BALDOR®

A MEMBER OF THE ABB GROUP

BC200/BC201 Regenerative Drive Adjustable Speed DC Control

6/15 **Installation & Operating Manual** MN716

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

Thank you for purchasing the BC200/BC201 chassis style DC drive. Baldor is committed to providing total customer satisfaction by producing quality products that are easy to install and operate.
The BC200/BC201 is manufactured with Surface Mount components (SMT), incorporating advanced circuitry and technology.

The BC200/BC201 is a full-wave regenerative drive capable of operating DC PM or Shunt motors in a bidirectional mode. Its 4-quadrant operation provides forward and reverse torque in both directions. This allows the control to maintain constant speed with overhauling loads and provides rapid instant reversing and controlled braking. Because of its excellent controllability and response time, the BC200/BC201 can replace servos in many applications. The control is factory set for armature feedback, which can provide 1% load regulation over a motor base speed of 50:1.
However, tachometer feedback is also available if superior regulation is required. By resetting mode jumper J7 to the TRQ position, the BC200/BC201 can be changed from a speed control to a torque control.

The BC200/BC201™ can be operated with either a two (2) or three (3) wire start/stop circuit, or can be started from the AC line. A set of dedicated relay contacts are provided which are activated via the start/stop circuit. They can be used to turn on or off corresponding equipment or to sound an alarm if the drive stops.

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.

SAFETY NOTICE Continued

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	Input Volts (VAC)	Max. Line Current (Amps RMS)	Armature (VDC)	Max. Current (ADC)	Max. Field Current @ 200/100 VDC	Max Power HP, (kW)
BC200	115	16	-90 to +90	11	3	1, (.75)
	230	16	-180 to +180	11	3	2, (1.5)
BC201	115	24	-90 to +90	16	3	1-1/2, (1)
	230	24	-180 to +180	16	3	3, (2)

Table 1-2 Performance Specifications

Parameter	Specification	Factory Setting
AC Line Input Voltage (VAC ±10%, Single Phase, 50/60Hz)	115 or 230	230
Arm Voltage Range at 115VAC Line (VDC)	-90 to +90	-
Arm Voltage Range at 230VAC Line (VDC)	-180 to +180	180
Field Voltage at 115VAC Line (VDC)	100/50	-
Field Voltage at 230VAC Line (VDC)	200/100	-
Service Factor	1.0	-
Duty	Continuous	-
Max Load Capacity (% for 2 minutes)	150	-
Ambient Temperature Range (°C)	0-50*	-
Speed Range (Ratio)	50:1	-
Arm Feedback Load Regulation (% Base Speed)	±1	-
Tach Feedback Load Regulation (% Set Speed)	±1	-
Current Ranges (ADC)	2.5, 5.0, 7.5, 10, 15**	15 or 10
FWD and REV Accel Range (Secs.)	0.1-15	1
Dead Band Range (% Base Speed)	-3 to +3	0
Max Speed Trimpot Range (% Base Speed)	70-110	100
IR Comp Range at 115VAC Line (VDC)	0-15	5
IR Comp Range at 230VAC Line (VDC)	0-30	10
FWD and REV CL Range (% Range Setting)	0-150	150
Timed CL Range (Sec.)	1-15	5
Voltage Following Input Range (VDC) ***	-10 to +10	-10 to +10
Voltage Following Linearity (% Base Speed)	±0.5	-
Tachometer Voltage Input (Volts/1000 RPM)	7, 20/30, 50	50

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

Mount the BC200/BC201 in a vertical position (connection terminals in down or up position) on a flat surface free of moisture, metal chips, or corrosive atmosphere. Mount the control in such a manner that there is unrestricted air flow through the heatsink cooling fins.

