

BALDOR[®]
MOTORS AND DRIVES

AC INVERTER

Series 15P
Potentiometer Adjustable
Inverter Control

Installation and Operating Manual

4/99

MN715P

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Section 1

Quick Start

Overview

The quick start procedure is as follows:

1. Read the Safety Notice and Precautions in section 2 of this manual.
2. Mount the control. Refer to Section 3, "Physical Installation" procedure.
3. Connect AC power. Refer to Section 3 "Control Installation".
4. Connect the motor. Refer to Section 3, "Control Installation".
5. Set the switches and adjust the potentiometers for desired operation. See Figure 1-1.

The following procedure will help get your system up and running quickly, and will allow you to prove the motor and control operation. This procedure assumes that the control and motor are correctly installed.

 **WARNING:** Make sure that unexpected operation of the motor shaft during start up will not cause injury to personnel or damage to equipment.

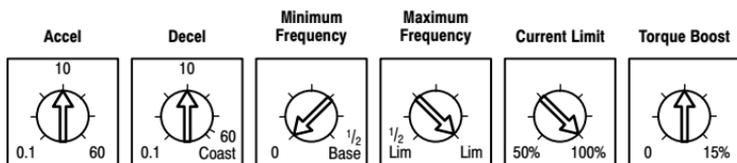
Power-up Procedure

1. Open cover.
2. Be sure all S1 switches are OFF.
3. Rotate the % Speed control on the front panel to 0% speed (fully counterclockwise position).
4. Turn power on. Be sure the "Fault" LED is off.
5. Press FWD. The LED on the FWD button should be on.
6. Rotate the % Speed control to 30%. The motor should rotate in the forward direction.
Note: If the motor rotates in the reverse direction, turn power off and reverse any two of the three motor lead connections (J5-T1, T2 or T3). Turn power on and start at step 3 again.
7. Press STOP. The motor should decel to a stop and the LED on the STOP button should be on.
8. Press REV. The LED on the REV button should be on.
9. Rotate the % Speed control to 30%. The motor should rotate in the reverse direction.
10. Turn power off.

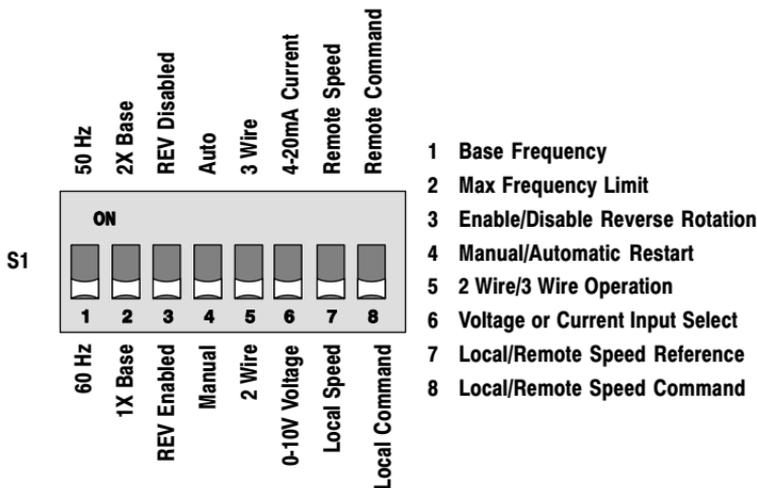
The control is now ready to be configured for your application and placed into service. Refer to the appropriate connection diagram and setup procedure to configure your system.

Figure 1-1 Factory Settings

Potentiometers P1 to P6 (arrows indicate factory settings).



Switch S1, shown with all switches in OFF position (factory settings).



Section 2

General Information

Year 2000 Compliance

The motor control products listed below are manufactured or offered for sale by Baldor Electric and are certified to be year 2000 compliant.

DC Motor Controls: Series BC100/200, BC19H, BC20H, TSD, UM, UMH.

AC Motor Controls: Series ID10, ID1100, ID15H, ID15J, ID15P, ID15V, ZD17H, ZD18H, ID21H, ZD22H, SD23H, ZD24M, ZD25M, SD26M, BSC, DBSC, BTS, SBTS, FLEX, FLEX+, MINTDRIVE.

Position Controllers: PMC, SmartMove, NextMove.

Furthermore, year 2000 compliance means that the product will:

Not use dates or perform any date processing.

Date information is irrelevant to proper operation; and

There are no problems or issues to address to ensure continued and proper operation of the product listed due to changes in century dates.

CE Compliance

A custom unit may be required, contact Baldor. Compliance to Directive 89/336/EEC is the responsibility of the system integrator. A control, motor and all system components must have proper shielding grounding and filtering as described in MN1383. Please refer to this manual for installation techniques for CE compliance.

Limited Warranty

For a period of two (2) years from the date of original purchase, BALDOR will repair or replace without charge controls and accessories which our examination proves to be defective in material or workmanship. This warranty is valid if the unit has not been tampered with by unauthorized persons, misused, abused, or improperly installed and has been used in accordance with the instructions and/or ratings supplied. This warranty is in lieu of any other warranty or guarantee expressed or implied. BALDOR shall not be held responsible for any expense (including installation and removal), inconvenience, or consequential damage, including injury to any person or property caused by items of our manufacture or sale. (Some states do not allow exclusion or limitation of incidental or consequential damages, so the above exclusion may not apply.) In any event, BALDOR's total liability, under all circumstances, shall not exceed the full purchase price of the control. Claims for purchase price refunds, repairs, or replacements must be referred to BALDOR with all pertinent data as to the defect, the date purchased, the task performed by the control, and the problem encountered. No liability is assumed for expendable items such as fuses.

Goods may be returned only with written notification including a BALDOR Return Authorization Number and any return shipments must be prepaid.

Safety Notice:

This equipment contains voltages that may be as great as 1000 volts! Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the start-up procedure or troubleshoot this equipment.

This equipment may be connected to other machines that have rotating parts or parts that are driven by this equipment. Improper use can cause serious or fatal injury. Only qualified personnel should attempt the start-up procedure or troubleshoot this equipment.

