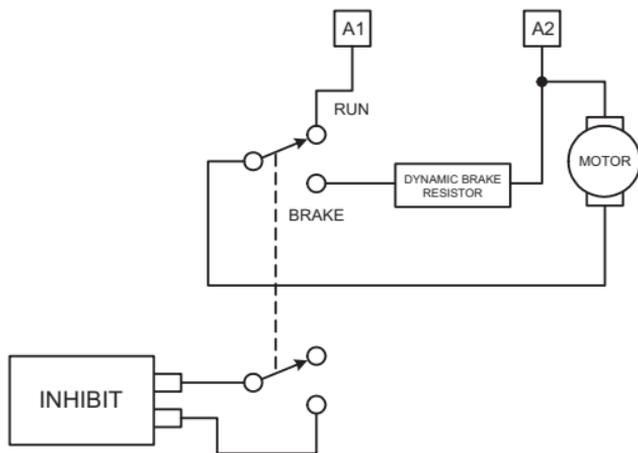


Figure 14. Dynamic Brake Wiring with Inhibit set to "Inhibit Zero Mode"

Inhibit Terminals

Activate the INHIBIT to coast the motor to minimum or zero speed (see Figure 15 for INHIBIT terminal location). Deactivate the INHIBIT terminals to accelerate the motor to set speed. See Figure 16 on page 34 for jumper J501 and J502 configuration, which determines if the INHIBIT is normally open or normally closed to run. The INHIBIT function will work the same way in Speed or Torque Mode.

Twist inhibit wires and separate them from power-carrying wires or sources of electrical noise. Use shielded cable if the inhibit wires are longer than 18 inches (46 cm). If shielded cable is used, ground only one end of the shield to earth ground. Do not ground both ends of the shield.

ACE offers two accessory plug harnesses for connecting to the INHIBIT terminals: part number KTW-0001 [plug with 18 in. (46 cm) leads]; and part number KTW-0002 [plug with 36 in. (91 cm) leads].

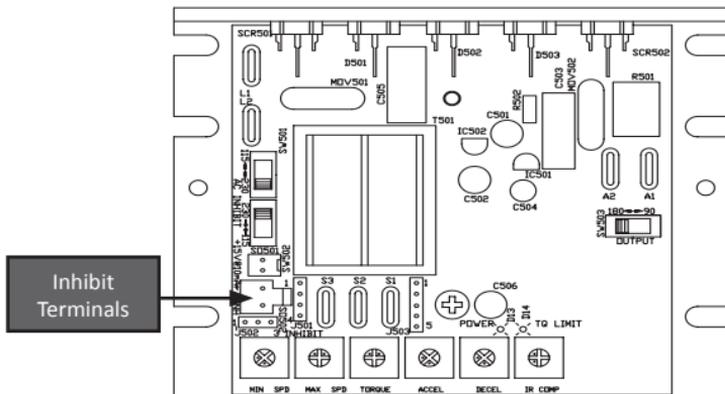
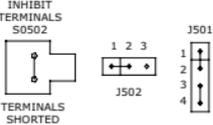
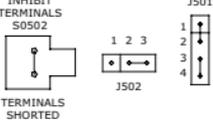
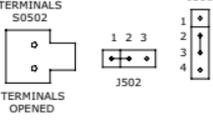
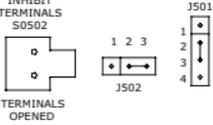


Figure 15. Inhibit Terminals

CONFIGURATION	DRIVE RESPONSE
<p>INHIBIT TERMINALS S0502</p>  <p>TERMINALS SHORTED</p>	<p>INHIBIT MIN MODE INHIBITS TO MINIMUM SPEED WHEN INHIBIT TERMINALS ARE SHORTED</p>
<p>INHIBIT TERMINALS S0502</p>  <p>TERMINALS SHORTED</p>	<p>INHIBIT ZERO MODE INHIBITS TO ZERO SPEED WHEN INHIBIT TERMINALS ARE SHORTED</p>
<p>INHIBIT TERMINALS S0502</p>  <p>TERMINALS OPENED</p>	<p>INVERT INHIBIT MIN MODE INHIBITS TO MINIMUM SPEED WHEN INHIBIT TERMINALS ARE OPENED</p>
<p>INHIBIT TERMINALS S0502</p>  <p>TERMINALS OPENED</p>	<p>INVERT INHIBIT ZERO MODE INHIBITS TO ZERO SPEED WHEN INHIBIT TERMINALS ARE OPENED</p>

NOTE: The MAX SPD and MIN SPD trim pots must be recalibrated everytime the inhibit mode (J501 or J502) jumpers are changed.

