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BALDOR
MOTORS AND DRIVES

AC SERVO DRIVE

BPS Series 2000/3000
Power Supply
for DBSC 2000/3000

Installation & Operating Manual

5/01 **MN1220**

Table of Contents

Section 1
General Information 1-1
Overview 1-1
CE Compliance 1-1
Limited Warranty 1-1
Product Notice 1-2
Safety Notice 1-2
Section 2
Installation 2-1
Receiving & Inspection 2-1
Location Considerations 2-1
BPS LEDs' 2-1
Mechanical Installation 2-2
Electrical Installation 2-2
System Grounding 2-2
Line Impedance 2-3
Line Reactors 2-3
Load Reactors 2-3
Power Disconnect 2-4
Protection Devices 2-4
Power Connections 2-5
VCC and X10 Connections 2-6
Dynamic Brake Resistor 2-6
Optional II/O Connections 2-8
Power-Up Procedure 2-8
Section 3
Specifications and Product Data 3-1
Identification 3-1
Specifications 3-1
Terminal Tightening Torque Specifications 3-1
DB Resistor Selection 3-2
Dimensions 3-3
Size B Dimensions & Mounting 3-3
Mounting Considerations 3-4

Section 1
General Information

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Overview

The BPS (Baldor Power Supply) is designed to provide power to the DBSC 2000/3000 series servo controls. A daisy chain communication with all DBSC controls allows the BPS to detect if a control has a fault condition and provide soft–start operation. The Regen or Dynamic Brake resistor connects to the BPS rather than on each individual control.

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 MN1383 for installation techniques for CE compliance. For additional information, refer to Sections 3 and 8 of this manual.

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.

Product Notice

Intended use:

These drives are intended for use in stationary ground based applications in industrial power installations according to the standards EN60204 and VDE0160. They are designed for machine applications that require variable speed controlled three phase brushless AC motors.

These drives are not intended for use in applications such as:

- Home appliances
- Medical instrumentation
- Mobile vehicles
- Ships
- Airplanes

Unless otherwise specified, this drive is intended for installation in a suitable enclosure. The enclosure must protect the control from exposure to excessive or corrosive moisture, dust and dirt or abnormal ambient temperatures. The installation, connection and control of drives is a skilled operation, disassembly or repair must not be attempted.

In the event that a control fails to operate correctly, contact the place of purchase for return instructions.

Safety Notice:

This equipment contains high voltages. 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.

- System documentation must be available at all times.
- Keep non-qualified personnel at a safe distance from this equipment.
- Only qualified personnel familiar with the safe installation, operation and maintenance of this device should attempt start-up or operating procedures.
- Always remove power before making or removing any connections to this control.

PRECAUTIONS: Classifications of cautionary statements.

⚠ **WARNING: Indicates a potentially hazardous situation which, if not avoided, could result in injury or death.**

⚠ **Caution: Indicates a potentially hazardous situation which, if not avoided, could result in damage to property.**

Continued on next page.

⚠ **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.**

⚠ **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.**

⚠ **WARNING:** **Be sure all wiring complies with the National Electrical Code and all regional and local codes or CE Compliance. Improper wiring may cause a hazardous condition.**

⚠ **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.**

⚠ **WARNING:** **A DB Resistor may generate enough heat to ignite combustible materials. To avoid fire hazard, keep all combustible materials and flammable vapors away from brake resistors.**

⚠ **Caution:** **Suitable for use on a circuit capable of delivering not more than the RMS symmetrical short circuit amperes listed here at rated voltage.**

Horsepower	RMS Symmetrical Amperes
1–50	5,000

⚠ **Caution:** **To prevent equipment damage, be certain that the input power has correctly sized protective devices installed as well as a power disconnect.**

⚠ **Caution:** **Avoid locating the BPS immediately above or beside heat generating equipment, or directly below water or steam pipes.**

⚠ **Caution:** **Avoid locating the BPS in the vicinity of corrosive substances or vapors, metal particles and dust.**

⚠ **Caution:** **Baldor recommends not using "Grounded Leg Delta" transformer power leads that may create ground loops and degrade system performance. Instead, we recommend using a four wire Wye.**

⚠ **Caution:** **Power supplies are intended to be connected to a permanent main power source, not a portable power source. Suitable fusing and circuit protection devices are required.**

⚠ **Caution:** **Do not tin (solder) exposed wires. Solder contracts over time and may cause loose connections.**

⚠ **Caution:** **Electrical components can be damaged by static electricity. Use ESD (electro-static discharge) procedures when handling this BPS.**

⚠ **Caution:** **The holes in the top and bottom of the enclosure are for cable clamps. Be sure to use an M4 bolt 12mm in length. Longer bolts may short circuit the electrical components inside the BPS.**

Section 2
Installation

Receiving & Inspection

Baldor products are thoroughly tested at the factory and carefully packaged for shipment. When you receive the BPS, 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 the product.
2. Remove the BPS from the shipping container and remove all packing materials. The container and packing materials may be retained for future shipment.
3. Verify that the part number of the BPS you received is the same as the part number listed on your purchase order.
4. Inspect the BPS for external physical damage that may have been sustained during shipment and report any damage immediately to the commercial carrier.
5. If the BPS is to be stored for several weeks before use, be sure that it is stored in a location that conforms to published storage humidity and temperature specifications stated in this manual.

