BALDOR®

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NEMA-4X—IP65

for Catalogs BC154 and BCWD140

6/15 **Installation & Operating Manual** MN705

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Chapter 1
General Information

Introduction

Thank you for purchasing the Baldor BC154/BCWD140 Series NEMA-4X (IP-65) SCR DC Motor Speed and Torque Control. It 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 has a shaft seal.

Short circuit and transient protection are provided for ultimate in reliability. Electronic overload protection prevents motor burnout and demagnetization of PM motors. The control can be operated in either the Speed or Torque mode via jumper selection. The current range, which is also jumper selectable, eliminates the necessity for calibration of IR Compensation and Current Limit for most applications. AC line voltage 230/115VAC (jumper selectable), DC armature voltage (180/90VDC) and feedback type may be Armature/Tachometer.

Standard features include armature fusing (fuse sold separately), electronic start/stop switch, and an LED indicator array for Power On, Stop and Overload. Although factory set for most applications, a variety of trim pots allow adjustments of parameters.

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 phaseto- 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 Inhibit 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 Electrical Ratings

Model Number	InputVoltage (VAC- 50/60Hz)	Max. AC Load Current (Amps RMS)	Output Voltage (VDC)	Max. Output Current (ADC)	Max. Field Current (ADC)	Maximum Power HP (kW)	Fuse or Breaker (Amps)
BC154	115	15.0	0 to 90	10.2	1.13	1 (0.75)	20
BCWD140	230	15.0	0 to 180	10.2	1.13	2 (1.5)	20
	230	15.0	0 to 90	10.2	1.13	1 (0.75)	20

Table 1-2 Performance Specifications

Parameter	Specification	Factory Setting
AC Line Input Voltage (VAC ±10%)	115 / 230	230
AC Line Frequency (Hz)	50 / 60	-
Armature Voltage Range at 115VAC Line (VDC)	0 to 130*	-
Armature Voltage Range at 230VAC Line (VDC)	0 to 220*	180
Field Voltage at 115VAC Line (VDC)	100 / 50	-
Field Voltage at 230VAC Line (VDC)	200 / 100	-
Horsepower at 115VAC	1 / 50-1	
Horsepower at 230VAC	1 / 25-2	
Ambient Temperature Range (°C / °F)	0-40 / 32-104	-
Operating Humidity Range (% Relative, Non-Condensing)	0-95	-
Storage Temperature (°C / °F)	-25 to +85 /-13 to +185	-
Speed Range (Ratio)	50:1	-
Speed Regulation (Armature Feedback, % Base Speed)	±1	-
Speed Regulation (Tachometer Feedback, % Set Speed)	±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.

Introduction

The BC154/BCWD140 is intended to be installed in a vertical position on a flat surface free of moisture, metal chips, or corrosive atmosphere.
Control installation must ensure unrestricted air flow through the heatsink cooling fins.

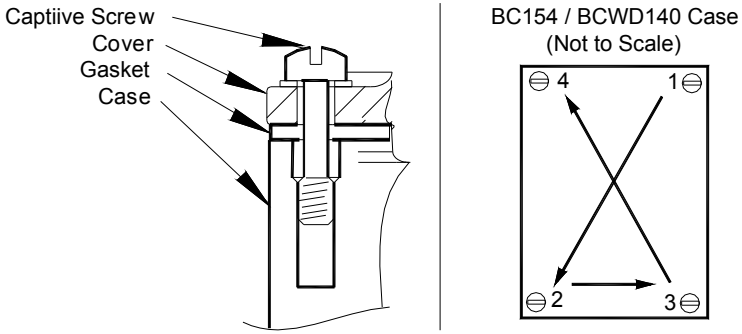
Note: If drive is mounted in other than a vertical position, decrease maximum allowable ambient temperature by 10°C.

Enclosure - When mounting the BC154 or BCWD140 in an enclosure, it must be large enough to provide proper heat dissipation. If full rating is required, a minimum enclosure size of 12W x 12D x 24H should be used. Smaller enclosures may be used if full rating is not required or if adequate ventilation, or auxiliary cooling methods are used.

Front Cover - The BC154/BCWD140 case 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. See Figure 2-1.

Note: Front cover screws are captive.

