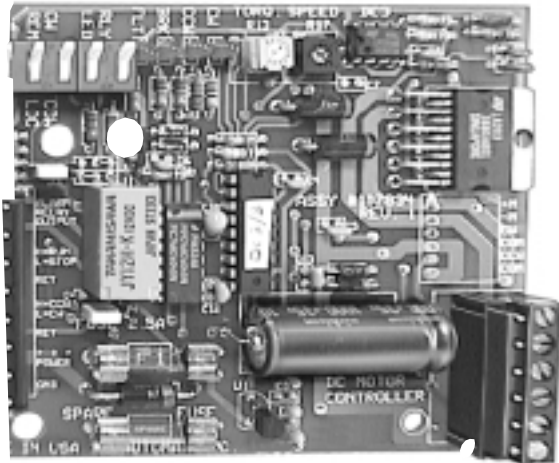


DC Motor Controller Board



Introduction

Using state-of-the-art microprocessor technology, the DC Motor Controller Board provides protection and operational advantages over "hardwired" DC motor actuators. A current sensing circuit continuously monitors motor operating conditions. When stalled or abnormally high motor current exists, the controller automatically shuts power off to the motor. Current sensing protects not only dc motor brushes from destruction, but also protects power supplies during fault conditions, including solar recharging systems from extreme battery discharge. A fault latching circuit will maintain this off status until an input direction change is detected to reset the latched controller for normal operation.

The current sensing circuit and initial setup procedures use on-board local control switches and adjustments. Local control and LED status indicators ease calibration by eliminating special test measurements and control room activity. Remote operations are accomplished by 2-wire switching from PLC's, dry contact relays or switches. A 2-wire "brake" control is optionally used for mid-stroke positioning.

The AUTOMAX DC Motor Controller Board conveniently mounts inside Centura CE Series Electric Actuators. The CE actuators' unique housing design satisfies NEMA 4, 4X, 7, and 9 ratings simultaneously, providing indoor and outdoor protection in industrial applications including gas and oil, pulp and paper, oil patch sites, and chemical processing.

Features and Benefits

The Controller Board addition to a DC Motor Actuator offers:

1. Adjustable, fault current motor protection.
2. Two, 2-wire signal inputs: direction and dynamic brake.
3. Control of 12 and 24 VDC motor actuators.
4. Adjustable torque and speed control.
5. PCB pluggable terminal blocks for interface wiring.
6. Solid-state microprocessor based motor driver replaces relays.
7. An on-board glass fuse, field replaceable.
8. Four (4) status LED indicators: CW and CCW direction, BRAKE set, and FAULT latch set.
9. Local switches provide for alarm and LED disabling to conserve power consumption.
10. Reverse polarity protection.
11. Field settable failure mode.

Centura CE Series Actuators are designed with:

1. Captive cover bolts.
2. Manual override with integral motor power cutout switch.
3. Quick set, end-of-travel cams with micro precision adjustment screws.
4. Standard aluminum housing, with polyester coating for superior corrosion resistance, rated for NEMA 4, 4X, 7, and 9 applications.
5. Options include: a manual override hand wheel, up to four (4) extra SPDT switches, and an extra conduit entry.

Flowserve's design and manufacturing expertise includes Autobrakit mounting hardware for convenient adaptation of Centura Series Actuators to all types of valves and dampers. Consult your Flowserve Representative today for your actuating needs.



An automated choke valve with Autobrakit mounting hardware

Installation and Operating Instructions

This instruction set contains information for proper setup of the Controller Card. Additional actuator mounting and maintenance information may be found in appropriate instruction sets.

Automax CE Electric Actuators are factory adjusted for 90 degree operation and shipped, as viewed from the motor side, in the full clockwise position.

Control Input Connections

1. Connect remote directional input wiring to H=CW/L=CCW and RET terminals (TB1 pins 5 and 6), per Page 3 input details.
2. Connect remote braking input wiring, when required, to the H=RUN/L=STOP and RET terminals (TB1 pins 3 and 4), per Page 3 input details.

Initial Setup for Valve Port Alignment

1. Set the six (6) on-board local control switches to BRK, LOCAL, LOCAL, CW, LED, RLY.
2. Ensure CW limit cam has engaged CW limit switch with valve in full clockwise position.
3. Connect proper DC voltage supply to +++/POWER and RET terminals (TB1 pins 7 and 8), noting proper voltage level and polarity. Label on motor gearbox identifies proper actuator voltage rating. Voltage input is diode protected against + / - reversal, but actuator will not respond if polarity is reversed.
4. Apply power and observe LED CW is blinking when BRK / RUN is in run.
5. Set CW/CCW switch to CCW, and observe LED CCW is lit, and LED CW is out. Motor begins to turn, and valve begins to open.

Note: If LED F (fault) lights, adjust I SENSE pot 1/8 turn clockwise, clear fault by turning BRK on or by toggling direction control switch.