PRECAUTIONS:

- ⚠ WARNING:** Do not touch any circuit board, power device or electrical connection before you first ensure that power has been disconnected and there is no high voltage present from this equipment or other equipment to which it is connected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the start-up procedure or troubleshoot this equipment.
- ⚠ WARNING:** Be sure that you are completely familiar with the safe operation of this equipment. This equipment may be connected to other machines that have rotating parts or parts that are controlled by this equipment. Improper use can cause serious or fatal injury. Only qualified personnel should attempt the start-up procedure or troubleshoot this equipment.
- ⚠ 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 power up start feature that will start the motor whenever input power is applied and a RUN (FWD or REV) command is issued and maintained. If an automatic power up start of the motor could cause injury to personnel, this feature should be turned off.
- ⚠ WARNING:** Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that grounds are connected. Electrical shock can cause serious or fatal injury.
- ⚠ WARNING:** Do not remove cover for at least five (5) minutes after AC power is disconnected to allow capacitors to discharge. Electrical shock can cause serious or fatal injury.

Continued on next page.

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- ⚠ WARNING:** Motor circuit may have high voltage present whenever AC power is applied, even when motor is not rotating. Electrical shock can cause serious or fatal injury.
 - ⚠ WARNING:** Dynamic brake resistors may generate enough heat to ignite combustible materials. Keep all combustible materials and flammable vapors away from brake resistors.
 - ⚠ Caution:** Disconnect motor leads (T1, T2 and T3) from control before you perform a “Megger” 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 Underwriters Laboratories Inc. requirements.
 - ⚠ Caution:** Do not connect AC power to the Motor terminals T1, T2 and T3. Connecting AC power to these terminals may result in damage to the control.
 - ⚠ Caution:** Baldor recommends not using “Grounded Leg Delta” transformer power leads that may create ground loops. Instead, we recommend using a four wire Wye.

Section 3

Receiving and Installation

Receiving & Inspection

The Series 15P Inverter 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 control you received is the same as listed on your purchase order.
3. If the control is to be stored for several weeks before use, be sure that it is stored in a location that conforms to published storage specifications. (Refer to Section 6 of this manual).

Physical Installation

The mounting location is important. The control should be installed in an area that is protected from direct sunlight, corrosives, harmful gases or liquids, dust, metallic particles and vibration. Exposure to these elements can reduce the operating life and degrade performance of the control.

Several other factors should be carefully evaluated when selecting a location for installation:

1. For effective cooling and maintenance, the control should be mounted on a smooth, non-flammable vertical surface. Table 3-1 lists the Watts Loss ratings for enclosure sizing.
2. Provide at least two inches of clearance on all sides for airflow.
3. Front access must be provided to allow the control cover to be opened or removed for service and to allow viewing of the Keypad LEDs.
4. **Altitude derating.** Up to 3300 feet (1000 meters), no derating required. Above 3300 feet, derate peak or continuous output current by 2% for each 1000 feet above 3300 feet.
5. **Temperature derating.** Up to 40°C, no derating required. Above 40°C, derate peak or continuous output current by 2% per °C above 40°C. Maximum ambient is 55°C.

Table 3-1 Series 15P Watts Loss Ratings

| 115VAC | | 230VAC | | 460VAC | |
|------------------|------------------|------------------|------------------|------------------|------------------|
| 2.5kHz PWM | 7.5kHz PWM | 2.5kHz PWM | 7.5kHz PWM | 2.5kHz PWM | 7.5kHz PWM |
| 17 Watts/ Amp | 20 Watts/ Amp | 17 Watts/ Amp | 20 Watts/ Amp | 19 Watts/ Amp | 28 Watts/ Amp |

Control Installation

The control must be securely fastened to the mounting surface. Use the four (4) mounting holes to fasten the control to the mounting surface or enclosure.

Shock Mounting

If the control will be subjected to levels of shock greater than 1G or vibration greater than 0.5G at 10 to 60Hz, the control should be shock mounted. Excessive vibration within the control can cause internal connections to loosen and could lead to component failure or electrical shock hazard.

Electrical Installation

Interconnection wiring is required between the motor control, AC power source, motor, host control and any operator interface stations. Use UL listed closed loop connectors that are of an appropriate size for the wire gauge being used. Connectors are to be installed using crimp tool specified by the manufacturer of the connector. Only Class 1 wiring should be used.

System Grounding

Baldor controls are designed to be powered from standard three phase lines that are electrically symmetrical with respect to ground. System grounding is an important step in the overall installation to prevent problems.

Input Current Requirements

Table 3-2 Input Current Requirements for Stock Products

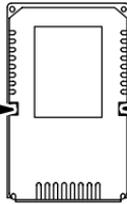
| 115VAC – 1 ϕ | | 230VAC – 3 ϕ | | 460VAC – 3 ϕ | |
|-------------------|------------|-------------------|------------|-------------------|------------|
| Catalog Numbers | Input Amps | Catalog Numbers | Input Amps | Catalog Numbers | Input Amps |
| ID15P1F33-ER | 7.5 | ID15P201-ER | 4.8 | ID15P401-ER | 2.4 |
| ID15P1F50-ER | 10.2 | ID15P201F5-ER | 6.9 | ID15P401F5-ER | 3.5 |
| ID15P1F75-ER | 14.4 | ID15P202-ER | 7.8 | ID15P402-ER | 3.9 |
| ID15P101-ER | 16.6 | ID15P203-ER | 11.0 | ID15P403-ER | 5.5 |
| | | | | ID15P405-ER | 8.7 |

Cover Removal

The cover is made of plastic and could be damaged during removal if handled roughly. Refer to Figure 3-1. Insert a screw driver or small blade tool and pry the cover outward as shown to release the side. When both sides are released, remove the cover.

Figure 3-1 Cover Removal

Use small screw driver or suitable tool to pry cover slightly outward to release cover from its catch.

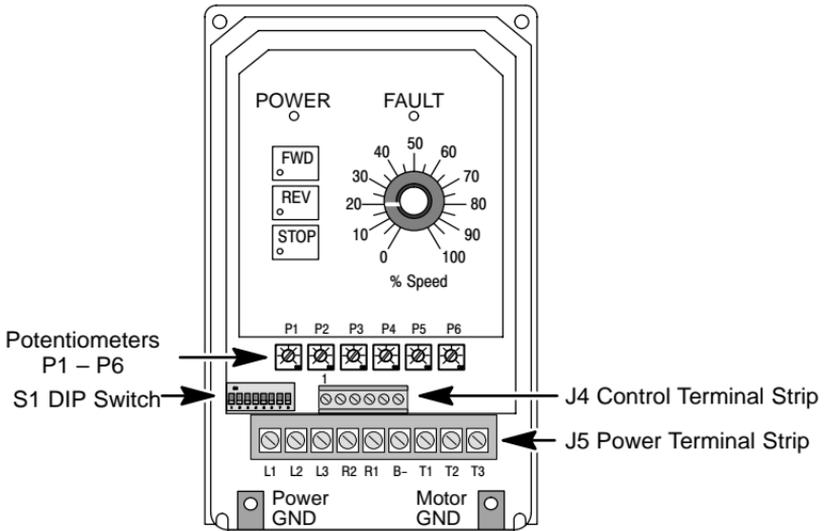


Use small screw driver or suitable tool to pry cover slightly outward to release cover from its catch.

