AMERICAN CONTROL ELECTRONICS™
An ISO 9001:2008 Certified Company

# DCX Series

***1Q PWM Chassis Adjustable Speed Drive with a Low Voltage AC Input for Low Voltage PMDC Brushed Motors***

14300 De La Tour Drive
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**Full manual available online**

## Specifications

| Model | Source Voltage (VDC) | Armature Voltage Range (VDC) | Armature Current (Amps) | Motor Horsepower Range |
|---|---|---|---|---|
| DCN300-16 | 12<br>24 | Up to 95%<br>of Source Voltage | 16 | 1/20 - 1/5<br>1/10 - 2/5 |

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

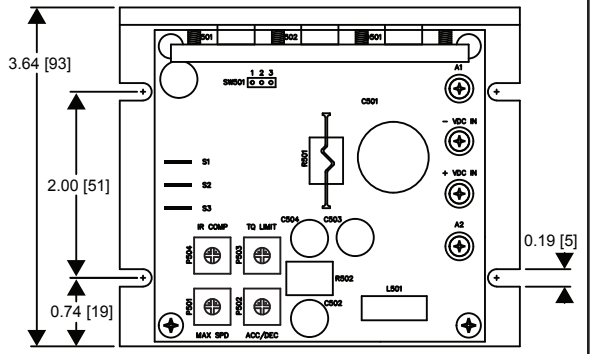
**Source Voltage**.....10 - 32 VDC
**Form Factor**.....1.01 at base speed
**Acceleration Time Range**.....0.5 - 10 seconds
**Deceleration Time**.....0.5 seconds
**Analog Input Voltage Range**.....0 - 10 VDC
**Input Impedance (S1 to S2)**.....200K ohms
**Load Regulation**.....1% base speed
**Speed Range**.....80:1
**Vibration** *(0 - 50 Hz)*.....0.5G maximum
*(>50 Hz)*.....0.1G maximum
**Ambient Temperature Range**.....10°C - 40°C
**Weight**.....1.7 lbs
**Safety Certifications**.....UL/cUL Listed Equipment, file # E132235

## 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 +VDC IN and the negative terminal is wired to -VDC IN.
- 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 dynamic 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




| MODEL | HEIGHT |
|---|---|
| DCX200-12 | 1.37 [35] |
| DCX300-32 | 1.44 [37] |
| DCX600-16 | 1.44 [37] |
| DCX700-8 | 1.97 [50] |

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 0.19" (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 when possible.

**Wiring**

Use 18 - 24 AWG wire for logic wiring.
Use 10 - 12 AWG wire for DC source (+VDC IN, -VDC IN) 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 200% of the maximum armature voltage and current. Fuse the positive terminal.

## Connections

**POWER**

**Input Power**

Connect the DC input power leads to terminals +VDC IN (positive) and -VDC IN (negative).
**Connecting the DC input power backwards will cause damage to the drive.**

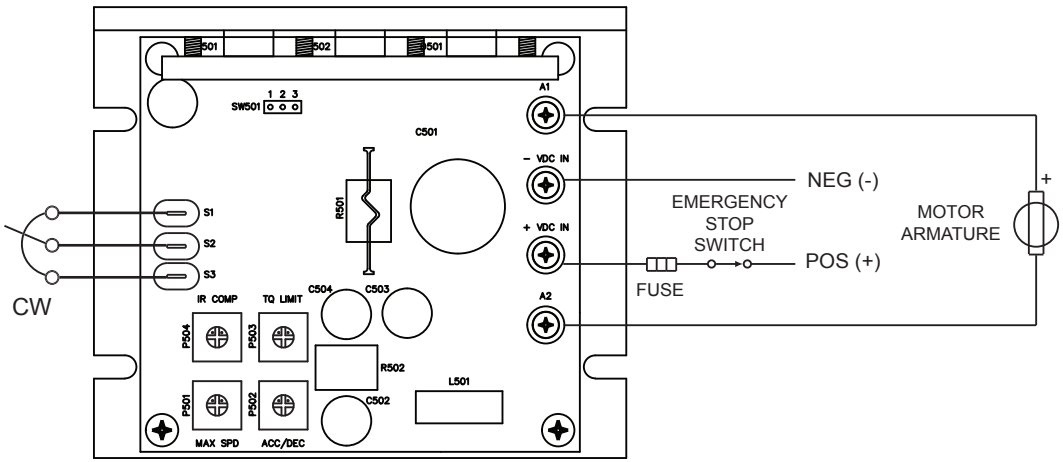
**Motor**

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**

**Speed Potentiometer**

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

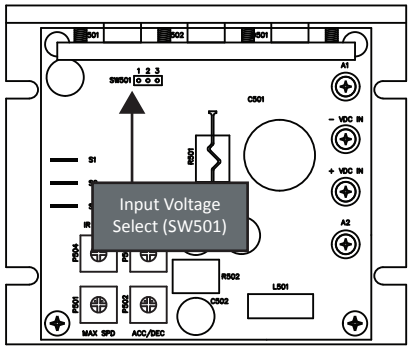


# Startup

### SELECT JUMPERS

**Input Voltage Select (SW501)**
For models DCX200-12 and DCX700-8, leave jumper SW501 on pins 1 and 2.

For models DCX300-32 and DCX600-16, leave jumper SW501 on pins 1 and 2 for a higher input voltage (24 and 48 VDC respectively). Jumper pins 2 and 3 for a lower input voltage (12 and 36 VDC respectively).




