BALDOR®

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BC160 NEMA 4X / IP65
Adjustable Speed DC Control

6/15 **Installation & Operating Manual** MN712

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

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Introduction

Introduction

Thank you for purchasing the BC160 Series NEMA 4X (IP65) DC drive. Baldor is committed to providing total customer satisfaction by providing quality products that are easy to install and operate.

The Baldor SCR DC Motor, Variable Speed and Torque Control is designed for applications requiring washdown watertight integrity. Its housing is ruggedly constructed of die cast aluminum which is protected with an acrylic coating for the ultimate in corrosion resistance. All switches are sealed with rubber boots and the main speed potentiometer contains a shaft seal. The BC160 state-of-the-art electronics include short circuit and transient protection to provide the ultimate in reliability. Electronic overload protection is also provided, which prevents motor burnout and demagnetization of PM motors. The control can be operated in either the speed or torque mode via a jumper selection. The BC160 contains jumper selections for feedback type (armature/tachometer).

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.

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.

SAFETY NOTICE Continued

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 Electrical Ratings

Model Number	Line Voltage (VAC-50/60Hz)	Max. Line Current (ADC)	Output Voltage (VDC)	Max Output Current (ADC)	Maximum Field Current (ADC)	Maximum Horsepower HP, (kW)
BC160	115	22	0 - 90	15	1.5	1.5, (1.12)
	230	22	0 - 180	15	1.5	3.0, (2.25)

Table 1-2 Performance Specifications

Description	Specification	Factory Setting
AC Line Input Voltage (VAC ±15%, 50/60 Hz)	115/230	230
Horsepower Rating (HP)	1.5/3	3
Armature Voltage Range (VDC)	0 – 200 (1)	180VDC
Field Voltage (VDC)	200/100 (2)	—
Ambient Temperature Range (ºC)	0 - 45	—
Speed Range (Ratio)	50:1 (3)	—
Load Regulation (Armature Feedback, % Base Speed)	±1	—
Load Regulation (Tachometer Feedback, % Set Speed)	±1	—
ACCEL and DECEL Range (Seconds)	0.1 - 15	1
IR COMP (VDC)	0 - 30	8
Current Limit Range, %	0 - 180	150
Timed Current Limit Range (Seconds)	0.5 - 15	7
Voltage Following Linearity (% Base Speed)	±0.5	—