Terminal Identification

The terminals for signal, AC power and motor connections are shown in Figure 3-2. Separate ground connections are provided for power and motor grounds.

Figure 3-2 Terminal Identification



AC Line Connections

A power disconnect should be installed between the input power service and the control for a fail-safe method to disconnect power. The control will remain in a powered-up condition until all input power is removed from the control and the internal bus voltage is discharged.

Protective Devices

Recommended fuse sizes are based on the following:

115% of maximum continuous current for time delay.

150% of maximum continuous current for Fast or Very Fast action.

Note: These general size recommendations do not consider harmonic currents or ambient temperatures greater than 40°C.

Be sure a suitable input power protection device is installed. Use the recommended circuit breaker or fuses listed in Tables 3-3 and 3-4 (Wire Size and Protection Devices). Input and output wire size is based on the use of copper conductor wire rated at 75 °C. The table is specified for NEMA B motors.

| | |
|----------------------------|--|
| Circuit Breaker: | 1 phase , thermal magnetic. Equal to GE type THQ or TEB for 230VAC |
| | 3 phase , thermal magnetic. Equal to GE type THQ or TEB for 230VAC or Equal to GE type TED for 460VAC |
| Fast Action Fuses: | 115/230VAC, Buss KTN 460VAC, Buss KTS |
| Very Fast Action Fuses: | 115/230VAC, Buss JJN 460VAC, Buss JJS |
| Time Delay Fuses: | 115/230VAC, Buss FRN 460VAC, Buss FRS |

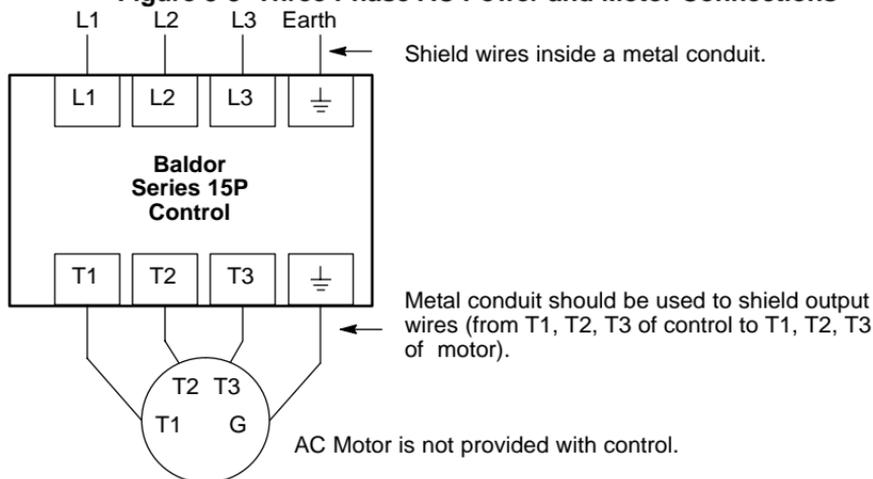
Three Phase Wire Size and Protection Devices

Table 3-3 Wire Size and Protection Devices - 3 phase

| Control Rating | | Input Breaker Amps | Input Fuse | | Wire Gauge | |
|----------------|-----------|--------------------|------------------|-----------------|------------|-----------------|
| Input Volts | Output HP | | Fast Acting Amps | Time Delay Amps | AWG | mm ² |
| 230 | 1 | 7 | 6 | 5 | 14 | 2.08 |
| 230 | 1.5 | 7 | 8 | 7 | 14 | 2.08 |
| 230 | 2 | 15 | 12 | 9 | 14 | 2.08 |
| 230 | 3 | 15 | 15 | 12 | 14 | 2.08 |
| 460 | 1 | 3 | 3 | 2.5 | 14 | 2.08 |
| 460 | 1.5 | 7 | 4 | 3.5 | 14 | 2.08 |
| 460 | 2 | 7 | 5 | 4.5 | 14 | 2.08 |
| 460 | 3 | 7 | 8 | 6.3 | 14 | 2.08 |
| 460 | 5 | 15 | 12 | 10 | 14 | 2.08 |

Note: All wire sizes are based on 75°C copper wire, 1% line impedance.

Figure 3-3 Three Phase AC Power and Motor Connections



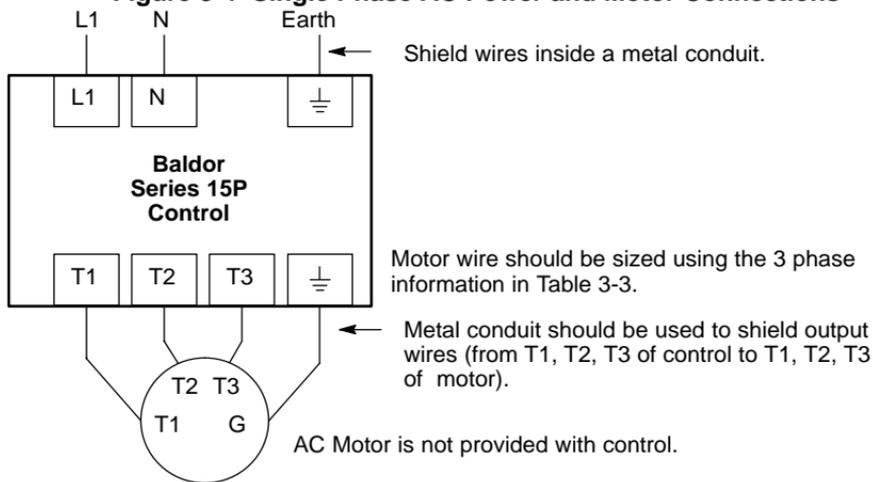
115VAC 1 Phase Wire Size and Protection Devices

Table 3-4 Wire Size and Protection Devices - 1 phase

| Control Output Rating HP | Input Breaker Amps | Input Fuse | | Wire Gauge | |
|--------------------------|--------------------|------------------|-----------------|------------|-----------------|
| | | Fast Acting Amps | Time Delay Amps | AWG | mm ² |
| 0.33 | 10 | 12 | 10 | 14 | 2.08 |
| 0.5 | 12.5 | 15 | 15 | 14 | 2.08 |
| 0.75 | 17.5 | 20 | 17.5 | 12 | 3.31 |
| 1.0 | 20 | 25 | 20 | 12 | 3.31 |

Note: All wire sizes are based on 75°C copper wire, 1% line impedance.

