



An American Control Electronics Brand

# DC30-12/24-4Q-L

4Q PWM Microprocessor-based Chassis  
Adjustable Speed Drive with Positioning Control  
for Low Voltage PMDC Brushed Motors

## Specifications

Model	Source Voltage (VDC)	Armature Voltage Range (VDC)	Peak Armature Current (Amps)	Motor Horsepower Range
DC30-12/24-4Q-L	12	Up to 95% of Source Voltage	30*	1/50 - 1/6

\* Peak current rating for 1 minute. Continuous current rating is 15 amps.

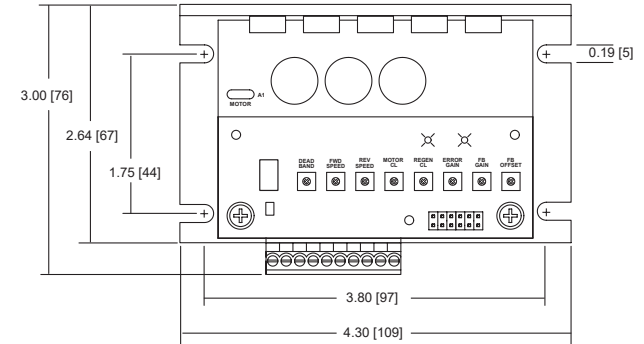
Source Voltage.....	8 - 32 VDC
Form Factor.....	1.01 at base speed
Acceleration Time Range.....	0.5 - 16 seconds
Deceleration Time Range.....	0.5 - 16 seconds
Analog Input Voltage Range.....	0 - 5 VDC
Input Impedance (S1 to S2).....	>100K ohms
Load Regulation.....	1% base speed
Speed Range.....	100:1
Vibration (0 - 50 Hz).....	0.5G maximum
(>50 Hz).....	0.1G maximum
Ambient Temperature Range.....	0°C - 55°C
Weight.....	0.6 lbs

## Safety Warnings

### READ ALL SAFETY WARNINGS BEFORE INSTALLING THIS EQUIPMENT

- **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.
- 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.
- The drive is not diode-protected from reverse battery voltage. You must ensure that the positive terminal is wired to POS and the negative terminal is wired to NEG.
- 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.
- **Removing DC power is the only acceptable method for emergency stopping.** Do not use regenerative braking, decelerating to minimum speed, or coasting to a stop for emergency stopping. They may not stop a drive that is malfunctioning. Removing DC power is the only acceptable method for emergency stopping.
- Applying and removing DC source voltage is recommended for infrequent starting and stopping of a drive only. Regenerative braking, decelerating to minimum speed, or coasting to a stop is recommended for frequent starts and stops. Frequent starting and stopping can produce high torque. This may cause damage to motors.
- **Do not disconnect any of the motor leads from the drive** unless power is removed or the drive is disabled. Opening any one lead while the drive is running may destroy the drive.
- Under no circumstances should power and logic level wires be bundled together.
- Be sure potentiometer tabs do not make contact with the potentiometer's body. Grounding the input may cause damage to the drive.
- This product does not have internal solid state motor overload protection. It does not contain speed-sensitive overload protection, thermal memory retention, or provisions to receive and act upon signals from remote devices for over temperature protection. If motor protection is needed in the end-use product, it needs to be provided by additional equipment in accordance with NEC standards.

## Dimensions



Height = 1.41 [35.8]

ALL DIMENSIONS IN INCHES [MILLIMETERS]

## Installation

### Mounting

- Drive components are sensitive to electrostatic discharge. Avoid direct contact with the circuit components.
- Protect the drive from dirt, moisture, and accidental contact.
- Provide sufficient room for access to the terminal block 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. Six 0.15" (4 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 when possible.

### Wiring

Use 18 - 24 AWG wire for logic wiring.  
Use 10 - 12 AWG wire for DC source (POS, NEG) and motor (A1, A2) wiring.

### Shielding Guidelines

As a general rule, it is recommended to shield all conductors. If it is not practical to shield power conductors, it is recommended to shield all logic-level leads. If shielding of 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 the drive, ground the shield at the end away from the drive. Do not ground both ends of the shield.

### Fusing

The drive requires an external line fuse for protection. Use fast acting fuses rated for at least 150% of the maximum armature voltage and current. Fuse the positive terminal.