Figure 2-1 Captive Cover Screws



Tighten the four case captive screws in the 1- 4 sequence.
Torque Specification: 12 lb-in (14 kg-cm)

2

Mounting

1. Refer to mounting hole locations shown in Figure 2-2. Locate and drill mounting holes.
2. Securely mount control to flat mounting surface using appropriate hardware.
3. Open cover (refer to Figure 2-1) so that electrical installation can be performed.

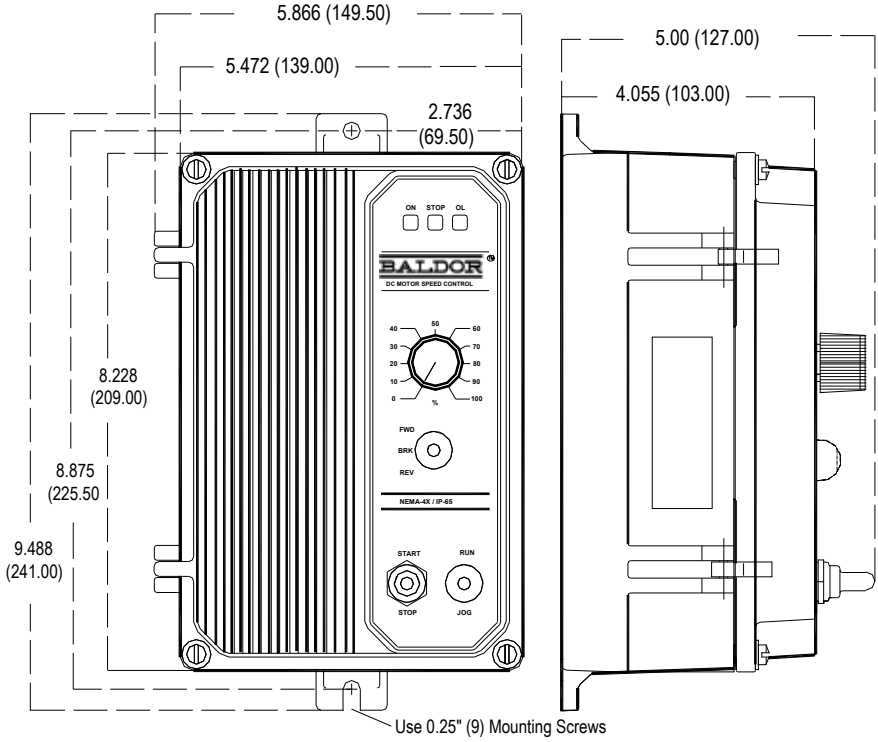
Power Connection Refer to Figure 2-3 for connections.

1. Connect AC line voltage to terminals L1 and L2. See Table 2-1.
   Set both jumpers J2A and J2B to the correct input line voltage of 115 or 230VAC.
   This control does not contain AC line fuses.
   A 25 amp rated fuse or circuit breaker can be to protect the unit from catastrophic failure.
2. Connect ground wire (earth) to green ground screw terminal. See Figure 2-3 and Table 2-1.

Table 2-1 Terminal Block Wiring Information

Terminal Block	Terminal	Supply Wire Size (AWG - Copper)		Tightening Torque Specification	
		Minimum	Maximum	lbs- in	kg-cm
TB1	A1, A2, L1, L2	22	12	12	14
TB2	F1, F2	22	14	3.5	4
TB3	T+, T-	22	14	3.5	4
TB4	N.O., COM, N.C.	22	14	3.5	4

Figure 2-2 Mounting Hole Locations



Armature Connection

1. Select the proper fuse size for your motor. See Table 2-2.
   Control will not operate if fuse is not installed.
   Fuse type should be Littlefuse 326 ceramic, Buss ABC, or equivalent.
   Table 2-2 suggests appropriate armature fuse ratings. However, the specific application may require larger fuse ratings based on ambient temperature, CL set point and duty cycle of operation. (Fuse rating is based upon 1.7 times the motor current rating.)
2. Install the correct fuse in the ARM FUSE fuse holder on circuit board. See Figure 2-3.
3. Connect the armature leads: see PM type or Shunt Wound type.