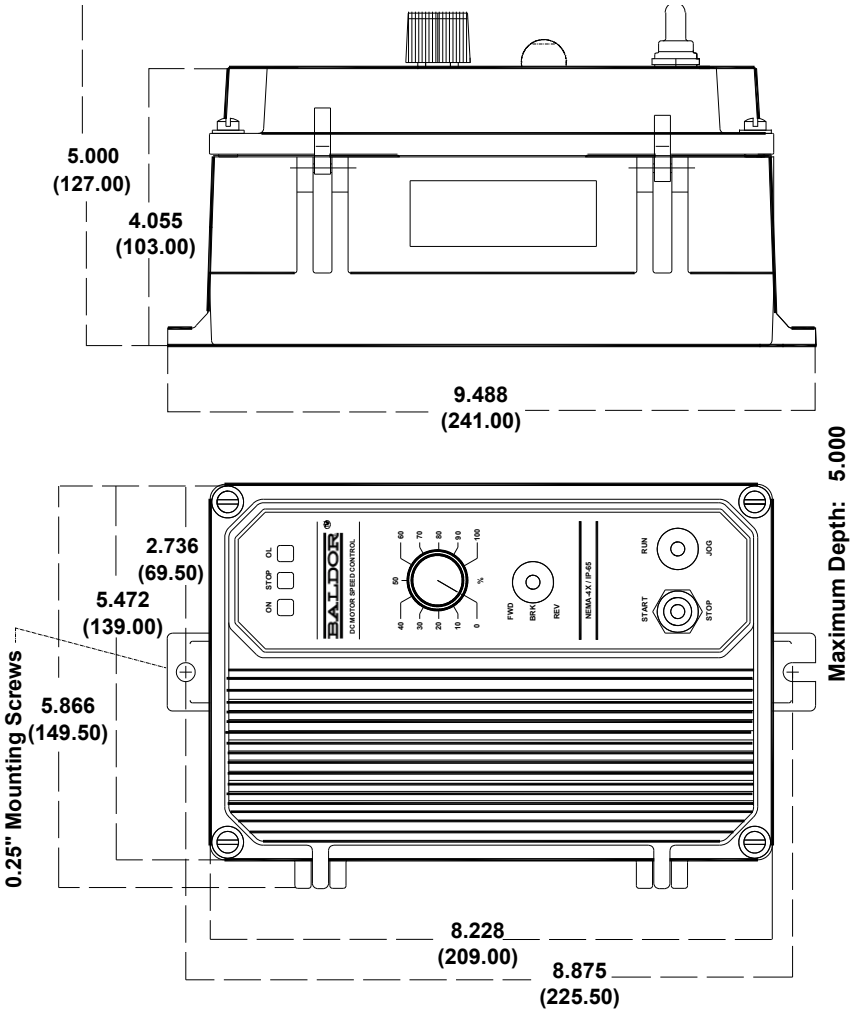
Notes:
(1) Maximum recommended output voltage is 180VDC at 230VAC.
Exceeding this output Voltage will cause a reduction in load regulation performance.
(2) For shunt wound motor with lower field voltage, use F+ and L1 connection.
(3) Consult motor manufacturers for constant torque speed range of motor.
(Typical speed range for most 3HP DC motors is 20:1).

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

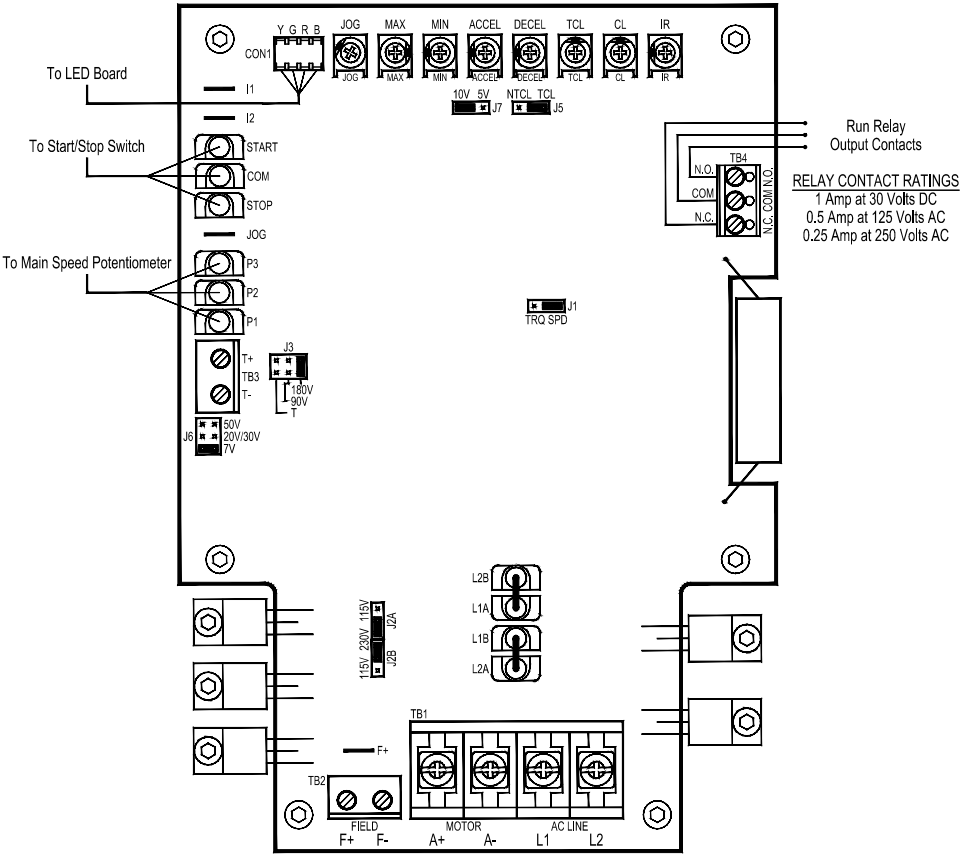
It is recommended that the control be mounted on a flat surface with adequate ventilation. Locate the mounting holes using the rear cover as a template or use the dimensions shown in Figure 2-1. Mount the control on a flat surface in a location where it will not be exposed to contaminants such as water, metal chips, solvents or excessive vibration and/or temperature extremes. Leave enough room to allow for AC line, motor leads, and other wiring that is required. If the control is mounted in a closed, unventilated cabinet, remember to allow for proper heat dissipation. If full rating is required, a minimum enclosure size of 12 W x 24 H x 12 D should be used.