Figure 16. Inhibit Personality Configuration

Decelerating to Minimum Speed

The switch shown in Figure 17 may be used to decelerate a motor to a minimum speed. Closing the switch between S1 and S2 decelerates the motor from set speed to a minimum speed determined by the MIN SPD trim pot setting. If the MIN SPD trim pot is set full CCW, the motor decelerates to zero speed when the switch between S1 and S2 is closed. The DECEL trim pot setting determines the rate at which the drive decelerates. By opening the switch, the motor accelerates to set speed at a rate determined by the ACCEL trim pot setting.

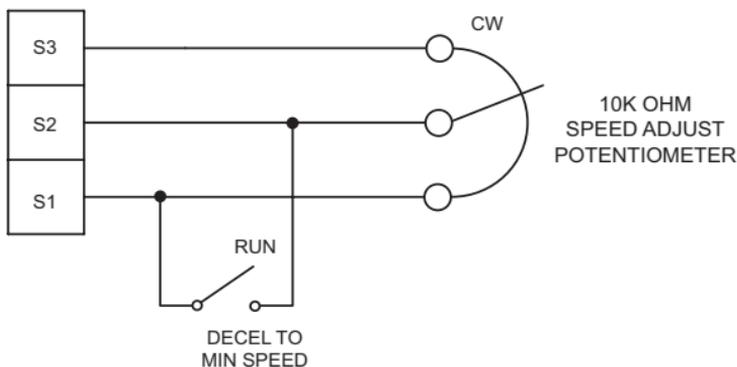


Figure 17. Run/Decelerate to Minimum Speed Switch

Section 5. Calibration



Dangerous voltages exist on the drive when it is powered. When possible, disconnect the voltage input from the drive before adjusting the trim pots. If the trim pots must be adjusted with power applied, use insulated tools and the appropriate personal protection equipment. **BE ALERT.** High voltages can cause serious or fatal injury.

LGD series drives have user-adjustable trim pots. Each drive is factory calibrated to its maximum current rating. Readjust the calibration trim pot settings to accommodate lower current rated motors.

All adjustments increase with CW rotation, and decrease with CCW rotation. Use a non-metallic screwdriver for calibration. Each trim pot is identified on the printed circuit board.

Minimum Speed (MIN SPD)

The MIN SPD setting determines the minimum motor speed when the speed adjust potentiometer or input voltage signal is set for minimum speed. It is factory set for zero speed.

To calibrate the MIN SPD:

1. Set the MIN SPD trim pot full CCW.
2. Set the speed adjust potentiometer or input voltage signal for minimum speed.
3. Adjust MIN SPD until the desired minimum speed is reached or is just at the threshold of rotation.

Maximum Speed (MAX SPD)

The MAX SPD setting determines the maximum motor speed when the speed adjust potentiometer or input voltage signal is set for maximum speed.

To calibrate MAX SPD:

1. Set the MAX SPD trim pot full CCW.
2. Set the speed adjust potentiometer or input voltage signal for maximum speed.
3. Adjust MAX SPD until the desired maximum speed is reached.

Note: Check the MIN SPD and MAX SPD adjustments after recalibrating to verify that the motor runs at the desired minimum and maximum speed.

Torque (TORQUE)



TORQUE should be set to 150% of motor nameplate current rating. Continuous operation beyond this rating may damage the motor. If you intend to operate beyond the rating, contact your ACE representative for assistance.

The TORQUE setting determines the maximum torque for accelerating and driving the motor. To calibrate TORQUE, refer to the recommended TORQUE settings in Figure 18 on page 40 or use the following procedure:

1. With the power disconnected from the drive, connect a DC ammeter in series with the armature.
2. Set the TORQUE trim pot to minimum (full CCW).
3. Set the speed adjust potentiometer or input voltage signal to maximum speed.
4. Carefully lock the motor armature. Be sure that the motor is firmly mounted.
5. Apply line power. The motor should be stopped.
6. Slowly adjust the TORQUE trim pot CW until the armature current is 150% of motor rated armature current.
7. Turn the speed adjust potentiometer CCW or decrease the input voltage signal.
8. Remove line power.
9. Remove the stall from the motor.
10. Remove the ammeter in series with the motor armature if it is no longer needed.

IR Compensation (IR COMP)

The IR COMP setting determines the degree to which motor speed is held constant as the motor load changes.

Use the following procedure to recalibrate the IR COMP setting:

1. Set the IR COMP trim pot to minimum (full CCW).
2. Increase the speed adjust potentiometer or input voltage signal until the motor runs at midspeed without load (for example, 900 RPM for an 1800 RPM motor). A handheld tachometer may be used to measure motor speed.
3. Load the motor armature to its full load armature current rating. The motor should slow down.
4. While keeping the load on the motor, rotate the IR COMP trim pot until the motor runs at the speed measured in step 2. If the motor oscillates (overcompensation), the IR COMP trim pot may be set too high (CW). Turn the IR COMP trim pot CCW to stabilize the motor.
5. Unload the motor.