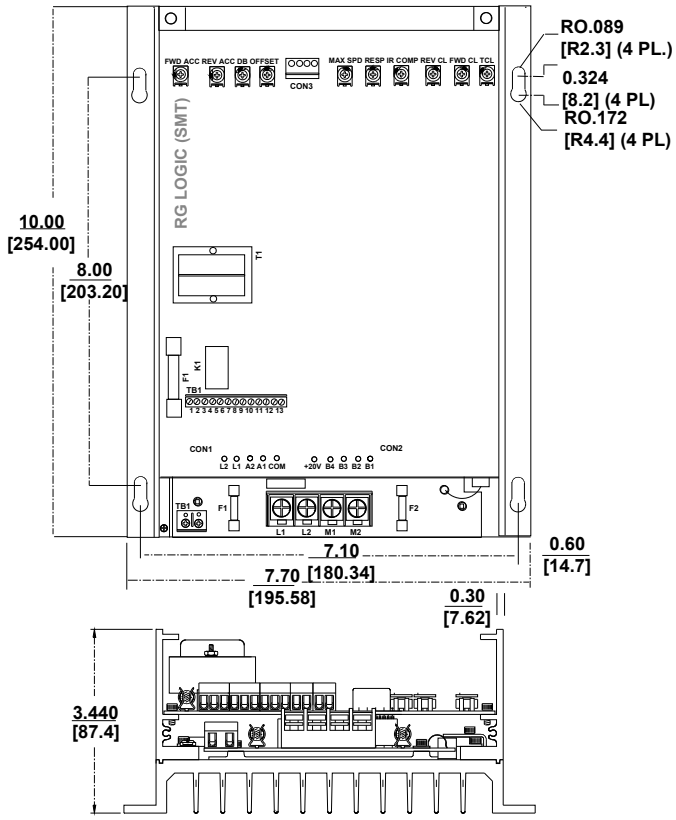
Note: If drive is mounted in other than a vertical position, decrease maximum allowable ambient temperature by 10°C.

A 5K ohm Remote Speed potentiometer is provided with each control. Install potentiometer using hardware provided. Be sure to install insulating disk between potentiometer and inside of

front panel.

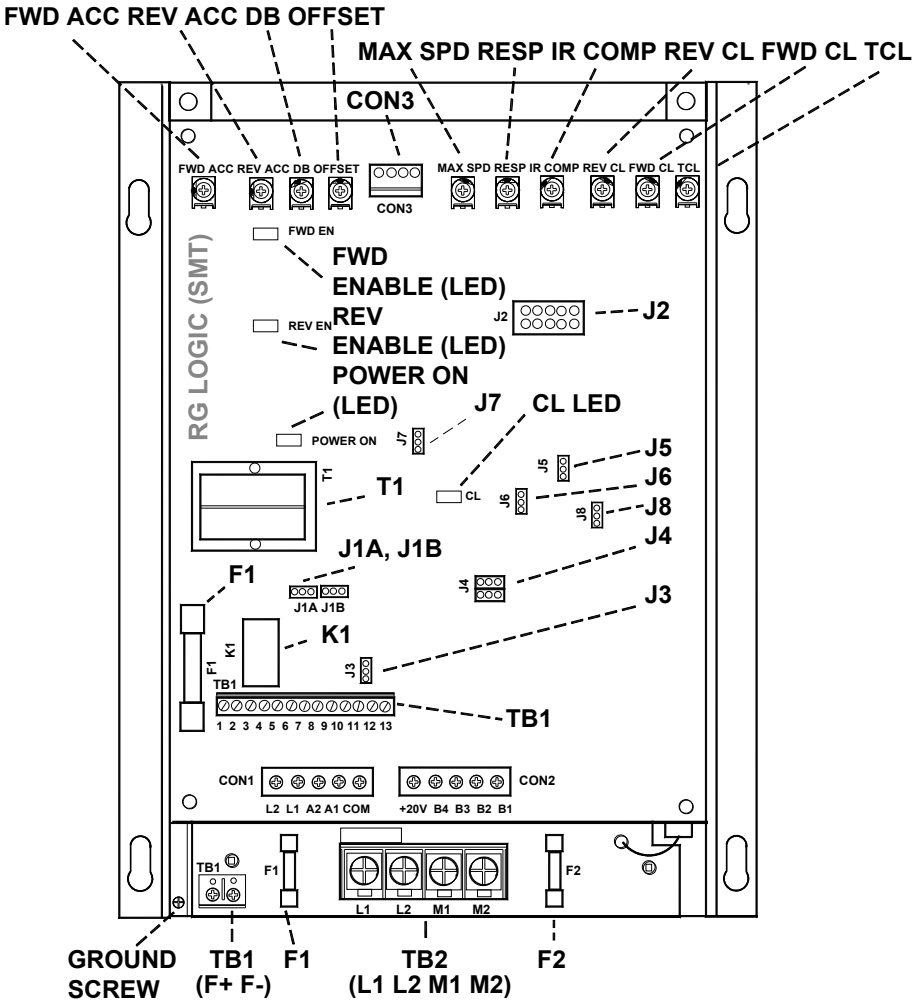
Enclosure - When mounting the BC200 or BC201 in an enclosure, it must be large enough to allow for proper heat dissipation. A 12x12x24 enclosure is suitable for the BC200 at full rating and a 12x24x36 enclosure is suitable for the BC201 at full rating. Smaller enclosures may be used if full rating is not required or if adequate ventilation, or auxiliary cooling methods are used.