6. Set BRAKE ON/OFF switch to ON and observe motor stops and LED BRK is on. Set BRAKE ON/OFF switch to OFF and observe motor turning.
7. Set BRAKE ON/OFF switch to ON when valve reaches final counterclockwise position, and set CCW limit cam to engage CCW limit switch.

Note: If CCW limit cam engages limit switch before attaining desired position, set BRAKE ON/OFF switch to ON, adjust cam to disengage switch, and continue with Step 6.

8. Set CW/CCW switch to CW, BRAKE ON/OFF switch to OFF, and observe CW limit switch/cam stops motor when valve reaches proper clockwise position.

Note: Set BRAKE ON/OFF switch to ON if limit cams require adjustment. This eliminates actuator from rotating during cam/switch adjustments.

9. Repeat clockwise and counterclockwise position checks and ensure valve limits are correct.

Speed and Current Limiting Adjustments

TORQUE and I SENSE adjustments are dynamic settings that vary by application and affect CW and CCW directions equally. Toggle CW/CCW switch to cycle actuator while making adjustments.

1. Set the TORQUE (speed) adjustment counterclockwise, when needed, to slow actuator stroke speed.
2. Setting the I SENSE (current limiting) adjustment counterclockwise will reduce the amount of motor current needed to trigger the fault latch circuit. The I SENSE adjustment should be set to allow CW/CCW motor reversals "on-the-fly".

Note: Check to ensure adequate power is available at times of normal high current conditions. Verify the I SENSE adjustment allows motor to operate "into" and "off of" valve seat.

3. Set the two (2) on-board LOCAL/REMOTE switches to REMOTE. This will disable CW/CCW and BRAKE ON/OFF local switches, while transferring control to remote inputs connected at TB1.
4. Verify proper operation from the control room.
5. Set LED switch to "OFF" for power savings, if desired.

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Flow Control Division
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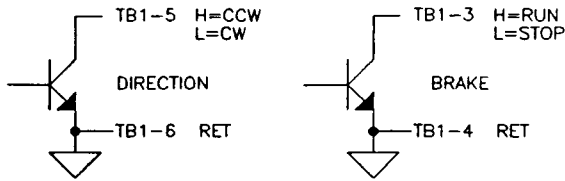
1350 N. Mountain Springs Parkway
Springville, Utah 84663-3004
Phone: 801 489 8611

1978 Foreman Dr.
Cookeville, TN 38501
Phone: 931 432 4021

Interface Wiring

- A. PLC Open Collector Outputs are also known as discrete digital outputs. The "output on" state causes a zero volt measurement at TB1 signal and RET terminals. The "output off" state voltage will equal approximately 5.00V at TB1 terminals.

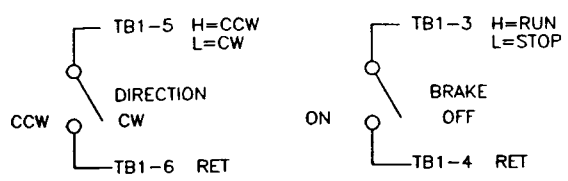
PLC TTL OUTPUT CONFIGURATION
OPEN COLLECTOR (O.C.)



Control Input Configurations

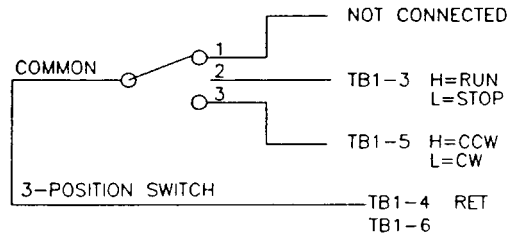
- B. Dry-Contact Switching, while using manual or relay control, does NOT require external voltages to be applied to contacts. When contacts are closed, the voltage between the TB1 signal and RET terminals will equal zero volts. Open contact voltage will equal approximately 5.00V at TB1 terminals.