Location Considerations

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

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

1. For effective cooling and maintenance, the BPS should be mounted on a smooth, non-flammable vertical surface.
2. At least 0.6 inches (15mm) top and bottom clearance must be provided for air flow. Refer to Section 7 for mounting dimensions.
3. **Altitude derating**. Up to 3300 feet (1000 meters) no derating required. Derate the continuous and peak output current by 1.1% for each 330 feet (100 meters) above 3300 feet.
4. **Temperature derating**. From 5°C to 40°C ambient no derating required. Above 40°C, derate the continuous and peak output current by 2.5% per °C above 40°C. Maximum ambient is 50°C.

BPS LEDs'

The system troubleshooting procedures involves observing the status of the "Ready" LED, the "DB On" LED and the "Monitor" 7 segment display. Table 2-1 provides information related to the indications provided by these devices.

The DB LED is on whenever Dynamic Brake power is dissipated into the optional DB (Dynamic Brake) resistor.

Display Identification

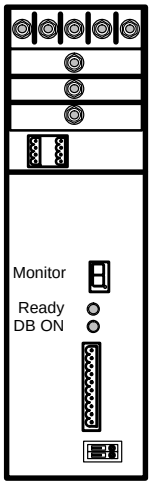


Table 2-1 Operating Mode Indications

Ready	Monitor	Status
OFF	OFF	BPS disabled or powered off
Green	Decimal Point	BPS enabled, normal operation, no faults
OFF	0	Logic supply power loss
OFF	1	Logic supply undervoltage
OFF	2	Bus undervoltage
OFF	3	Loss of one or more power phases (L1, L2, L3)
OFF	4	Overtemperature
OFF	5	Dynamic brake fault
OFF	6	Reduced voltage starting feature is active and input AC power is too high (L1, L2, L3)
Green	L	Reduced voltage starting feature is active

Mechanical Installation

The BPS must be securely fastened to the mounting surface by the BPS mounting holes. The location of the mounting holes is shown in Section 3 of this manual.

Electrical Installation

All interconnection wires between the BPS, control, AC power source, motor, host control and any operator interface stations should be in metal conduits. Use listed closed loop connectors that are of appropriate size for 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

The BPS is 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. The recommended grounding method is shown in Figure 2-1 and 2-2.

Figure 2-1 Recommended System Grounding for UL

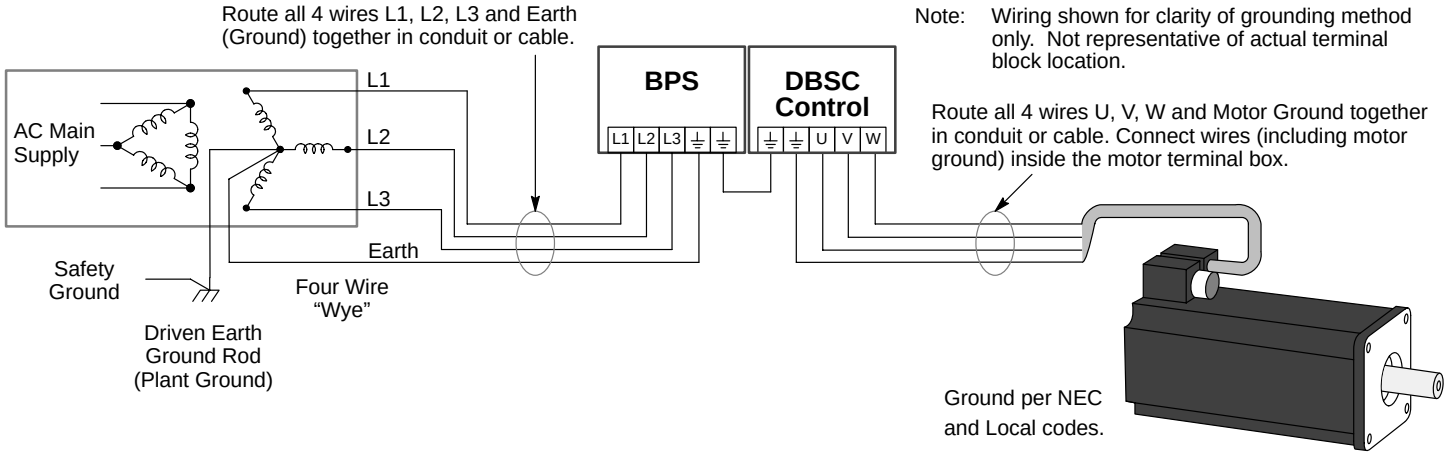
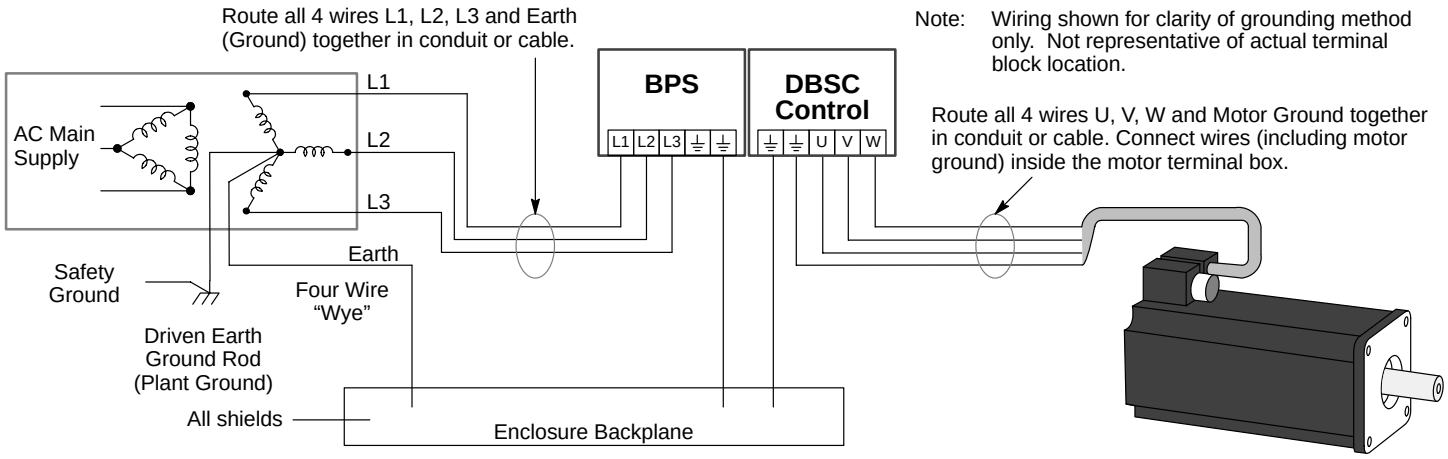