Figure 2-1A Mounting Hole Locations



Note: CONTROL SHOWN ABOVE IS MODEL BC201. HEIGHT OF MODEL BC200 IS 2.57" (65mm).

Figure 2-1B Control Board Component Location



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.

AC LINE

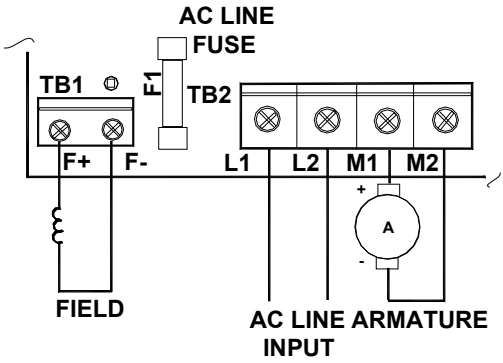
Verify the AC line voltage matches the line voltage of the control. Connections are shown in Figure 2-2. The BC200/BC201 has a single AC line fuse connected in series with terminal L1. Fuse (F1) is 25A for BC201 and 20A for BC200). Be sure to fuse each conductor which is not at ground potential (do not fuse neutral or grounded conductors).

A separate AC line switch or contactor must be connected as a disconnect switch so that contacts open each ungrounded conductor. See Table 2-1.

Table 2-1 Terminal Block Wiring Information

Terminal Block Designation	Connection Designation	Supply Wire Gauge (AWG - Copper)		Maximum Tightening Torque (lbs- in)
		Minimum	Maximum	
TB1 (Power Board)	F+, F-	22	14	3.5
TB2 (Power Board)	L1, L2, M1, M2, GND	18	10	3.5
TB1 (Logic Board)	Logic Connections	22	14	3.5

Figure 2-2 Power Connections



Ground Connection

Connect all ground wires (earth) to the green ground screw that is provided on the inside of the control to the right side of TB1 (not shown), tighten to correct torque, Table 2-1.

Motor Armature Connection

Connect the motor armature positive lead (+) to Terminal M1 and negative lead (-) to Terminal M2, as shown in Figure 2-2.

An armature fuse (F2) is also provided with a rating equal to the maximum RMS rating of the control. It is recommended that the correct size armature fuse be installed, depending on the rating of the motor and form factor (RMS/AVG current). Fuse type should be Littlefuse 326 ceramic or Buss ABC, or equivalent. A fuse chart is presented in Table 2-2, which 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.

Table 2-2 Armature Fuse Chart (F2 Power Board)

Motor Horsepower		Approximate DC Motor Current Amps	Fuse Rating (AC Amps)
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	15, 20 *
1-1/2	3	15.0	25

The Logic Control board contains a low amperage fuse F1 (.150 amp Littlefuse 3AG, normal blow or equivalent), which protects the control transformer and other components against catastrophic failure, Figure 2-1. Under normal circumstances, this fuse should never blow.
If the fuse should blow, refer to Troubleshooting Guide.

Motor Field Connection (Shunt Wound Motors Only)

Full Voltage Field Connection (Shunt Wound Motors Only)

Do not use F+ and F- terminals for any other motor type.
Connect the motor field leads to F1 (+) and F2 (-) terminals of TB2 as shown in Figure 2-2 and Table 2-3.

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.

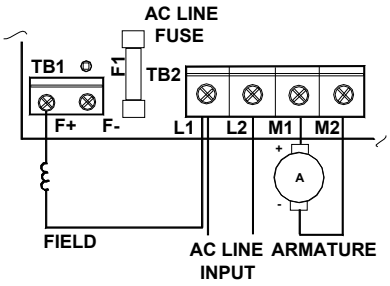
Table 2-3 Field Connections (Shunt Wound Motors Only)

AC Line Voltage (VAC)	Armature Voltage (VDC)	Field Voltage (VDC)	Field Connections
115	90	100	F+ and F-
115	90	50	F+ and L1
230	180	200	F+ and F-
230	180	100	F+ and L1
230	90*	100	F+ and L1

Half Voltage Field Connection (Shunt Wound Motors Only)

Do not use F+ and F- terminals for any other motor type.
Connect the motor field leads to F1 (+) and L1 (-) terminals of TB2, as shown in Figure 2-3 and Table 2-3.

