AMERICAN CONTROL ELECTRONICS™

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DCRx00-6

4Q PWM Microprocessor-based Chassis Adjustable Speed Drive for Low Voltage PMDC Brush Motors

Specifications

Model	Source Voltage (VDC)	Armature Voltage Range (VDC)	Armature Current Continuous [Peak] (Amps)	Motor HP Range Continuous [Peak]
DCR300-6	12 24	Up to 95% of Source Voltage	3 [6]*	1/100 - 1/30 [1/15] 1/50 - 1/15 [1/8]
DCR600-6	36 48	Up to 95% of Source Voltage	3 [6]*	1/40 - 1/10 [1/5] 1/25 - 1/8 [1/4]

* Peak rating for 1 minute.

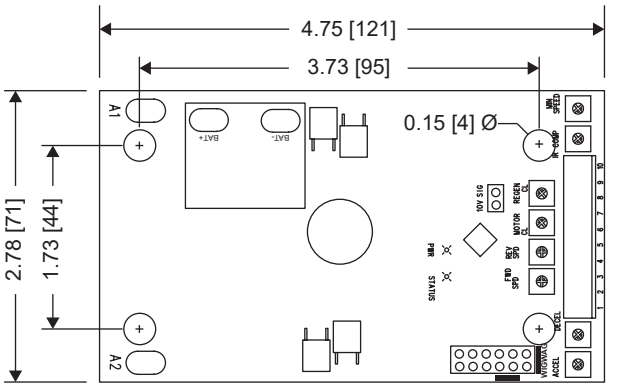
DC Source Voltage Range *12 VDC input* ..... 11 - 21 VDC
24 VDC input ..... 21 - 31 VDC
36 VDC input ..... 22 - 42.5 VDC
48 VDC input ..... 42.5 - 63 VDC
Acceleration Time Range ..... 0.5 - 15 seconds
Deceleration Time Range ..... 0.5 - 15 seconds
Input Impedance *(terminal 3 to 2)* ..... >100K ohms
Analog Input Voltage Range ..... 0 - 5; 0 - 10 VDC
Form Factor 1.01
Load Regulation ..... 1.0% of base speed
Speed Range 80:1
Maximum Vibration *0 - 50 Hz (>50 Hz)* 0.5G (0.1G)
Surrounding Air Temperature Range ..... 32 - 104°F / 0 - 40°C
Weight ..... 0.15 lbs / 0.07 kg

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 approved personal protection equipment and insulated tools if working with power applied. Use a non-metallic screwdriver for adjusting the calibration trim pots.
- 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.
- The drive is not diode-protected from reverse battery voltage. You must ensure that the positive terminal is wired to +BAT and the negative terminal is wired to -BAT.
- **Removing DC source power is the only acceptable method for emergency stopping.** Do not use braking, decelerating, or coasting to a stop for emergency stopping. They may not stop a drive that is malfunctioning.
- Applying and removing DC source voltage is recommended for infrequent starting and stopping of a drive only. 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 damage 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
DCR300-6	1.33 [34]
DCR600-6	1.95 [50]

ALL DIMENSIONS IN INCHES [MILLIMETERS]

Installation

Mounting

- Components are sensitive to electrostatic discharge. Avoid direct contact with the circuit board. Hold the drive by the chassis only.
- Protect from dirt, moisture, and accidental contact.
- Provide sufficient room for access to the terminal block and calibration trim pots.
- Mount away from heat sources. Operate within the surrounding air temperature range.
- Prevent loose connections by avoiding excessive vibration.
- Mount in either a horizontal or vertical plane. Four 0.19" (5 mm) wide slots in the chassis accept #8 pan head screws.
- The chassis should be earth grounded.

Wiring: Use 18 - 24 AWG wire for logic wiring. Use 10- 12 AWG wire for DC source (+BAT, -BAT) and motor (A1, A2) wiring. Follow NEC standards for 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: Use fast acting fuses rated for at least 150% of the maximum armature current. Fuse the positive terminal.

Connections

Input Power
Connect the DC input power leads to terminals +BAT (positive) and -BAT (negative).
Connecting the DC input power backwards will cause damage to the drive.