Figure 2-2 Recommended System Grounding for CE



Note: Use shielded cable for control signal wires. Route control signal wires in conduit. These wires must be kept separate from power and motor wires.

System Grounding Continued

Ungrounded Distribution System

With an ungrounded power distribution system it is possible to have a continuous current path to ground through the MOV devices. To avoid equipment damage, an Isolation transformer with a grounded secondary is recommended. This provides three phase AC power that is symmetrical with respect to ground.

Input Power Conditioning

The BPS is designed for direct connection to standard three phase lines that are electrically symmetrical with respect to ground. Certain power line conditions must be avoided. An AC line reactor or an isolation transformer may be required for some power conditions.

- If the feeder or branch circuit that provides power to the BPS has permanently connected power factor correction capacitors, an input AC line reactor or an isolation transformer must be connected between the power factor correction capacitors and the BPS.
- If the feeder or branch circuit that provides power to the BPS has power factor correction capacitors that are switched on line and off line, the capacitors must not be switched while the BPS is connected to the AC power line. If the capacitors are switched on line while the BPS is still connected to the AC power line, additional protection is required. TVSS (Transient Voltage Surge Suppressor) of the proper rating must be installed between the AC line reactor or an isolation transformer and the AC input to the BPS.

Line Impedance

The BPS requires a minimum 3% line impedance. If the impedance of the incoming power does not meet the requirement for the BPS, a 3 phase line reactor can be used to provide the needed impedance in most cases. Line reactors are optional and are available from Baldor.

The input impedance of the power lines can be determined as follows:

Measure the line to line voltage at no load and at full rated load.
Use these measured values to calculate impedance as follows:

$$\%\text{Impedance} = \frac{(\text{Volts}_{\text{No Load Speed}} - \text{Volts}_{\text{Full Load Speed}})}{(\text{Volts}_{\text{No Load Speed}})} \times 100$$

Line Reactors

Three phase line reactors are available from Baldor. The line reactor to order is based on the full load current of the motor (FLA). If providing your own line reactor, use the following formula to calculate the minimum inductance required.

$$L = \frac{(V_{L-L} \times 0.03)}{(I \times \sqrt{3} \times 377)}$$

Where:	L	Minimum inductance in Henries.
	V_{L-L}	Input volts measured line to line.
	0.03	Desired percentage of input impedance.
	I	Input current rating of BPS.
	377	Constant used with 60Hz power.
		Use 314 if input power is 50Hz.

Power Disconnect

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

Protection Devices

The AC input power lines must have suitable protection devices installed. Input and output wire size is based on the use of copper conductor wire rated at 75 °C. Use the recommended circuit breaker or fuse types as follows:

Circuit Breaker: 1 phase, thermal magnetic.
Equal to GE type THQ or TEB for115 or 230 VAC

3 phase, thermal magnetic.
Equal to GE type THQ or TEB for 230 VAC or
GE type TED for 460 VAC.

Fast Action Fuses: Buss KTN on 230 VAC or
Buss KTS on 460 VAC, Buss FRS or equivalent.

Time Delay Fuses: Buss FRN on 230 VAC or
Buss FRS on 460 VAC or equivalent.

Table 2-2 describes the wire size to be used for power connections and the ratings of the protection devices.

Recommended fuse sizes are based on the following:
115% of maximum continuous current for time delay fuses.
150% of maximum continuous current for fast or very fast acting fuses.