Figure 2-1 Mounting Hole Locations



Front Cover - The BC160 is designed with a hinge so that when the front cover is open, all wiring stays intact. To open the cover, the four cover screws must be loosened, so they no longer are engaged in the case bottom. (Front cover screws are captive type). When closing cover, tighten screws, diagonally, so that the gasket is slightly compressed. Do not overtighten.

Figure 2-2 Control Board Component identification



Electrical Connections

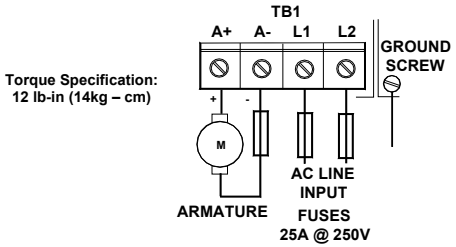
To avoid erratic operation, do not bundle the AC line and motor wires with signal or control wiring. Do not bundle motor wires from multiple controls in the same conduit. Use shielded cables on all signal wiring over 12 (30 cm). The shield should be earth grounded on the control side only. Wire the control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

To maintain the watertight integrity of the control, be sure to use suitable watertight connectors and wiring, which are appropriate for the application. Two .875 (22.2 mm) knockout holes are provided for a standard 1/2 knockout connector (not supplied) for wiring.
A watertight plug is provided if only one knockout is used.

AC LINE

Verify the AC line voltage matches the line voltage of the control. Connections are shown in Figure 2-3. Connect the AC Line to terminals L1 and L2. Verify jumpers J2A and J2B are both set to the correct input line voltage, 115 or 230VAC. 25A fuse must be used for AC line. A Disconnect is recommended.

Figure 2-3 Connection Diagram



Ground Connection

Connect all ground wires (earth) to the green ground stud located between the Bx knockouts, tighten to correct torque.

Motor Armature Connection

Connect the motor armature positive lead (+) to Terminal A+ and negative lead (-) to Terminal A-, as shown in Figure 2-3.

Note: 180 volt DC motors must be used with 230VAC line, 90 volt motors can be used with a 230VAC or 115VAC line.

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.

Table 2-1 Field Connections (Shunt Wound Motors Only)

AC LINE VOLTAGE (VAC)	MOTOR VOLTAGE	FIELD VOLTAGE (VDC)	FIELD CONNECTION
115	90	100	F+, F-
115	90	50	F+, L1
230	180	200	F+, F-
230	180	100	F+, L1
230	90*	100	F+, L1

* Step Down Operation

Full Voltage Field

Connect the field positive (+) lead to Terminal F+ and the negative lead (-) to Terminal F-, on the Barrier Terminal Block (Table 2-1, Figure 2-4A).

Half Voltage Field

For 50 Volt DC with 100 Volt rated armature, use Terminal L1 and F+, on the terminal board (Table 2-1, Figure 2-4B).

