BALDOR®

A MEMBER OF THE ABB GROUP

BC138 – BC139 DC CONTROL

6/15 **Installation & Operating Manual** MN708

Any trademarks used in this manual are the property of their respective owners.

Important:
Be sure to check www.baldor.com to download the latest version of this manual in Adobe Acrobat PDF format.

Table of Contents

Chapter 1
Introduction

Introduction

The BC138 AND BC139 adjustable speed SCR controls for DC motors offer proven reliability in a rugged all-metal NEMA-1 /IP20 enclosure. They are specifically designed for fractional horsepower permanent magnet (PM) DC motors. BC138 is designed for 115 VAC input and is rated 1/100-1/3 HP at 90 VDC. BC139 is designed for 208/230 VAC input and is rated 1/50 – 3/4 HP @ 180 VDC.

Note: Catalog Number BC139 can also be used on 90 Volt DC motors.

Baldor's Plug-in Horsepower Resistor®* automatically presets the drive's IR Comp. for maximum performance and CL circuits for safe operation on various motors. Although factory calibrated, internal trimpots for MIN, MAX, IR, CL, ACCEL and DECEL can be used to fine-tune the Drive for specific applications. Connections to the control are via a barrier terminal block. By changing the orientation of the front cover, the wiring can be brought in either from the bottom or the top of the control.

Motor failure due to demagnetization is eliminated by the patented ultra-fast Direct-Fed™ current limit circuit. The controls contain AC line and armature* fusing, which provide protection against catastrophic failure. Auto-Inhibit® allows the drive to be turned on and off rapidly using the AC line without damage to the control and/or motor. The internal CL LED is a diagnostic indicator that lights when the motor is overloaded.

SAFETY NOTICE

A Warning statement indicates a potentially hazardous situation which, if not avoided, could result in injury or death.

A Caution statement indicates a potentially hazardous situation which, if not avoided, could result in damage to property.

A Note indicates additional information that is not critical to the installation or operation.

WARNING: This equipment may contain voltages as high as 1000 volts! Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the start-up procedure or troubleshoot this equipment.

WARNING: Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that all grounding instructions have been followed. Electrical shock can cause serious or fatal injury.

WARNING: Electrical shock can cause serious or fatal injury. Be sure that all power is disconnected and there is no voltage present from this equipment or equipment to which it is or will be connected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation and start-up procedures.

WARNING: Electrical shock can cause serious or fatal injury. Verify there is no voltage phase-to-phase or phase-to-neutral at the motor leads before connecting motor to this control. Motor may have high voltage present even when disconnected from this control.

WARNING: Do not use motor overload relays with an automatic reset feature. These are dangerous since the process may injure someone if a sudden or unexpected automatic restart occurs. If manual reset relays are not available, disable the automatic restart feature using external control wiring.

WARNING: This unit has an automatic restart feature that will start the motor whenever input power is applied and a RUN (FWD or REV) command is issued. If an automatic restart of the motor could cause injury to personnel, the automatic restart feature should be disabled.

WARNING: Using a jumper to eliminate the start/stop function will cause the motor to run at the Main Speed Potentiometer setting when the AC line is applied.

WARNING: If possible, do not adjust trim pots with the main power applied. Electrical shock can cause serious or fatal injury. If adjustments are made with the main power applied, an insulated adjustment tool must be used to prevent shock hazard and safety glasses must be worn.

WARNING: Do not use this drive in an explosive environment. An explosion can cause serious or fatal injury. This drive is not explosion proof.

WARNING: When the Enable jumper is installed, the drive and motor will start and run when AC power is applied, when power is restored after a momentary power loss, or after an overload or TCL fault is reset. The user must ensure that automatic start up of the driven equipment will not cause injury to operating personnel or damage to the driven equipment. The user is responsible for providing suitable audible or visual alarms or other devices to indicate that the drive may start at any moment. Failure to observe this warning could result in severe bodily injury or loss of life.

SAFETY NOTICE Continued

WARNING: Do not use start/stop, inhibit or enable functions as a safety disconnect. Use only an AC line disconnect for that purpose. Failure to observe this warning could result in severe bodily injury or loss of life.

Caution: Disconnect motor leads (A1 and A2) from control before you perform a Dielectric Withstand test on the motor. Failure to disconnect motor from the control will result in extensive damage to the control. The control is tested at the factory for high voltage / leakage resistance as part of Underwriter Laboratory requirements.