Figure 3-4 Single Phase AC Power and Motor Connections



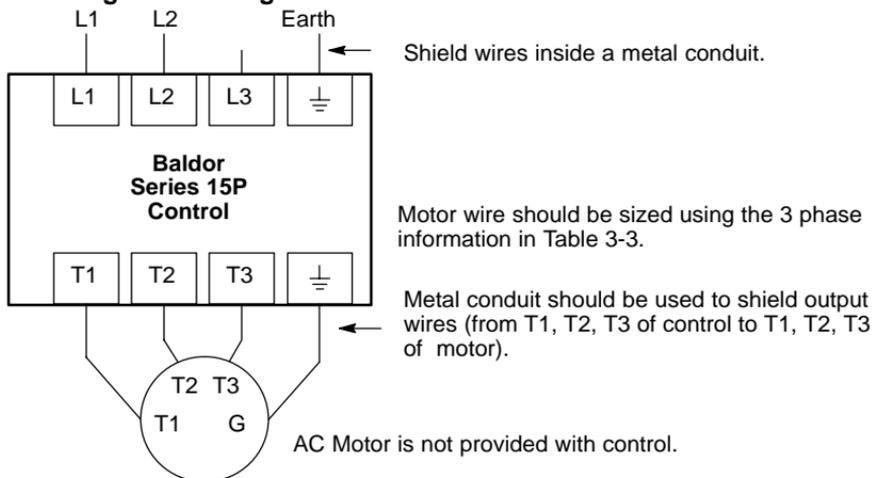
230VAC Single Phase Derating for Three Phase Controls

Single phase AC input power can be used to power a three phase control. However, the continuous and peak current ratings of the control must be reduced by 35% (derated).

| Control Output Rating HP | Input Breaker Amps | Input Fuse | | Wire Gauge | |
|--------------------------|--------------------|------------------|-----------------|------------|-----------------|
| | | Fast Acting Amps | Time Delay Amps | AWG | mm ² |
| 0.75 | 10 | 10 | 9 | 14 | 2.08 |
| 1 | 10 | 12 | 10 | 14 | 2.08 |
| 1.5 | 12.5 | 15 | 15 | 14 | 2.08 |
| 2 | 15 | 20 | 17.5 | 14 | 2.08 |
| 3 | 25 | 25 | 25 | 12 | 3.31 |

Note: All wire sizes are based on 75°C copper wire, 1% line impedance.

Figure 3-5 Single Phase 230VAC Power and Motor Connections



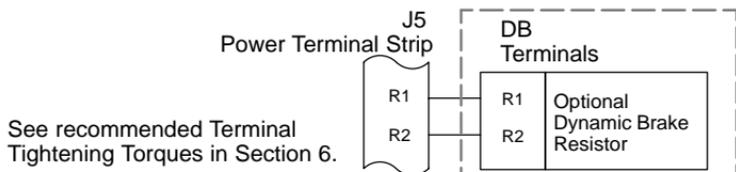
Motor Brake Connections

For motors with spring set brakes, connect the brake power leads and the motor power leads separately. Because the inverter has variable voltage output to the motor, the inverter may not supply enough power at low frequencies for proper brake operation. If using a motor with an internally connected brake, the brake power leads must be connected to a separate power source for proper brake operation. Refer to Figure 3-2 for terminal locations.

Optional Dynamic Brake Hardware

Dynamic Brake (DB) Hardware must be installed on a flat, non-flammable, vertical surface to obtain effective cooling and operation. The ambient temperature must not exceed 80°C. DB connections are shown in Figure 3-6.

Figure 3-6 Wiring for RGA Assembly



Note: Although not shown, metal conduit should be used to shield all power wires and motor leads.

General Machinery Load Calculations:

1. Calculate braking duty cycle:

$$\text{Duty Cycle} = \frac{\text{Braking Time}}{\text{Total Cycle Time}}$$

2. Calculate deceleration torque:

$$T_{\text{Decel}} = \frac{\text{RPM change} \times Wk^2}{308 \times \text{time}} - \text{Friction}_{(\text{Lb.Ft.})}$$

where: T_{Decel} = Deceleration torque in lb-ft.
 Wk^2 = Inertia in lb-ft²
time = In seconds

3. Calculate watts to be dissipated in dynamic braking resistor:

$$\text{Watts} = T_{\text{Decel}} \times (S_{\text{max}} - S_{\text{min}}) \times \text{Duty Cycle} \times (0.0712)$$

where: S_{max} = Speed to start braking
 S_{min} = Speed after braking

4. Multiply watts calculated in step 3 by 1.25 to allow for unanticipated loads (safety factor).

Analog Input

(S1-7 = OFF)

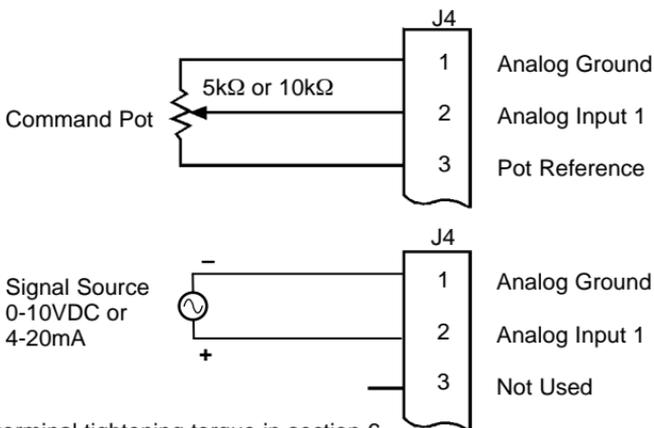
If S1-7 is OFF, the front panel % Speed potentiometer is selected. The J4 inputs are ignored.

(S1-7 = ON)

One analog input is available at J4-2 and J4-1 as shown in Figure 3-7. The input may be connected to a potentiometer as shown or an input signal can be applied to pin J4-2. The analog signal can be 0-10VDC or 4-20 mA as selected by S1-6 (see Table 3-5).

Note: A potentiometer value of 5k Ω to 10k Ω , 0.5 watt may be used.

Figure 3-7 Analog Input



See recommended terminal tightening torque in section 6.