Figure 2-3 Half Voltage Field Connection



Main Speed Potentiometer Connection

The main speed potentiometer can be connected in several ways using terminals 10, 11, 12, 13. (A 5K ohm potentiometer is supplied with control. A 10K potentiometer can also be used.)

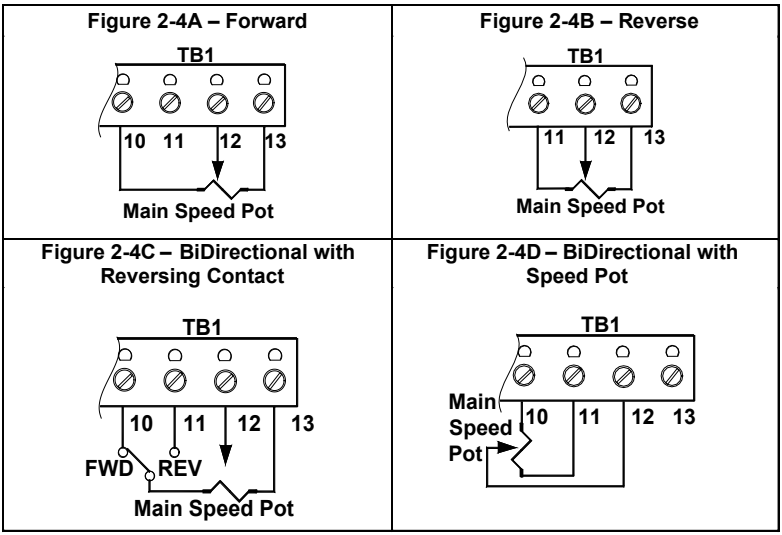
Caution: Terminals 10, 11, 12 and 13 are not isolated from AC line. Do not ground (earth).

A. Unidirectional operation only - Connect potentiometer to terminals 10, 12, 13 for forward direction. Connect to terminals 11, 12, 13. for reverse direction. See Figures 2-4A and 2-4B.

B. Bidirectional operation using user supplied, SPDT, FWD/REV Switch - Connect potentiometer and switch to terminals 10, 11, 12, 13. See Figure 2-4C.

C. Bidirectional operation with potentiometer - Connect potentiometer to terminals 10, 11, 12. See Figure 2-4D.

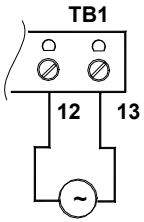
Figure 2-4 Main Speed Potentiometer Connections



Voltage Following

An isolated analog voltage can be used in lieu of main speed potentiometer. Connect signal to terminals 12 and 13. See Figure 4-5.

Figure 2-5 Voltage Following



± ISOLATED VOLTAGE SOURCE

Note: Terminal 13 is common. A positive signal with respect to terminal 13 will produce a positive output to motor. A negative signal with respect to terminal 13 will produce a negative output. A 0 to ±10 VDC is required to operate control from 0 to ± full output. If required, use the (Optional) BC212, Signal Isolator.

Enable

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.

Control may be started and stopped with the Enable circuit. To use this feature, install a jumper across TB1, terminals 5 and 7, (Start/Stop circuit), and connect Enable contacts to TB1, terminals 8 and 9. When the contacts close the control is in the Enable state and the motor will start and run. When the Enable contacts open, the control is in the Inhibit state and the motor will coast to rest. See Figure 2-6A.

Note: If Enable is not used, install a jumper between terminals 8 and 9 or control will not operate.

Start/Stop Circuit

A standard 3-wire start/stop push button control station may be connected to TB1 terminals 5, 6, and 7, allowing remote start/stop control. If AC input power is cycled On/Off, or if the timed current limit mode has timed out, the start push button must be used to restart the motor. See Figure 2-6B.

Note: The Start/Stop function may be bypassed by connecting a jumper wire across the Start and Com terminals of TB1.

Note: The Timed CL function will operate only when the Start/Stop mode is used.

Note: The Control will not start if the input AC line voltage is below 20% of nominal, (190 VAC on 230 VAC input).

OUTPUT RELAY

S.P.S.T. relay contacts (terminals 3 and 4) are used to signal a warning or to shut other equipment down if control goes to an Inhibit state. Rating of contacts are 1A-28VDC, 0.5A-115VAC. See Table 4-4 for relay control state vs. contact state. See Figure 4-6C.