Table 2-2 Armature Fuse Chart

Motor Horsepower		DC Motor Current (A)	Fuse Rating (A)
90VDC	180VDC		
1/8	1/4	1.3	2
1/6	1/3	1.7	2-1/2
1/4	1/2	2.5	4
1/3	3/4	3.3	5
1/2	1	5.0	8
3/4	1-1/2	7.5	12
1	2	10.0	20

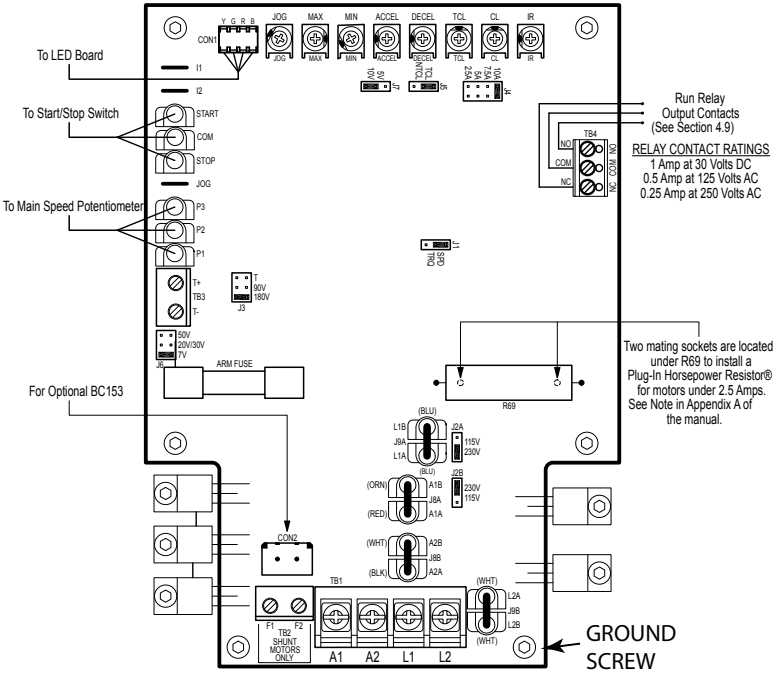
Permanent Magnet (PM Type)

Connect motor armature leads to A1(+) and A2(-). See Figures 2-4 and 2-5.
Set jumper J3 to the proper position 90V (90 VDC motors) or 180V (180 VDC motors).

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

Note: Motor performance and efficiency, including brush life, may be adversely affected when using a 90 VDC motor with a 230VAC line.

Figure 2-3 Control Board



Shunt Wound Motors

Connect motor armature leads to A1(+) and A2(-). See Figures 2-4 and 2-5.

a. For 90 VDC motors with 100 volt fields and 180 VDC motors with 200 volt fields. Connect full voltage shunt field wires to F1 and F2.

b. For 90 VDC motors with 50 volt fields and 180 VDC motors with 100 volt fields. Connect half voltage field wires to F1 and L1.

4. Select Speed Or Torque Mode.
   Set J1 (factory set for speed control). to SPD for Speed control or to TRQ for torque control.
5. Set Armature Current. Jumper J4 is factory set for 10 amp motors (10A).
   For motors with less armature current rating, place J4 in the proper position.

Note: The factory setting for Current Limit is 150% of the nominal current setting (e.g., if J4 is selected for 10 amps, the actual CL setting will be 15 amps).

Figure 2-4 Full Voltage Field Connection

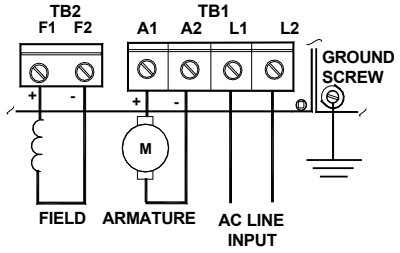
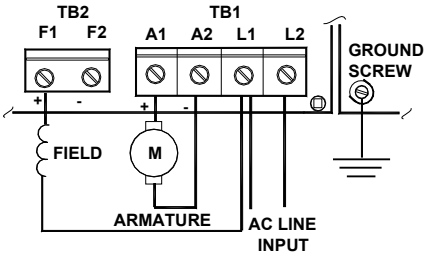


Figure 2-5 Half Voltage Field Connection



Torque specifications are provided in Table 2-1.

Table 2-2A Field Connection (Shunt Wound Motors Only)

AC Line Voltage (VAC)	Armature Voltage (VDC)	Field Voltage (VDC)	Field Connections
115	90	100	F1, F2
115	90	50	F1, L1
230	180	200	F1, F2
230	180	100	F1, L1
230	90*	100	F1, L1

* Step down operation.