Table 3-5 S1-6 Switch Settings

| S1-6 | J4 Description |
|---------------------|---|
| “OFF” | J4-1 is ground. |
| Voltage Mode | J4-2 accepts a 0-10VDC input (from a potentiometer or other signal source). |
| “ON” | J4-1 is negative side of the 4-20mA connection. |
| Current Mode | J4-2 is positive side of the 4-20mA connection. |

Digital Inputs

(S1-8 = OFF)

If S1-8 is OFF, the front panel commands FWD, REV and STOP are selected. The J4 inputs are ignored.

(S1-8 = ON)

Three inputs are available on the J4 connector. Switch S1-5 determines whether two wire or three wire operation is used. If two wire is selected (S1-5= OFF) the STOP input at J4-6 is not used.

Note: Pressing the STOP switch on the front panel keypad will override the J4 commands and cause the motor to decel to a stop.

2 Wire Operation of Digital Inputs (S1-5 = OFF)

J4-4 Forward

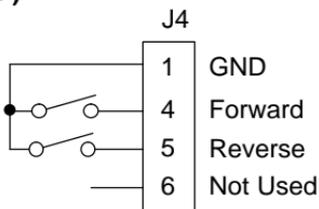
Open – Disables forward operation.
Decel to stop.

Closed – Starts forward motor rotation.

J4-5 Reverse

Open – Disables reverse operation.
Decel to stop.

Closed – Starts reverse motor rotation.



3 Wire Operation of Digital Inputs (S1-5 = ON)

J4-4 Forward

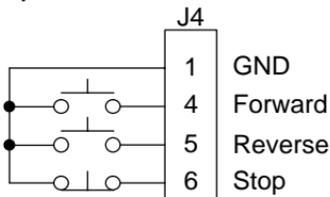
Momentary Closed – Starts forward motor rotation.

J4-5 Reverse

Momentary Closed – Starts reverse motor rotation.

J4-6 Stop

Momentary Open – Motor decels to stop.



Note: Simultaneous closure of J4-4 and J4-5 will cause the motor to decel to stop if the motor is running. If the control is in a fault condition, simultaneous closure of these inputs will attempt a fault reset.

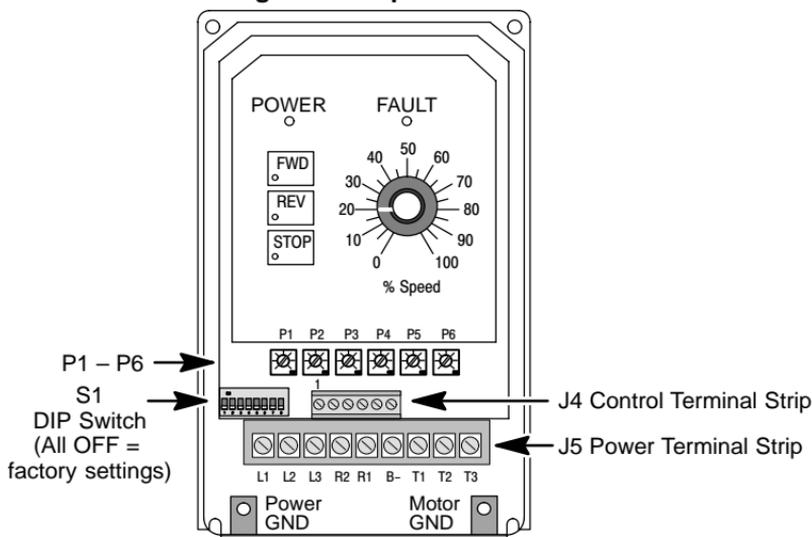
Section 4

Setup and Operation

Overview

The operator interface panel is shown in Figure 4-1.

Figure 4-1 Operator Interface



POWER

LED is on when AC input power is applied to the control.

FAULT

LED is on when a fault condition is present in the control.

FWD

Press FWD to initiate forward rotation of the motor, in local command mode. LED is on when control is in forward run mode.

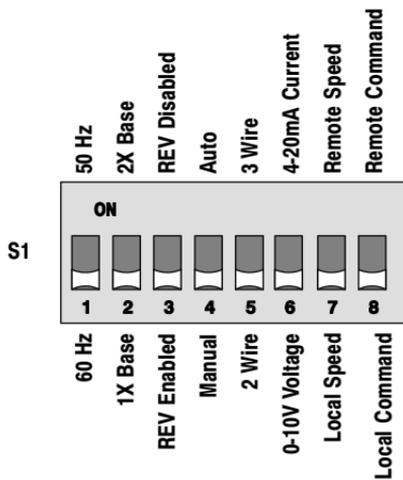
REV

Press REV to initiate reverse rotation of the motor, in local command mode. LED is on when control is in reverse run mode.

STOP

Press STOP to initiate a stop sequence, in local or remote modes. Depending on the setting of potentiometer P2, the motor will either ramp or coast to a stop. The LED is on when the control is in stop mode.

S1 Settings (OFF = Open; ON = Closed)



S1 Settings Continued

| Switch | Setting | Description |
|--------|---------|---|
| 1 | OFF | Base Frequency = 60Hz |
| | ON | Base Frequency = 50Hz |
| 2 | OFF | Maximum frequency limit = Base Frequency (60/50Hz) |
| | ON | Maximum frequency limit = 2 X Base Frequency (130 or 110 Hz) |
| 3 | OFF | Reverse motor rotation ENABLED |
| | ON | Does not allow reverse motor rotation |
| 4 | OFF | Power up Start DISABLED (see notes) |
| | ON | Power up Start ENABLED the control will resume operation as soon as power is applied. Power up start is disabled the first time you power up the drive (see notes). |
| 5 | OFF | Terminal 2 wire mode (If S1-8 = ON) |
| | ON | Terminal 3 wire mode (If S1-8 = ON) |
| 6 | OFF | Analog input VOLTAGE (if S1-7 = ON) |
| | ON | Analog input CURRENT (if S1-7 = ON) |
| 7 | OFF | Use local speed reference (front panel potentiometer) |
| | ON | Use remote speed reference (J4 connector) |
| 8 | OFF | Use local commands (front panel FWD, REV, STOP) |
| | ON | Use remote commands (J4 connector) |

Note 1: If power up start is ON and local commands are used, the drive will resume operation in the same FWD or REV direction when power is applied.

