

# RBX Series

## Installation and Maintenance Manual



*An Altra Industrial Motion Company*

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## WARNING

Improper installation or operation of this control may cause injury to personnel or control failure. The control must be installed in accordance with local, state, and national safety codes. Make certain that the power supply is disconnected before attempting to service or remove any components!!! If the power disconnect point is out of sight, lock it in disconnected position and tag to prevent unexpected application of power. Only a qualified electrician or service personnel should perform any electrical troubleshooting or maintenance. At no time should circuit continuity be checked by shorting terminals with a screwdriver or other metal device.

## INTRODUCTION

The RBX Series is a high performance, dual voltage versatile DC motor control which provides a wide range of standard features, with many options that extend its capabilities. The RBX Series will operate 1/8 through 1.0 horsepower at 115VAC input, and 1/4 through 2.0 horsepower at 230VAC input. A chassis only model is available to operate a 1.5 horsepower motor at 115VAC input, or 3.0 horsepower at 230VAC input. Reference "Basic Model Selection" guide.

### The RBX Series consists of two basic types:

- Chassis mounted, no enclosure, no power relays.
- Plastic enclosure with power relays - Nema 4/12 standard.

The RBX Series is designed for Permanent Magnet, Shunt Wound, and some Universal Series (AC/DC) motors in the above horsepower ranges. The RBX Series incorporates transient voltage protection with adjustable Current Limit and AC fuses for protection. Minimum and Maximum speeds are easily adjusted by trimpots, as is the I.R. Compensation. Acceleration and Deceleration are fully adjustable via individual trimpots.

# BASIC MODEL SELECTION

CATALOG NUMBER	VAC INPUT	VDC OUTPUT	HP RANGE	PACKAGE	DESCRIPTION
RBX2C	115/230 VAC	0-90/180 VDC	1/4 - 2.0	CHASSIS	LOWER HORSEPOWER CHASSIS CONTROL
RBX2C-RA1	115 VAC	0-90/180 VDC	1/8 - 1.0	CHASSIS	115 VAC RELAY FORWARD / REVERSING CONTROL
RBX2C-RA2	230 VAC	0-90/180 VDC	1/8 - 1.0	CHASSIS	230 VAC RELAY FORWARD / REVERSING CONTROL
RBX2US	115/230 VAC	0-90/180 VDC	1/6 - 2.0	ENCLOSED	LOWER HORSEPOWER ENCLOSED CONTROL
RBX2US-RA1	115 VAC	0-90/180 VDC	1/8 - 1.0	ENCLOSED	115 VAC RELAY FORWARD / REVERSING CONTROL
RBX2US-RA2	230 VAC	0-90/180 VDC	1/4 - 2.0	ENCLOSED	230 VAC RELAY FORWARD / REVERSING CONTROL
RBX2US-9A	115/230 VAC	0-90/180 VDC	1/8 - 2.0	ENCLOSED	HAS JOG CAPABILITIES
RBX3C	115/230 VAC	0-90/180 VDC	1.5 - 3.0	CHASSIS	HIGHER HORSEPOWER CAPABILITIES
RBX2UB	115/230 VAC	0-90/180 VDC	1/6 - 2.0	ENCLOSED	BLANK COVER, OPERATED REMOTELY
RBX2UB-25A-38	115/230 VAC	0-90/180 VDC	1/6 - 2.0	ENCLOSED	SAME AS RBX2US EXCEPT IT HAS 4-20mA CAPABILITIES

*Note: The enclosed model includes a relay to switch AC power using a low power switch in the cover.*

## CONTROL FEATURES

**INPUT VOLTAGE SELECTION SWITCH** - Switch **selectable** between 115 VAC and 230 VAC input. Improper setting of this switch may cause performance of the drive to not be adequate for the application and MAY cause damage to the control.

**MIN SPEED** - (Minimum speed) Allows adjustment of the motor speed when the speedpot is set at minimum. This permits the user to eliminate the “Deadband” on the main speed control, permitting zero calibration. Clockwise rotation of the “MIN” trimpot increases output VDC.

**ACCEL** - (Acceleration) Allows adjustment of the motor acceleration from a minimum of 0.3 seconds to a maximum of 12 seconds.

**DECEL** - (Deceleration) Allows adjustment of the motor deceleration from a minimum of 0.6 seconds to a maximum of 12 seconds.

**MAX SPEED** - (Maximum speed) Allows adjustment of the motor speed when the speedpot is set at maximum (CW). This permits the user to eliminate the “DEADBAND” of the speedpot, providing full speed at maximum rotation. Rotation of the “MAX” trimpot in the clockwise direction increases maximum output VDC.

**IR COMP** - (Speed Regulation) Allows adjustment of the circuitry that controls the speed regulation of the motor. This feature controls armature speed by changing the armature voltage to compensate for increased or decreased motor loading. Clockwise rotation of the “IR COMP” trimpot will increase gain compensation.

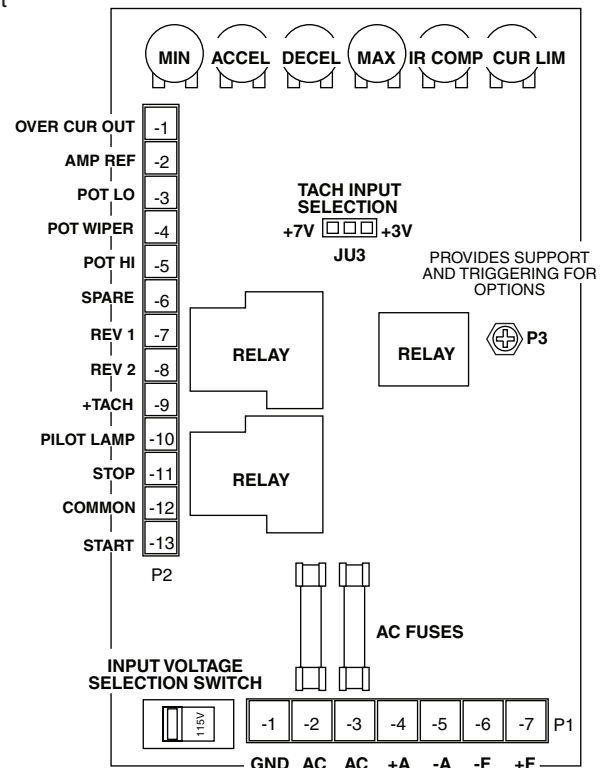
**CUR. LIM.** - (Current Limit) Provides protection from excessive armature current by limiting the maximum armature current the control can provide. This enables adjustment of the maximum torque the motor can deliver. Set Current Limit (CUR. LIM.) at 125% of the rated motor current. Clockwise rotation of the “CUR. LIM.” trimpot increases the torque (current) the control will provide.

**TACH INPUT SELECTION** - Factory set at 3V per 1000 RPM, jumper selectable (JU3) to 7V per 1000 RPM. Refer to “Tach Feedback” section in “Control Modifications” for more information.

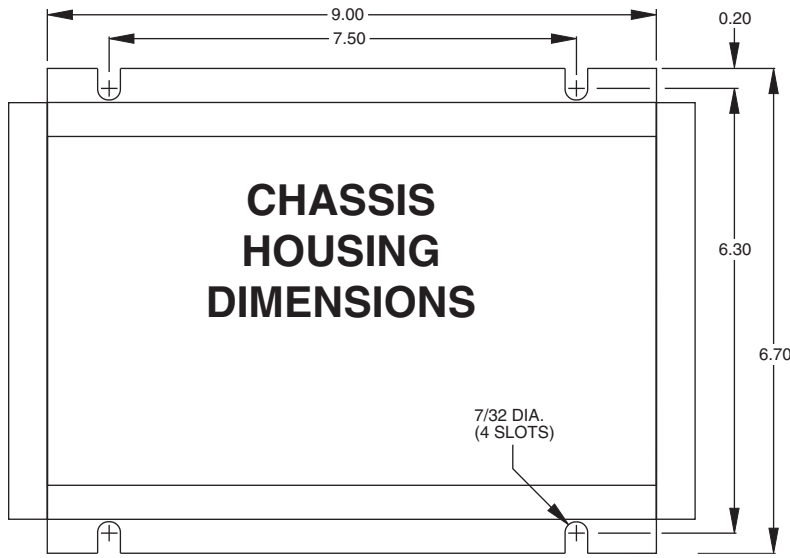
**TERMINAL STRIP P1** - Barrier type terminal strip provides for connection of AC lines, motor leads, motor field (if necessary), and earth ground.