Figure 2-6 Enable, Start/Stop and Relay Circuit Wiring

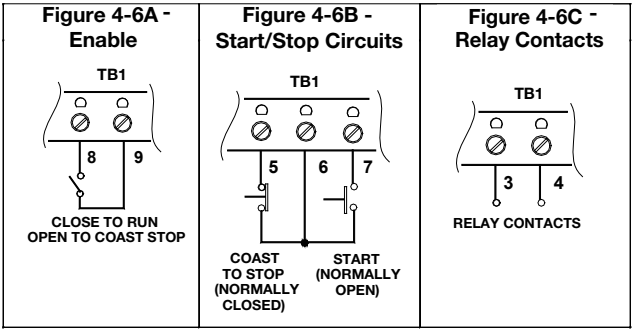


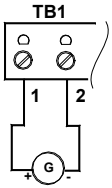
Table 2-4 Control State vs. Relay Contact State

Description of Control State	Relay Contact State	
	Using Start / Stop	Start / Stop Bypassed
Power Off	0	0
Power Applied	0	X
Control in Stop Mode	0	N/A
Control is started with Start button	X	N/A
Control has Timed Out in TCL	0	N/A
0 = Open, X = Closed, NA = Not Applicable		

DC Tachometer Input

If Tachometer Feedback is used, Jumper J5 must be in the TFB position and an analog tach signal must be connected to TB1, terminals 1 and 2. The IR COMP Trimpot must be set to minimum, fully CCW. Connect the tachometer so that when the motor rotates in the desired forward direction the positive tach voltage lead is connected to terminal 1 and the negative lead to terminal 2. See Figure 2-7.

Figure 2-7 Tachometer Connection



Note: If the Tachometer leads are connected backwards, the motor will run at full speed and will not respond to a speed reference signal. Verify position of Jumper J5 is in TFB and the tach signal polarity is correct.

Startup and Adjustments

Motor Type

The BC200/BC201™ is a full wave regenerative, bi-directional control used to operate Permanent Magnet, (PM), and Shunt Wound DC motors. Do not use the control in applications where specified ratings would be exceeded.

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.

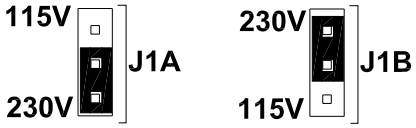
Set Jumpers

The BC200/BC201 have selectable jumpers which must be set before the control can be used. Refer to Figure 2-1 for jumper locations.

J1A, J1B - Input AC Line Voltage

Select proper input line voltage, 115VAC or 230VAC, by placing both jumpers (J1A and J1B) in the correct corresponding position, 115 or 230. Factory set for 230VAC shown in Figure 2-8.

Figure 2-8 AC Line Voltage Select



J2 - Armature Current

Select the J2 position (2.5, 5, 7.5, 10, 15) closest to the rated motor current. See Figure 2-8 and Table 2-5.

Note: The maximum output current is set to 150% of the J2 position, which may be readjusted using the FWD CL and REV CL trimpots. On Model BC200, position 10A is factory setting.

Figure 2-9 J2 Position

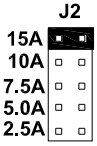


Table 2-5 J2 Position vs Motor Horsepower

Jumper J2 Position Motor Current (DC AMPS)	Motor Horsepower	
	90VDC	180VDC
15A (1)	1-1/2	3
10A	1	2
7.5A	3/4	1-1/2
5.0A	1/2, 1/3	1. 3/4
2.5A	1/4	1/2

J3 - Motor Armature Voltage

Select the desired armature voltage by placing J3 in the proper position, 90 or 180. See Figure 2-1.

Note: For 115 volt AC line input, the armature voltage must be set to 90. For 230 volt input, the armature voltage normally is set for 180. However, it is also possible to set the armature voltage to 90 for step-down operation.

Table 2-6 Relationship of Voltage and Jumper Position

AC Input Voltage	J1A, J1B 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 overheating may result.

J4 – Tachometer Voltage

Place J4 in the position 7V, 20/30, 50V that corresponds to the tachometer voltage in Volts/1000. See Figure 2-9.

Note: Selection of the jumper position is not required if armature feedback is used.) The tach voltage jumper position is based on motor speed of 1,800 RPM.

For example, if the tach is 25V/1000 and the motor speed is 3,600 RPM, use the 50V position. For other tach voltages and motor speeds, an external resistor (RT) may be used as follows:

1. Place J4 in 7V position
2. Calculate the value of (RT) as follows:

   RT = [(5.4 x VT x S) 68,000] ohms

   VT = Tach Voltage in Volts/1000 RPM

   S = Base speed of motor in RPM

Note: Choose the closest standard 1/2 watt resistor value to the calculated value.