See Figure 18 on page 40 for recommended IR COMP settings.

MODELS LGD400-1.5, LGD410-1.5, LGD430-1.5, LGD440-1.5



MODELS LGD400-10, LGD410-10, LGD430-10, LGD440-10



Figure 18. Recommended TORQUE and IR COMP Settings
(actual settings may vary with each application)

Acceleration (ACCEL)

The ACCEL setting determines the time the motor takes to ramp to a higher speed. See Specifications on page 1 for approximate acceleration times. ACCEL is factory set for the shortest acceleration time (full CCW).

To set the acceleration time:

1. Set the speed adjust potentiometer or input voltage signal for minimum speed. The motor should run at minimum speed.
2. Set the speed adjust potentiometer or input voltage signal for maximum speed. Measure the time it takes the motor to go from minimum to maximum speed.
3. If the time measured in step 2 is not the desired acceleration time, turn the ACCEL trim pot CW for a longer acceleration time or CCW for a shorter acceleration time. Repeat steps 1 through 2 until the acceleration time is correct.

Deceleration (DECEL)

The DECEL setting determines the time the motor takes to ramp to a lower speed. See Specifications on page 1 for approximate deceleration times. DECEL is factory set for the shortest deceleration time (full CCW).

To set the deceleration time:

1. Set the speed adjust potentiometer or input voltage signal for maximum speed. The motor should run at maximum speed.
2. Set the speed adjust potentiometer or input voltage signal for minimum speed. Measure the time it takes the motor to go from maximum to minimum speed.
3. If the time measured in step 2 is not the desired deceleration time, turn the DECEL trim pot CW for a longer deceleration time or CCW for a shorter deceleration time. Repeat steps 1 through 2 until the deceleration time is correct.

Torque Mode Calibration



MAX SPD and TORQUE trim pots must be recalibrated every time the drive is switched between Speed and Torque modes.

1. Disconnect power from the drive and connect a DC voltmeter across the armature.
2. Set the MAX SPD and TORQUE trim pots to the 12 o'clock position.
3. Set the external potentiometer or input voltage for maximum.
4. Apply line power.
5. Adjust the TORQUE trim pot so the motor is running at the motor's maximum rated input voltage (nameplate rating).
6. Remove line power and the DC voltmeter. Be sure the motor is firmly mounted. Connect a DC ammeter in series with the armature. Carefully lock the motor armature.
7. Apply line power.
8. With the external potentiometer set to full CW or with the input voltage signal set for maximum, slowly adjust the MAX SPD trim pot until the motor draws 100% of the motor's rated armature current (nameplate rating).
9. Remove the line power, the stall from motor, and the ammeter.

Section 6. Application Notes

Multiple Fixed Speeds

Replace the speed adjust potentiometer with a series of resistors with a total series resistance of 10K ohms (Figure 19). Add a single pole, multi-position switch with the correct number of positions for the desired number of fixed speeds.

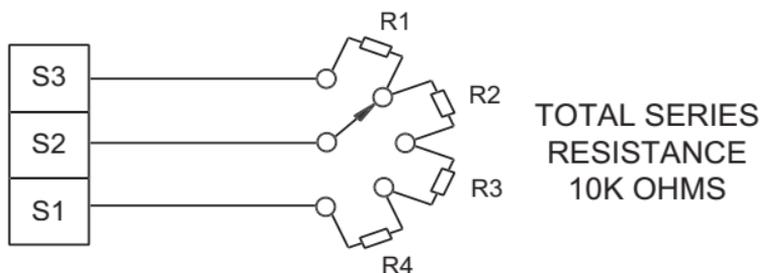


Figure 19. Multiple Fixed Speeds

Independent Adjustable Speeds

Replace the speed adjust potentiometer with a single pole, multi-position switch, and two or more potentiometers in parallel, with a total parallel resistance of 10K ohms. Figure 21 shows the connection of two independent speed adjust potentiometers that can be mounted at two separate operating stations.

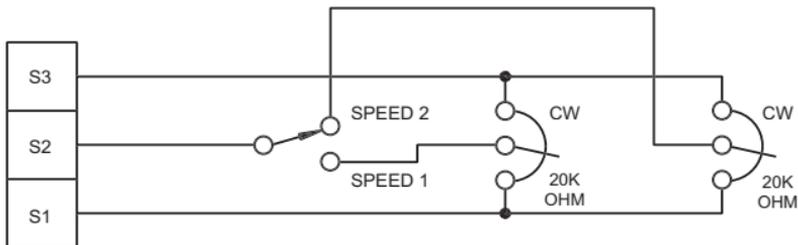


Figure 21. Independent Adjustable Speeds

RUN/JOG Switch - Inhibit Connection

Using a RUN/JOG switch is recommended in applications where quick stopping is not needed and frequent jogging is required. Use a single pole, two position switch for the RUN/JOG switch, and a normally closed momentary pushbutton for the JOG pushbutton.