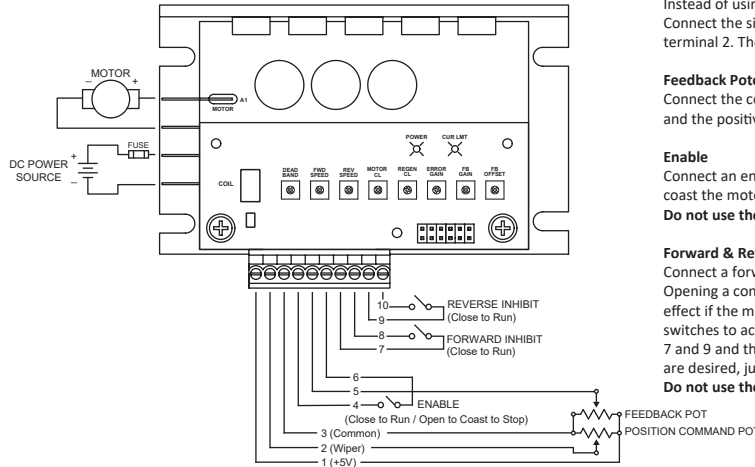
## Connections

### Input Power

Connect the DC input power leads to terminals POS (positive) and NEG (negative).  
**Connecting the DC input power backwards will cause damage to the drive.**

### Motor

Connect the DC armature leads to terminals A1 and A2. If the motor does not spin in the desired direction, power down the drive and reverse these connections.



### LOGIC

#### Position Potentiometer

Use a 10K ohm, 1/4 W potentiometer for position control. Connect the counter-clockwise end of the potentiometer to terminal 3, the wiper to terminal 2, and the clockwise end to terminal 1. If the potentiometer works inversely of desired functionality, (i.e. to move motor forward, you must turn the potentiometer counterclockwise), power off the drive and swap the terminal 1 and 3 connections.

#### Position Analog Signal

Instead of using a potentiometer, the drive may be wired to follow an analog input signal of 0 - 5 VDC. Connect the signal common / negative (-) to terminal 3 and the signal reference / positive (+) to terminal 2. The drive is not isolated and the common terminal 3 is connected to battery negative.

#### Feedback Potentiometer

Connect the common / negative end of the potentiometer to terminal 3, the reference to terminal 5, and the positive end to terminal 1.

#### Enable

Connect an enable switch to terminals 4 and 6. Close the connection to run and open the connection to coast the motor to a stop. If no switch is desired, jumper terminals 4 and 6.

**Do not use the Enable function for emergency stopping.**

#### Forward & Reverse Inhibit

Connect a forward inhibit switch to terminals 7 and 8 and a reverse inhibit switch to terminals 9 and 10. Opening a connection regeneratively brakes the motor to a stop. The forward inhibit switch has no effect if the motor is running in reverse, and vice versa. The inhibits can be used with normally closed switches to act as end-of-travel limits. If the use of only one inhibit switch is desired, jumper terminals 7 and 9 and then connect the switch to either the forward or reverse inhibit input. If no inhibit switches are desired, jumper terminals 7 and 8 and jumper terminals 9 and 10.

**Do not use the Inhibit functions for emergency stopping.**

# Startup

## STARTUP

- Verify that no foreign conductive material is present on the printed circuit board.

1. If using a speed adjust potentiometer, turn it fully counterclockwise (CCW). If using an analog signal, set it for 0 VDC.
2. Apply the DC source voltage.
3. Close the Enable switch.
4. Command a position using the position potentiometer or analog signal. The motor should move to the commanded position.
5. Remove the DC source voltage.

