AMERICAN CONTROL ELECTRONICS

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DCH401-5

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

Specifications

Model	Line Voltage (VAC)	Armature Voltage Range (VDC)	Peak Armature Current (Amps)	Armature Horsepower Range
DCH401-5	115 230	0-12 or 0-24	7.5*	1/50 - 1/20 1/25 - 1/8

* Peak current rating for 10 seconds. Continuous current rating is 5 amps.

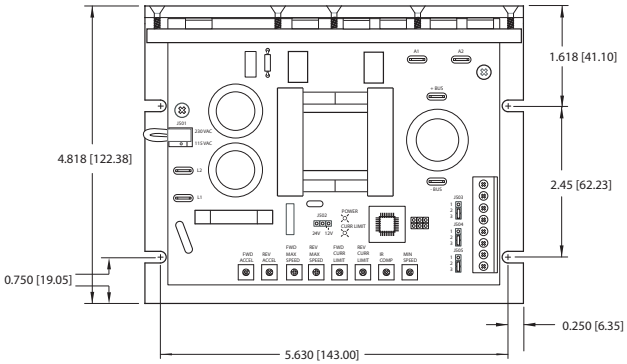
AC Line Voltage.....115/230 VAC ± 10%, 50/60 Hz, single phase
Form Factor.....1.05 at base speed
Acceleration Time Range.....0.5 - 16 seconds
Deceleration Time Range.....0.5 - 16 seconds
Analog Input Voltage Range.....0 - 5, 0 - 10 VDC
Input Impedance (S1 to S2).....>100K ohms
Load Regulation.....1% 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.....1.34 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.
- **Circuit potentials are at 115 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.
- 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.
- **ACE strongly recommends the installation of a master power switch in the line voltage input.** The switch contacts should be rated for 250 VAC and 200% of motor nameplate current.
- **Removing AC line 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 AC line power is the only acceptable method for emergency stopping.
- Line starting and stopping (applying and removing AC line voltage) is recommended for infrequent starting and stopping of a drive only. Dynamic 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.
- 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, the motor will overspeed, which may cause motor damage, or result in bodily injury or loss of life.
- Under no circumstances should power and logic level wires be bundled together.
- Be sure potentiometer tabs do no make contact with the potentiometer's body. Grounding the input will cause damage to the drive.

Dimensions



ALL DIMENSIONS IN INCHES [MILLIMETERS]

Installation

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. 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.

Wiring

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

Shielding Guidelines

As a general rule, 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 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

DCH401-5 drives provide an on board fuse for the AC line (L1). Fuse is a fast acting fuse rated for 2A at 250 VAC.

Connections

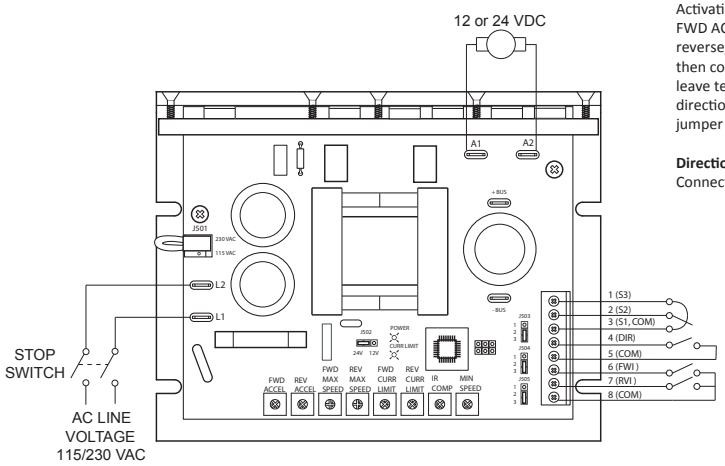
POWER

Input Power

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

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 S1, the wiper to S2, and the clockwise end to S3. If the potentiometer works inversely inversely of desired functionality, (i.e. to increase motor speed, you must turn the potentiometer counterclockwise), power off the drive and swap the S1 and S3 connections.