Connect the RUN/JOG switch and JOG pushbutton to the inhibit plug as shown in Figure 22. The motor coasts to a stop when the RUN/JOG switch is set to JOG. Press the JOG pushbutton to jog the motor. Return the RUN/JOG switch to RUN for normal operation.

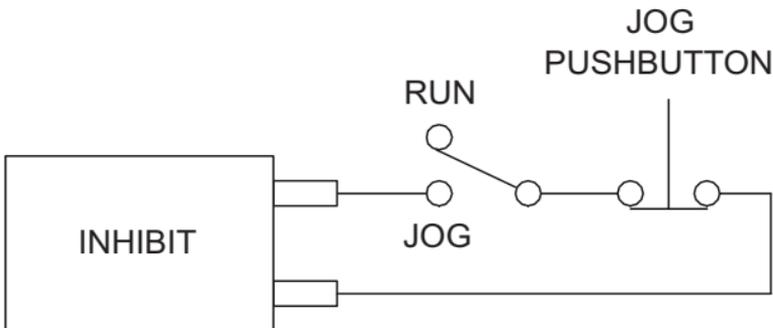


Figure 22. RUN/JOG Switch - Connection to Inhibit Plug with Normally Open Inhibit set for Zero Mode

RUN/JOG Switch - Potentiometer Connection

Connect the RUN/JOG switch and the JOG pushbutton as shown in Figure 23. When the RUN/JOG switch is set to JOG, the motor decelerates to minimum speed (minimum speed is determined by the MIN SPD trim pot setting). Press the JOG pushbutton to jog the motor. Return the RUN/JOG switch to RUN for normal operation.

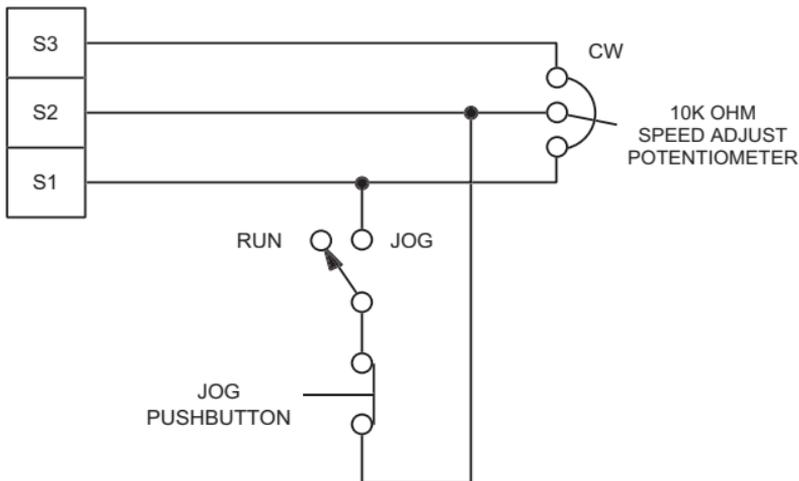


Figure 23. RUN/JOG Switch - Connection to Speed Adjust Potentiometer

Leader-Follower Application

In this application, use a ISO202-1 to monitor the speed of the leader motor (Figure 24). The ISO202-1 isolates the leader motor from the follower drive, and outputs a voltage proportional to the leader motor armature voltage. The follower drive uses this voltage reference to set the speed of the follower motor. An optional ratio potentiometer may be used to scale the ISO202-1 output voltage.

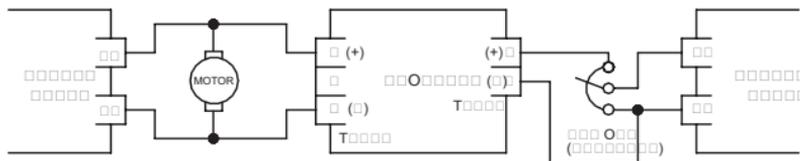


Figure 24. Leader-Follower Application

Single Speed Potentiometer Control Of Multiple Drives

Multiple drives can be controlled with a single speed adjust potentiometer using an ISO101-8 at the input of each drive to provide isolation (Figure 25). Optional ratio potentiometers can be used to scale the ISO101-8 output voltage, allowing independent control of each drive.