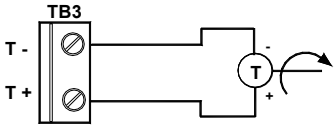
DC Tachometer Connection

If Tachometer feedback is required, an analog tach signal must be connected to terminal block TB3. For location, see Figure 2-3.

To avoid erratic operation, do not bundle AC line and motor wires with potentiometer, voltage following, enable, inhibit or other signal wiring. Use shielded cables on all signal wiring over 12 (30 cm). The shield should be grounded on the control side only.

Connect the Tachometer so that when the motor rotates the positive tach voltage lead is connected to T+ and the negative tach lead is connected to T-. See Figure 2-6.

Figure 2-6 Tachometer Connection Diagram



Torque specifications are provided in Table 2-1.

Note: For Tachometer feedback, Jumper J3 must be set to the T position, Jumper J6 must be set for the proper tach voltage, and the IR COMP must be set to minimum (CCW) position.

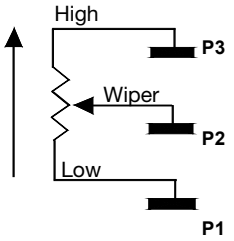
Remote Speed Reference

The control is operated by the main potentiometer on front panel. However, the control can be operated remotely by and external potentiometer, or 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 (if required). If the potentiometer is removed, a watertight seal must be installed to prevent water entry through the cover.

Remote Potentiometer (5K)

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 2-7.

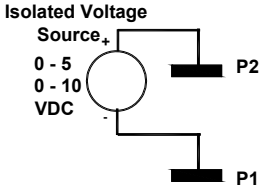
Figure 2-7 Remote Potentiometer Connection (5K)



Analog Input

An isolated 0-5 or 0-10VDC analog voltage can also be used to control speed. See Figure 2-8.

Figure 2-8 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.
2. When using an external analog signal, the main speed potentiometer must be disconnected from terminal 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 2-9.

Figure 2-9 Remote Start/Stop Switch Connection

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

Inhibit

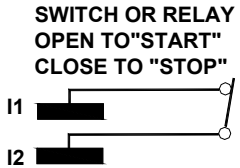
WARNING: When the Inhibit jumper is installed, the drive and motor will start and run when AC power is applied, when power is restored after a momentary power loss, or after an overload or TCL fault is reset. The user must ensure that automatic start up of the driven equipment will not cause injury to 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.

The control can be electronically stopped and started with the Inhibit circuit. To Stop the control, Terminals I1 and I2 must be connected as shown. See Figure 2-10.

The control can be restarted by opening the contact.

Figure 2-10 Inhibit Circuit Wiring

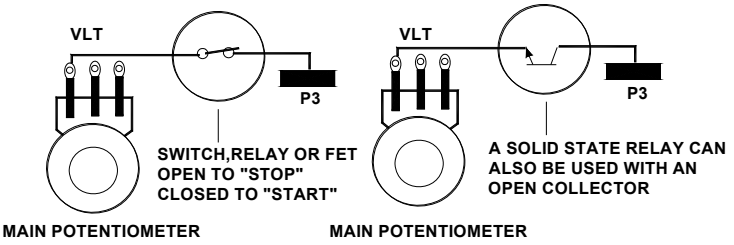


Note: The Inhibit Circuit is not isolated. Do not connect common or ground leads from the remote circuit.

Enable

The control can also be started and stopped with an Enable circuit (the Enable circuit functions opposite to that of the inhibit circuit; open to start, close to stop, Enable: open to stop, close to start). The Enable function is established by wiring a contact in series with the violet potentiometer lead connected to terminal P3. The Enable circuit is not isolated. Do not connect common or ground leads from external power sources. See Figure 2-11.

Figure 2-11 Enable Circuit Wiring

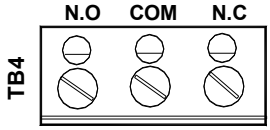


Note: The MIN speed trimpot must not be set higher than 70% CW rotation (Approximately 2:00 o'clock position) or Enable will not function.

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 2-12.

Figure 2-12 Run/Fault Relay Connections



N.O - Normally Open
COM - Common
N.C - Normally Closed

Torque specifications are provided in Table 2-1.