Caution: Do not connect AC power to the Motor terminals A1 and A2. Connecting AC power to these terminals may damage the control.

Caution: Baldor recommends not to use Grounded Leg Delta transformer power leads that may create ground loops. Instead, we recommend using a four wire Wye.

Caution: Suitable for use on a circuit capable of delivering not more than 5,000 RMS symmetrical short circuit amperes listed here at rated voltage.

Caution: Adjusting the current limit above 150% of the motor nameplate rating can cause overheating and demagnetization of the PM motor.

Caution: Do not leave the motor in a locked rotor condition for more than a few seconds since motor damage may occur.

Caution: Shunt wound motors may be damaged if field windings remain energized for an extended period of time without armature rotation.

Receiving

Each control is thoroughly tested at the factory and carefully packaged for shipment.
When you receive your control, there are several things you should do immediately.

1. Observe the condition of the shipping container and report any damage immediately to the commercial carrier that delivered your control.
2. Verify that the part number you received is the same as the part number listed on your purchase order.
3. Do not unpack until ready for use.

Table 1-1 General Performance Specifications

Parameter	Specification
Speed Range Ratio	50:1
Armature Feedback Load Regulation (0 – Full Load, 50:1 Speed Range) (% Base Speed)	1**
Line Voltage Regulation at Full Load, ± 10% Line Variation (% Base Speed)	1/2**
Control Linearity (% Speed vs. Dial Rotation)	2
CL/Torque Range (% Full Load)	0 - 200
ACCEL Time Range (0 – Full Speed) (Secs.)	0.2 - 10
DECEL Time Range (Full – 0 Speed) (Secs.)	0.2 - 10
MIN Speed Trimpot Range (% Full Speed)	0 - 30**
MAX Speed Trimpot Range (% Full Speed)	50 - 110**
IR Comp. Trimpot Range (at Specified Full Load) (Volts)	0 - 24
Ambient Temperature Range (ºC / ºF)	0 - 40 / 32 - 104
Operating Humidity Range (%Relative, Non-Condensing)	0 - 95
Storage Temperature Range (ºC / ºF)	-25 to +85 /-13 to +185

Table 1-2 Electrical Ratings

Model Number	Line Voltage (VAC 50/60Hz)	Max. AC Load Current (RMS)	Armature Voltage (VDC)	Max. DC Load Current (DC Amps)	Maximum Horsepower HP, (kW)
BC138	115	5.0	0 – 90	3.5	1/3, (0.25)
BC139	208/230	5.0	0 – 180	3.5	3/4, (0.50)
		5.0	0 – 90*	3.5	1/3, (0.25)

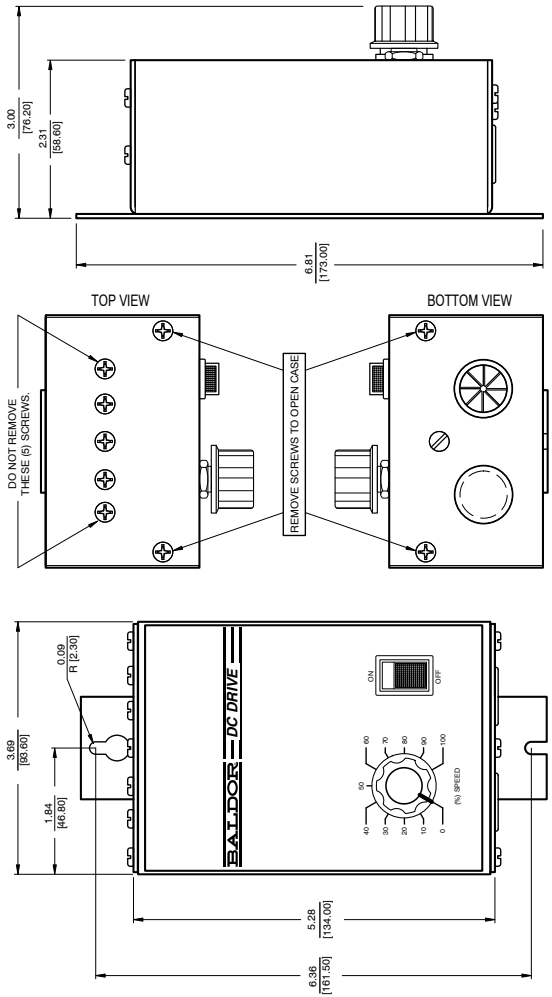
WARNING: Do not use this drive in an explosive environment. An explosion can cause serious or fatal injury. This drive is not explosion proof.