**TERMINAL STRIP P2** - Barrier type terminal strip provides for connection of speed potentiometer and any accessories and/or jumper wires which control the drive.

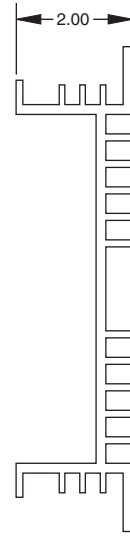
**RELAY** - (Power Interrupt Relay's) Available only on the RBX2US-RA1, RBX2US-RA2 & RBX2US-9A controls, the relay's permits the switching of AC power with a low current signal. For the RBX2US-RA1, RBX2US-RA2 & RBX2US-9A controls, the relay's will not allow start up after power failure without manually restarting.



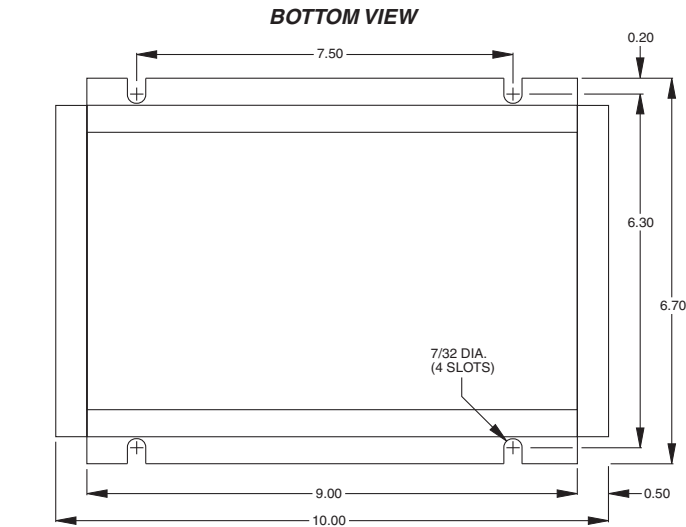
# OVERALL CONTROL DIMENSIONS



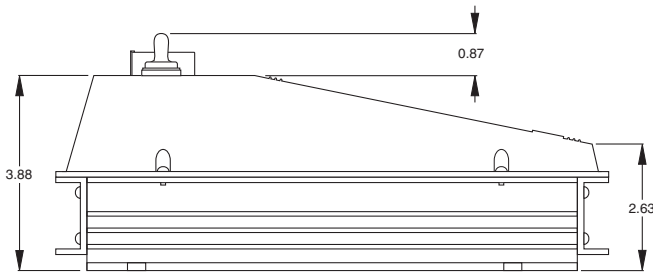
TOP VIEW



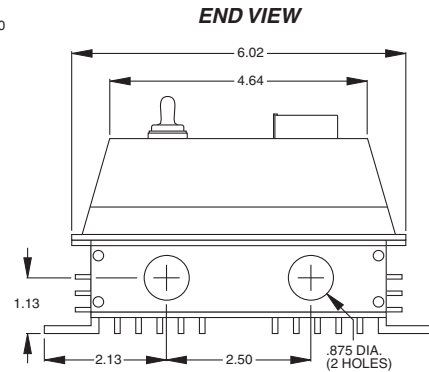
END VIEW



# ENCLOSED HOUSING DIMENSIONS

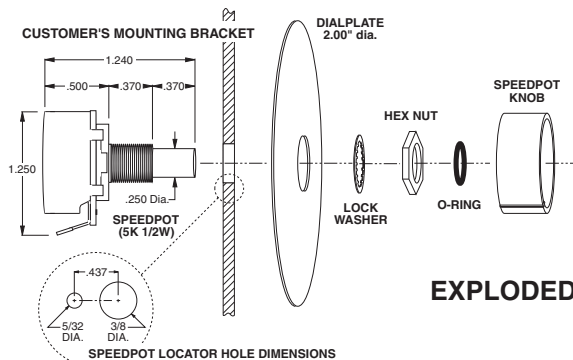


SIDE VIEW



# SPEEDPOT MOUNTING DIMENSIONS

(For RBX2C-RA1, RBX2C-RA2, RBX2C, and RBX3C)



EXPLODED VIEW

**DO NOT MOUNT CONTROL WHERE AMBIENT TEMPERATURE IS OUTSIDE RANGE OF -10° to 45° C. (15° to 115° F.)**

## MOUNTING INSTRUCTIONS

1. Four 7/32" slots are provided for control mounting.
2. The RBX Series chassis can be used as a template.
3. Use standard hardware to mount.
4. For the Enclosed controls ONLY: Two 7/8" diameter holes are provided in one endplate to facilitate wiring. This allows for easy connection of 1/2" conduit.

**NOTE: For enclosed models using 1 h.p. 90V or 2 h.p. 180V motors, the control MUST be mounted vertically.**

### CAUTION:

**DO NOT ATTEMPT TO PERFORM HI-POT TEST ACROSS AC LINES WITH THE CONTROL IN CIRCUIT. THIS WILL RESULT IN IMMEDIATE OR LONG TERM DAMAGE TO THE CONTROL.**

## WIRING PROCEDURE

1. Size all wires which carry armature or line current to handle currents AS SPECIFIED BY NATIONAL, STATE, AND/OR LOCAL CODES. All other wires may be # 20AWG or smaller as permitted by local code.
2. Control wire (Pot, Tach, etc.) should be separated from all the Armature, Field (if Shunt Wound), and the AC wires when routed in conduits or in wire trays. The enclosed version has two holes on one endplate for this purpose.

## TERMINAL STRIP WIRING - P1

**CAUTION: BE SURE CONTROL HOUSING IS PROPERLY GROUNDED.**

The RBX Series uses a 7 position barrier type terminal strip to handle the power connections.

- P1-1 (EARTH GROUND)** - Ground the control by connecting the ground wire to this terminal. NOTE: Terminals P1-5 (-ARM) and P2-2 (AMP REF) are electrically the same, which is the common reference point (low voltage common) for the control logic. The EARTH GROUND terminal (P1-1) is electrically different from common. If connected together, either at the amplifier or in any other fashion, fatal or hazardous operation may occur and permanent damage to the control WILL result!
- P1-2 (AC1) 115VAC** - Connect incoming hot AC (black wire) to this terminal. NOTE: This is fused (F1) on the control.  
**(AC1) 230VAC** - Connect either hot side.
- P1-3 (AC2) 115VAC** - Connect the neutral AC (white wire) to this terminal. NOTE: This is fused (F2) on the control.  
**(AC2) 230VAC** - Connect either hot side.
- P1-4 (+ ARMATURE)** - Connects to the plus (+) Armature wire on the motor. 0-90VDC for 115VAC input or 0-180VDC for 230 VAC input. See "SPECIFICATIONS" for output rating.

**CAUTION: ARMATURE CONNECTION MUST NOT BE SWITCHED OR BROKEN WHILE CONTROL IS ON OR SERIOUS DAMAGE TO THE CONTROL MAY RESULT.**

- P1-5 (- ARMATURE)** - Connects to minus (-) Armature wire (also considered circuit common) on the motor.
- P1-6 (- FIELD)** - **DO NOT use for Permanent Magnet motor.** Connect minus (-) Field wire of the Shunt Wound motor.

FIELD VOLTAGE TABLE		
Model #	VAC Input	VDC Field
RBX Series	115	100
	230	200

- P1-7 (+ FIELD)** - **DO NOT use for Permanent Magnet motor.** This supplies + Field voltage for a Shunt Wound motor. See chart above for dual voltage Field Wound motors. This output is rated at 1 Amp for RBX series controls and 1.5 Amps for the RBX3C control. For motors with dual voltage field (ie. 50/100V or 100/200V), make sure the highest value is connected.

# TERMINAL STRIP WIRING - P2

The RBX Series uses a 13 position barrier type terminal strip for control connections.

**CAUTION: NONE OF THE P2 TERMINALS SHOULD BE EARTH GROUNDED!**

**P2-1 (OVER CURRENT OUT)** - Can be used to signal that the control is in current limit. It can also signal other devices or alarms. This is a low level logic signal which goes "high" when the current limit amplifier is in current limit. The logic of this control is +12 volts, while the output at this terminal is approximately 1.5 volts through a 1000Ω resistor when in Current Limit.