Figure 2-4A Full Voltage Field

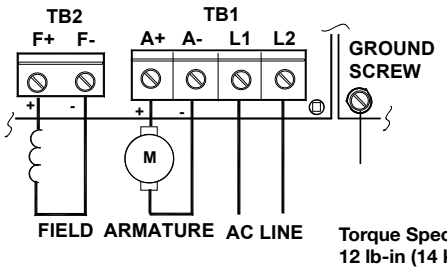
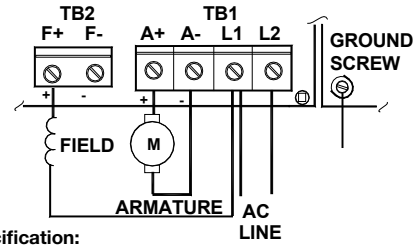


Figure 2-4B Half Voltage Field



Torque Specification: 12 lb-in (14 kg-cm)

DC Tachometer Input

If tachometer feedback is required, an analog tach signal must be connected to the terminal block TB3. See Figure 2-5.

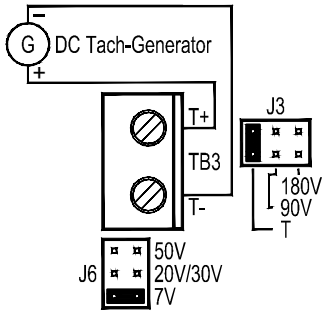
Note: For tachometer feedback, Jumper J3 must be set to the TFB position, jumper J6 must be set to the proper tach voltage, and the IR COMP must be set to minimum (ccw) position.

Connect the tachometer so that when the motor rotates in the desired forward direction, the positive tach voltage lead is connected to T+ and the negative tach lead is connected to T- (See Figure 2-5).

Figure 2-5 Tachometer Connection Diagram

Tachometer wires much be connected so that correct polarity is achieved when tach rotates in the desired forward direction.

Torque Specification: 12 lb-in (14 kg-cm)



Remote Speed Reference

The control has a main speed potentiometer prewired. However, the control can be operated from a remote potentiometer, or from an Isolated analog voltage for voltage following. To operate from an external source remove white, orange and violet potentiometer leads from terminals P1, P2 and P3. The leads may be taped and left in the control. The potentiometer itself may be removed, provided a watertight seal is used to cover the hole in the front cover.

Remote Potentiometer (5K Ohms)

Connect remote potentiometer wires to terminals P1, P2 and P3, so that the high side of the potentiometer connects to P3, the wiper to P2 and the low side to P1. See Figure 2-6A.

Analog Input

An isolated 0-5 or 0-10VDC analog voltage can also be used to control speed. See Figure 2-6B.

Figure 2-6A Remote Potentiometer

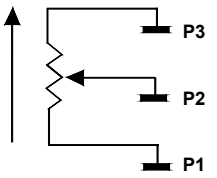
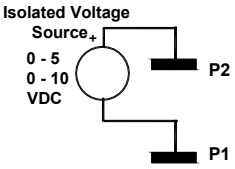


Figure 2-6B Analog Voltage Connection



Notes:

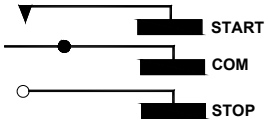
1. If the available analog speed reference signal voltage is not isolated, an optional Signal Isolator Board, model BC145, may be installed. Reference: Instruction Manual MN1373, BC145 Signal Isolator Board.
2. When using an external analog signal, the main speed potentiometer must be disconnected from terminals P1, P2, and P3. The MIN trimpot may need to be adjusted to achieve 0 output voltage.

Remote Start/Stop Switch

A remote Start/Stop Switch may be installed by disconnecting the wires from the Start, Com, and Stop terminals, and reconnecting the terminals to a remotely mounted switch. (See Figure 4-5).

Note: The Start/Stop function may be bypassed by connecting a jumper wire across the Start and Com terminals.