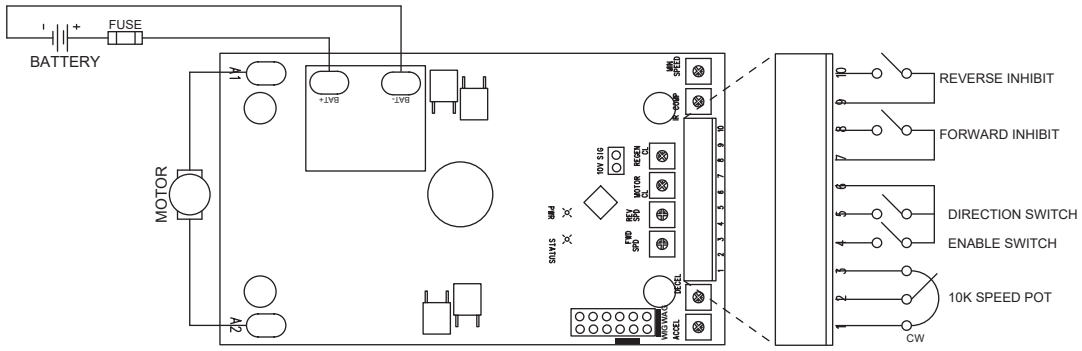
Motor
Connect the DC armature leads to terminals A1 and A2. If the motor does not spin in the desired direction, power down the drive and reverse these connections.

Speed Potentiometer / Analog Signal
Use a 10K ohm, 1/4 W potentiometer for speed 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 increase motor speed, you must turn the potentiometer counterclockwise), power off the drive and swap the terminal 1 and 3 connections. To use an analog signal, connect the common (-) end of the signal to terminal 3 and the reference (+) end of the signal to terminal 2.

Enable Switch
Connect an enable switch to terminals 4 and 6. Close the switch to run and open the switch to coast the motor to a stop. The enable comes into effect regardless of direction. If no switch is desired, jumper the COM and EN terminals. **Do not use the Enable function for emergency stopping.**

Direction Switch
Connect a direction switch to terminals 5 and 6. Close the switch to run in reverse.

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 inhibits bypass the DECEL trim pot. The forward inhibit switch has no effect if the motor is running in reverse, and vice versa. 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

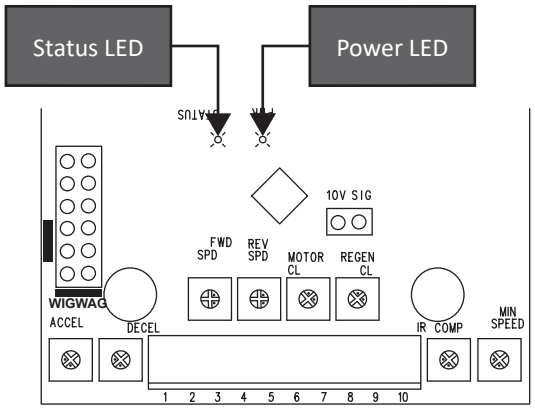
- Verify that no foreign conductive material is present on the printed circuit board.
- Ensure that all jumpers are properly set.

1. Set the speed adjust potentiometer or analog signal for minimum speed.
2. Apply the source voltage.
3. Close the enable.
4. Slowly advance the speed adjust potentiometer clockwise (CW) or increase the analog signal. The motor slowly accelerates as the potentiometer is turned CW. Continue until the desired speed is reached.
5. Remove the source voltage from the drive to coast the motor to a stop.

LEDs

Power (PWR): Green LED
Off: The drive does not have power.
Blinking: The source voltage is out of the acceptable range. See the Status LED to determine if the source voltage is too low or too high.
Solid: The source voltage is within range and the drive is operating correctly.

Status (CUR LIM/FAULT): Red LED.
Solid: The drive is either in Motoring Limit or Regenerative Torque Limit.
Continuous Blinking: The drive is overheating. Provide more ventilation to the drive or decrease the load.
2 Blinks: The source voltage is too low.
3 Blinks: The source voltage is too high.



Operation

10V SIG Jumper

Potentiometer or 0-5 VDC Analog Signal - If using a 10k potentiometer or 0-5 VDC analog signal to vary the motor speed, whether in unidiectional mode or bidirectional mode, leave jumper 10V SIG open.