**P2-2 (AMP REF)** - This is the common point of the logic. It is used as common with OVER CURRENT OUT (P2-1), +TACH (P2-9), REV 1 (P2-7), REV 2 (P2-8), and WIPER (P2-4). NOTE: Never connect this terminal to earth ground !! Serious damage and injury may result !! This terminal is electrically the same point as -ARM (P1-5).

**P2-3 (SPEEDPOT LO)** - Connects to the low side (orange wire) of the 5K Speedpot (normally the CCW end). This input is raised and lowered by the MIN trimpot. Electronic speed input voltage (voltage follower) may be referenced to Speedpot LO if the MIN trimpot adjustments are to be active. Otherwise, inputs may be referenced to AMP REF (P2-2), which will bypass the MIN trimpot. INPUT MUST NOT BE GROUNDED !

**CAUTION FOR VOLTAGE FOLLOWER APPLICATIONS:  
THE INPUT CONNECTION TO THE SPEEDPOT MUST NOT BE GROUNDED !!  
SERIOUS DAMAGE TO THE CONTROL MAY RESULT FROM A GROUNDED INPUT.**

**P2-4 (SPEEDPOT WIPER)** - Connects to the wiper (red wire) of the Speedpot (center lead). Use this input for the plus (+) side of voltage follower operation or tach follower. The minus (-) side connects to AMP REF (P2-2). INPUT MUST NOT BE GREATER THAN +12V MAXIMUM AND MUST NOT BE GROUNDED !

**P2-5 (SPEEDPOT HI)** - Connects to high side (white wire) of the Speedpot (CW end). This is internal +12 volts. INPUT MUST NOT BE GROUNDED !

**P2-6 (SPARE)** - This terminal is not connected to the control circuit. It can be used as a terminal for field modifications.

**P2-7 (REV 1)** - REV 1 and REV 2 are identical quick stop inputs. One of them must be held low (to AMP REF) before the control will operate. The two are diode separated to form an "OR" gate. Since -ARM (P1-5) is also low in the system, these two inputs can be wired to the motor side of a reversing switch or relay. During the period of switching, neither input will be low, which will instantly return the set speed to zero and reset the acceleration ramp.

**P2-8 (REV 2)** - Identical to REV 1 (P2-7).

**P2-9 (+TACH)** - Connect +Tach from a DC tachometer for tachometer feedback. The minus (-) lead from the tachometer goes to AMP REF (P2-2). Output voltage from the tachometer at full speed can range from 6 to 12 volts. The scale is corrected using the JU3 jumper selectable setting of 3V/7V per 1000 RPM and the MAX speed trimpot. A 3 volt per 1000 RPM OR 7 volt per 1000 RPM tachometer should be used.

**P2-10 (PILOT LIGHT)** - Connecting point for on-off neon indicator lamp. The remaining lead will be connected to P2-11.

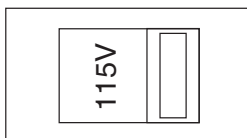
**P2-11 (STOP)** - Install one or more normally closed stop switches (in series) between STOP (P2-11) and COMMON (P2-12). Not active on RBX2C-RA1, RBX2C-RA2 & RBX3C controls.

**P2-12 (COMMON)** - Mid point of Start-Stop switches. Not active on RBX2C-RA1, RBX2C-RA2 & RBX3C controls.

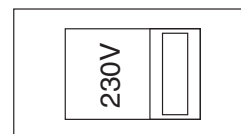
**P2-13 (START)** - Install one or more normally open start switches (in parallel) between START (P2-13) and COMMON (P2-12). Not active on RBX2C-RA1, RBX2C-RA2 & RBX3C controls.

## SETTING INPUT VAC

For use with 110 through 130 VAC inputs, slide 115/230 VAC input voltage selector switch completely to the left as shown below left. For use with 208 through 240 VAC inputs, slide the same selector switch completely to the right as shown below right.



**Note:**  
An incorrect setting of the input VAC selector switch will result in damage to the controller.

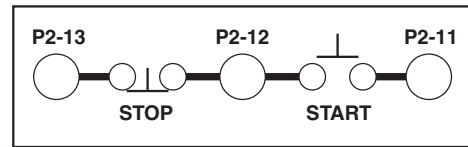




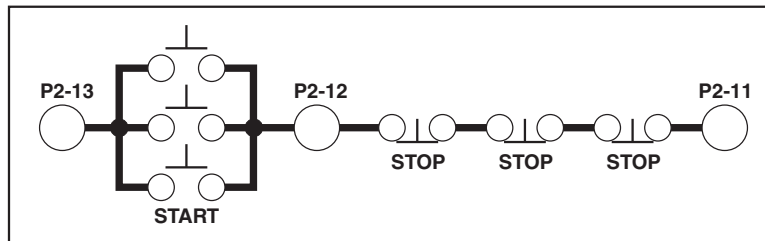
# SWITCH LADDER CIRCUIT DIAGRAMS



START-STOP WIRING

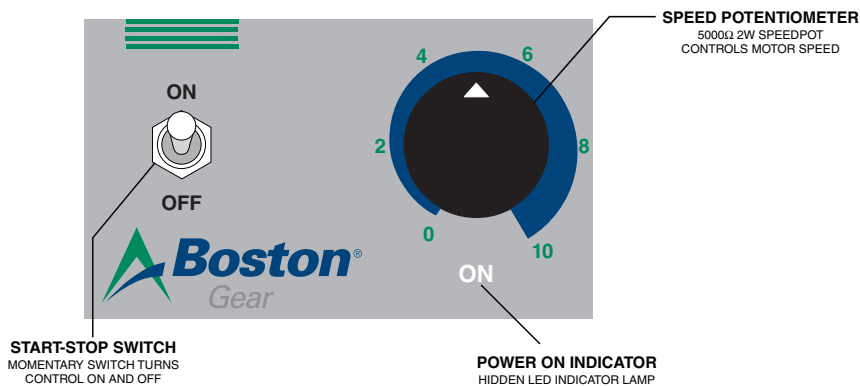


START-STOP WIRING  
(WITH 3 STATIONS)



Warning:  
This diagram is for  
"RC" and "RE" versions  
ONLY! DO NOT use  
on "C" version.

## CONTROL PANEL IDENTIFICATION



## INITIAL START UP

1. **Check** to see that the 115/230 VAC selection switch is set for the desired input voltage.
2. Recheck all wiring. Accidental grounds, loose or pinched wires on armature or speed potentiometer wires may damage the control when power is applied.
3. See "ADJUSTMENT PROCEDURE" and observe the WARNINGS pertaining to cover removal for adjustments.
4. Preset trimpots for your horsepower by using the "TRIMPOT CHART". NOTE: When using the DC-25A option the trimpot chart does not apply – please see instructions in Options section (pg 15) for proper settings.
5. Turn speed potentiometer to zero (fully CCW).
6. Turn power on and advance speedpot while observing motor.
7. If motor rotation is incorrect, turn power off at external disconnect and reverse the +ARM and -ARM connections.
8. If operation is satisfactory, no re-adjustments are needed.
9. If instability or surging is observed, or if maximum speed is higher than desired, proceed to "ADJUSTMENT PROCEDURE".
10. For other problems, see section "IN CASE OF DIFFICULTY".

**WARNING:**  
WHEN MAKING AN ADJUSTMENT, ALWAYS USE A SCREWDRIVER WITH AN INSULATED SHAFT TO AVOID THE SHORT CIRCUITING OF PC BOARD COMPONENTS. WHENEVER THE CONTROL COVER IS REMOVED, IT MUST BE SUPPORTED TO AVOID ACCIDENTAL CONTACT BETWEEN CONTROL CHASSIS AND LIVE COVER COMPONENTS.

# TRIMPOT ADJUSTMENT PROCEDURE

Four adjustments (MIN., MAX., IR COMP., and CUR. LIM.) are checked at the factory using a typical motor. Use the "TRIMPOT CHART" to adjust the trimpots to the approximate setting for your horsepower. The other two adjustments (ACCEL and DECEL), are the Acceleration and Deceleration adjustments and should be set for your particular application requirements. The "TRIMPOT CHART" is approximate and is valid when using a speedpot or a 0 to 12VDC input signal to control the speed. Operation of the control beyond  $\pm 10\%$  of normal line voltage is not recommended and could result in readjustments. These settings are permanent; periodic readjustment is normally not needed. (NOTE: Use only an ungrounded voltmeter).