Figure 2-7 Remote Start/Stop Switch Connection



Inhibit

The control can be electronically stopped and started with the Inhibit circuit. To Stop the control, Terminals I1 & I2 must be connected as shown via a contact. The control can be restarted by opening the contact. (See Figure 2-8A).

Note: The Inhibit Circuit is not isolated. Do not common or ground inhibit leads.

Figure 2-8A Inhibit Circuit Wiring

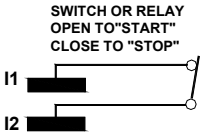
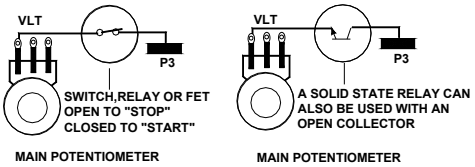


Figure 2-8B Enable Circuit Wiring



Enable

The control can be started and stopped with an Enable circuit (the Enable circuit functions opposite to that of the inhibit circuit; Inhibit: open to start, close to stop, Enable: open to stop, close to start). The Enable function is established by connecting a contact in series with the violet potentiometer lead, connected to terminal P3. The Enable circuit is not isolated. Do not connect the Enable line to common or ground. See Figure 2-8B.

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.

Note: The MIN speed trimpot must not be set higher than 70% CW rotation (approximately 2:00 o'clock position) or Enable will not function.

RUN/FAULT RELAY CONNECTION

The Run/Fault Relay, K1, Output Contacts are located at TB4 and can be used to turn on or off equipment. See Figure 2-9. The Run/Fault Relay Contact status for various drive operating conditions is shown in Table 2-2.

Relay Contacts Ratings: 1 Amp at 30 Volts DC, 0.5 Amps at 125 Volts AC, and 0.25 Amps at 250 Volts AC.

Figure 2-9 Run/Fault Relay Connections

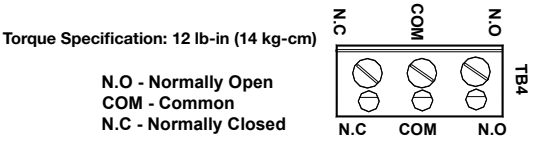


Table 2-2 Drive Operating Condition and Run/Fault Relay Contact Status

Drive Operating Condition	Description	Run Relay Operation (J5 Installed in NTCL Position) (Factory Setting)		Fault Relay Operation (J5 Installed in TCL Position)	
		N.O. Contact	N.C. Contact	N.O. Contact	N.C. Contact
Power Off	Main Power Disconnected	Open	Closed	Open	Closed
Run Mode	Normal Drive Operation	Closed	Open	Closed	Open
Stop Mode	Selected by Operator	Open	Closed	Open	Closed
Fault*	Drive Tripped	-	-	Open	Closed

Note: *TCL Fault.

Startup and Adjustments

Set Jumpers

This control has selectable jumpers which can be changed to accommodate various applications. Jumpers must be set before the control can be used. See Figure 2-2 for location of jumpers.

Note: Jumpers J2 and J4 have not been installed in this control. Factory setting for J1 is Speed Mode.

J1 - Speed And Torque Mode

Speed Control Mode

When Jumper J1 is placed in the SPD position the drive will control motor speed as a linear function of the main speed potentiometer setting or analog voltage input. The range of output speed can be adjusted with the MIN and MAX trimpots. The motor will maintain the preset speed as long as the maximum load does not exceed the current limit set point. If the motor load exceeds the current limit setting, the Overload LED will turn on and the motor will stall. See Figure 6-2A below and 6-2B.