MOUNTING INSTRUCTIONS

The BC138 and BC139 are mounted via the rear cover mounting strap. Locate the mounting holes using the rear cover as a template or use the dimensions as shown in the outline drawing. (See Figure 2-1.) Mount the control on a flat surface in a location where it will not be exposed to contaminants such as water, metal chips, solvents or excessive vibration and/or temperature extremes.

Note: Allow adequate clearance around control to permit motor and AC power cables to enter through the Bx knockouts on bottom of enclosure.

Figure 2-1 Mechanical Specifications (Inches/mm)



When mounting the control in an enclosure, the enclosure should be large enough to provide adequate heat dissipation so that the ambient temperature does not exceed 40°C (104°F) at full rating. Consult Baldor if more information is required.

Note: The BC138 and BC139 can be oriented so that the AC power and motor wiring can be brought in from the top of the control. Mount the rear cover so that the Bx knockouts are located on the top by rotating the rear cover 180º. The front cover is then installed right side up using the four (4) 6x32 screws previously removed from the top and bottom of the enclosure.

After wiring the front cover, install the mating rear cover with the four (4) 6x32 screws previously removed from the top and bottom of enclosures. See Figure 2-1.

Electrical Connections

Important Application Note: To avoid erratic operation, do not bundle the AC line and motor wires with signal or control wiring. Also, do not bundle motor wires from multiple controls in the same conduit. Use shielded cables on all signal wiring over 12 (30 cm). The shield should be earth grounded on the control side only. Wire the control in accordance with the National Electrical Code requirements and other local codes that may apply.

Table 2-2 Minimum Supply Wire Size Requirements

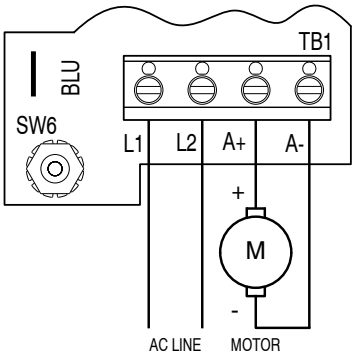
Terminal Block Designation	Connection Designation	Supply Wire Gauge (AWG - Copper)		Maximum Tightening Torque	
		Minimum	Maximum	lbs- in	kg-cm
TB1	L1, L2, A+, A-	22	14	3.5	4.0

AC Line

The BC138 and BC139 contain a 5-Amp AC line fuse used to protect the control against catastrophic failure. If fuse blows, the control may be miswired, the motor is shorted or grounded, or the speed control module is defective. Replace with Littelfuse 326, Buss ABC or equivalent.

Connect AC power to terminals L1 and L2. Be sure that the control model corresponds to the correct AC line input voltage. Model BC138 is for 115 VAC 50/60 Hz and Model BC139 is for 208/230 VAC 50/60 Hz. See Table 2-2 and Figure 2-2.

Figure 2-2 AC Line and Armature Connection



Ground Connection

Connect all ground wires (earth), of connections to the control, to the green ground stud located between the Bx knockouts, tighten to correct torque (Table 2-2).

Motor Armature Connection

Connect the motor armature positive lead (+) to Terminal A+ and negative lead (-) to Terminal A-, as shown in Figure 2-2.

Motor Field Connection (Shunt Wound Motors Only)

Do not use F+ and F- terminals for any other motor type. The BC138 and BC139 controls are primarily designed for permanent magnet (PM) motors. However, a shunt motor can also be controlled by wiring the shunt field directly to the 1/4 quickdisconnect terminals located on the main speed control module. See Figures 2-3 and 2-4 for the F+ and F- terminal locations. Attach motor field using insulated 1/4 Q-D female terminals. For Standard PM (2-wire) motors, the Field is not used.

CAUTION! Do not connect motor armature leads to Terminals F+ and F-. Do not use Terminals F+ and F- for any purpose other than to power the field of a shunt wound motor. Shunt wound motors may be damaged if the field remains energized without armature rotation for an extended period of time.

Full Voltage Field

Connect the field positive (+) lead to Terminal F+ and the negative lead (-) to Terminal F-, on the Barrier Terminal Block (Table 2-2).