DRY CONTACT SWITCHING
SPST SWITCH OR RELAY



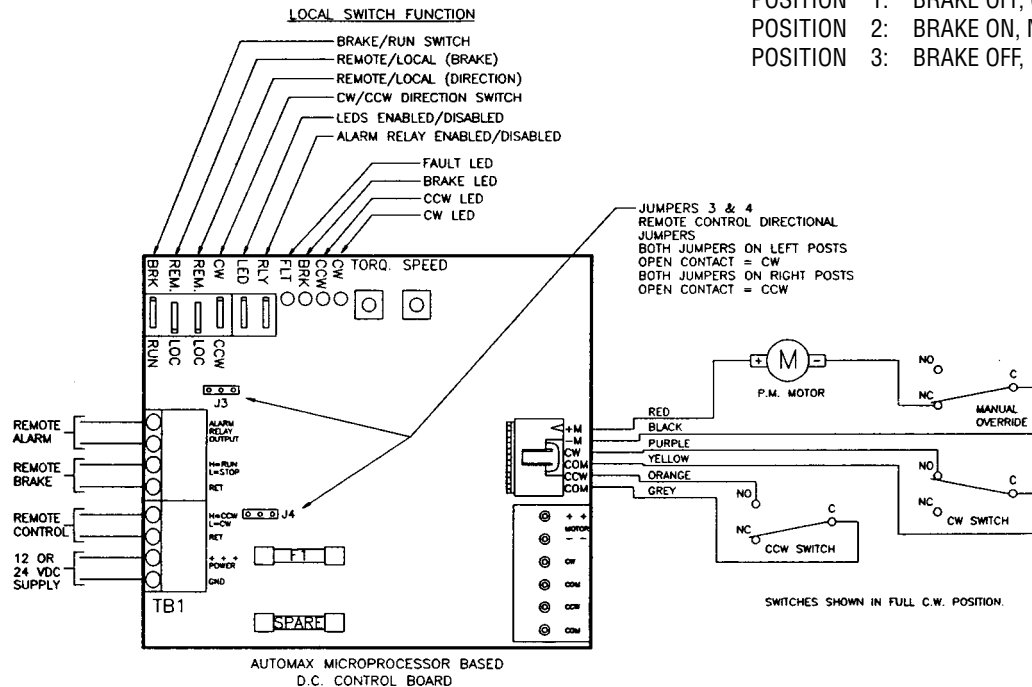
ABOVE DIAGRAMS REPRESENT JUMPERS J3 & J4 ON LEFT TWO POSTS

- C. 3-Way Manual Switching is similar to dry-contact switching, as discussed above in Step B, but allows one single pole, 3 position manual switch to control direction and braking at a remote jogging station.



- POSITION 1: BRAKE OFF, CW ROTATION
- POSITION 2: BRAKE ON, NO ROTATION
- POSITION 3: BRAKE OFF, CCW ROTATION

DC Motor Controller Board Layout and Motor Interface Wiring





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Troubleshooting Guide

1. No LED indicators lit:
 - A. DC Power Supply not on
 - B. On-board fuse blown, check for proper power polarity and voltage level at +++/POWER and GND (TB1 pins 7 and 8), replace fuse.
 - C. LED switch set to OFF
2. Actuator is not responding to remote inputs:
 - A. Ensure on-board local control switches LOCAL/REMOTE are set to REMOTE.
 - B. Check polarity of signaling terminal wiring, and proper voltage measurements, see Page 3, Input Configurations.
 - C. Check LED F (fault) latch set, adjust I SENSE adjustment as required, following instructions on Page 2.
 - D. Check that jumpers J3 & J4 are both on left two posts or both on right two posts as desired. See diagram on Page 3 for directions.

DC Motor Actuator Specifications

DC Motor System	12V	24V	
Supply Voltage (maximum)	14V	28V	Volts
Remote Signal (18AWG)	5000	5000	ft.
Cycle Time*, (min/max adj)			
CE2B, CE2C	6-14	6-14	sec.
CE4B, CE4C	8-20	8-20	sec.
CE7B, CE7C	15-31	15-31	sec.
CE1B, CE1C	20-42	20-40	sec.
CE5B, CE5C	32-60	30-60	sec.
Supply Currents (typ.)			
Controller Board	10**	15**	mA
DC Motor (full load)	1.60	0.9	A
I Sense Adj. (max)	2.0	2.0	A
Operating Temperature	-40 to	160 Deg. F	
	(-40 to	70 Deg. C)	

* - Times are approximate under no load conditions and may vary slightly under actual operating conditions.

** - Board options set at minimum current draw.

How to Order

(Select from each column)

CENTURA Series Actuator - CE		Switches	Options	Conduit	Extras	
Size	Motor				(can add more than one)	
250 in-lbs -2	12 VDC (without brake)**-B	One extra -1	DC Motor Controller -DA	Right Hand -Blank	Epoxy Coating -E	
400 in-lbs -4	24 VDC (without brake) -C	Two extra -2	4-20mA Transmitter -TX	Both Left & Right -X	Heater & Stat -H	
700 in-lbs -7		Three extra -3	0-135 Ohm Potentiometer -P1		Manual Handwheel -Z	
1,000 in-lbs -1		Four extra -4	0-1000 Ohm Potentiometer-P2			
1,500 in-lbs -5			0-5000 Ohm Potentiometer-P3			
			0-10K Ohm Potentiometer -P4			
			0-1000, 0-10K Dual Pot -P6			

Weight CE2, CE4, CE7, CE1 = approx. 18 lbs., CE5 = approx. 20 lbs.

Ordering Example: Automax CENTURA Series Electric Rotary Actuator capable of 400 in-lbs. torque, to operate on 12 VDC with DC Motor Controller would read: **CE4BDA**

*Flowserve can supply special mounting on the bottom of the CENTURA Series actuators to direct couple to many common valve lines.

**No mechanical solenoid brake as supplied on AC Actuators.