0-10 VDC - If using a 0-10 VDC analog signal to vary the motor speed, whether in unidiectional mode or bidirectional mode, place a jumper on 10V SIG.

Unidirectional Mode vs. Bidirectional (WigWag) Mode

Unidirectional Mode - In unidirectional mode, the potentiometer determines the speed of the motor. The direction switch determines the direction. For Unidirectional Mode, leave the jumper on the WIGWAG header open.

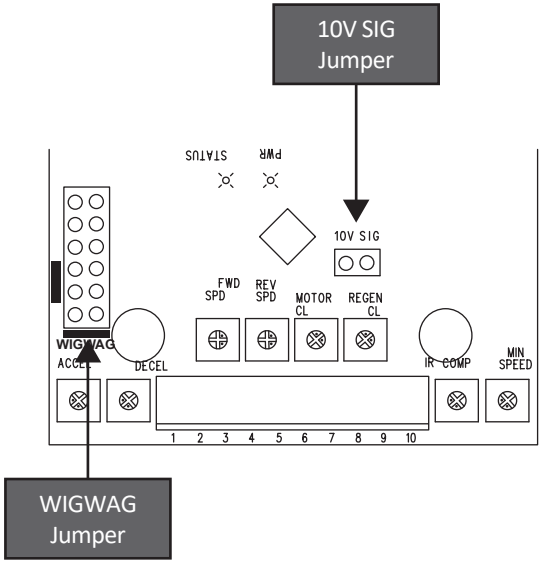
Bidirectional Mode - In bidirectional mode, the potentiometer determines the speed and the direction of the motor:

Full CCW = Full Speed Reverse
50% = Stop / Zero Speed
Full CW = Full Speed Forward

Bidirectional Mode - Closing the direction switch will invert the potentiometer.

Full CCW = Full Speed Forward
50% = Stop / Zero Speed
Full CW = Full Speed Reverse

For Bidirectional mode, place a jumper on the WIGWAG header. Bidirectional Mode can also be referred to as WigWag Mode.



Calibration

Minimum Speed (MIN SPEED): The MIN SPEED setting determines the minimum motor speed when the speed adjust potentiometer is set for minimum speed. It is factory set for zero speed. To calibrate the MIN SPEED:

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

Maximum Forward Speed (FWD SPD): The FWD SPD setting determines the maximum motor speed in the forward direction when the speed adjust potentiometer is set for maximum speed. To calibrate the FWD SPD:

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

Maximum Reverse Speed (REV SPD): The REV SPD setting determines the maximum motor speed in the reverse direction when the speed adjust potentiometer is set for maximum speed. To calibrate the REV SPD:

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

Motor Torque (MOTOR CL): The MOTOR CL setting determines the maximum torque for accelerating and driving the motor in the forward and reverse directions. To calibrate the MOTOR CL:

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

Regen Torque (REGEN CL): The REGEN CL setting determines the maximum torque for decelerating the motor and resisting an overhauling load in the forward and reverse directions. Turn the REGEN CL trim pot CW to increase the regen current limit and CCW to decrease the regen current limit. See the approximate settings below.

0.5 Amps at 12/36 VDC 1.0 Amp at 24/48 VDC	3.25 Amps at 12/36 VDC 4.50 Amps at 24/48 VDC	6.0 Amps at 12/36 VDC 8.0 Amps at 24/48 VDC
1.9 Amps at 12/36 VDC 1.9 Amps at 24/48 VDC	3.9 Amps at 12/36 VDC 5.4 Amps at 24/48 VDC	
2.6 Amps at 12/36 VDC 3.6 Amps at 24/48 VDC	5.3 Amps at 12/36 VDC 7.1 Amps at 24/48 VDC	

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 (ACCEL): The ACCEL setting determines the time the motor takes to ramp to a higher speed. ACCEL is factory set for the shortest acceleration time (full CCW). To calibrate the ACCEL:

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 ACCEL 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.

Deceleration (DECEL): The DECEL setting determines the time the motor takes to ramp to a lower speed. DECEL is factory set for the shortest deceleration time (full CCW). To calibrate the DECEL:

1. Set the speed adjust potentiometer for maximum speed.
2. Set the speed adjust potentiometer for minimum speed. Measure the time is takes the motor to go from maximum speed 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 3 until the deceleration time is correct.