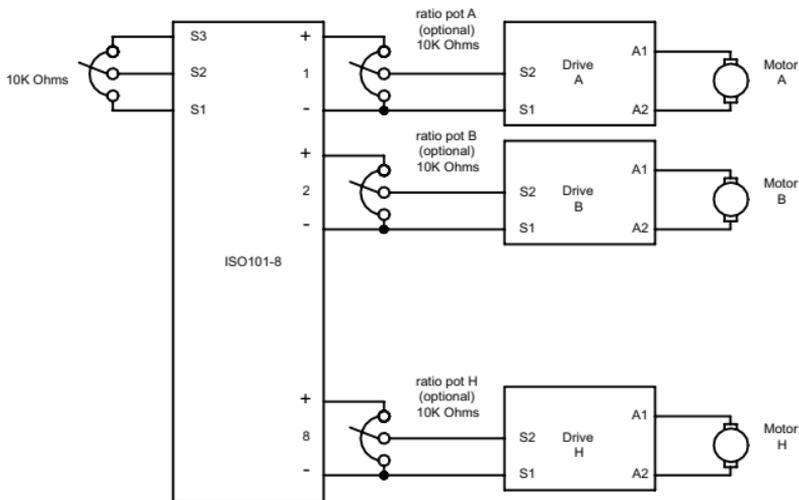


Figure 25. Single Speed Potentiometer Control of Multiple Drives

Reversing

A dynamic brake may be used when reversing the motor direction (Figure 26). Use a three pole, three position switch rated for at least the maximum DC armature voltage and maximum braking current. Wait for the motor to stop completely before switching it to either the forward or reverse direction. See the Dynamic Braking section on page 32 for recommended dynamic brake resistor sizes.

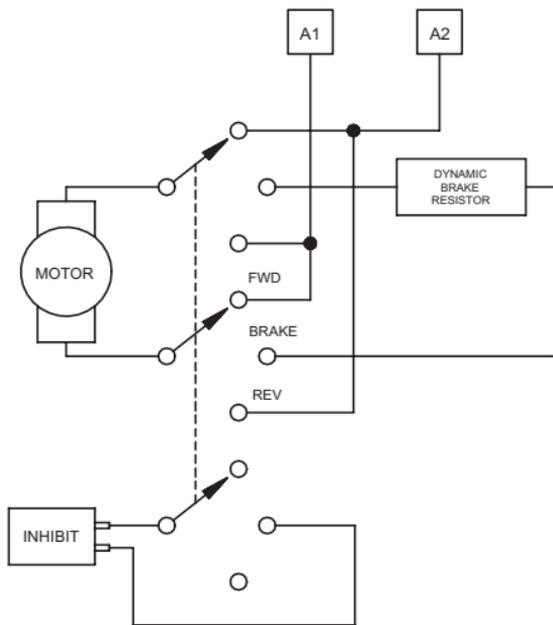


Figure 26. Reversing Circuit Wiring

Reversing with a CLD100-1 Controller

A CLD100-1 controller can be used in a reversing application. The CLD100-1 must be inhibited while braking. If the inhibit feature is not used, the CLD100-1 will continue to regulate. This will cause overshoot when the motor is reconnected to the drive. Figure 27 shows a wiring diagram of the reversing circuit using a LGD series drive and a CLD100-1.

Note: Only one feedback device (Optical Encoder or Magnetic Pickup) may be connected to a CLD100-1 at a time.

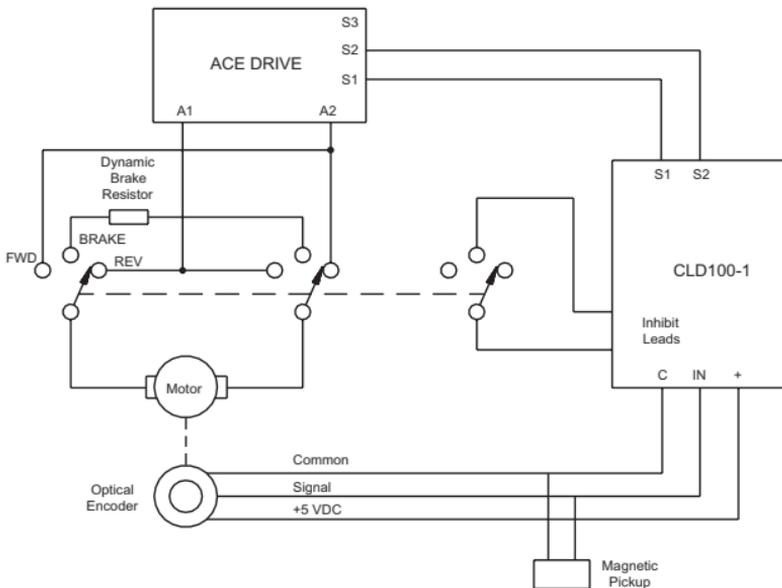


Figure 27. Reversing with a CLD100-1

Section 7. Diagnostic LEDs

LGD series drives are equipped with two diagnostic LEDs:

- Power (POWER): Green LED lights whenever AC line voltage is applied to the drive.
- Current Limit (TQ LIMIT): Red LED lights whenever the drive reaches current limit.