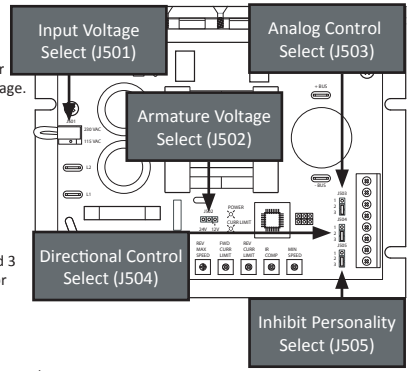
Forward & Reverse Inhibit

Connect a forward inhibit switch to terminals 6 and 8 and a reverse inhibit switch to terminals 7 and 8. Activating an INHIBIT connection regeneratively brakes the motor to a stop. The inhibits bypass the FWD ACCEL and REV ACCEL trim pots. 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 6 and 7 and then connect the switch to terminal 8 and either terminals 6 or 7. If no inhibit switches are desired, leave terminals 6, 7, and 8 open and set jumper J505 for "NORMAL". See the STARTUP section for directions on how to set the INHIBITS for either normally open or normally closed operation using jumper J505. **Do not use the Inhibit functions for emergency stopping.**

Direction

Connect a direction switch to the COM and DIR terminals. Close the switch to change direction.

Startup



SELECT JUMPERS

Input Voltage Select (J501)
Set the voltage jumper SW501 to either 115V or 230V to match the AC line voltage.

Armature Voltage Select (J502)
Set the voltage jumper J502 to either 12V or 24V to match the maximum armature voltage.

Analog Control Select (J503)
Jumper pins 1 and 2 to use a 0-10 VDC analog control input. Jumper pins 2 and 3 to use a 0-5 VDC analog control input or speed adjust potentiometer.

Directional Control Select (J504)
Jumper pins 1 and 2 for BI-DIRECTIONAL mode.
In BI-DIRECTIONAL mode, the speed adjust potentiometer sets both speed and direction (full CCW = full reverse, full CW = full forward). The direction switch still comes into effect.
Jumper pins 2 and 3 for UNI-DIRECTIONAL mode. In UNI-DIRECTIONAL mode, the speed adjust potentiometer only sets speed.

Inhibit Personality Select (J505)
Jumper pins 1 and 2 for INVERT (open to stop). Jumper pins 2 and 3 for NORMAL (close to stop).

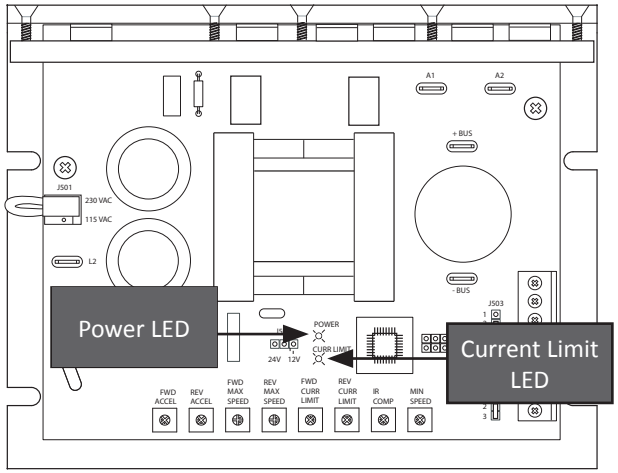
STARTUP

- 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 AC line 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 AC line voltage from the drive to coast the motor to a stop.

LEDs

Current Limit (CURR LMT): Red LED turns on whenever the drive reaches current limit.
Power (POWER): Green LED turns on whenever AC line voltage is applied to the drive.



Calibration

Minimum Speed (MIN SPD): The MIN SPD 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 SPD:

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

Forward Maximum Speed (FWD MAX SPEED): The FWD MAX SPEED setting determines the maximum motor speed in the forward direction (when A1 is positive with respect to A2). To calibrate the FWD MAX SPEED:

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

Reverse Maximum Speed (REV MAX SPEED): The REV MAX SPEED setting determines the maximum motor speed in the reverse direction (when A2 is positive with respect to A1). To calibrate the REV MAX SPEED:

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

Forward Torque (FWD CURR LIMIT): The FWD CURR LIMIT setting determines the maximum torque for accelerating and driving the motor in the forward and reverse directions. To calibrate the FWD CURR LIMIT:

1. With the power disconnected from the drive, connect a DC ammeter in series with the armature.
2. Set the FWD CURR LIMIT 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 FWD CURR LIMIT 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.

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

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.

Forward Acceleration (FWD ACCEL): The FWD ACCEL setting determines the time the motor takes to ramp to a higher speed. To calibrate the FWD ACCEL, turn the FWD ACCEL trim pot CW for a longer acceleration time and CCW for a shorter acceleration time.

Reverse Acceleration (REV ACCEL): The REV ACCEL setting determines the time the motor takes to ramp to a lower speed. To calibrate the REV ACCEL, turn the REV ACCEL trim pot CW for a longer deceleration time and CCW for a shorter deceleration time.