Half Voltage Field

For 50 Volt DC with 100 Volt rated armature, use Terminal L1 and F+, on the terminal board (Table 2-2).

Figure 2-3 Full Voltage Field Connection

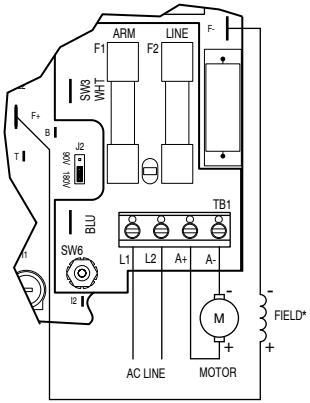
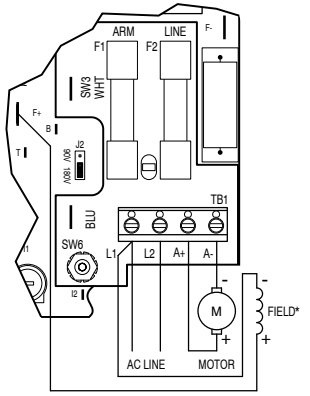
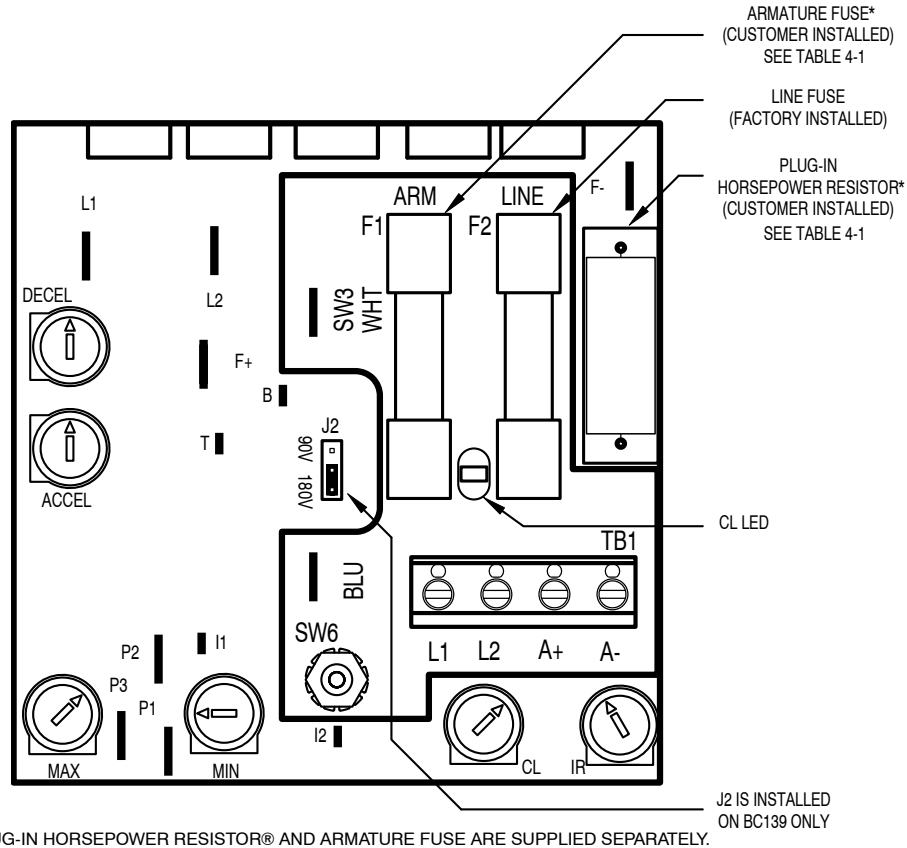


Figure 2-4 Half Voltage Field Connection



*Shunt motors only

Figure 2-5 Control Layout & General Connection Diagram



*PLUG-IN HORSEPOWER RESISTOR® AND ARMATURE FUSE ARE SUPPLIED SEPARATELY.

Plug-In Horsepower Resistor

A Plug-In Horsepower Resistor must be installed to match the drive to the motor horsepower and armature current. See Table 2-3 for the correct value.