The Run/Fault Relay Contact status for various drive operating conditions is shown in Table 2-3. Relay Contacts Ratings: 1 Amp at 30VDC, 0.5 Amps at 125VAC, and 0.25 Amps at 250VAC.

Table 2-3 Drive Operating Condition and Run/Fault Relay Contact Status

Drive Operating Condition	Description	Run Relay Operation (J5 = NTCL Position) (Factory Setting)		Fault Relay Operation (J5 = TCL Position)	
		Normally Open	Normally Closed	Normally Open	Normally Closed
Power Off	Main Power Disconnected	Open	Closed	Open	Closed
Run Mode1	Normal Drive Operation	Closed	Open	Closed	Open
Stop Mode2	Selected by Operator	Open	Closed	Open	Closed
Fault3	Drive Tripped	-	-	Open	Closed

Notes:

1. Run Mode is selected with the optional FWD-BRK-REV Switch.
2. Stop Mode is selected using the optional FWD-BRK-REV Switch.
3. TCL Fault.

Install Cover

1. Ensure the gasket is in place around the cover lip.
2. Close cover. Tighten cover screws as specified in Figure 2-1.

Important Application Information

Motor Type

The BC154/BCWD140 is designed for Permanent Magnet (PM), Shunt Wound and Universal (AC/DC) motors. Use of higher voltage motors will result in reduction of available maximum (MAX) speed (Trimpot Adjustment). Also, if motor is not an SCR rated type, the actual AC line amperage at full load should not exceed the motor's DC nameplate rating.

Torque Requirements

When replacing an AC induction motor with a DC motor and speed control, consideration must be given to the maximum torque requirements. The full load torque rating of the DC motor must be equal to, or greater than, that of the AC motor.

Acceleration Start

The BC154/BCWD140 contains an adjustable acceleration start feature that allows the motor to smoothly accelerate from 0-full speed over a time period of 0.1 to 15 seconds.

Limitation In Use

The BC154/BCWD140 controls are designed for use on machine applications.

Setting selectable jumpers

The BC154/BCWD140 has selectable jumpers that can be set to accommodate various applications. Jumpers must be set before the control can be used. Set the jumpers as follows:

Be certain all power is off.

J1 - Speed and torque mode

Selects Speed (SPD) or Torque (TRQ) operating modes.

Speed Mode - When Jumper J1 is placed in the "SPD" position, the drive will control motor speed as a linear function of the main 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 6-2, 6-3 through 6-6, which illustrate Motor Speed and Torque Modes.

Figure 3-1 Motor Speed vs. Potentiometer Rotation (Speed Mode)

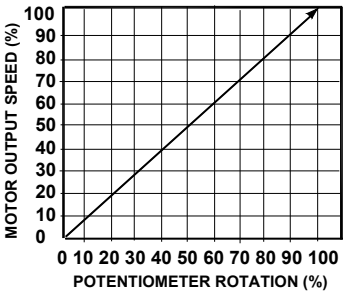
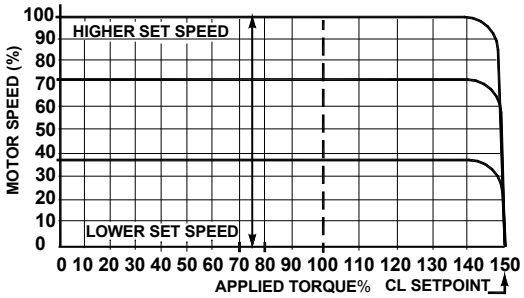


Figure 3-2 Preset Motor Speed vs. Motor Load (Speed Mode)



Torque Mode - When Jumper J1 is placed in the “TRQ” position, the drive will control motor torque as a linear function of main potentiometer setting. 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 jumper J4 and the CL trimpot.