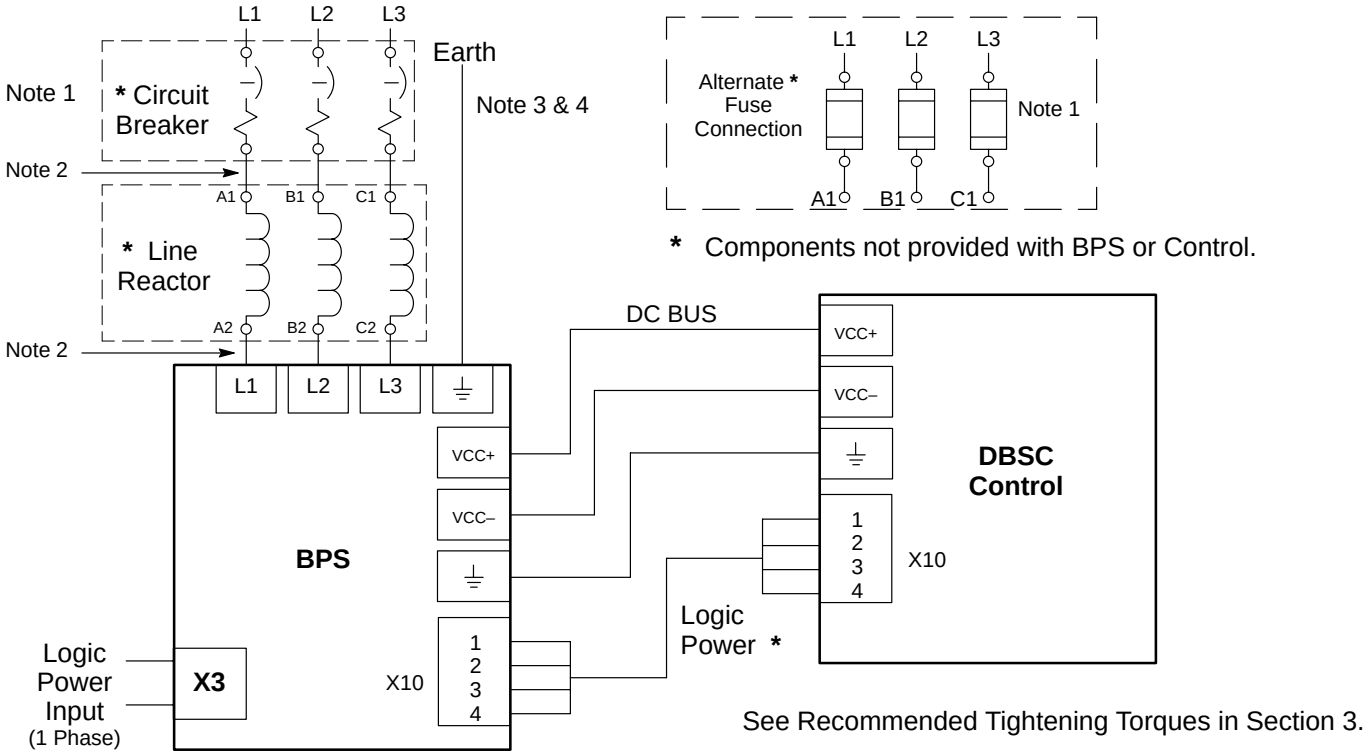
Table 2-2 Wire Size and Protection Devices

Catalog Number	L1, L2, L3 Incoming Power						X3 Logic Power		
	Maximum Continuous Amps	Input Breaker	Input Fuse		Wire Gauge		Input Fuse	Wire Gauge	
			Fast Acting	Time Delay	AWG	mm^2		AWG	mm^2
BPS2060	60A	90A	90A	70A	6	13.3	Internal	16	1.0
BPS2100	100A	150A	150A	115A	3	26.7	Internal	16	1.0
BPS3030	30A	50A	50A	40A	8	8.37	Internal	16	1.0
BPS3050	50A	70A	80A	60A	6	13.3	Internal	16	1.0

Note: All wire sizes are based on 75°C copper wire, 3% line impedance. Higher temperature smaller gauge wire may be used per NEC and local codes. Recommended fuses/breakers are based on 25°C ambient, maximum continuous output current and no harmonic current.

Power Connections

Figure 2-3 Power Connections



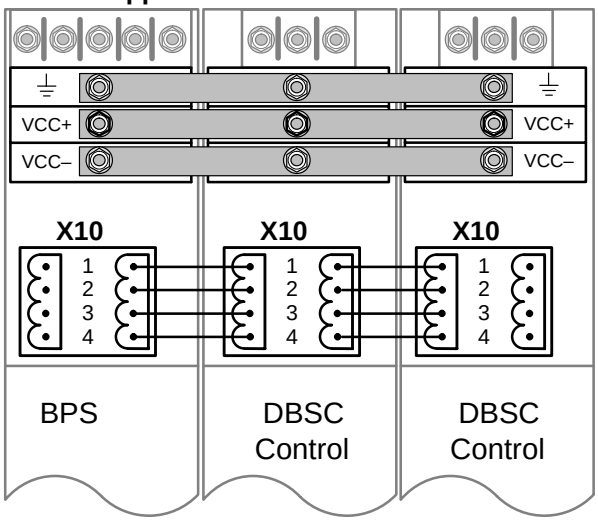
Important:
Be sure to connect the proper voltage for X3 Logic Power input. Look at the last digit of the identification number to determine voltage:
BPSxxx0 = 230VAC – 1 phase
BPSxxx1 = 115VAC – 1 phase

Notes:

1. See Protection Device description in this section.
2. Metal conduit or shielded cable should be used. Connect conduits so the use of a Reactor or RC Device does not interrupt EMI/RFI shielding.
3. Use the same gauge wire for Earth as used for L1, L2, L3 connections.
4. Reference EMC wiring in control manual (MN1220 Section 8).