Figure 2-10A Motor Speed vs. Pot Rotation

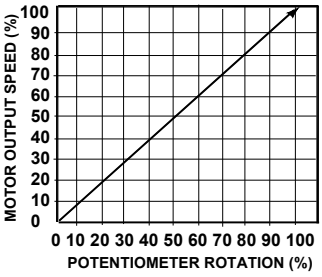
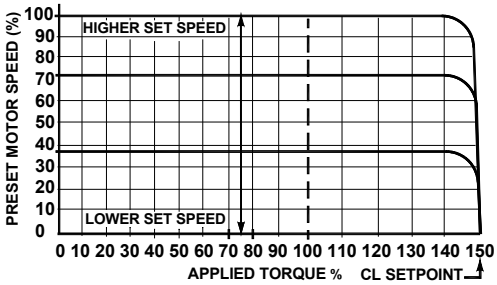


Figure 2-10B Motor Speed vs. Motor Load



Torque Control Mode

When Jumper J1 is in the TRQ position, the drive will control motor torque as a linear function of main potentiometer rotation. If the motor load exceeds the torque setting, the motor will stall, the Overload LED will light, and the drive will apply a constant preset torque based on the potentiometer setting.

The Overload LED will light when the load torque approaches the current limit set point. The torque limits are set via the CL trimpot. See Figures 2-11A below and 2-11B.

Note: When operating in the Torque Mode, Jumper J5 must be in the NTCL position or drive will shut down when CL Timer, times out.

Figure 2-11A Motor Torque vs. Pot Rotation

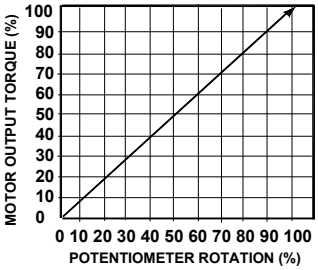
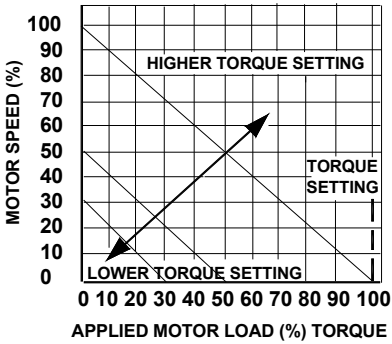


Figure 2-11B Preset Speed vs. Applied Load



J2A & J2B - AC Line

Select the proper input line voltage, 115VAC or 230VAC by placing both, J2A and J2B in the correct positions, 115V or 230V. See Figure 2-12.

Figure 2-12 AC Line Input Voltage Selection (Jumpers J2A and J2B)

208/230 Volt AC Line Input
(J2A and J2B Set to "230V")
(Factory Setting)

115 Volt AC Line Input
(J2A and J2B Set to "115V")

J3 - Armature Voltage/Tachometer Feedback

Select the desired armature voltage by placing J3 in the proper position, 90V for 20 - 130VDC motors or 180V for 180 - 220VDC motors. For 115VAC line input the armature voltage must be set to 90V. For 230VAC line input, the Armature Voltage is normally set to 180V. It is also possible to operate in a Step-Down Mode, (90 -180VDC motor with a 230VAC line), by setting J3 to 90V. However, reduced performance may result.

If Tachometer feedback is to be used, J3 must be placed in the T position and an external DC tachometer must be used.

Table 2-3 Relationship of AC Line Input and Motor Voltage with Jumper J2 and J3 Position

AC Input Voltage	J2A, J2B Position	J3 Position**	Motor Voltage
115	115	90	90
230	230	180	180
230	230	90*	90*

* A 90VDC motor can be used with a 230VAC line but speed range may be reduced and motor derating may be required.
** Position J3 to T if tachometer feedback is used.

J5 - Current Limit Mode
(Factory set for TCL) This control contains electronic current limiting which limits the maximum DC motor current (the current limit set point is established with the setting of the CL trimpot). Timed and non-timed modes of current limit operation are provided.

Timed Current Limit TCL
The drive will turn off after being in current limit for a preset time. This time period is adjustable with the TCL trimpot from 0.5-15 seconds and is factory set for approximately seven (7) seconds. This provides motor overload protection. When the control times out in TCL, it can be reset by setting the start/switch to the STOPposition and then to START, or by disconnecting and reconnecting the AC line. If the Start Switch is jumpered out, the control can be restarted after timing out in TCL, by cycling the AC power On and Off.