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 3-3 Motor Output Torque vs. Potentiometer Rotation (Torque Mode)

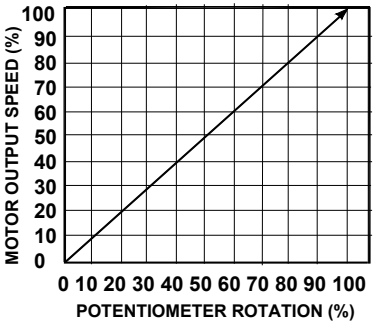
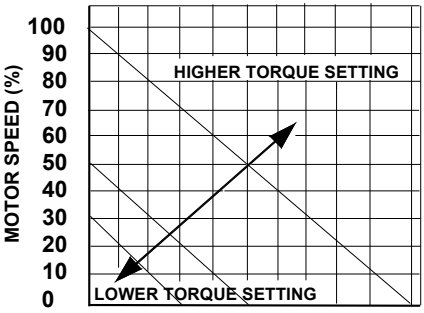


Figure 3-4 Motor Speed vs. Applied Motor Load (Torque Mode)



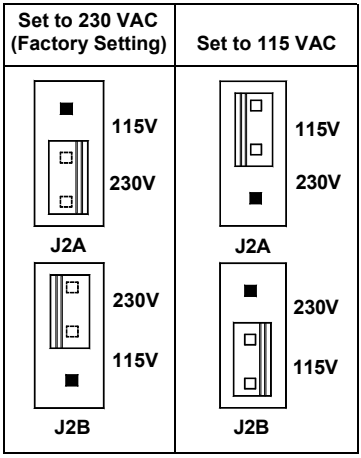
Note: *S1 and S2 = Speed Setting*

J2 - Input AC line voltage

Selects the AC line voltage source connected to the drive (115/230VAC).

J2A and J2B in the correct corresponding positions, “115V” or “230V”, see Figure 3-5.

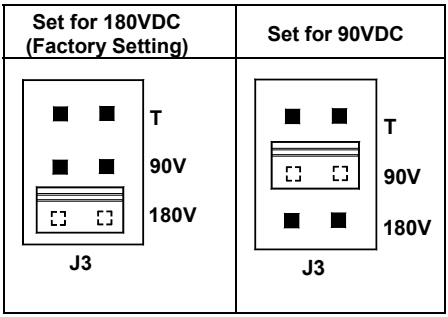
Figure 3-5 Setting AC Line Voltage with Jumper J2A and J2B



J3 - Armature Voltage Output and Tachometer Feedback

Select the required armature voltage by placing J3 in the proper position “90V” for 90-130VDC motors and “180V” for 180-220VDC motors. For 115VAC line input, J3 must be set to “90V”. See Figure 3-6.

Figure 3-6 Setting Armature Voltage with Jumper J3



For 230VAC line input, the Armature voltage is normally set to “180V”. It is possible to operate in a Step-Down Mode (90-180VDC motor with a 230VAC line) by setting J3 to “90”. 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 installed.

Table 3-1 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. However, speed range may be reduced and motor derating may be required.

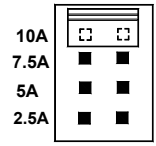
** Set J3 to “T” if tachometer feedback is used.

J4 - Armature Current

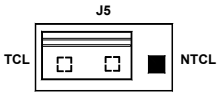
Select the J4 position (2.5A, 5A, 7.5A, 10A) closest to the rated motor current. Note that the output is factory set to 150% of the J4 position (e.g. 15 amps in the 10A position and 11 amps in the 7.5 position, etc.). This setting can be readjusted using the CL trimpot.

Note: For subfractional horsepower motors with current ratings below 2.5 amps, the drive can be modified. Refer to Appendix A.

Table 3-2 Jumper J4 Setting vs. Motor Horsepower

Jumper J4 Factory Setting	Motor Horsepower Range	
	90VDC	180VDC
	1	2
	3/4	1-1/2
	1/3 - 1/2	3/4 - 1
	1/6 - 1/4	1/3 - 1/2

J5 - Current Limit Mode



(Factory set for TCL). This control contains electronic current limiting which limits the maximum DC current to the motor (the current limit set point is established with the selection of the J5 position and the setting of the CL trimpot). See Figure 6-8. Two modes of current limit operation are provided:

Timed Current Limit "TCL"

In this mode the drive will turn off after being in current limit for a preset time. The time period is adjustable with the TCL trimpot from 0.5-15 seconds and is factory set for approximately seven (7) seconds. TCL provides electronic motor overload protection.

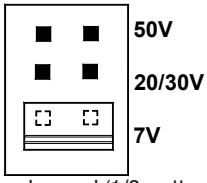
After the control times out in TCL, it can be reset by placing the front panel Start Switch to the "STOP" position and then to "START", or by cycling the AC power. If the Start Switch is jumpered out, the control can be restarted after timing out in TCL, by cycling AC power OFF and ON.