VCC and X10 Connections DC power connections are shown in Figure 2-4. Copper bus bars connect VCC+, VCC– and GND between each module from the BPS to the last control. X10 connections are daisy chained from the BPS to each control as shown.

Figure 2-4 Copper Bus Bar Installation and X10 Connections

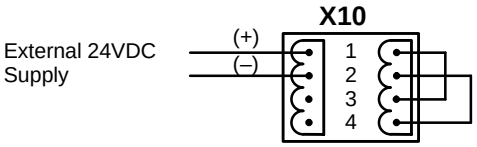


See Section 3 for correct bus bar length information.

See Terminal Tightening Torques in Section 3 of this manual.

If an optional 24VDC power supply or battery backup is used instead of the BPS, the connections to X10 must be made as shown in Figure 2-5. This allows position information and other memory related information to be stored when AC power is removed from the BPS.

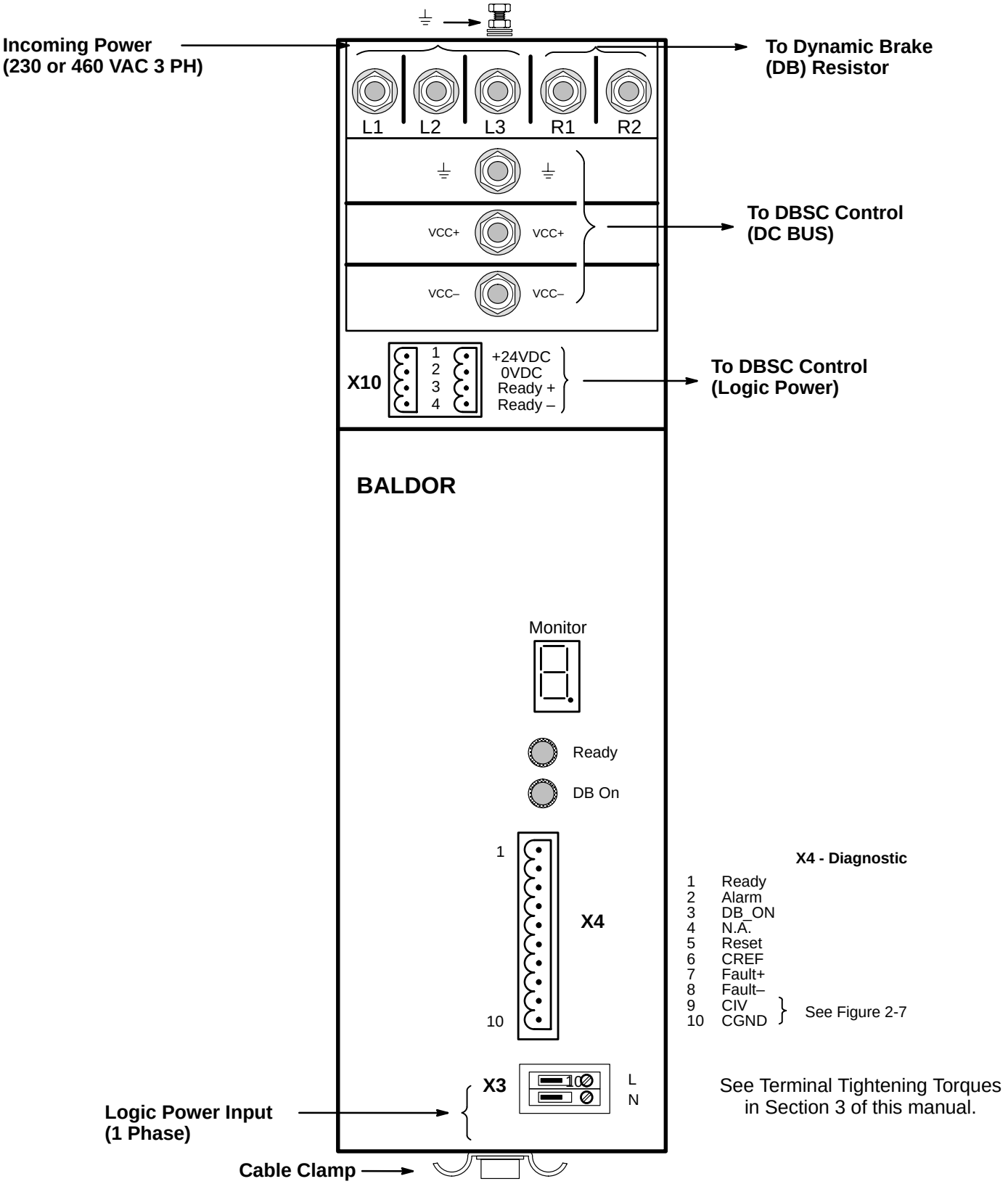
Figure 2-5 External 24VDC connections (not BPS)



Jumpers must be installed to prevent a fault condition.

Dynamic Brake Resistor An external DB (Dynamic Brake) resistor must be installed to dissipate excess power from the DC bus during motor deceleration operations. For selection of the DB resistor, refer to the specifications located in Section 3 of this manual. DB hardware is connected at the R1 and R2 terminals.