**MAX.** Sets maximum motor speed when speedpot is at 100% CW rotation. Clockwise rotation increases maximum motor speed.

- 1) Connect a DC voltmeter; plus to +ARM and minus to -ARM.
- 2) Set meter voltage range for either 90 VDC or 180 VDC.
- 3) With no load on the motor, adjust the MAX trimpot to the rated armature voltage as seen on the meter.

NOTE: A tachometer or strobe may be used in place of a meter. Follow the above steps, but adjust the MAX trimpot to the rated motor base speed, indicated by tach or strobe.

**MIN.** Sets minimum motor voltage when Speedpot is set at zero. Clockwise rotation of the MIN. trimpot will increase the minimum motor voltage.

- 1) Set Speedpot to zero (fully CCW).
- 2) With no load on the motor, adjust the MIN trimpot clockwise until the motor starts to rotate.
- 3) Slowly back off the trimpot in the CCW direction until the motor stops.

NOTE: If motor rotation is desired at zero Speedpot setting, adjust the MIN trimpot clockwise until the desired minimum speed is reached.

**IR COMP.** Provides a means of improving speed regulation in the armature feedback mode. If a change in motor speed during a load change is of no concern, rotate this trimpot fully CCW.

- 1) Set speedpot at 50%.
- 2) Observe motor speed during a no load condition.
- 3) Apply a full load to the motor.
- 4) Adjust the I.R. COMP. trimpot clockwise (while the load is applied) until the no load motor speed is obtained.

**CUR. LIM.** Limits DC motor armature current (torque) to prevent damage to the motor or control. The current limit is set for 125% of the rated motor current. Clockwise rotation of this trimpot increases the armature current (or torque produced).

- 1) Turn drive power OFF!
- 2) Connect a DC Ammeter in series with the +ARM line (between +A on motor and +ARM on the control). Preset the current limit trimpot CCW.
- 3) Turn power on and set speedpot to 50%.
- 4) Increase the motor load until the motor stalls (zero RPM).
- 5) Set CUR. LIM. trimpot by adjusting CW to 125% of the rated motor armature current (see "TRIMPOT CHART").

**ACCEL** Allows adjustment of acceleration by user.

- 1) Clockwise trimpot rotation increases length of acceleration time needed for the control to reach full speed.

**DECEL** Allows adjustment of deceleration by user.

- 1) Clockwise trimpot rotation increases length of deceleration time needed for the control to reach zero speed.



# TRIMPOT SETTING CHART

MIN	ACCEL	DECEL	MAX	IR	CUR LIM	HP	VOLTS	MIN	ACCEL	DECEL	MAX	IR	CUR LIM	HP	VOLTS
						<b>1/8</b>	<b>115</b>							<b>1/4</b>	<b>230</b>
						<b>1/6</b>	<b>115</b>							<b>1/3</b>	<b>230</b>
						<b>1/4</b>	<b>115</b>							<b>1/2</b>	<b>230</b>
						<b>1/3</b>	<b>115</b>							<b>3/4</b>	<b>230</b>
						<b>1/2</b>	<b>115</b>							<b>1.0</b>	<b>230</b>
						<b>3/4</b>	<b>115</b>							<b>1.5</b>	<b>230</b>
						<b>1.0</b>	<b>115</b>							<b>2.0</b>	<b>230</b>
						<b>1.5</b>	<b>115</b>							<b>3.0</b>	<b>230</b>

NOTE: These settings apply when using a 5000Ω speedpot.

# BASIC HOOK-UP DIAGRAMS

## RBX2C-RA1/RBX2C-RA2/RBX2US-RA1/RBX2US-RA2

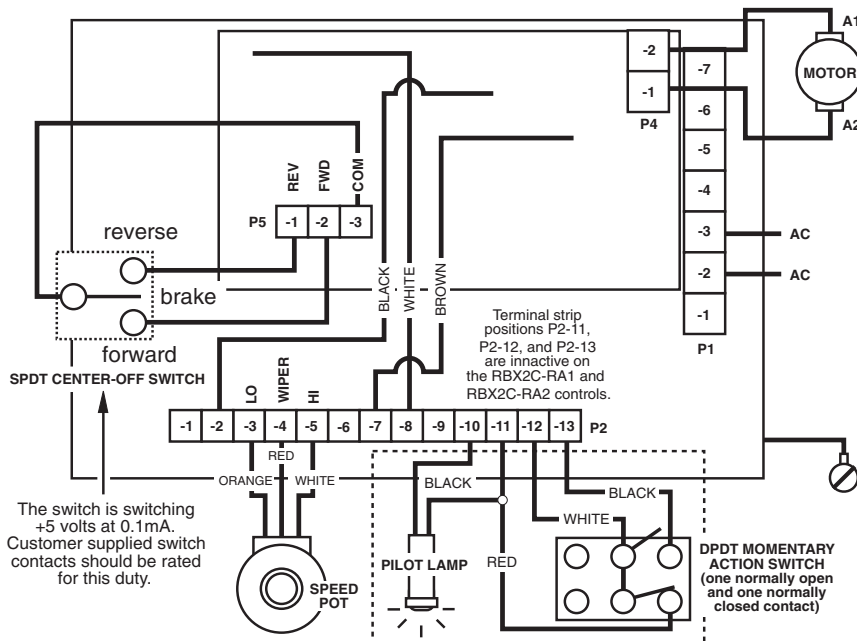
Forward / Reverse with Zero Speed  
Detect and Dynamic Brake

MODELS	AC INPUT	HP	DBR VALUE	PACKAGE
RBX2C-RA1	115 VAC	1-5 - 1	5Ω 50W	CHASSIS
RBX2C-RA2	230 VAC	1/4 - 2	10Ω 50W	CHASSIS
RBX2US-RA1	115 VAC	1/8 - 1	5Ω 50W	ENCLOSED
RBX2US-RA2	230 VAC	1/4 - 2	10Ω 50W	ENCLOSED

**Warning:** Models RBX2C-RA1, RBX2C-RA2, RBX2US-RA1, and RBX2US-RA2 because of the reversing feature no longer allows for dual voltage operation. The 115/230 VAC input selector switch must be in the correct position based upon the model used as indicated in the table above.

### HOOK-UP USING SPDT SWITCH OR CONTACT

**NOTE:**  
INPUTS TO TERMINAL STRIP P5 CANNOT BE REFERENCED TO EARTH GROUND!



Models RBX2C-RA1, RBX2C-RA2, RBX2US-RA1, and RBX2US-RA2 use a relay reversing option board that automatically “brakes” to zero speed before reversing. The SPDT center-off switch is used to select direction. When the direction is reversed, relays K1, K2, and K3 connect the dynamic brake resistor to the armature. The motor “brakes” and at zero speed the relays reverse the armature leads, causing the motor to rotate in the opposite direction. When the switch is in the center (STOP) position, the motor armature is connected to the dynamic brake resistor.

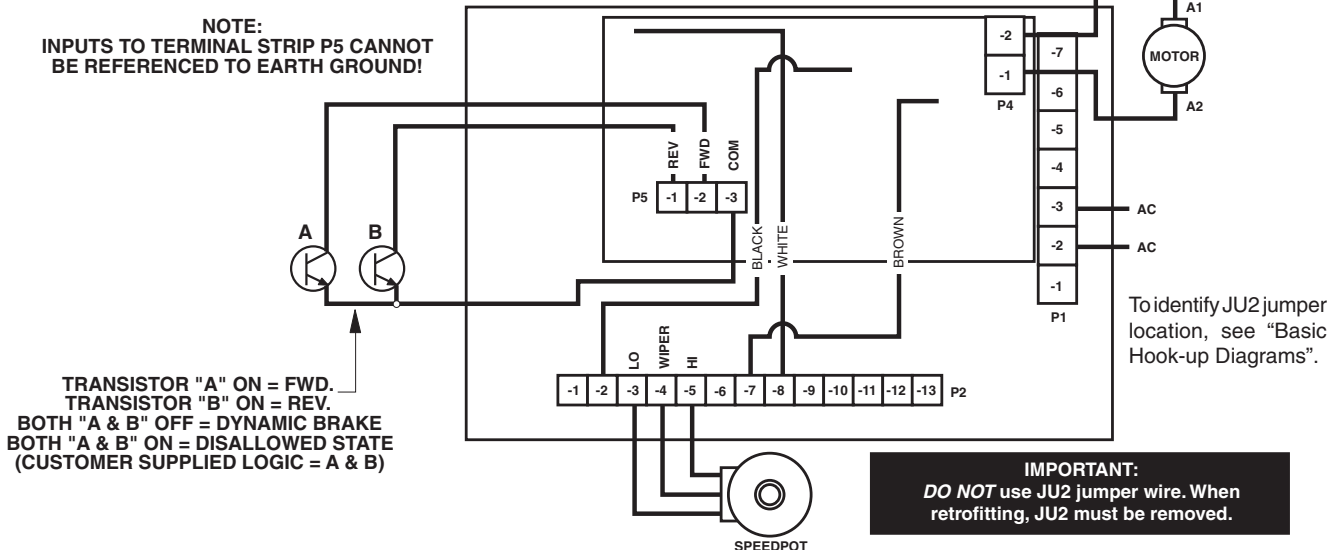
**VERY IMPORTANT:**  
DO NOT USE JU2 JUMPER WIRE.  
WHEN RETROFITTING, JU2  
JUMPER MUST BE REMOVED!