Table 2-3 Plug-In Horsepower Resistor® & Fuse Selection Chart

Motor Horsepower Armature Voltage		Plug-In Horsepower Resistor Value (Ohms)	Baldor Catalog No.	Current (ADC)	AC Amps	
90	180				Fuse Rating Armature	Fuse Rating Line
1/100	1/50	1.0	BR1000	0.20	0.5	5
1/50	1/25	0.51	BR0510	0.30	0.5	5
1/30	1/15	0.35	BR0350	0.33	0.5	5
1/20	1/10	0.25	BR0250	0.5	0.75	5
1/15	1/8	0.25	BR0251	0.8	1.0	5
1/12	1/6	0.18	BR0180	0.85	1.25	5
1/8	1/4	0.1	BR0100	1.3	2.0	5
1/6	1/3	0.1	BR0101	2.0	2.5	5
1/4	1/2	0.05	BR0050	2.5	4.0	5
1/3	3/4	0.035	BR0035	3.3	5.0	5

Armature Fuse

The BC138 and BC139 have provision for installing an armature fuse that helps protect the motor and control from damage due to overload. Armature fuses are 3 AG type and are supplied in the kit with the Plug-in Horsepower Resistor.

Notes:

1. An armature fuse must be installed or control will not operate. Fuse value is calculated based on 1.7 times the DC current rating of the motor. See Table 2-3.
2. Motor horsepower and armature current must be specified in order to select correct Plug-in Horsepower Resistor.
3. For motor horsepower not indicated, use the lower ohm value Plug-in Horsepower Resistor.
4. Specific applications may require a different fuse value than indicated. This is based on several factors such as ambient temperature.

Startup & Adjustments

Jumper J2 is provided on Model BC139 only and is factory set to "180V" position, Figure 2-2. For step-down operation (208/230 Volts AC line input and 0-90 Volts DC output), set J2 to the "90V" position.

After the control has been mounted properly and electrical connections have been completed,

1. Verify the speed adjust potentiometer is set fully counterclockwise.
2. Apply AC power.
3. Observe the Power ON LED indicator is illuminated. If not on, refer to troubleshooting.
4. Verify correct direction of motor rotation.
   Start the control. The motor shaft should begin to rotate as the potentiometer knob is turned clockwise, or the analog speed reference signal is increased.
   Verify the motor shaft is rotating in the desired 'forward' direction.
   If the direction of rotation is incorrect, stop the control and disconnect AC power.
   Switch the motor lead connections at the A+ and A- terminals.
   If a tachometer is connected, the leads may also need to be switched for correct signal polarity.
   If the CL LED is on, refer to troubleshooting.

WARNING: If possible, do not adjust trim pots with the main power applied. Electrical shock can cause serious or fatal injury. If adjustments are made with the main power applied, an insulated adjustment tool must be used to prevent shock hazard and safety glasses must be worn.

Trimpot Adjustments

The control contains trimpots which have been factory set for most applications. Some applications may require readjustment to tailor the control for a specific performance requirement.

Acceleration Start

The ACCEL is factory set at approximately 2 seconds. To readjust to different times, set the knob to the desired position. To increase the acceleration time, rotate the ACCEL Trimpot clockwise. To decrease the acceleration time, rotate the ACCEL Trimpot counterclockwise. The ACCEL Trimpot range is 0.2 – 10 seconds.

Deceleration

The DECEL is factory set to provide a ramp-down time of 2 seconds. To change the ramp-down time, adjust the DECEL trimpot. To increase the deceleration time, rotate the DECEL Trimpot clockwise. To decrease the deceleration time, rotate the DECEL Trimpot counterclockwise. The DECEL Trimpot range is 0.2 – 10 seconds.

Minimum Speed Trimpot (MIN)

The MIN Trimpot sets the minimum speed of the motor when the Main Speed Potentiometer is set fully counterclockwise. The MIN Trimpot is factory set to 0% of base motor speed. To increase the minimum speed, rotate the MIN Trimpot clockwise. To decrease the minimum speed, rotate the MIN Trimpot counterclockwise. The MIN Trimpot range is 0% – 30% of base motor speed.

Note: Readjusting the MIN Trimpot will affect the maximum speed setting. Therefore, it is necessary to readjust the MAX Trimpot if readjusting the MIN Trimpot. It may be necessary to repeat these adjustments until both the minimum and maximum speeds are set to the desired levels.

Maximum Speed Trimpot (MAX)

The MAX Trimpot sets the maximum speed of the motor when the Main Speed Potentiometer is set fully clockwise. The MAX Trimpot is factory set to 100% of base motor speed. To increase the maximum speed, rotate the MAX Trimpot clockwise. To decrease the maximum speed, rotate the MAX Trimpot counterclockwise. The MAX Trimpot range is 50% – 110% of base motor speed.