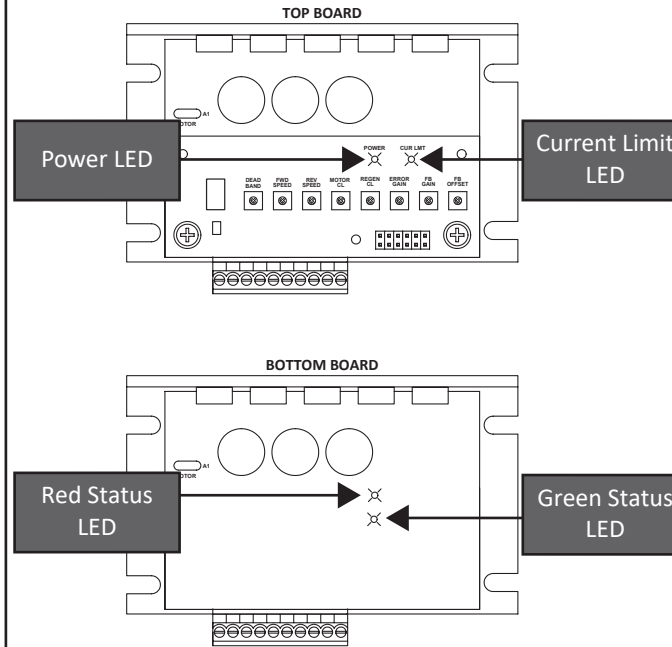
# LEDs

## TOP BOARD LEDs

**Current Limit (CURR LIMIT):** Red LED turns on whenever the drive reaches current limit.  
**Power (POWER):** Green LED turns on whenever DC source voltage is applied to the drive.

## BOTTOM BOARD LEDs

**Status LEDs - Over Voltage:** Green and red LEDs flash quickly.  
 The source voltage is too high (greater than 32 VDC).  
**Under Voltage:** Green LED flashes slowly. Motor output is disabled.  
 The source voltage is too low (less than 7.5 VDC).  
**Over Temperature:** Green LED flashes quickly. Motor output is disabled.  
 The ambient temperature is too high (greater than 55°C).  
**Thermal Foldback:** Red LED flashes quickly. Ambient temperature reached 75°C. Drive will lower current limit until the ambient temperature lowers to an acceptable operating temperature.



# Calibration

**Forward Speed (FWD SPEED):** The FWD SPEED setting determines the actuator speed in the forward direction (when A1 is positive with respect to A2). Turning the trim pot clockwise increases forward motor speed.

**Reverse Speed (REV SPEED):** The REV SPEED setting determines the actuator speed in the reverse direction (when A2 is positive with respect to A1). Turning the trim pot clockwise increases reverse motor speed.

**Motor Torque (MOTOR CL):** The MOTOR CL sets the maximum amount of current the actuator can draw when accelerating (motoring) the actuator in either direction. To calibrate the MOTOR CL:

1. With the power disconnected from the drive, connect a DC ammeter in series with the actuator.
2. Set the MOTOR CL trim pot to minimum (full CCW).
3. Command minimum position (position potentiometer full CCW or analog signal at 0 VDC).
4. Carefully lock the actuator. Be sure that it is firmly mounted.
5. Apply power source and command the actuator to move. The actuator should be stopped.
6. Slowly adjust the MOTOR CL trim pot CW until the actuator current is 150% of rated current.
7. Command minimum position (position potentiometer full CCW or analog signal at 0 VDC).
8. Remove power source.
9. Remove the stall from the actuator.
10. Remove the ammeter in series with the actuator if it is no longer needed.

**Regen Torque (REGEN CL):** The REGEN CL sets the maximum amount of current the actuator can draw when stopping in either direction. If the red LED comes on when stopping, turn this trim pot clockwise to increase the current limit.

**Positional Error (DEADBAND):** The DEADBAND trim pot sets the allowed error around the desired final position. Turning the trim pot clockwise allows for more error. If the DEADBAND is too low, the actuator will oscillate at the commanded position. If too high, the final position may not be accurate enough for the application.

**Error Gain (ERROR GAIN):** The ERROR GAIN trim pot sets the responsiveness of the control. Too little ERROR GAIN and the system may seem sluggish. Too much ERROR GAIN and the actuator may overshoot the target / oscillate.

**Feedback Gain (FB GAIN):** The FB GAIN determines the fully extended position. Turn the trim pot CW to increase the extended position. The FB GAIN and FB OFFSET interact with each other, so double check the retracted position (FB OFFSET) after adjusting the FB GAIN.

**Feedback Offset (FB OFFSET):** The FB OFFSET determines the fully retracted position. Turn the trim pot CW to increase the retracted position. The FB GAIN and FB OFFSET interact with each other, so double check the extended position (FB GAIN) after adjusting the FB OFFSET.