To identify JU2 jumper location, see “Basic Hook-up Diagrams”.

RBX2US-RA1 and RBX2US-RA2 controls only! All components located inside dashed line are not applicable on the RBX2C-RA1 and RBX2C-RA2 controls.

### HOOK-UP FOR NPN OPEN COLLECTOR DIRECTIONAL CONTROL

**NOTE:**  
INPUTS TO TERMINAL STRIP P5 CANNOT BE REFERENCED TO EARTH GROUND!



TRANSISTOR "A" ON = FWD.  
TRANSISTOR "B" ON = REV.  
BOTH "A & B" OFF = DYNAMIC BRAKE  
BOTH "A & B" ON = DISALLOWED STATE  
(CUSTOMER SUPPLIED LOGIC = A & B)

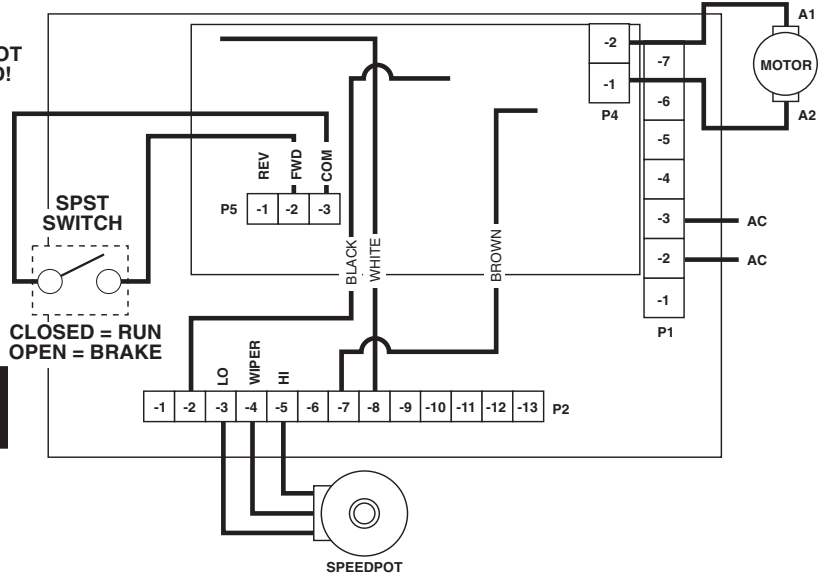
**IMPORTANT:**  
DO NOT use JU2 jumper wire. When retrofitting, JU2 must be removed.

## HOOK-UP FOR UNIDIRECTIONAL RUN / DYNAMIC BRAKE

**NOTE:**  
INPUTS TO TERMINAL STRIP P5 CANNOT  
BE REFERENCED TO EARTH GROUND!

**IMPORTANT:**  
*DO NOT* use JU2 jumper wire. When  
retrofitting, JU2 must be removed.

To identify JU2 jumper location, see "Basic  
Hook-up Diagrams".

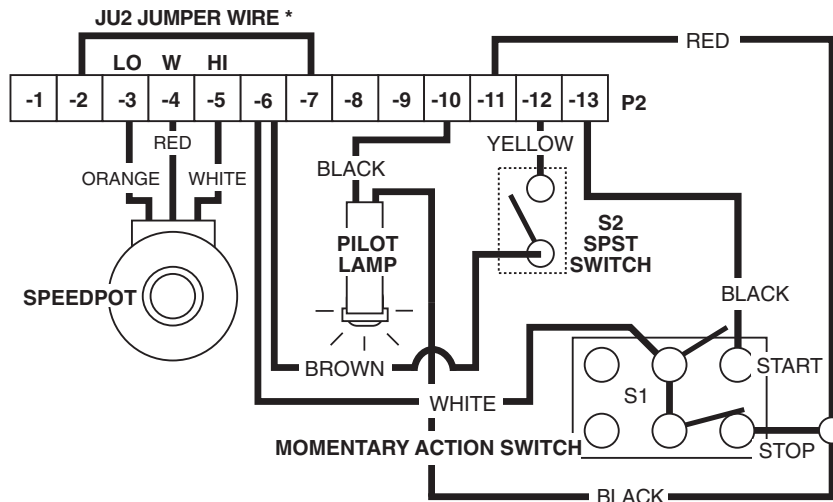


## RBX2US-9A

### Jog

See below for installation and availability

"S2" is located on the cover and disables the latch circuit of the power relay's, allowing the power switch to jog the drive.

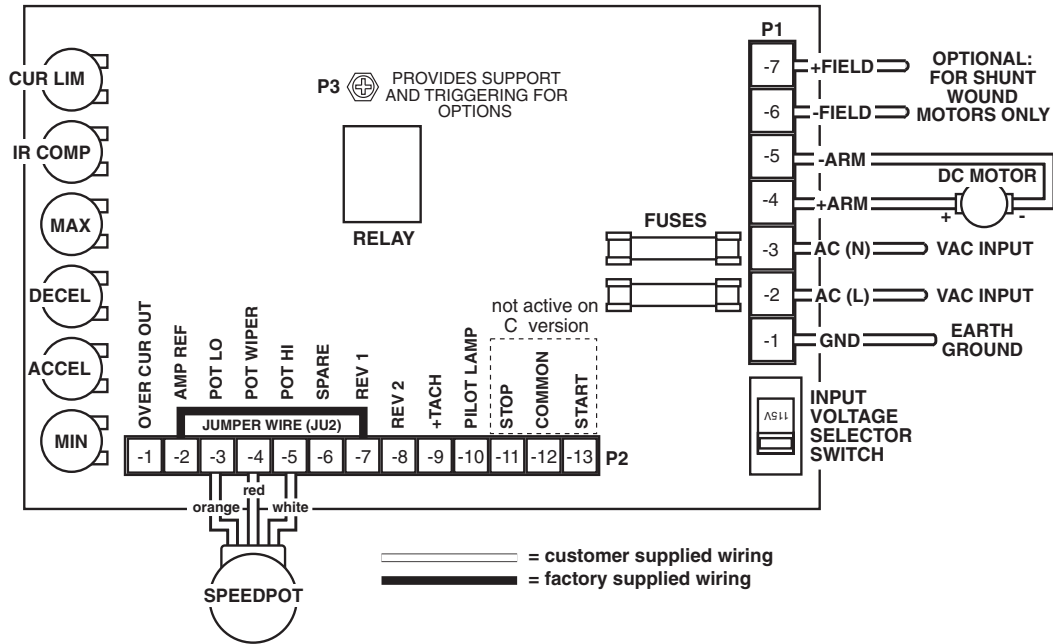


**NOTES:**

S1, S2 and pilot lamp are  
FACTORY PROVIDED.

\* This jumper wire is  
not used with some  
other options. Consult  
factory if more than one  
option is being wired.  
Using JU2 jumper when  
not required may cause  
permanent damage to the  
control.