Note: The Overload lamp will remain lighted until the control is reset.

Non-Timed Current Limit "NTCL"

In this mode the drive will reach the preset current limit during overload and stay at that 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 a tachometer feedback is used, select the J6 position that 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).

Factory setting is 7V.

Calculate the value of RT as follows:

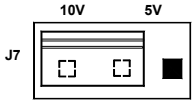
RT = [(1.64 x VT x S) - 20,000] ohms

where: RT = Calibration resistor value (ohms)
VT = Tach Voltage in Volts/1000 RPM
S = Base speed of motor in RPM

Install resistor (RT) in series with either tachometer lead.

Note: For tachometer feedback Jumper J3 must be in the "T" 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. The BC154/BCWD140 accepts a wide range of signal voltage and current. An installation kit (BC158) containing Auto/ Man Switch and required connections are also available.

Start-Up

When jumpers are set to the desired positions, and the electrical connections have been completed, the drive is ready for start-up.

First Time Start-up

Check of Electrical Items

1. Verify AC line voltage at source matches control rating.
2. Inspect all power connections for accuracy, workmanship and tightness and compliance to codes.
3. Verify control and motor are grounded to each other and the control is connected to earth ground.
4. Check all signal wiring for accuracy.
5. Be certain all brake coils, contactors and relay coils have noise suppression.

This should be an R-C filter for AC coils and reverse polarity diodes for DC coils. MOV type transient suppression is not adequate.

Check of Motor and Coupling

1. Verify freedom of motion of motor shaft.
2. Disconnect the load from the motor shaft. Verify operation of the drive and motor before the load is attached.

Procedure

1. Before starting, be sure the main speed adjust potentiometer is fully CCW.
2. Apply AC power.
3. Observe the Power “ON” LED and the “STOP” LED indicators are illuminated.
4. To start the control, move the START/STOP switch to the “START” position.

The “STOP” LED should extinguish.

5. Rotate the main speed adjust potentiometer clockwise. Motor speed should increase as potentiometer is rotated.
6. Verify the motor shaft is rotating in the desired “forward” direction.
   If the direction of rotation is wrong, stop the drive and disconnect AC power.
   Reverse the A1 and A2 motor lead connections.
   If a tachometer is connected, the leads may also need to be switched for correct signal polarity.
   Resume the procedure at step 1.
7. When steps 1-6 operation is correct, stop the drive and disconnect AC power.
   Couple the load to the motor shaft, verify the connection is secure.
8. Repeat Procedure steps 1-6 with the load coupled to the motor shaft.

TRIMPOT ADJUSTMENTS

The control contains trimpots that are factory set for most applications. Figure 2-3 shows the location of the trimpots and their approximate calibrated positions. Some applications may require adjustment of the trimpot values.

To adjust the trim pots, be sure the First Time Start-up procedure was successful and that power is applied to the control and the drive is ready for operation.

Minimum Speed (MIN)

The MIN trimpot sets the minimum speed of the motor as a % of full range.

Adjust the MIN trimpot as follows:

1. Rotate Main Potentiometer to minimum speed position (full counterclockwise).
2. Increase setting of MIN trimpot so that motor runs at desired minimum speed.

Maximum Speed (MAX)

The MAX trimpot sets the maximum speed of the motor.
Adjust the MAX trimpot as follows:

1. Rotate Main Potentiometer to maximum speed position (full clockwise).
2. Adjust MAX trimpot setting to desired setting of motor speed.

Acceleration (ACCEL)

The ACCEL trimpot sets the amount of time for the control voltage 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 already at speed position.
The trimpot is factory set to 1 second. If more rapid acceleration is desired, rotate the trimpot counterclockwise. Clockwise for longer accel time.

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 for the control voltage to reach minimum speed. The deceleration circuit operates when rapidly rotating the main speed potentiometer to full counter clockwise position, or when stopping the control when the motor is already at speed. It does not operate when power is removed.
The trimpot is factory set to one (1) second. If more rapid decel is desired, rotate the trimpot counterclockwise. Clockwise for longer decel time.

Note: For 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.

Current Limit (CL)

The CL trimpot sets 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. These CL trimpot is factory set at 150% of the motor current.
The value can be reduced by adjustment of the CL trimpot. Some applications require a lower torque limiting value to prevent damage to the process material or the drive train.