Note: Do not attempt to adjust the maximum speed above the rated motor RPM since unstable motor operation may occur. For moderate changes in the maximum speed, there will only be a slight effect on the minimum speed setting.

Current Limit Trimpot (CL)

CL circuitry is provided to protect the motor and control against overloads. The CL also limits the inrush current to a safe level during startup. The CL is factory set to approximately 1.5 times the full load rating of the motor. (CL trimpot is nominally set to approximately 65% of full CW rotation.) Note: Proper size Plug-in Horsepower Resistor® must be installed.

To set the CL to factory specifications adjust as follows:

1. Set speed control knob at approximately 30 - 50% CW rotation. Set CL trimpot to full CCW position.
2. Connect a DC ammeter in series with the armature lead.

3. Lock shaft of motor (be sure CL pot is in full CCW position). Apply power and rotate CL pot CW until DC ammeter reads 1.5 times motor rating. (Do not exceed 2 times motor rating.) Do not leave motor in locked rotor position for more than a few seconds or damage may occur. Note: The CL LED will illuminate when the control is in current limit.

Note: If only an AC ammeter is available, it can be installed in series with AC input line. Follow above instructions; however, set AC amperage at 0.75 motor rating.

IR Compensation Adjustment

IR compensation is provided to improve load regulation. If the load presented to the motor does not vary substantially, the IR adjustment may be set at a minimum level (approximately 1/4 of full setting). The control is factory adjusted to approximately 3% regulation. If superior performance is needed (less than 1% speed change of base speed from 0 - full load), then the IR Comp. should be adjusted as follows:

Note: Excessive IR Comp. will cause control to become unstable, which causes motor cogging.

1. Set IR Comp. trimpot at approximately 25% of CW rotation. Run motor unloaded at approximately 1/3 speed and record RPM.
2. Run motor with maximum load and adjust IR Comp. trimpot so that the motor speed under load equals the unloaded speed per Step 1.
3. Remove load and recheck unloaded RPM. If unloaded RPM has shifted, repeat procedure for more exact regulation.

The control is now compensated to provide minimal speed change under large variations of applied load.