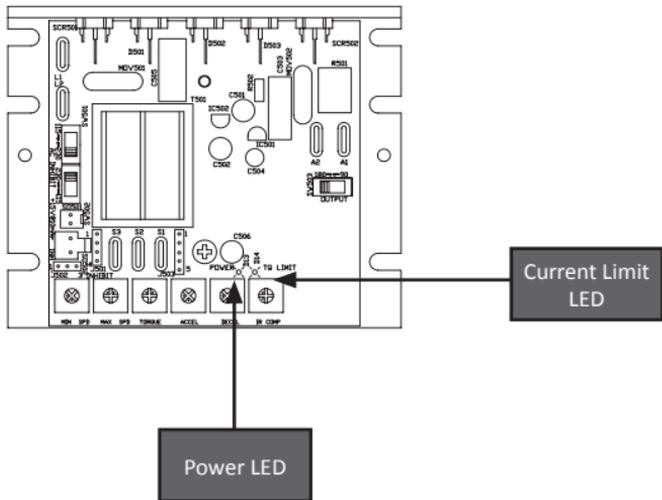


Figure 28. Diagnostic LED Locations

Section 8. Troubleshooting



Dangerous voltages exist on the drive when it is powered. When possible, disconnect the drive while troubleshooting. High voltages can cause serious or fatal injury.

Before Troubleshooting

Perform the following steps before starting any procedure in this section:

1. Disconnect AC line voltage from the drive.
2. Check the drive closely for damaged components.
3. Check that no conductive or other foreign material has become lodged on the printed circuit board.
4. Verify that every connection is correct and in good condition.
5. Verify that there are no short circuits or grounded connections.
6. Check that the switch settings are correctly set.
7. Check that the drive's rated armature is consistent with the motor ratings.

For additional assistance, contact your local AMERICAN CONTROL ELECTRONICS distributor, or the factory direct:

1-815-624-6915 or FAX: 1-815-624-6965

PROBLEM	POSSIBLE CAUSE	SUGGESTED SOLUTIONS
Line fuse blows.	1. Line fuse is the wrong size.	1. Check that the line fuse is correct for the motor size.
	2. Motor cable or armature is shorted to ground.	2. Check motor cable and armature for shorts.
	3. Nuisance tripping caused by a combination of ambient conditions and high-current spikes (i.e. reversing).	3. Add a blower to cool the drive components, decrease TORQUE settings, resize motor and drive for actual load demand, or check for incorrectly aligned mechanical components or "jams". See page 38 for information on adjusting the TORQUE trim pot.
Line fuse does not blow, but the motor does not run.	1. Speed adjust potentiometer or input voltage signal is set to zero speed.	1. Increase the speed adjust potentiometer setting or input voltage signal.
	2. INHIBIT mode is active.	2. Remove the short from the INHIBIT terminals or add a short to INHIBIT terminals if INHIBIT mode is set to INVERTED.
	3. S2 is shorted to S1.	3. Remove the short.
	4. Drive is in current limit.	4. Verify that the motor is not jammed. Increase TORQUE setting if set too low. See page 38.
	5. Drive is not receiving AC line voltage.	5. Apply AC line voltage.
	6. Motor is not connected.	6. Remove power. Connect the motor to A1 and A2. Reapply power.

PROBLEM	POSSIBLE CAUSE	SUGGESTED SOLUTIONS
Motor does not stop when the speed adjust potentiometer is full CCW.	1. MIN SPD is set too high.	1. Calibrate MIN SPD. See page 37.
Motor runs in the opposite direction	1. Motor connections to A1 and A2 are reversed.	1. Remove power. Reverse connections to A1 and A2. Reapply power.
Motor runs too fast.	1. MAX SPD is set too high.	1. Calibrate MAX SPD. See page 37.
Motor will not reach the desired speed.	1. MAX SPD setting is too low.	1. Increase MAX SPD setting. See page 37.
	2. IR COMP setting is too low.	2. Increase IR COMP setting. See page 39.
	3. TORQUE setting is too low.	3. Increase TORQUE setting. See page 38.
	4. Motor is overloaded.	4. Check motor load. Resize the motor and drive if necessary.
Motor pulsates or surges under load.	1. IR COMP is set too high.	1. Adjust the IR COMP setting slightly CCW until the motor speed stabilizes. See page 39.
	2. Motor bouncing in and out of current limit.	2. Make sure motor is not undersized for load; adjust TORQUE trim pot CW. See page 38.