# RBX2C and RBX3C

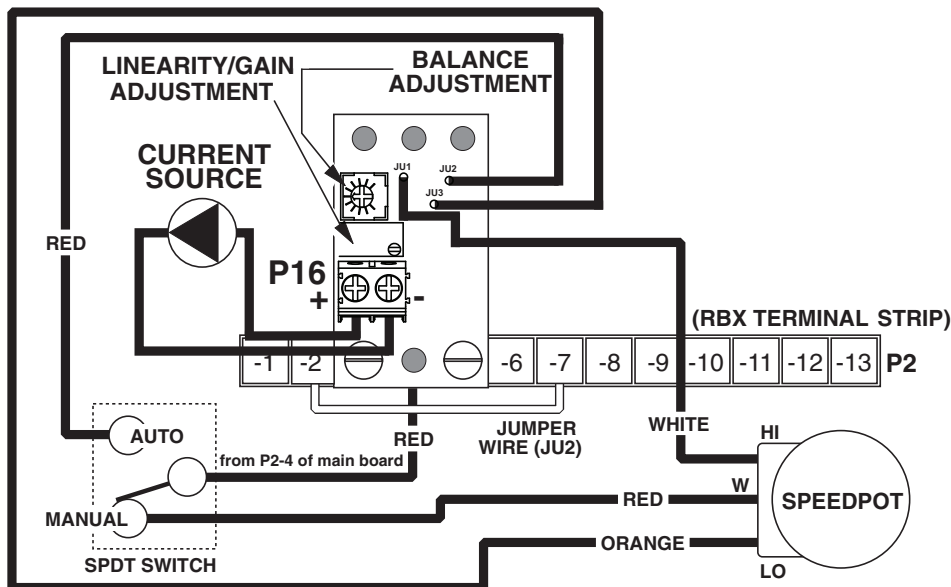


## 1.5 and 3.0 HORSEPOWER - MODEL RBX3C

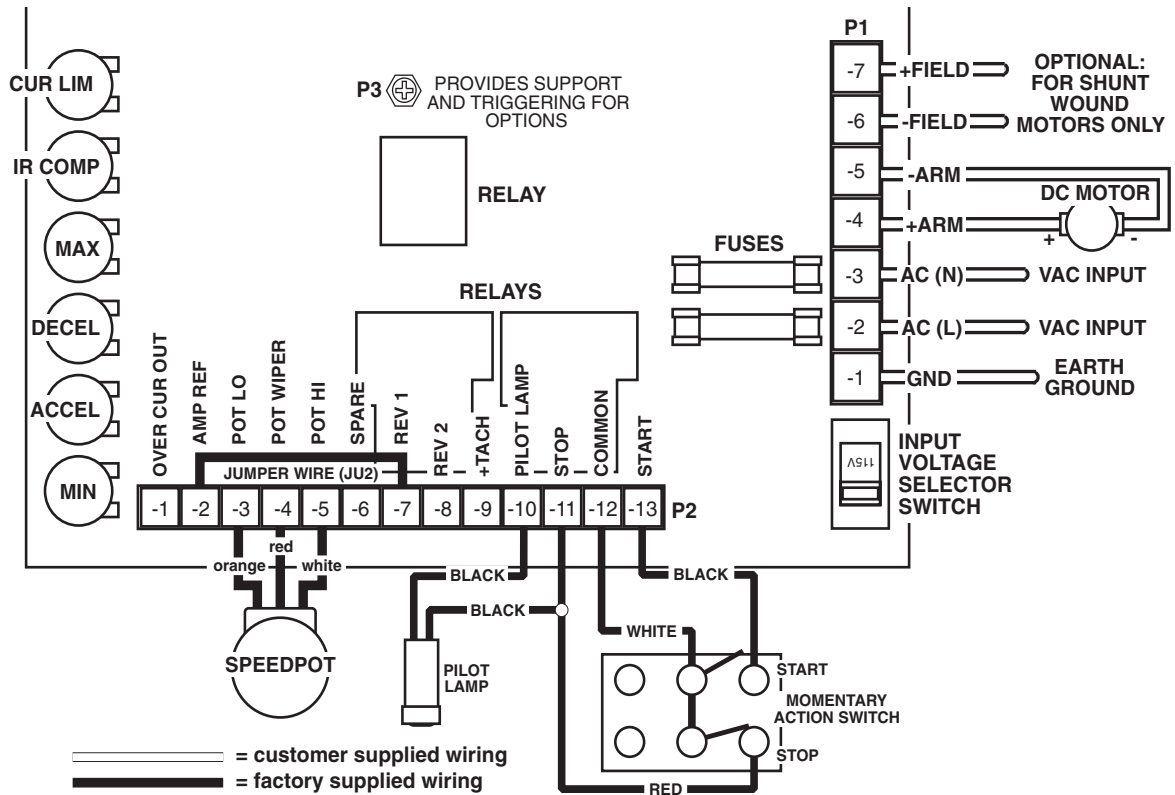
For 1.5 and 3.0 horsepower applications, the RBX3C control has the following restrictions:

- Available in chassis mount only.
- The 1.5 horsepower model is available in 115 VAC input at 0-90 VDC out, while the 3.0 horsepower model is available in 230 VAC input at 0-180 VDC out.
- Relay, power switching, start-stop, reversing, dynamic braking & jogging are not available from factory (they are customer supplied and wired).
- The isolation board (DC-25A) is available.

# RBX2UB-25A-38



# RBX2US and RBX2UB\*



\* Blank cover with no switches or speedpot.

## JU2 JUMPER WIRE SELECTION CHART

**NOTE:** Jumper wires may be required on terminal strip P2 for the control to operate (refer to jumper chart below).

REV 1 (P2-7) and REV 2 (P2-8) are both stop inputs. One of these inputs must be held low to AMP REF (P2-2) for the control to operate. Jumpering is necessary between AMP REF and REV 1 or REV 2 to satisfy the "OR" gate. An option board may be installed on the control satisfying the "OR" gate. This jumper (between P2-2 and P2-7) is called JU2. For inhibiting with soft start and fast stop, the JU2 jumper may be replaced by a SPST switch.

YES = JUMPER REQUIRED

NO = JUMPER NOT USED

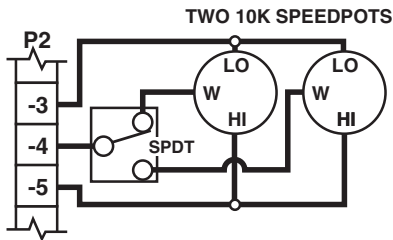
OPTION	DESCRIPTION	JUMPER	USED
RBX2US-9A	JOG	JU2	YES
DC-25A	CURRENT FOLLOWER	JU2	YES
RBX2C-RA1/RBX2C-RA2	FWD / REV with ZERO SPEED and D.B.R.	JU2	NO
RBX2US-RA1/RBX2US-RA2	FWD / REV with ZERO SPEED and D.B.R.	JU2	NO

**NOTE:** Installing JU2 jumper when not required may cause permanent damage to control.

# CONTROL MODIFICATIONS

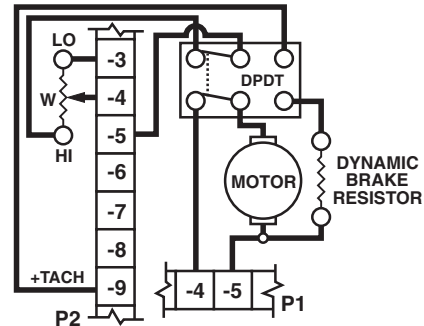
## TWO SPEED OPERATION

Two pot operation is done using two 10KΩ speed potentiometers in parallel (both HI's to P2-5, both LO's to P2-3). The WIPER is switched using a SPDT switch.



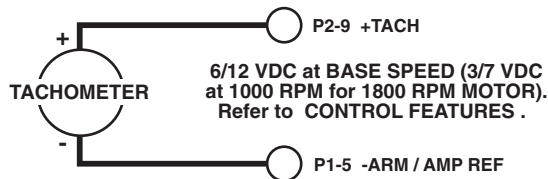
## DYNAMIC BRAKING

A DPDT switch is used to inhibit the control and to connect the DBR. Typical values for the DBR (dynamic brake resistor) are 5Ω for 115V, 10Ω for 230V. Note that motor horsepower, inertia, and cycle time effect sizing of the DBR.



## TACHOMETER FEEDBACK

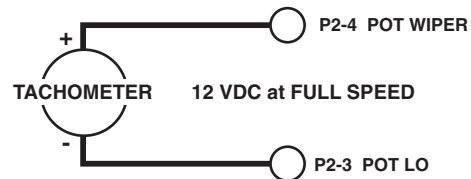
Improves speed regulation to  $\pm 1/2\%$  of base speed.