Figure 2-6 Internal Connection Diagram

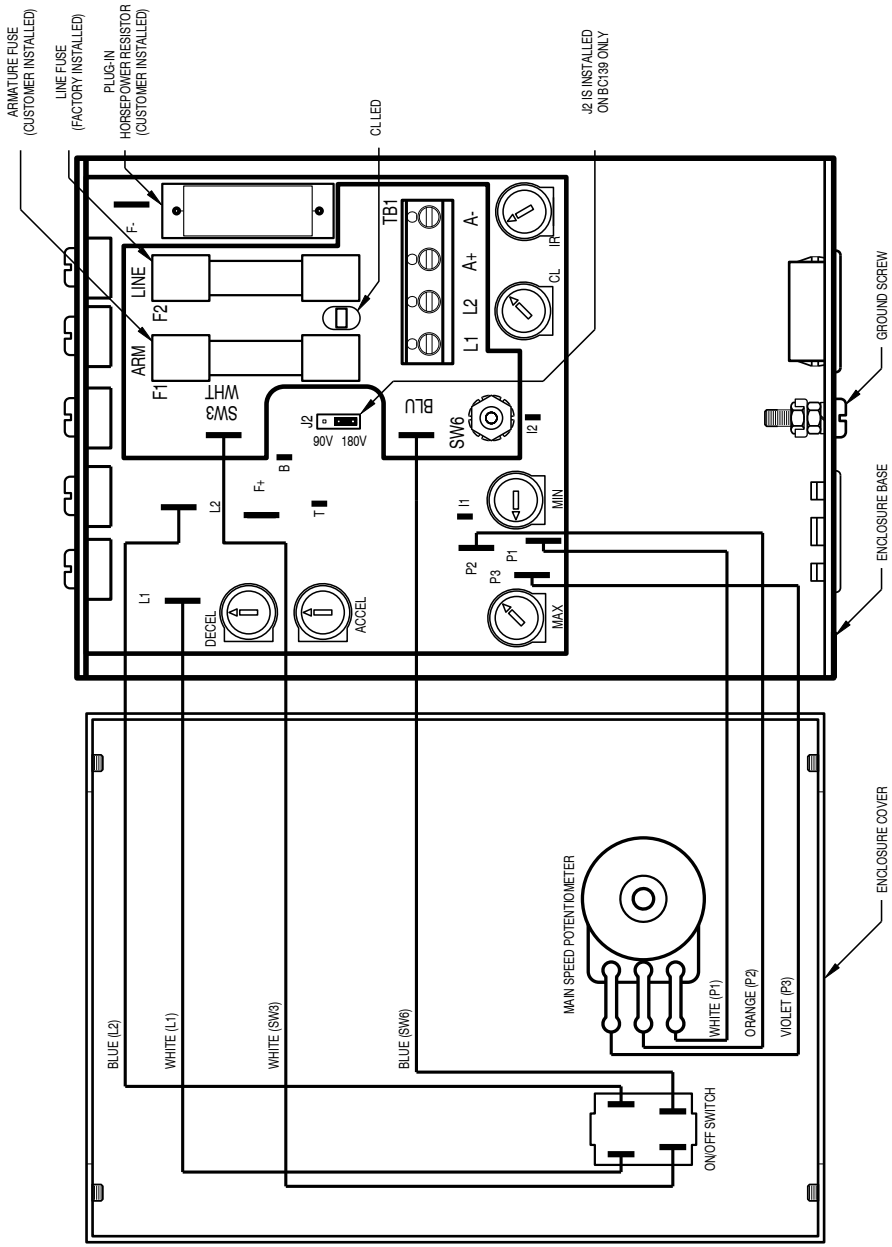


Table 2-3 Troubleshooting Guide

Indication / Symptom	Possible Cause / Solution
Motor does not run.	AC input voltage not present at L1, L2 terminals. Verify correct wiring.
	Blown line fuse or tripped circuit breaker. Blown armature fuse or control circuit fuse. Replace blown fuse with SL-40 or equivalent. If fuse blew due to miswiring, power bridge module may be defective.
Motor is not running. Power ON LED is illuminated.	Check ENABLE or INHIBIT circuit for loose or disconnected wiring.
	Main speed pot is set to zero. Re-adjust to desired speed.
	Main speed pot, speed reference signal input, or motor connections are open. Verify there are no loose or disconnected wires.
Motor hums or runs at very low speed. Motor slows when load is applied. CL LED is illuminated.	Incorrect motor wiring. Verify correct wiring.
	Motor is overloaded. Check motor current with DC ammeter. Reduce load.
	Motor may be defective. Check motor for shorts or grounds. Check brushes.
	Current Limit (CL) trimpot may not be set correctly. Re-adjust CL trimpot in accordance with section 5.2.6.
Motor runs at high speed and does not respond to main speed pot or speed reference signal.	Check field wiring. If using tachometer feedback, check tachometer signal.