Figure 2-6 Connector Locations



Optional I/O Connections

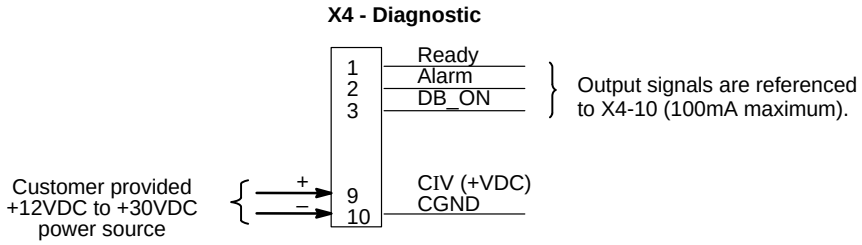
Connector X4 contains the input and output connections for the BPS (Baldor Power Supply). Connection to the X4 I/O terminal strip is optional. No connections are required for normal operation. However, to monitor BPS status or to "Reset" the BPS you may make some or all of these optional connections.

Status monitor output connections (Opto Isolated Outputs)
Status monitor output connections are shown in Figure 2-7. The output signals (X4-1, 2 and 3) can then be connected to an external device (referenced to X4-10). These internal contacts close when active and apply the voltage +24VDC at the output.

The Alarm Output (X4–2) activates immediately when one of the following faults occur: Loss of AC Power, Phase Loss (AC input), Loss of Logic Power, Bus Undervoltage, Overtemperature or Dynamic Brake fault. The other Status Monitor outputs (X4–1 and 3) have a 100ms delay before activation.

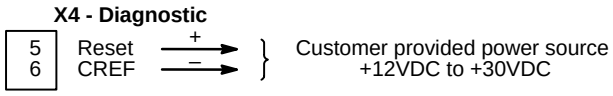
Note: The maximum current draw when all three outputs are active must not exceed 100mA.

Figure 2-7 Status Monitor Output Connections



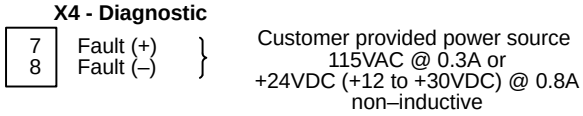
Reset connection
Connection of the Reset input is shown in Figure 2-8. This is useful to reset after a fault condition. The reset input voltage is +24VDC (12 to 30VDC @ 10mA) and must be applied for at least 60 μs.

Figure 2-8 Reset Input



Fault Relay connection
Fault Relay connection is shown in Figure 2-9. The fault relay output can be connected to an external relay or other device. This internal normally closed contact opens when a fault condition occurs. The fault list is the same as for the Alarm Output.

Figure 2-9 Fault Relay



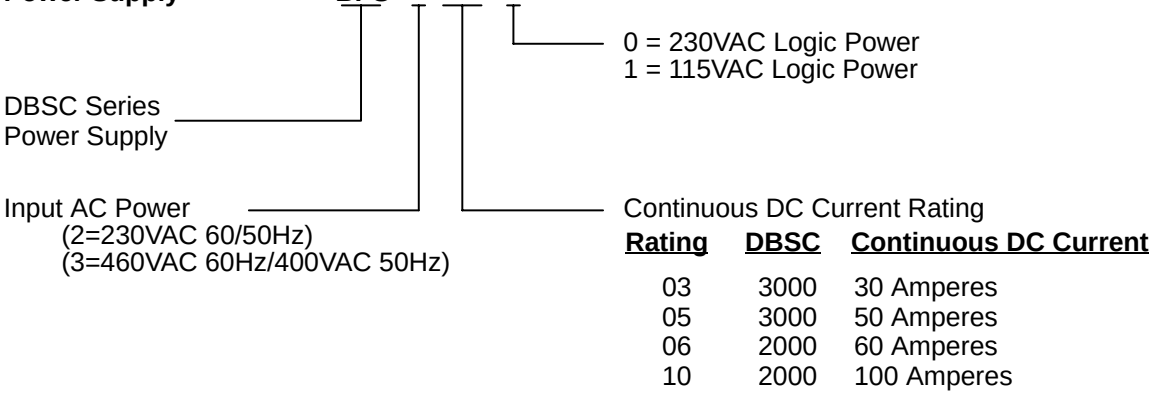
Power-Up Procedure

Refer to the manual for the DBSC control MN1220.

Section 3
Specifications and Product Data

Identification

Power Supply **BPS X XX X**



Rating	DBSC	Continuous DC Current
03	3000	30 Amperes
05	3000	50 Amperes
06	2000	60 Amperes
10	2000	100 Amperes