NOTE: NEED 1% OR LESS - TACH OUTPUT RIPPLE

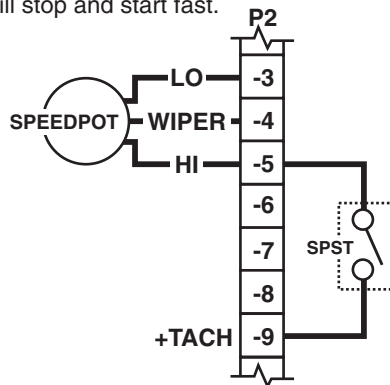
## TACHOMETER FOLLOWER

Allows control output to follow tachometer voltage.



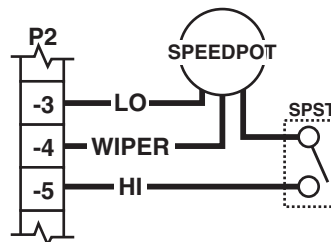
## INHIBIT (USED INDEPENDENTLY)

The customer supplied SPST switch is connected in series between the speedpot HI (P2-5) and the +TACH terminal (P2-9). To inhibit, speedpot HI is closed to the +TACH terminal. To restart, the switch is returned to open. NOTE: The control will stop and start fast.



## INHIBIT (USED WITH SPEEDPOT)

The customer supplied SPST switch is connected in series between the speedpot HI terminal (P2-5) and speedpot HI. To inhibit, the SPST switch contacts are opened. To restart, the switch is returned to the closed position. NOTE: The control will soft stop and soft start through the acceleration setting.



NOTE: Permits starting and stopping of motor without breaking AC lines. In the event of SCR failure or false triggering, the Inhibit circuit will not stop motor.

Always use a shielded wire when connecting to the inhibit terminal. The shield should be connected to the -Armature or Common of the control.

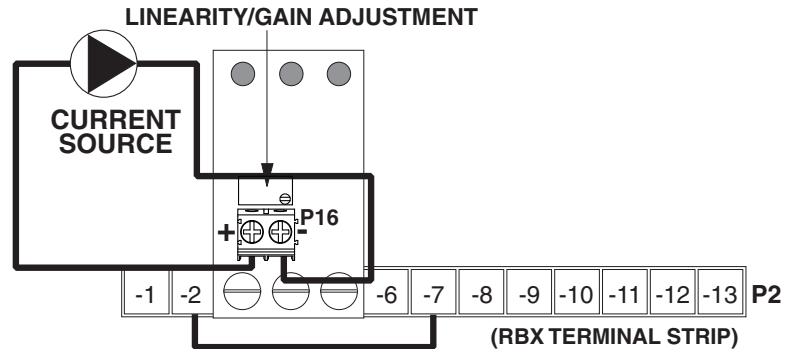


# OPTION DESCRIPTIONS

## ***DC-25A option*** **Isolated 4-20 mA Signal Follower**

**Field Installed  
Available All Models**

**DO NOT USE TRIMPOT CHART TO  
ADJUST MIN AND MAX TRIMPOTS  
ON MAIN BOARD.**



### **DC-25A SETUP PROCEDURE**

The DC-25A includes a 4-20 mA isolated signal card that replaces the speedpot to control speed. The 4-20 mA signal input can be either grounded or ungrounded. The board sets on spacers screwed to the pot HI, Wiper, and LO terminals on the main board using long screws. The current source connects to the + and - two position terminal strip (P16-1 and -2) on the DC-25A option board.

The Linearity trimpot on the DC-25A option board is set at the factory for proper linearity, however this trimpot may need to be re-set after tuning the Max and Min trimpot settings on the control for your specific application. If needed then refer to the setup procedure below.

The following is the recommended procedure to set up the DC-25A option:

- 1) With the DC-25A oriented so that trimpots are along the top, adjust Min trimpot to minimum (full CCW) and Max trimpot to 50%. The voltage is set below the typical motor voltage to make certain the drive is NOT in saturation before setting the option board saturation point.
- 2) Set the Linearity/gain pot on the option board full CW. This is a 20 turn pot and you should hear a clicking with each turn when fully up or just count 20 turns.
- 3) Make certain your motor is connected to +/-ARM output of the drive. (Note: For proper tuning this setup is best done on an unloaded motor.)
- 4) With power applied and a voltmeter monitoring motor output Vdc, apply 4mA to DC-25A option board. Check voltmeter reading and adjust the Linearity/gain trimpot, R16, on the DC-25A board CCW until motor output voltage is less than 0.1Vdc.
- 5) Now apply 20mA to the DC-25A option board and adjust the Max trimpot to a voltage that is 5 volts above the final desired max motor voltage output. Adjust the Linearity/gain trimpot on the DC-25A option board CCW until the motor output voltage decreases to the desired max voltage set point.
- 6) Now, apply 4mA to the DC-25A option board again and adjust the Min trimpot to deadband or the desired minimum motor voltage output. The deadband point is when you are at 0Vdc and any further increase of the Min trimpot would result in an output to the motor. Re-apply 20mA to the option board and verify max output has not changed. A small adjustment may be needed to the Max trimpot to reset to desired max output.
- 7) Adjust 4-20 input to 12mA. If tuned properly the output voltage of an unloaded motor should be within a few volts of 1/2 output (based on max output setting above).

# DC-RSW

## Manual Reversing options

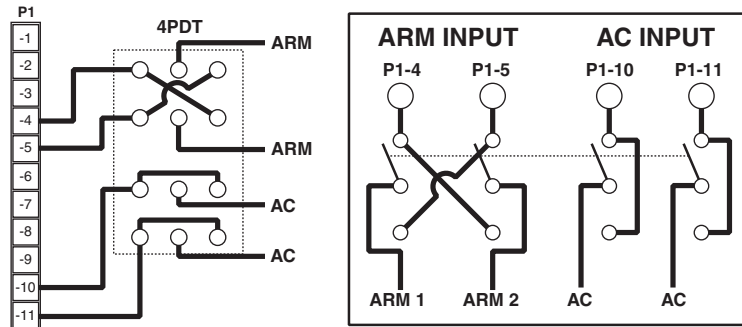
Chassis Model only

Permits reversing of motor. This is accomplished using a 4PDT blocked center switch. When switched between the forward/reverse positions, a delay is encountered due to the blocked center position, which protects the control from any voltage that may be at the armature terminals. The center position is OFF/NEUTRAL.

**THE MOTOR MUST COME TO A COMPLETE STOP BEFORE CHANGING DIRECTIONS. IF THE MOTOR DOES NOT COME TO A COMPLETE STOP, SERIOUS DAMAGE TO THE CONTROL MAY RESULT. BYPASS OF THE CENTER BLOCK OF THE SWITCH MAY RESULT IN DAMAGE TO THE CONTROL.**

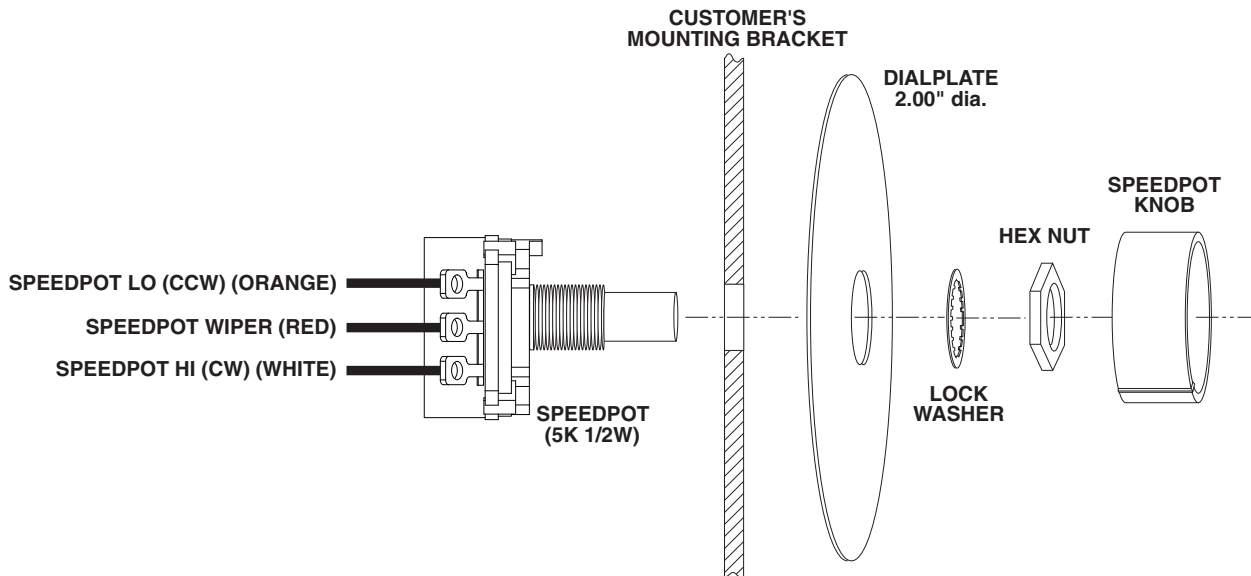
**Note:** This option is not available for 1.5 HP - 90V, and 3 HP - 180V applications.