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

Note: For tachometer feedback, Jumper J5 must be in the TFB position.

J5 - FEEDBACK TYPE

The BC200/BC201 can be operated in either armature feedback, AFB or tachometer feedback, TFB. Armature feedback provides adequate load regulation for most applications. For very precise performance, tachometer feedback, TFB should be used.

Notes:

1. If tach feedback is desired, an external DC tachometer must be used and connected.
2. The IR Comp trimpot must be set to the minimum setting [CCW] for tachometer feedback.

J6 - Current Limit Mode

(Factory set for TCL). The BC200/BC201 contains electronic current limiting which limits the maximum DC current to the motor, (the current limit set point is established with the setting of the CL trimpot). Two modes of current limit operation are provided:

Timed Current Limit, TCL

Note: For the Timed Current Limit feature to operate, the Start/Stop control circuit must be used. Also, the Timed Current Limit feature cannot be used in either torque mode since nuisance tripping will occur.

In Timed Current Limit mode 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 5 seconds. To restart the control after it has timed out, the start button must be pressed.

Non-Timed Current Limit, NTCL

In this mode, the drive will reach preset Current Limit during overload and stay at that level until drive is turned off or fuse blows. If Non-Timed CL is desired, move jumper J6 from the factory set TCL position to the NTCL position. The NTCL position must be used when operating in the torque mode.

J7 - Speed or Torque Control

Described in Operation section of this chapter.

J8 - Speed Linear Torque (S/L) and Non Linear Torque (NLT)

Described in Operation section of this chapter.

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 BC200/BC201 contains trimpots, which are factory set for most applications. Figure 2-1 illustrates the location of the trimpots and their approximate calibrated positions. Some applications may require readjustment of the trimpots to tailor the control for a specific requirement. Readjust trimpots as needed.

Forward Acceleration (FWD ACCEL)

The FWD ACC trimpot determines the amount of time it takes the control voltage to reach full output in the forward direction. It also determines the amount of time it takes for the control voltage, in the reverse direction, to reach zero output. (FWD ACCEL also sets the Reverse Decel.)

Reverse Acceleration (REV ACCEL)

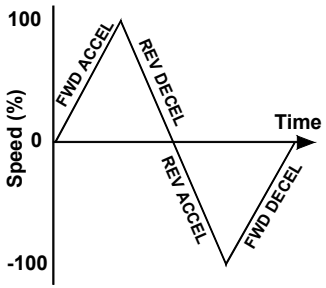
The REV ACC trimpot determines the amount of time it takes the control voltage to reach full output in the reverse direction and the time it takes for the control voltage, in the forward direction, to reach zero output. (REV ACC is the Forward Decel)

The FWD and REV ACC trimpots are factory adjusted to 1 second.
The acceleration times are adjustable to a maximum of 15 seconds.

Notes:

1. The FWD and REV CL trimpots settings may override the rapid accel and decel settings.
2. BC211 4-quadrant ACC / DECEL accessory module is available as an option. It provides separate control of FORWARD acceleration and deceleration and REVERSE acceleration and deceleration. See Figure 2-10.

Figure 2-10 Accel/Decel Trimpot Adjustment



Offset

This trimpot determines the amount of bias in the forward or reverse direction. The trimpot is factory set to provide approximately zero offset, which means neither the forward nor the reverse speed is favored. Adjust offset to suit application requirement. See Figure 2-11.

Deadband (DB)

The DB trimpot sets the amount of main speed potentiometer rotation required to initiate control voltage output. It is factory adjusted to approximately 25% of rotation. Adjust Deadband to suit application requirements by rotating the DB trimpot cw, (increase) or ccw (decrease). See Figure 2-12.

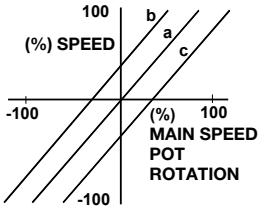
The DB trimpot also determines the amount of delay that will occur before regeneration starts. (Regeneration occurs when the applied load torque is in the same direction as the motor rotation.) To readjust the DB to factory setting:

a. Set Main Speed pot to zero speed position.

b. Set DB trimpot to full CCW position.

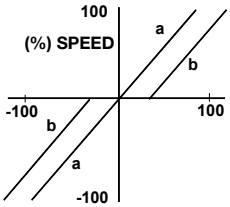
c. Adjust DB trimpot CW until motor hum is eliminated.