Specifications

Description	Unit	BPS20		BPS30	
		060	100	030	050
Input Bus Voltage – Nominal (Range)	VAC	230 (3ϕ) (180-264; 60Hz 180-230; 50Hz)		460 (3ϕ) (400-528; 60Hz 340-457; 50Hz)	
Input Frequency	Hz	50 / 60 ±5%			
Nominal Output Bus Voltage	VDC	320		650	
Nominal Output Bus Current	A_{RMS}	60	100	30	50
Peak Output Bus Current	A_{RMS}	120	200	60	100
Input Logic Voltage – Nominal (Range)	VAC	115 (+6% –10%; 60Hz only 1 phase) 230 (+6% –10%; 50/60Hz 1 phase)			
Input Logic Current – Nominal (Range) *	AMP	2.4A (@115) or 1.2 (@230)			
Output Logic	VDC	+24 (+20% – 15%)			
Output Logic	ADC	6.9 (for 3 Controls) 8.0 (for 5 Controls)			
Mounting	–	Panel or Thru Wall			
Package Size		B			
Weight	lb(kg)	33(15)			
Dynamic Brake Switching Threshold On / Off	VDC	388 / 375		776 / 750	
Dynamic Brake Peak Power	kVa	22.8	38	22.8	38
Dynamic Brake Maximum Switching Current	A_{peak}	60	100	30	50
Dynamic Brake Maximum Duty Cycle	%	25		25	
Dynamic Brake Maximum Inductive Load	µH	100			
Operating Temperature Range	°C	+0 to 40. Above 40°C, derate the continuous and peak output current by 2.5% per °C above 40°C. Maximum ambient is 50°C.			
Storage Temperature Range	°C	–25 to +70			
Humidity	%	10% to 90% non-condensing (IEC68–2–38)			
Class of Protection (Enclosure)		IP20			
Operating Altitude	Feet (Meters)	To 3300 feet (1000 meters). Derate the continuous and peak output current by 1.1% for each 330 feet (100 meters) above 3300 feet (1000 meters).			
Shock		10G (DIN IEC 68–2–6/29)			
Vibration		1G @ 10 – 150 Hz (according to DIN IEC 68–2–6/29)			

All values at 25°C unless otherwise stated.

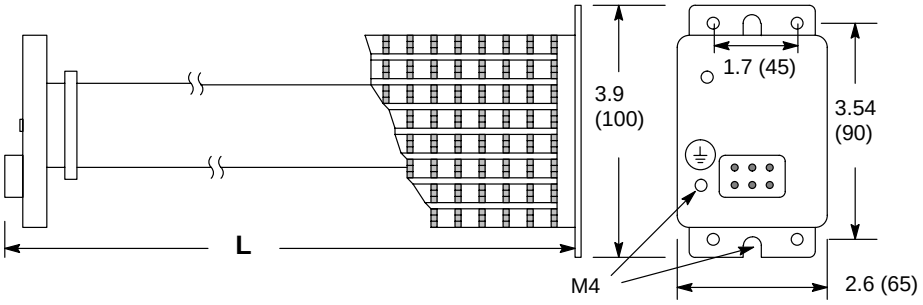
***** Maximum surge current <150msec = 15A (BPS20); 30A (BPS30)

Terminal Tightening Torque Specifications

BPS Size	Tightening Torque							
	GND		L1, L2, L3		R1, R2		+VCC, –VCC, GND	
	Lb-in	Nm	Lb-in	Nm	Lb-in	Nm	Lb-in	Nm
Size B	35-46	4.0-5.0	20-27	2.3-3.0	20-27	2.3-3.0	35-46	4.0-5.0

DB Resistor Selection

Size RG



L = 5.5 (140) for 44 watt
8.9 (228) for 100 watt
13.2 (337) for 320/640 watt

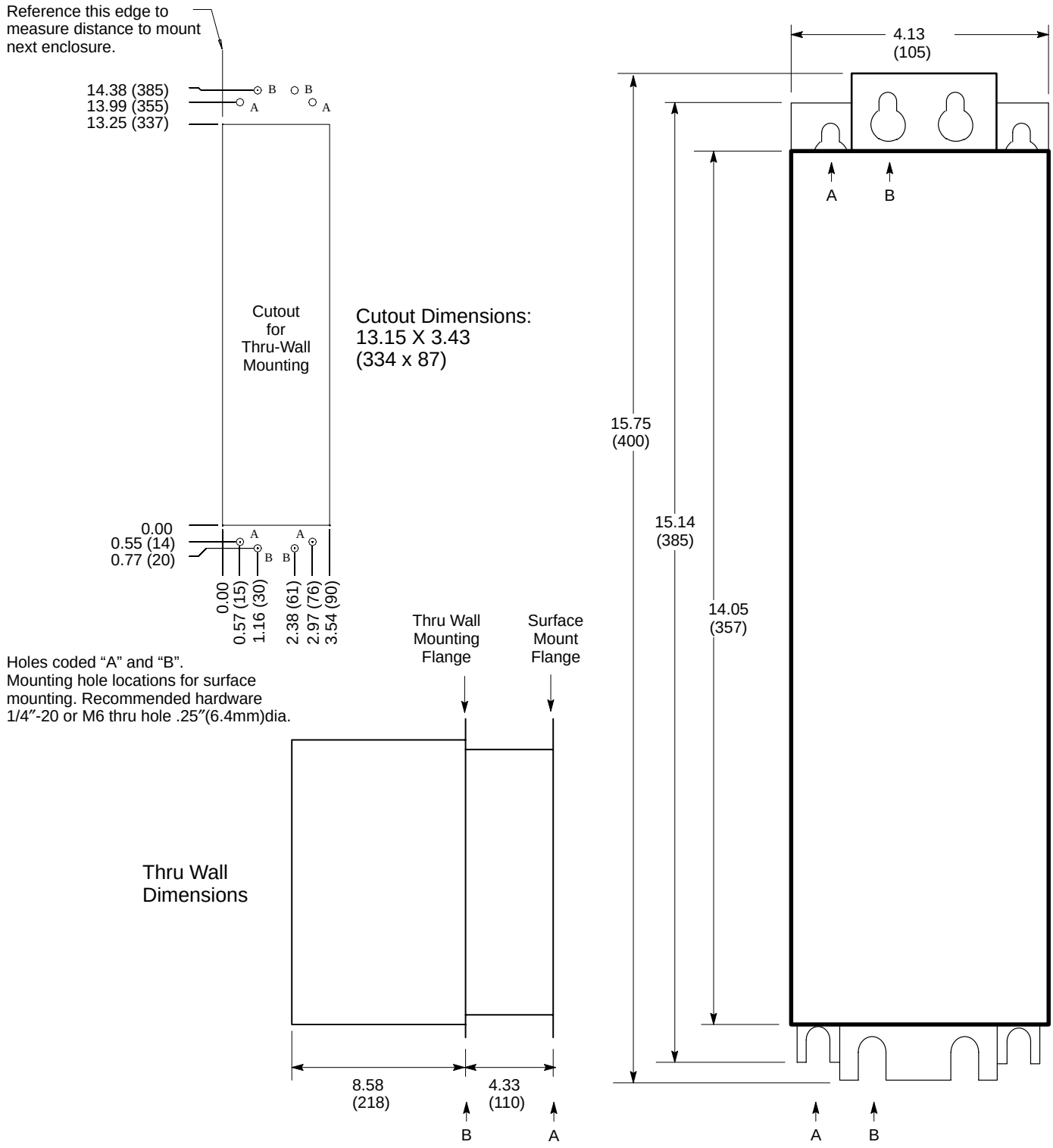
Clearance Requirements (all sizes):
2″ (51mm) top and bottom
1″ (26mm) left and right side