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

IR Compensation (IR)

The IR Comp circuit is used to stabilize motor speed under varying loads. Factory set to 4/8 VDC for Controls with 90/180 VDC Output.

Note: If control is in Tach Feedback mode, the IR trimpot should be set to minimum (fully CCW).

Adjust the IR trimpot as follows:

1. Run motor at approximately 30-50% of rated speed under no load and measure actual speed.
2. Load motor to rated current. Rotate IR trimpot so that the fully loaded speed is the same as the unloaded speed measured in the previous step.

IR compensated is set 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 for Timed Current Limit to be operational.
This trimpot determines the approximate time the drive will stay in Current Limit before tripping.
The trimpot is adjustable over a time range of 0.5-15 seconds and is factory set to seven (7) seconds.
Rotating the trimpot clockwise increases the trip time.
This function provides motor overload protection.

Jog Speed (JOG)

This trimpot is operational only when the optional RUNSTOP-JOG Switch (BC157) is installed.
In the JOG position, the JOG trimpot can be adjusted to the JOG speed.

LED Indications

The front cover has three LEDs that indicate the control's operational status.

1. Power On Indicator (ON) - This LED is Green when AC power is applied to the control.
2. Stop Indicator (STOP) - This LED is Yellow in the stop mode (start/stop switch=stop). This indicator remains off if the control was running and inhibit is asserted or enable is opened.
3. Overload Indicator (OL) - When the motor is loaded to the current limit setpoint, this LED will glow Red. If the control is allowed to stay in CL and then trips out in TCL (Timed Current Limit), the OL LED will remain Red 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 4-1.

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 4-1 Troubleshooting Guide

Indication	Possible Cause	Corrective Action
Motor is not running and Stop LED is on.	Start/stop switch is in the stop position.	Move the switch to the start position.
	The main speed potentiometer is set to zero speed.	Set the main speed potentiometer for the desired speed.
	The main speed potentiometer, signal input, or motor connections are open.	Verify main speed potentiometer, signal input, or motor connections.
Motor is not running and Stop LED is not on.	Inhibit is asserted or enable is opened.	Remove the inhibit signal or enable the drive.
Motor runs then stops after a short time or, the drive trips due to overload (TCL Fault).	Drive is tripped. Drive is overloaded.	Restart drive by cycling AC power. Reduce load.
Line fuse blows or circuit breaker trips.	The fuse or breaker is the incorrect rating.	Install correct size fuse or breaker.
OL LED indicator is on.	Motor is overloaded.	Check motor amps with DC ammeter in series with armature. (If motor is shunt type, field may be open or not receiving proper voltage.) Correct problem.
	Check motor for shorts or grounds.	Motor may be defective. Replace motor.
	Check position of CL trimpot.	Adjust CL trimpot if set too low.
	Rapid Acceleration caused OL trip.	Verify Accel trim pot setting. Cycle power.
Power ON LED is not on.	Verify AC power is available.	Correct AC input power problem.
		Replace fuse or reset breaker.
Motor runs at high speed and does not respond to the main adjust pot or remote speed signal.	Check position of Jumper, J3.	Set J3 correctly.
		If tach is connected, verify signal polarity.

Modification for Subfractional HP Motors

Note: Before making this modification you must have a .05 ohm Plug-in Horsepower Resistor (Baldor P/N WD3007A07).

Turn off all power.

Carefully clip out the large power resistor R69 on the printed circuit board. The resistor location is shown in Figure 1-3.

Insert the .05 ohm Plug-in Horsepower Resistor into the two (2) pins located under the resistor, R69. Each of the current selection values are now divided by 10. See Table A-1.

Table A-1 Current Limit Settings with .05 ohm Plug-in Horsepower Resistor Installed

Original J4 Selections	New J4 Selections	New CL Trimpot Range	New CL Trimpot Factory Setting
10.0 Amps	1.0 Amps	0 - 2.0 Amps	1.50 Amps
7.5 Amps	0.75 Amps	0 - 1.5 Amps	1.13 Amps
5.0 Amps	0.5 Amps	0 - 1.0 Amps	0.75 Amps
2.5 Amps	0.25 Amps	0 - 0.5 Amps	0.38 Amps

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