Figure 2-11 Offset Trimpot Adjustment



CURVE	OFFSET
(a)	None
(b)	Forward
(c)	Reverse

Figure 2-12 Deadband Trimpot Adjustment



Curve (a): No Deadband
Curve (b): Max. Deadband

Note: If the deadband trimpot is set too low (CCW direction), the motor may oscillate between forward and reverse. Adjust deadband trimpot CW until the instability disappears. (Oscillation may also occur due to response setting.

Forward Current Limit (FWD CL) and Reverse Current Limit (REV CL)

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

Sets the maximum DC motor current for both the forward and reverse directions. The amount of DC current determines the amount of maximum motor torque in both the Speed Control Mode and Torque Mode. These CL trimpots are factory set at 150% of the motor current. The value can be reduced by adjustment of the CL trimpots. Some applications require a lower torque limiting value to prevent damage to the process material or the drive train.

Re-Adjust the CL trimpots as follows:

a. Turn CL trimpot to MIN (CCW) position. Be sure jumper J2 is in proper position approximately equal to the motor DC ampere rating.

b. Connect in a DC ammeter in series with armature lead. Load shaft of motor in accordance with application requirements.

c. Apply power; Rotate CL trimpot CW until desired CL setting is reached (factory setting is 1.5 times rated motor current). Be sure control is in Forward direction for FWD CL trimpot adjustment and likewise with REV CL.

Note: do not stall motor shaft for more than 2 - 3 seconds, to prevent motor damage.

IR Compensation (IR Comp)

The IR Comp is used to stabilize motor speed under varying loads. If control is in Tach Feedback mode, the IR Comp should be set to minimum -CCW.

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

Re-Adjust the IR Comp trimpot as follows:

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

b. Load motor to rated current. Rotate IR Comp trimpot so that loaded speed is the same as the unloaded speed measured in the previous step.

Control is now compensated so that minimal speed change will occur over a wide range of motor loads.

Maximum Speed (MAX)

The MAX trimpot is used to set the maximum output voltage of the control which, in turn, sets the maximum speed of the motor. In the Torque Control Mode, the MAX trimpot setting determines the unloaded motor speed.

Adjust the MAX trimpot as follows:

a. Rotate Main Speed potentiometer to full speed (CW).

b. Adjust MAX trimpot to desired maximum motor speed.

Note: Do not exceed maximum rated RPM of motor since unstable operation may result.

Response (RESP)

This trimpot determines the dynamic response of the control. The factory setting is approximately 50% of full rotation. The setting may be increased if a faster response is required.

Note: If response is made too fast, unstable operation may result.

Timed Current Limit (TCL) Trimpot

Trimpot is used only when control is connected for 3-wire Start/Stop and J6 is in the TCL position. The TCL trimpot sets the delay time for the Timed Current Limit. The trimpot is adjustable over a time range of 1·15 seconds and is factory set for approximately 5 seconds. See Table 2-7.
Calibrate the TCL trimpot by setting the trimpot to the approximate desired delay time.

Table 2-7 Current Limit Timer Settings

Approximate Trip Time (Seconds)	Trimpot Position
1	Full CCW
8	Midway
15	Full CW

Operation

The input voltage can be derived from the wiper of the main speed potentiometer or from an isolated analog input (voltage following mode). Since the BC200/BC201 are 4-quadrant regenerative drives, the motor speed will follow both a positive and negative wiper voltage and drive the motor in both the forward direction and reverse direction. In addition, it will apply both forward and reverse torque to stabilize motor speed.

The BC200/BC201 can be operated as speed control or torque control by setting the position of jumper J7. The main speed potentiometer controls the magnitude of the mode selected.
Set jumper J7 to SPD for speed control or to TRQ for torque control.

Speed or Torque Control

When jumper J7 is set to the SPD position, motor speed is a function of the voltage on input terminals 12 (signal) and 13 (common).

Note: When J7 is set for speed control (SPD), J8 must be set to S/L position (factory setting).