Section 9. Block Diagrams

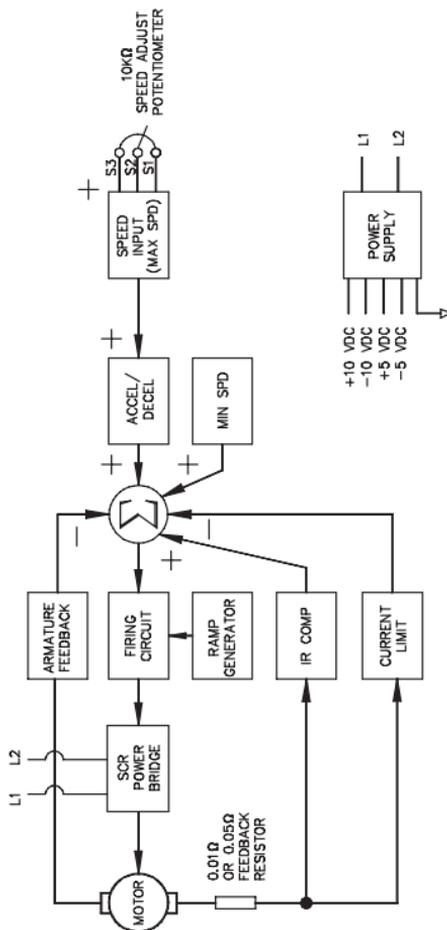


Figure 29. LGD Series Block Diagram

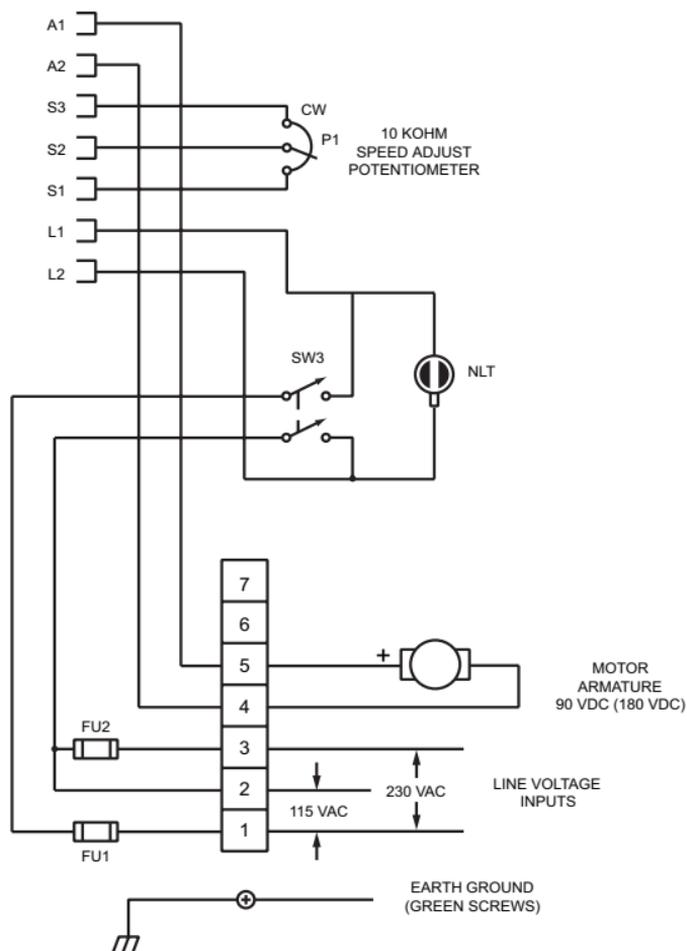


Figure 30. LGD410-1.5, LGD410-10, LGD440-1.5, and LGD440-10
Terminal Block Connections