**Control with Field installed 4PDT switch.** The customer provides interconnecting wiring.



# KDPD

This is a replacement pot kit used to control the speed of the motor.



## FCVR-B

This is a cover kit to be used with a chassis control which will convert the unit into a NEMA 4/12 control. This kit will include endplates, gaskets, and hardware and will be operated remotely.

## FCVR-S

This is a cover kit to be used with a chassis control which will convert the unit into a NEMA 4/12 control. This kit will include endplates, gaskets, switches, speedpot, and hardware.

### IN CASE OF DIFFICULTY

PROBLEM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION(S)
Motor doesn't operate	Blown fuse Incorrect or no power source Speedpot set at zero Worn motor brushes Improper or missing jumpers	Replace fuse Install proper service Adjust speedpot CW to start Replace motor brushes See "JU2 Jumper Wire Selection Chart"
Armature output voltage cannot be adjusted, output is a constant DC level	No motor or load connected Speedpot low connection open	Check that the motor or load is connected to Armature terminals Check that speedpot low wire is connected
Motor stalls or runs very slowly with speed control turned fully CW	Low voltage Overload condition Worn motor brushes Max. speed set incorrectly	Should be above 104V or 208V Reduce load or re-adjust Current Limit Replace motor brushes See "Adjustment Procedure"
Motor hunts	Too much IR Comp Motor is in Current Limit Motor speed is above rated speed	See "Adjustment Procedure" See "Adjustment Procedure" Reduce Max trimpot setting
Repeated fuse blowing	Overload condition Worn motor brushes Defective motor Failed electrical components	Reduce load Relace motor brushes Replace motor Return for repair
Motor runs but will not stop	Incorrect wiring Defective wiring Failed component	Check "Terminal Strip Wiring" sections Check wiring Return for repair

After using this section, if control will still not operate, consult your Boston Gear Representative or return unit for repair.

## FUSING

The motor and control are protected against overloads by the current limit circuit. Additional protection is provided through 2 fuses, which are mounted on the main board. Use exact fuse replacements if the fuse requires changing. Before changing fuses, be sure the power to the control is disconnected at the power source. Note: Both sides of VAC input are fused.

HP: 1/8 - 2.0 H.P.  
HP: 3.0 H.P.

FUSE SIZE: 20 Amp  
FUSE SIZE: 20 Amp

FUSE TYPE: Bussman ABC-20 or Little Fuse 314020  
FUSE TYPE: Bussman ABC-20 or Little Fuse 314020

# SPECIFICATIONS

AC INPUT VOLTAGE ..... 120V/240V ±10%  
 ALTITUDE ..... Up to 7,500 feet above sea level  
 CONTROL OVERLOAD CAPACITY ..... 200% for 1 minute  
 DIMENSIONS & WEIGHTS:

	WIDTH	LENGTH	DEPTH	WEIGHT	MODELS
ENGLISH	6.70"	9.00"	2.25"	40 oz.	RBX2, RBX3, RBX2C-RA1, RBX2C-RA2
	6.70"	10.00"	4.75"	56 oz.	RBX2US-RA1, RBX2US-RA2, RBX2UB-25A-38, RBX2US, RBX2US-9A, RBX2UB
METRIC	171 mm	229 mm	51 mm	1134 gm.	RBX2, RBX3, RBX2C-RA1, RBX2C-RA2
	171 mm	254 mm	121 mm	1422 gm.	RBX2US-RA1, RBX2US-RA2, RBX2UB-25A-38, RBX2US, RBX2US-9A, RBX2UB

DRIVE SERVICE FACTOR ..... 1.0  
 EFFICIENCY ..... 85% typical  
 ELECTRICAL SPECIFICATIONS - TYPICAL CURRENT & HORSEPOWER RANGES:

	115V AC INPUT / 0-90VDC OUTPUT		230V AC INPUT / 0-180VDC OUTPUT	
H.P.	MAX AC AMPS	MAX ARM AMPS	MAX AC AMPS	MAX ARM AMPS
1/8	1.80	1.40	-----	-----
1/6	2.60	2.10	-----	-----
1/4	3.50	2.70	1.80	1.40
1/3	4.40	3.40	2.20	1.70
1/2	6.50	5.00	3.30	2.50
3/4	9.30	7.20	4.80	3.70
1.0	13.20	10.20	6.50	5.00
1.5	21.50	14.70	9.70	7.50
2.0	-----	-----	12.90	9.90
3.0	-----	-----	22.00	15.00

FUSE PROTECTION ..... 2 AC line fuses (see "Fusing")  
 HUMIDITY ..... 99% non-condensing  
 INPUT FREQUENCY ..... 50 or 60 Hertz  
 MAXIMUM ARMATURE CURRENT - CONTINUOUS ..... 10 ADC (2 H.P.); 15 ADC (3 H.P.)  
 PILOT LAMP (all enclosed units except for RBX2UB) ..... Neon  
 POWER DEVICES ..... Packaged full wave bridge  
 SHUNT FIELD VOLTAGE ..... 100VDC for 115VAC in; 200VDC for 230VAC in; (1.0 A max.; 1.5 A max. - RBX3C)  
 SPEED CONTROL ..... Via 5KΩ Potentiometer OR 0 to +10 VDC isolated signal  
 SPEED RANGE ..... 50:1  
 SPEED REGULATION ..... ±1% of base speed  
 TACHOMETER FEEDBACK ..... jumper selectable 3V or 7V per 1000 RPM  
 TEMPERATURE RANGE ..... -10° to 45° C. ambient (15° to 115° F.)  
 TRANSIENT VOLTAGE PROTECTION ..... G-Mov  
 TRIMPOTS:

ACCELERATION RANGE ..... 0.3 to 12 seconds - adjustable  
 CURRENT LIMIT RANGE ..... 1 to 20 Amps (1/8 to 2 H.P.)  
 ..... 2 to 30 Amps (1.5 and 3 H.P.)  
 DECELERATION RANGE ..... 0.6 to 12 seconds - adjustable  
 I.R. COMPENSATION RANGE ..... 1/8 through 2.0 h.p.  
 ..... 1.5 and 3.0 h.p. (RBX3C control)  
 MAXIMUM SPEED RANGE ..... 60% to 120% of base speed  
 MINIMUM SPEED RANGE ..... 0 to 30% of maximum speed  
 TYPE RAMP OF ACCEL / DECEL ..... Linear

# Boston Gear DC Controls Warranty

**Boston Gear** warrants its products to be free from defects in material and workmanship.

The exclusive remedy for this warranty is Boston Gear factory replacement or repair of any part or parts of such product which shall within 12 months after delivery to the purchaser be returned to Boston Gear factory with all transportation charges prepaid and which Boston Gear determines to its satisfaction to be defective.

This warranty shall not extend to defects in assembly by other than Boston Gear or to any article which has been repaired or altered by other than Boston Gear or to any article which Boston Gear determines has been subjected to improper use.

Boston Gear assumes no responsibility for the design characteristics of any unit or its operation in any circuit or assembly.

This warranty is in lieu of all other warranties, express or implied; all other liabilities or obligations on the part of Boston Gear, including consequential damages, are hereby expressly excluded.

**NOTE:** Carefully check the control for shipping damage. Report any damage to the carrier immediately. Do not attempt to operate the drive if visible damage is evident to either the circuit or to the electronic components.

All information contained in this manual is intended to be correct; however information and data in this manual are subject to change without notice. Boston Gear makes no warranty of any kind with regard to this information or data.

Further, Boston Gear is not responsible for any omissions or errors or consequential damage caused by the user of the product.

Boston Gear reserves the right to make manufacturing changes which may not be included in this manual.



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