### STARTUP

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

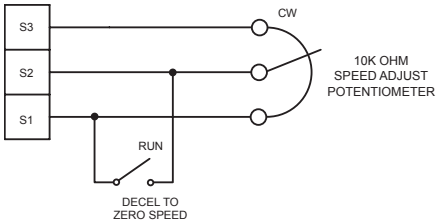
1. Turn the speed adjust potentiometer full counterclockwise (CCW).
2. Apply the input voltage.
3. Slowly advance the speed adjust potentiometer clockwise (CW). The motor slowly accelerates as the potentiometer is turned CW. Continue until the desired speed is reached.
4. Remove the input voltage from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



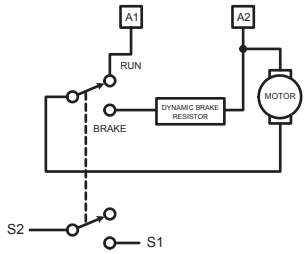
# Operation

### DECELERATING & STOPPING

**Decelerate to Zero Speed**
The switch shown below may be used to decelerate a motor to zero speed. Closing the switch between S1 and S2 decelerates the motor from set speed to a stop. The ACC/DEC 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 ACC/DEC trim pot setting.

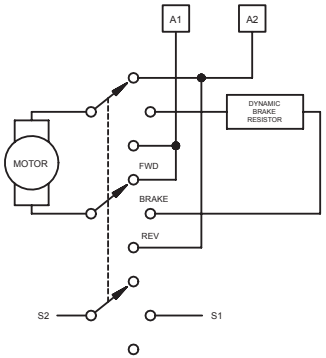



**Decelerate to Zero Speed (Dynamic Brake)**
Dynamic braking may be used to rapidly stop a motor. For the RUN/BRAKE switch, use a two pole, two position switch rated for at least the armature voltage rating and 150% of the armature current rating. For the dynamic brake resistor, use a 40 watt minimum, 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.




### REVERSING

**Reversing with a Dynamic Brake**
A dynamic brake may be used when reversing the motor direction. Use a three pole, three 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. **The motor must come to a complete stop before changing directions.**



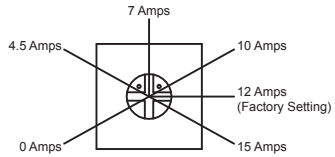

# Calibration

**Maximum Speed (MAX SPD):** The MAX SPD setting determines the maximum motor speed when the speed adjust potentiometer is set for maximum speed. To calibrate the MAX SPD:

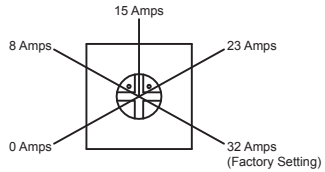
1. Set the MAX SPD trim pot full CCW.
2. Set the speed adjust potentiometer for maximum speed.
3. Adjust the MAX SPD trim pot until the desired maximum speed is reached.

**Torque (TQ LIMIT):** The TQ LIMIT setting determines the maximum torque for accelerating and driving the motor. To calibrate the TQ LIMIT:

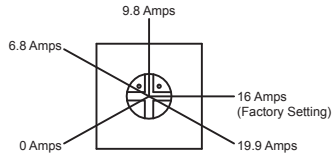
1. With the power disconnected from the drive, connect a DC ammeter in series with the armature.
2. Set the TQ LIMIT trim pot to minimum (full CCW).
3. Set the speed adjust potentiometer to maximum speed (full CW).
4. Carefully lock the motor armature. Be sure that the motor is firmly mounted.
5. Apply line power. The motor should be stopped.
6. Slowly adjust the TQ LIMIT trim pot CW until the armature current is 150% of motor rated armature current. **Continuous operation beyond this rating may damage the motor.**
7. Turn the speed adjust potentiometer CCW.
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.



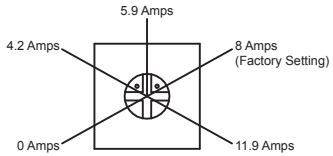

**DCX200-12**




**DCX300-32**




**DCX600-16**




**DCX700-8**

**IR Compensation (IR COMP):** The IR COMP setting determines the degree to which motor speed is held constant as the motor load changes. To calibrate the IR COMP:

1. Set the IR COMP trim pot full CCW.
2. Increase the speed adjust potentiometer until the motor runs at midspeed without load. 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.

**Acceleration/Deceleration (ACC/DEC):** The ACC/DEC setting determines the time the motor takes to ramp to a higher speed. ACC/DEC is factory set for the shortest acceleration/deceleration time (full CCW). To calibrate the ACC/DEC:

1. Set the speed adjust potentiometer for minimum speed.
2. Set the speed adjust potentiometer for maximum speed. Measure the time is takes the motor to go from minimum speed to maximum speed.
3. If the time measured in step 2 is not the desired acceleration time, turn the ACC/DEC trim pot CW for a longer acceleration time, or CCW for a shorter acceleration time. Repeat steps 1 through 3 until the acceleration time is correct.