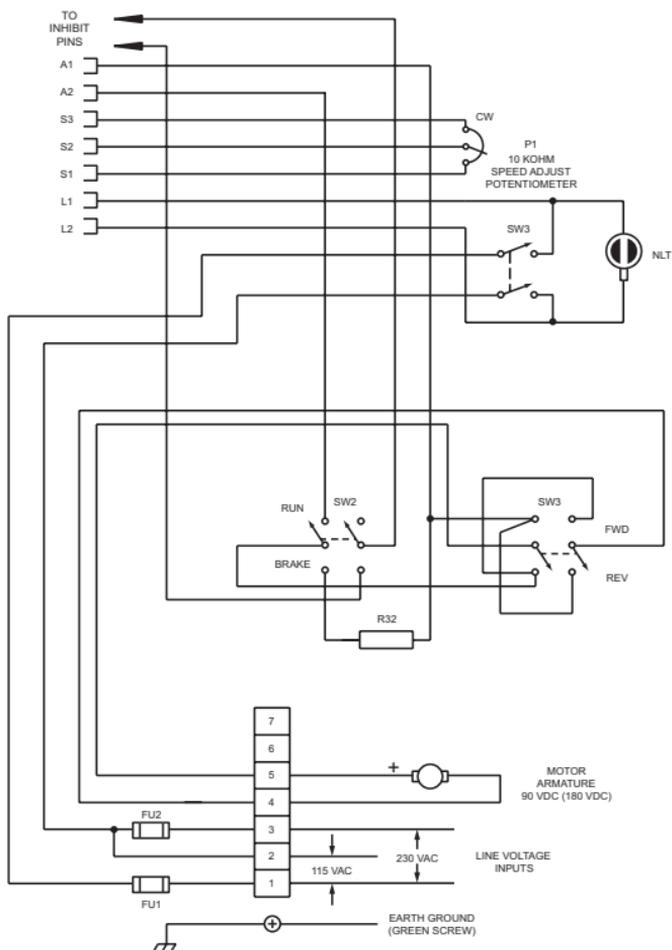


Figure 31. LGD430-1.5 and LGD430-10 Terminal Block Connections

Section 10. Accessories & Replacement Parts

Displays

Closed Loop.....	CLD100-1
Open Loop.....	OLD100-1

Heat sinks

Chassis.....	HSK-0001
NEMA 1.....	HSK-0002

Kits

Potentiometer & Connector

10K Pot, Insulating Washer.....	KTP-0001
10K Pot, Insulating Washer, 7 Insulated Tabs.....	KTP-0005

Fuse

2 1.5 Amp 250 V 3AG Fast-blow Glass Fuses.....	KTF-0001
2 3 Amp 250 V 3AG Fast-blow Glass Fuses.....	KTF-0002
2 5 Amp 250 V 3AG Fast-blow Glass Fuses.....	KTF-0003
2 8 Amp 250 V 3AG Fast-blow Glass Fuses.....	KTF-0004
2 10 Amp 250 V 3AB Normal-blow Ceramic Fuses.....	KTF-0005
2 15 Amp 250 V 3AB Normal-blow Ceramic Fuses.....	KTF-0006

Wiring

Inhibit Plug (18 in. leads).....	KTW-0001
Inhibit Plug (36 in. leads).....	KTW-0002

Logic Cards

Current Monitoring

5 Amps.....CMC100-5

20 Amps.....CMC100-20

Isolation

Uni-directional, 8 outputs.....ISO101-8

Bi-directional, 1 output.....ISO202-1

Notes

Notes

Unconditional Warranty

A. Warranty

American Control Electronics®, referred to as “the Corporation” warrants that its products will be free from defects in workmanship and material for twelve (12) months or 3000 hours, whichever comes first, from date of manufacture thereof. Within this warranty period, the Corporation will repair or replace, at its sole discretion, such products that are returned to American Control Electronics, 14300 De La Tour Drive, South Beloit, Illinois 61080 USA.

This warranty applies only to standard catalog products, and does not apply to specials. Any returns of special controls will be evaluated on a case-by-case basis. The Corporation is not responsible for removal, installation, or any other incidental expenses incurred in shipping the product to and from the repair point.

B. Disclaimer

The provisions of Paragraph A are the Corporation’s sole obligation and exclude all other warranties of merchantability for use, expressed or implied. The Corporation further disclaims any responsibility whatsoever to the customer or to any other person for injury to the person or damage or loss of property of value caused by any product that has been subject to misuse, negligence, or accident, or misapplied or modified by unauthorized persons or improperly installed.

C. Limitations of Liability

In the event of any claim for breach of any of the Corporation’s obligations, whether expressed or implied, and particularly of any other claim or breach of warranty contained in Paragraph A, or of any other warranties, expressed or implied, or claim of liability that might, despite Paragraph B, be decided against the Corporation by lawful authority, the Corporation shall under no circumstances be liable for any consequential damages, losses, or expenses arising in connection with the use of, or inability to use, the Corporation’s product for any purpose whatsoever.

An adjustment made under warranty does not void the warranty, nor does it imply an extension of the original 12-month warranty period. Products serviced and/or parts replaced on a no-charge basis during the warranty period carry the unexpired portion of the original warranty only.

If for any reason any of the foregoing provisions shall be ineffective, the Corporation’s liability for damages arising out of its manufacture or sale of equipment, or use thereof, whether such liability is based on warranty, contract, negligence, strict liability in tort, or otherwise, shall not in any event exceed the full purchase price of such equipment.

Any action against the Corporation based upon any liability or obligation arising hereunder or under any law applicable to the sale of equipment or the use thereof, must be commenced within one year after the cause of such action arises.



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