Non-Timed Current Limit NTCL

In this mode the drive will reach the preset current limit during overload and stay at that motor current level until a fuse blows or the drive is manually turned off. If non-timed CL operation is desired, move jumper J5 from the factory set TCL position to the NTCL position. The NTCL position must be used when operating in the Torque Mode.

J6 - Tachometer Voltage
Note: Selection of this jumper position is not required if tachometer feedback is not used.

If tachometer feedback is used, select the J6 position (See Figure 6-7) (7V, 20/30V, 50V) which corresponds to the tachometer voltage in Volts/1000 RPM. The selection of J6 position is based on a maximum motor speed of 1800 RPM.

If other than standard tachometer voltages and motor speeds are used, an external resistor (RT) may be used (1/2 watt rating).

1. Place J6 in 7V position
2. Calculate the value of (RT) as follows:

   RT = [(0.9 x VT x S) - 20,000] ohms

   VT = Tach Voltage in Volts/1000 RPM

   S = Base speed of motor in RPM
3. Install resistor (RT) in series with either tachometer lead.

Note: For tachometer feedback, Jumper J3 must be in the T position, and IR Comp trimpot must be set to minimum (ccw) position.

J7 - Signal Input Voltage
The output of this control is normally controlled with the main speed adjust potentiometer. However, an Isolated analog voltage may also be used in place of a potentiometer. The control can be scaled for either a 0-5VDC or 0-10VDC by placing J7 in the appropriate position 5V or 10V.
The scaling can be further adjusted with the Max trimpot.

Note: If an Isolated input signal is not available an accessory Signal Isolator Model BC145 can be installed.

Startup

After the control has been mounted properly and electrical connections have been completed and jumpers are correctly set, start the control as follows:

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.

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.

Acceleration (ACCEL)

The ACCEL trimpot sets the amount of time it takes the control to reach full output. The acceleration circuit operates when rapidly rotating the main speed potentiometer to full clockwise position, or when starting the control when the main speed potentiometer is rotated clockwise. The trimpot is factory set to 2 seconds. If more rapid acceleration is desired, rotate the trimpot counterclockwise.

Note: Rapid ACCEL setting may cause the current limit circuit to activate which will extend the acceleration time. For a longer acceleration time, rotate ACCEL trimpot clockwise. 50% rotation represents approximately seven (7) seconds and full rotation is approximately fifteen (15) seconds.

Deceleration (DECEL)

The DECEL trimpot sets the amount of time it takes the control to go from full speed to minimum speed when rotating the main potentiometer CCW. The trimpot is factory set to one 1 second, and can be readjusted to full counterclockwise position for more rapid DECEL.

Notes:

1. On high inertial loads, a rapid DECEL setting may cause the motor to coast to a stop slower than

the DECEL setting. To increase deceleration time, rotate DECEL trimpot clockwise. 50% rotation represents approximately seven (7) seconds and full rotation is approximately fifteen (15) seconds.

2. The Deceleration circuit works when rotating the main speed pot in the CCW direction or when opening the P3 lead of the main pot or when placing the Start/Stop switch to the STOP position. It does not operate when power is removed.

Current Limit (CL)

Caution: Adjusting the CL above 150% of motor rating can cause overheating and demagnetization of some PM motors. Consult motor manufacturer.

This trimpot is used to set the maximum amount of DC current that the motor can draw. The amount of DC current determines the amount of maximum motor torque in both the Speed Control Mode and Torque Mode. The CL trimpot is factory set at 150% of the motor current. Also see Section 8.1-C. The value can be set to a lower value by adjustment of the CL trimpot. Some applications require a lower torque limiting value so as not to damage the process material or the drive train.

IR Compensation (IR)

The IR comp circuit is used to stabilize motor speed under varying loads.

Note: If control is in Tach Feedback mode, the IR trimpot should be set to minimum - ccw.