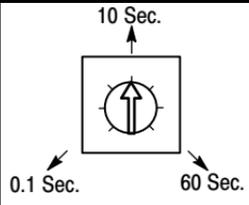
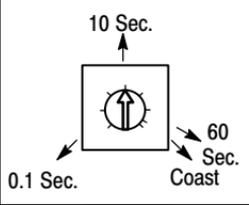
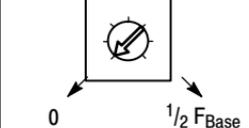
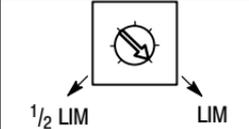
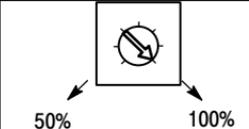
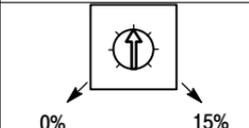
Note 2: If power up start is ON and remote 2 wire commands are used, the drive will resume operation if the forward or reverse switch is still closed (2 wire).

Note 2: If power up start is ON and remote 3 wire commands are used, the drive will not allow power up start operation (unless the momentary contacts stop and forward or reverse are manually held closed during power up).

Note 4: After power down, if any S1 switch position is changed, power up start is cancelled.

Potentiometers P1 - P6 (270° of rotation)

Refer to Figure 4-1 for location of potentiometers.

| | |
|--|---|
| <p>ACCEL time – P1 The time required to reach the Maximum Frequency setting of P4. Accelerates at a linear rate. First half (0 to 135°) = 0.1 sec to 10 sec last half (135 - 270°) = 10sec to 60 sec</p> |  |
| <p>DECEL time – P2 The time required to ramp to a stop. The voltage and frequency to the motor are reduced at a linear rate. First half (0 to 135°) = 0.1 sec to 10 sec last half (135 - 265°) = 10 sec to 60 sec (265 - 270°) = Coast - Allows motor to coast to stop.</p> |  |
| <p>Minimum frequency – P3 Sets the minimum output frequency to the motor . This is a percentage of the S1-1 base frequency setting.</p> |  |
| <p>Maximum frequency – P4 Sets the maximum output frequency to the motor. This is a percentage of the S1-2 frequency limit setting.</p> |  |
| <p>Current Limit – P5 50% to 100% of control rated amps.</p> |  |
| <p>Torque Boost – P6 Increases the nominal motor starting voltage from 0 to 15% to increase starting torque.</p> |  |

Operation Examples

Operating the Control from the Front Panel

To place the control in local speed and command mode, place S1-7 and S1-8 in the OFF position. Refer to Figure 4-1 for switch location.

Table 4-1 Active Switches for Local Operation

| S1 | Pos. | Position and Description |
|----|------|---|
| 7 | OFF | Local Speed Reference (front panel potentiometer) |
| 8 | OFF | Local command input (front panel FWD, REV, STOP) |

The control can operate as follows:

1. Set the P1 through P6 potentiometers as desired.
2. Set switches S1-1, S1-2, S1-3 and S1-4 as desired.
3. Adjust the motor's speed using the potentiometer on the front panel.
4. Press the FWD or REV keys on the front panel.
5. Press STOP on the front panel to stop motor rotation.

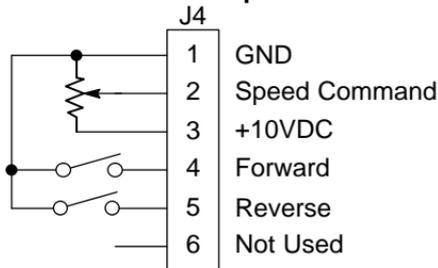
Note: S1-7 and S1-8 can be set so that either or both can be local or remote inputs. The front panel potentiometer can be used with remote command inputs by placing S1-7 OFF and S1-8 ON. Also, a remote speed reference can be used while the front panel switches are used by placing S1-7 ON and S1-8 OFF.

Speed Adjustment using a Remote Speed Reference

To use an external potentiometer or other signal source, refer to Figures 4-2, 4-3 and 4-4.

Figure 4-2 Remote Potentiometer 2 Wire Operation

| S1 | Pos. | Description |
|----|------|-------------------|
| 5 | OFF | 2 Wire |
| 6 | OFF | Voltage mode |
| 7 | ON | Remote Speed Ref. |
| 8 | ON | Remote commands |



1. Set the P1 through P6 potentiometers as desired.
2. Set switches S1-1, S1-2, S1-3 and S1-4 as desired.
3. Close the FWD or REV key (both Open = Stop).
4. Adjust the motor's speed using the potentiometer at J4-2.
5. Press STOP on the front panel to stop motor rotation.

Figure 4-3 Remote 0-10VDC 3 Wire Operation

J4

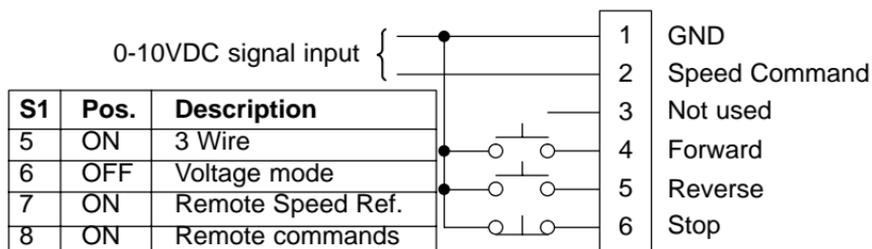
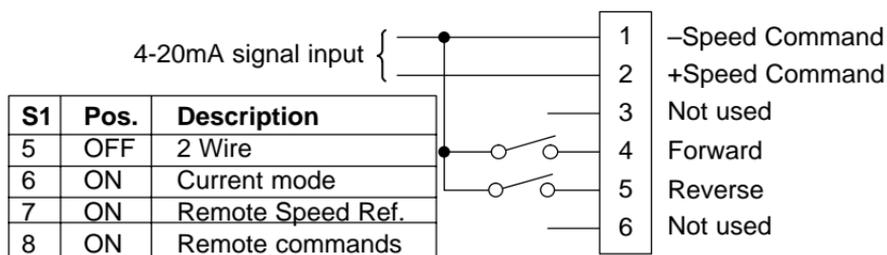


Figure 4-4 Remote 4-20mA 2 Wire Operation

J4



Section 5

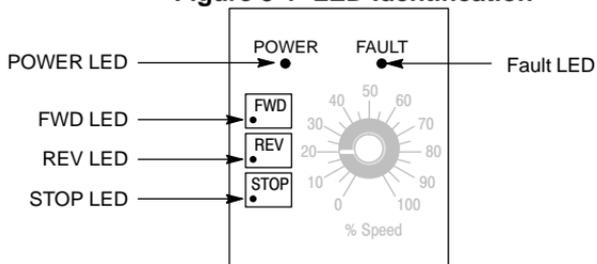
Troubleshooting

The Baldor Series 15P Control requires very little maintenance, if any, and should provide years of trouble free operation when installed and applied correctly. Occasional visual inspection to ensure tight wiring connections and cleaning to remove dust, dirt, or foreign debris which can reduce heat dissipation should be considered.