Baldor District Offices

UNITED STATES

ARIZONA
PHOENIX
4211 S 43RD PLACE
PHOENIX, AZ 85040
PHONE: 602-470-0407
FAX: 602-470-0464

ARKANSAS
CLARKSVILLE
706 WEST MAIN STREET
CLARKSVILLE, AR 72830
PHONE: 479-754-9108
FAX: 479-754-9205

CALIFORNIA
LOS ANGELES
6480 FLOTILLA STREET
COMMERCE, CA 90040
PHONE: 323-724-6771
FAX: 323-721-5859

HAYWARD
21056 FORBES STREET
HAYWARD, CA 94545
PHONE: 510-785-9900
FAX: 510-785-9910

COLORADO
DENVER
3855 FOREST STREET
DENVER, CO 80207
PHONE: 303-623-0127
FAX: 303-595-3772

CONNECTICUT
WALLINGFORD
65 SOUTH TURNPIKE ROAD
WALLINGFORD, CT 06492
PHONE: 203-269-1354
FAX: 203-269-5485

FLORIDA
TAMPA/PUERTO RICO/ VIRGIN ISLANDS
3906 EAST 11TH AVENUE
TAMPA, FL 33605
PHONE: 813-248-5078
FAX: 813-241-9514

GEORGIA
ATLANTA
62 TECHNOLOGY DRIVE
ALPHARETTA, GA 30005
PHONE: 770-772-7000
FAX: 770-772-7200

ILLINOIS
CHICAGO
340 REMINGTON BLVD.
BOLINGBROOK, IL 60440
PHONE: 630-296-1400
FAX: 630-226-9420

INDIANA
INDIANAPOLIS
5525 W. MINNESOTA STREET
INDIANAPOLIS, IN 46241
PHONE: 317-246-5100
FAX: 317-246-5110

IOWA
DES MOINES
1943 HULL AVENUE
DES MOINES, IA 50313
PHONE: 515-263-6929
FAX: 515-263-6515

MARYLAND
BALTIMORE
7071A DORSEY RUN RD
ELKRIDGE, MD 21075
PHONE: 410-579-2135
FAX: 410-579-2677

MASSACHUSETTS
BOSTON
6 PULLMAN STREET
WORCESTER, MA 01606
PHONE: 508-854-0708
FAX: 508-854-0291

MICHIGAN
DETROIT
5993 PROGRESS DRIVE
STERLING HEIGHTS, MI 48312
PHONE: 586-978-9800
FAX: 586-978-9969

MINNESOTA
MINNEAPOLIS
13098 GEORGE WEBER DR,
SUITE 400
ROGERS, MN 55374
PHONE: 763-428-3633
FAX: 763-428-4551

MISSOURI
ST LOUIS
13678 LAKEFRONT DRIVE
EARTH CITY, MO 63045
PHONE: 314-373-3032
FAX: 314-373-3038

KANSAS CITY
9810 INDUSTRIAL BLVD.
LENEXA, KS 66215
PHONE: 816-587-0272
FAX: 816-587-3735

NEW YORK
AUBURN
ONE ELLIS DRIVE
AUBURN, NY 13021
PHONE: 315-255-3403
FAX: 315-253-9923

NORTH CAROLINA
GREENSBORO
1220 ROTHERWOOD ROAD
GREENSBORO, NC 27406
PHONE: 336-272-6104
FAX: 336-273-6628

OHIO
CINCINNATI
2929 CRESCENTVILLE ROAD
WEST CHESTER, OH 45069
PHONE: 513-771-2600
FAX: 513-772-2219

OHIO (Continued)
CLEVELAND
8929 FREEWAY DRIVE
MACEDONIA, OH 44056
PHONE: 330-468-4777
FAX: 330-468-4778

OKLAHOMA
TULSA
5555 E. 71ST ST., SUITE 9100
TULSA, OK 74136
PHONE: 918-366-9320
FAX: 918-366-9338

OREGON
PORTLAND
16201 SE 98TH AVENUE
CLACKAMAS, OR 97015
PHONE: 503-691-9010
FAX: 503-691-9012

PENNSYLVANIA
PHILADELPHIA
103 CENTRAL AVENUE
SUITE 400B
MOUNT LAUREL, NJ 08054
PHONE: 856-840-8011
FAX: 856-840-0811

PITTSBURGH
159 PROMINENCE DRIVE
NEW KENSINGTON, PA 15068
PHONE: 724-889-0092
FAX: 724-889-0094

TENNESSEE
MEMPHIS
4000 WINCHESTER ROAD
MEMPHIS, TN 38118
PHONE: 901-365-2020
FAX: 901-365-3914

TEXAS
DALLAS
2920 114TH STREET SUITE 100
GRAND PRAIRIE, TX 75050
PHONE: 214-634-7271
FAX: 214-634-8874

HOUSTON
10355 W. LITTLE YORK ROAD
SUITE 300
HOUSTON, TX 77041
PHONE: 281-977-6500
FAX: 281-977-6510

UTAH
SALT LAKE CITY
2230 SOUTH MAIN STREET
SALT LAKE CITY, UT 84115
PHONE: 801-832-0127
FAX: 801-832-8911

WISCONSIN
MILWAUKEE
1960 SOUTH CALHOUN ROAD
NEW BERLIN, WI 53151
PHONE: 262-784-5940
FAX: 262-784-1215

INTERNATIONAL SALES
FORT SMITH, AR
P.O. BOX 2400
FORT SMITH, AR 72902
PHONE: 479-646-4711
FAX: 479-648-5895

BALDOR®

A MEMBER OF THE ABB GROUP

Baldor Electric Company
P.O. Box 2400, Fort Smith, AR 72902-2400 U.S.A., Ph: (1) 479.646.4711, Fax (1) 479.648.5792, International Fax (1) 479.648.5895
www.baldor.com

© Baldor Electric Company
MN708

All Rights Reserved. Printed in USA.
(A40298) - Rev. D 6/15