Re-adjust the IR trimpot as follows:

a. Run the motor at approximately 30-50% of rated speed under no load and measure actual speed.

b. Load the motor to rated current. Rotate IR trimpot so that the loaded speed is the same as the unloaded speed measured in setting CL. Control is now compensated so that minimal speed change will occur over a wide range of motor load.

Note: Too much IR Comp will cause unstable (oscillatory) operation.

Timed Current Limit (TCL)

Jumper J5 must be in the TCL position, in order for Timed Current Limit to be operational. This trimpot determines the approximate amount of time the drive will stay in Current Limit before trip out. The trimpot has an adjustment range of 0.5-15 seconds and is factory set for seven (7) seconds. The trimpot can be reset according to the desired trip time. Rotating the trimpot clockwise, increases the trip time. This function provides motor overload protection.

Jog Speed (JOG)

The trimpot is only operational when the optional RUN-STOP-JOG Switch (BC157) is installed. In the JOG position the JOG trimpot can be adjusted to the JOG speed.

Operation

Set the AC Line Switch to the ON position. Observe that the Pilot Light illuminates. Gradually increase the Main Speed Potentiometer. The motor should smoothly come up to the desired speed and remain stable.

Troubleshooting

The control has LEDs to display the control's operational status.

A. **Power On** Indicator (ON) – This lamp will glow GREEN when the AC power is applied to the control.

B. **Stop** Indicator (STOP) – This lamp will glow YELLOW when the control is placed in the STOP mode with the START/STOP Switch. This indicator remains off if the control was running and INHIBIT is asserted or if ENABLE is open.

C. **Overload** Indicator (OL) – When the motor is loaded to the current limit setpoint, this lamp will glow RED.

If the control remains in CL and then trips out in Timed Current Limit, the OL LED will remain lighted until the control is stopped and restarted with the START/STOP switch.
If the OL LED remains illuminated during control operation, a fault condition may exist.
Possible causes and solutions for these conditions may be found in Table 9-1.

Note: In some applications, especially those requiring the motor to cycle on and off or, changing from one speed to another, the OL indicator may blink indicating a transient overload. This may be a normal condition for the application.

Table 2-3 Troubleshooting Guide

Symptom	Possible Cause	Suggested Corrective Action
Motor is not running and Pilot Light not illuminated.	On/Off AC Line Switch in Off Position.	Set On/Off Switch to On Position.
	Blown Line fuse.	Replace Line Fuse.
	Defective On/Off AC Line Switch,	Replace On/Off AC Line Switch.
Motor does not run and Pilot Light is illuminated.	Main Speed Potentiometer set fully counterclockwise.	Rotate Main Speed potentiometer clockwise.
	Defective motor.	Check for defective motor, worn brushes, etc. Replace motor, if necessary.
	Blown Armature Fuse.	Replace Armature Fuse.
	CL Trimpot set fully counterclockwise.	Set CL Trimpot
Motor hums, runs at very low speed, or slows down substantially when loaded.	Low AC line input voltage.	Check AC line input voltage.
Motor continues to run with Main Speed Potentiometer set fully counterclockwise.	MIN speed trimpot set higher than 0% of base speed.	Readjust the MIN Trimpot.
	IR Comp trimpot set too high.	Readjust the IR Trimpot.
Motor runs in wrong direction.	Motor armature leads are reversed.	Reconnect motor armature leads.
Erratic motor performance.	Overload condition.	Remove overload.
	CL and/or IR Trimpots may be set incorrectly.	Readjust the CL and/or IR Trimpots
	Defective speed control module.	Replace speed control.
	Voltage Select Switch set to wrong position.	Recheck line voltage and the correct setting of the Voltage Select Switch.
	Defective motor, worn brushes, etc.	Repair or replace motor.

Optional Accessories

BC157 Run/Jog switch for BC154 & BC160, BC354

BC158 Auto/Manual Installation Kit for BC145 signal isolator for BC154, BC160, BC354

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