Table 2-8 Summary of Control (REGEN) Operation

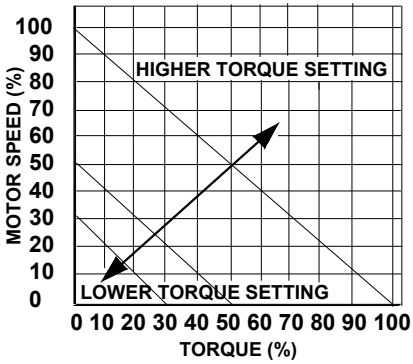
Quadrant	Type of Operation	Motor Rotation Direction	Motor Torque Direction	Applied Load Direction
I	Motoring	CW	CW	CCW
II	Regeneration	CCW	CW	CCW
III	Motoring	CCW	CCW	CW
IV	Regeneration	CW	CCW	CW

Torque Control Mode

When Jumper J7 is set to TRQ position, the BC200/BC201 will control motor torque. Two types of torque characteristics are selectable with jumper J8, Speed Linear Torque (S/L) and Non Linear Torque (NLT).

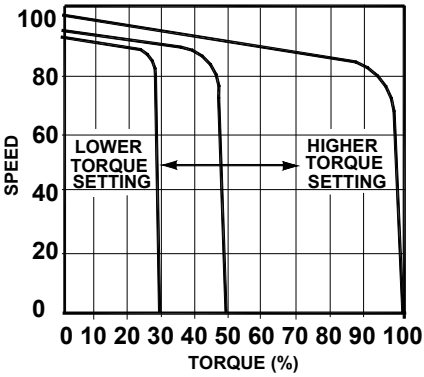
In the S/L position (factory setting), both output torque and motor speed vary linearly as a function of the analog input signal. The S/L type of torque is most suitable for take up and payout winders where the speed and torque requirements vary as the winder roll diameter changes.
The S/L torque characteristics are shown in Figure 2-13.

Figure 2-13 Linear Torque Curve



In the NL position, only torque (not speed) is varied by the input signal. The motor output torque remains constant over the motor's full speed range unless the load is less than the set torque. If the load torque decreases below the set torque, the motor will rapidly increase to full speed. This type of torque control is applicable to processes where the torque must remain constant over a wide motor speed range. The NL torque characteristics are shown in Figure 2-14.

Figure 2-14 Non-Linear Torque Curve



Because the BC200/BC201TM are regenerative controls, torque will be applied in both forward and reverse directions. The maximum torque can be set with the FWD CL and REV CL trimpots, and by using the FWD ACC and REV ACC trimpots, the rate of change of torque can be made more or less gradual. The maximum speed trimpot can be used to set the maximum motor speed under a no load condition.

Troubleshooting

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

A. **Power On**
This lamp indicates AC power is applied to the control.

B. **CURRENT LIMIT (CL)**
Indicates that the drive is in Current Limit. If set in the timed Current Limit mode (J6 set to TCL) and has timed out, the LED 2 will remain ON until the drive is restarted.

C. **Forward Enable** (FWD EN)
Indicates that the drive is engaged in the forward direction. [Enable circuit closed, (terminals 8 and 9), the start circuit asserted and a forward speed command.]
The FWD EN lamp will also be lighted in the reverse direction if the control is in regeneration.

D. **Reverse Enable** (REV EN)
Indicates that the drive is engaged in the reverse direction.
[Enable circuit closed (terminals 8 and 9), the start circuit asserted and a reverse speed command.]
The REV EN lamp will also be lighted in the forward direction if the control is in regeneration.

Table 2-9 Troubleshooting Guide

Indication / Symptom	Possible Soloutions
Motor is not running and Power On LED indicator is illuminated.	Start-Stop switch is in the STOP position. If this mode is used, place the switch in 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.
Power ON LED indicator is not illuminated.	Check AC Line connections have been made. Verify correct wiring.
	Check AC Line fuse.
Motor runs then stops after a short time or, The Drive trips due to overload (TCL Fault).	The drive must be manually restarted by disconnecting and reconnecting the AC power. Reduce load.
Line fuse blows or circuit breaker trips.	The line fuse or circuit breaker installed is the incorrect rating. See Table 1-4 for the correct line fuse or circuit breaker rating. Check for loose or damaged wiring.
Logic Control Board fuse, F1, blows.	Check to see if signal or control wiring is not shorted or grounded. Verify Start/Stop switch, Enable switch, and Speed Adjust pot are operating properly and are not shorted or grounded.
CL LED indicator is illuminated.	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.)
	Check motor for shorts or grounds. Motor may be defective.
	Check position of CL trimpot. The CL may be set too low.
	Rapid Acceleration change will cause the LED to illuminate. Verify potentiometer setting.
Motor runs at high speed and does not respond to main adjust speed pot or reference signal.	Check field wiring. If using tachometer feedback, check tachometer signal.
Note: For any other problems, consult your local Baldor District Office.	

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