Operational failures called faults are displayed on the LED's as they occur. Procedures in this section describe how to recognize a fault and restore normal operation.

Before service is performed, all input power must be removed from the control to avoid electrical shock hazard. Most troubleshooting can be performed using only a digital voltmeter having an input impedance exceeding 1 megohm. In some cases, an oscilloscope with 5 MHz minimum bandwidth may be useful. Before consulting the factory, check that all power and control wiring is correct and installed per the recommendations given in this manual.

Figure 5-1 LED Identification



Fault Code Determination

The Fault LED may blink to indicate a fault code (1 through 5). A fault code sequence is displayed as follows:

Fault LED OFF = 1.5 second and then blink "X" number of times (2 times per second). "X" is the fault code 1 to 5. After you determine the fault code, refer to Fault Code Descriptions for a description of the fault.

Fault Code Descriptions

Five failure conditions are indicated by LED's on the front panel. Carefully examine all LED's (Power, Fault, FWD, REV and Stop) to determine the cause of the fault condition. Press Stop to reset the control.

1. Non Resettable hardware faults (Power LED is blinking)

(HW Surge Current, HW Protect, Power Module faults)

| Power LED | Fault LED | Description |
|-----------|-----------|---|
| Blinking | 1 Blink | Hardware fault is detected. High output current, or control board power supply failure. |

- Check wiring to ensure a ground fault is not present.
- Make sure the load is not excessive.

2. Overload faults

(2 second or 60 second overload faults)

To indicate that the drive is in an overcurrent condition, but has not tripped, the FWD or REV LED will blink two times per second.

If the drive goes to 0% Overload left, the drive will fault and then start counting back up to 100%. During this counting up, the drive is not resettable. During this "count-up" condition, the fault LED and the STOP LED's will blink. This is the only condition in which both LED's will be blinking. When the drive reaches 100% Overload left, the fault LED will continue to blink, however, the STOP LED will remain continuously ON.

| FWD or REV LED | Fault LED | Description |
|----------------|-----------|---|
| Blinking | 2 Blinks | Peak current has exceeded its 2 or 60 second rated limits or continuous current limit exceeded. |

| STOP LED | Fault LED | Description |
|----------|-----------|---|
| Blinking | 2 Blinks | The remaining % Overload has been exceeded. A timer begins and all drive operations are suspended until 100% Overload capacity is regained. |

Press Stop to reset the control. If error remains, try these steps to correct the fault. (You may have to wait for the % Overload timer to expire).

- Verify proper sizing of control and motor.
- If error occurred while ramping motor, check motor, coupling and load.
- Increase ACCEL time (P1).
- Increase/Decrease Torque Boost value (P2).

3. Bus faults

(Over-voltage, Under-voltage or Precharge faults)

| Power LED | Fault LED | Description |
|-----------|-----------|---|
| ON | 3 blinks | High or low DC bus voltage is detected or DC Bus charging error detected. |

Press Stop to reset the control, if error remains try these steps to correct the fault.

- Lengthen DECEL time (P2).
- Add external dynamic braking assemblies.
- Correct problem with motor load.
- Check dynamic brake hardware wiring.
- Verify proper AC line voltage. Use step down transformer if needed. Use line reactor to minimize spikes.
- Check power line disturbances (sags caused by start-up of other equipment). Monitor power line fluctuations with date and time imprint to isolate power problem.

4. Dynamic Brake or Over-temperature faults

| Power LED | Fault LED | Description |
|-----------|-----------|---|
| ON | 4 Blinks | Dynamic Brake power limit or excessive control temperature. |

Press Stop to reset the control, if error remains try these steps to correct the fault.

- Correct motor loading. Verify proper sizing of control, motor and brake resistor.
- Relocate control to a cooler operating area. Add cooling fans or air conditioner to control cabinet.
- Remove debris from fan and heatsink surfaces.
- Verify fan operation. Replace fan or check fan wiring.

5. Microprocessor faults

(Communication timeout, incompatible front end and power boards, EEPROM or Power Base ID faults)

| Power LED | Fault LED | Description |
|-----------|-----------|---|
| ON | 5 Blinks | Cable defect or other internal problem. |

- Press Stop to reset the control.
- Turn power OFF then ON (cycle power). If fault remains call Baldor.

Section 6

Specifications and Product Data

Specifications:

| | |
|------------------------------------|---|
| Horsepower | 0.33-1HP @ 115VAC 1-3 HP @ 230VAC 1-5 HP @ 460VAC |
| Input Frequency | 50/60Hz \pm 5% |
| Output Voltage | 0 to Maximum Input Voltage (RMS) |
| Output Current | See Ratings Table |
| Output Frequency | 0 to 130Hz |
| Service Factor | 1.0 |
| Duty | Continuous |
| Overload Capacity | Constant Torque Mode: 200% for 2 seconds 150% for 60 seconds |
| Frequency Setting | 0-10VDC, 4-20mA and Rotary control on front panel |
| Frequency Setting Potentiometer | 5k Ω or 10k Ω , 1/2 Watt |
| Rated Storage Temperature: | - 30°C to +65°C |

Operating Conditions:

| | |
|-----------------------------------|---|
| Voltage Range: | |
| 115 VAC Models | 90-132 VAC 1 ϕ 60/50Hz |
| 230 VAC Models | 180-264 VAC 3 ϕ 60Hz/180-230 VAC 3 ϕ 50Hz |
| 460 VAC Models | 342-528 VAC 3 ϕ 60Hz/342-457 VAC 3 ϕ 50Hz |
| Input Line Impedance: | 1% Minimum Required |
| Ambient Operating Temperature: | 0 to +40°C Derate Output 2% per °C over 40°C to 55°C (130°F) Maximum |
| Enclosure: | NEMA 1: ER (suffix) Models |
| Humidity: | NEMA 1: To 90% RH non-condensing |
| Altitude: | Sea level to 3300 feet (1000 meters) Derate 2% per 1000 feet (303 meters) above 3300 feet |
| Shock: | 1G |
| Vibration: | 0.5G at 10Hz to 60Hz |
| LED Indicators | Power Fault Forward run command Reverse run command Stop command |

Display:

Control Specifications:

| | |
|----------------------|---|
| Control Method | Sine wave Carrier input, PWM output |
| PWM Frequency | Rated @ 7.5kHz |
| V/Hz Ratio | Linear with adjustable Torque Boost |
| Transistor Type | IGBT (Insulated Gate Bipolar Transistor) |
| Torque Boost | 0 to 15% adjustable |
| Brake Torque | Up to 60%, external resistor required |
| Accel/Decel Time | Separate rates, 0.1 to 60 sec. |
| Base Frequency | 50 or 60Hz |
| Frequency Setting | 0-10VDC, 4-20mA, and Rotary on front panel |
| Accel/Decel | Separate Accel/Decel rates (0.1 - 60 seconds) |
| Auto Start | ON or OFF |
| Protective Functions | Inverter trip – Over voltage, over current, under voltage, motor overload Short Circuit – Phase to phase and phase to ground |

Analog Input:

| | |
|--|--------------------|
| Potentiometer Input | 0 - 10VDC |
| Input Full Scale Range | 0-10VDC and 4-20mA |
| Differential Input Common Mode Rejection | 40db |
| Input Impedance | 20k Ω |

Digital Inputs: (3 Inputs)

| | |
|-----------------|--|
| Digital Inputs | Forward Reverse Stop |
| Input Impedance | 6.8k Ω (Closed contacts standard) |
| Leakage Current | 10 μ A Maximum |

Ratings Series 15P Stock Products

| Catalog No. | Rated Input Volts | Rated Output Volts | HP | kW | Output Current | | |
|---------------|-------------------|--------------------|------|------|----------------|-------------------|------------------|
| | | | | | Continuous | 60 Sec. Over-load | 2 Sec. Over-load |
| ID15P1F33-ER | 115 | 230 | 0.33 | 0.25 | 1.6 | 2.4 | 3.2 |
| ID15P1F50-ER | 115 | 230 | 0.5 | 0.37 | 2.3 | 3.5 | 4.6 |
| ID15P1F75-ER | 115 | 230 | 0.75 | 0.56 | 3.2 | 4.8 | 6.4 |
| ID15P101-ER | 115 | 230 | 1.0 | 0.75 | 4.2 | 6.3 | 8.4 |
| ID15P201-ER | 230 | 230 | 1 | 0.75 | 4.2 | 6.3 | 8.4 |
| ID15P201F5-ER | 230 | 230 | 1.5 | 1.1 | 6.0 | 9.0 | 12.0 |
| ID15P202-ER | 230 | 230 | 2 | 1.5 | 6.8 | 10.2 | 13.4 |
| ID15P203-ER | 230 | 230 | 3 | 2.2 | 9.6 | 14.4 | 19.2 |
| ID15P401-ER | 460 | 460 | 1 | 0.75 | 2.1 | 3.2 | 4.2 |
| ID15P401F5-ER | 460 | 460 | 1.5 | 1.1 | 3.0 | 4.5 | 6.0 |
| ID15P402-ER | 460 | 460 | 2 | 1.5 | 3.4 | 5.1 | 6.8 |
| ID15P403-ER | 460 | 460 | 3 | 2.2 | 4.8 | 7.2 | 9.6 |
| ID15P405-ER | 460 | 460 | 5 | 3.7 | 7.6 | 11.4 | 15.2 |

Note: All specifications are subject to change without notice.

Dynamic Brake Resistors

Table 6-2 Dynamic Braking Resistor Assemblies (RGA)

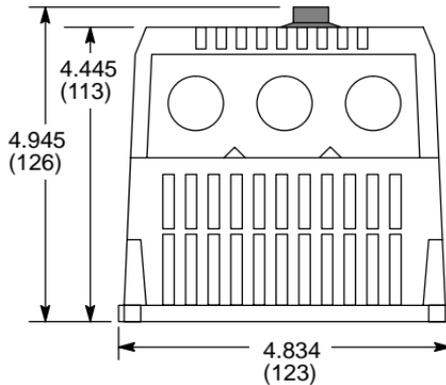
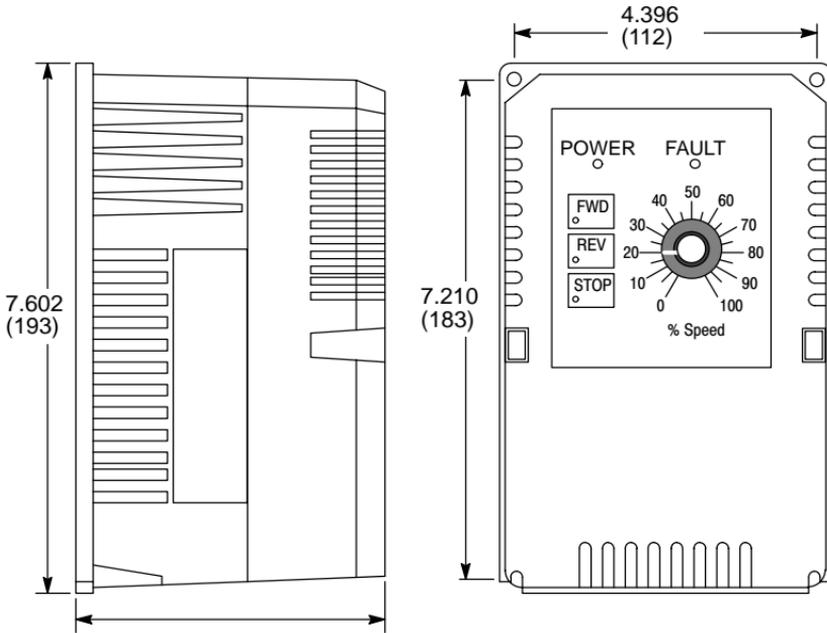
| Control VAC | Minimum Ohms | Continuous Rated Watts | | | | |
|-------------|--------------|------------------------|---------|---------|----------|----------|
| | | 100 | 200 | 600 | 1200 | 2400 |
| 115/230 | 60 | RGJ160 | RGJ260 | RGA660 | RGA1260 | RGA2460 |
| 460 | 120 | RGJ1120 | RGJ2120 | RGA6160 | RGA12120 | RGA24120 |

Terminal Tightening Torque Specifications

Table 6-3 Torques for "ER"

| Control Voltage Rating VAC | Tightening Torque | | | |
|----------------------------|------------------------|------|----------------------|-----|
| | Control Terminals (J4) | | Power Terminals (J5) | |
| | Lb-in | Nm | Lb-in | Nm |
| 115, 230 and 460 | 4 | 0.45 | 7 | 0.8 |

Mounting Dimensions



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4/99 C&J2500