Table 7-3 DB Resistor

Catalog No.	Catalog No. (320 Continuous Watts)	Catalog No. (640 Continuous Watts)
BPS2060	RG6.8	RG6.4
BPS2100	RG3.9	RG4.1
BPS3030	RG27A	RG23
BPS3050	RG15	RG16

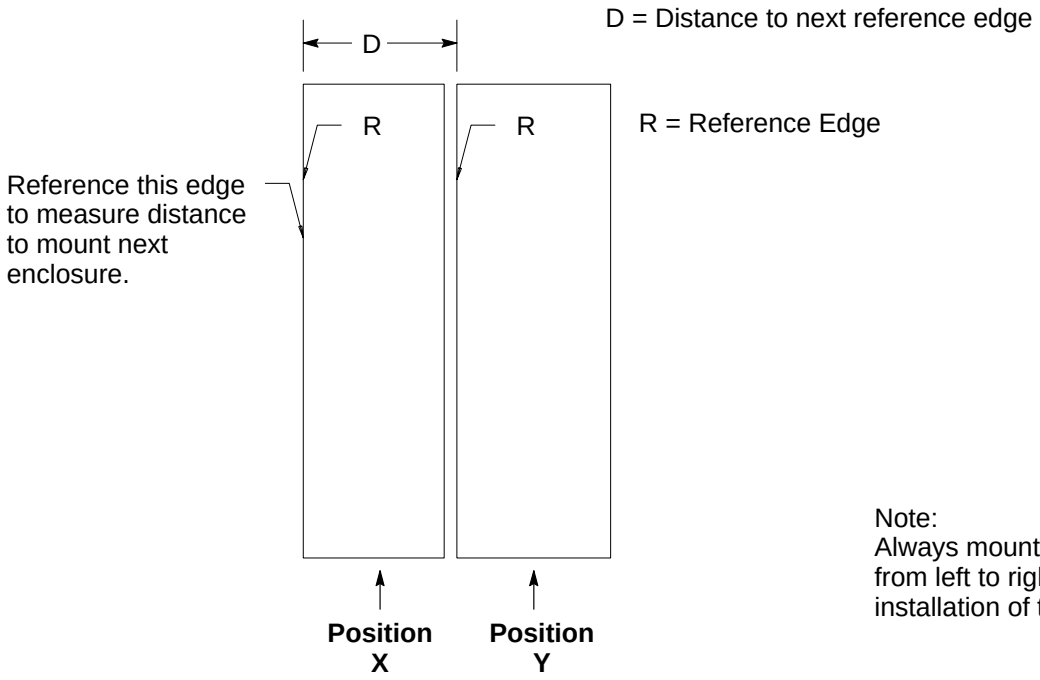
Dimensions

Size B Dimensions & Mounting



Dimensions Continued

Mounting Considerations



Note:
Always mount the BPS in the first position from left to right. This allows proper installation of the power bus bars.

For safe operation, allow a clearance distance between each control and on all sides of each control.

Mounting and Bus Bar Information

Position X Size	Position Y Size	Distance to next reference edge "D"	Power Bus Bar		
			Part Number	Length	Hole Spacing
D	D	10.6 (270)	V1093641	11.74(298)	10.64(270)
D	C	10.5 (267)	V1093651	4.93(125)	3.78(96)
D	B	10.5 (267)	V1093651	4.93(125)	3.78(96)
C	C	5.5 (140)	V1093661	6.82(173)	5.52(140)
C	B	5.5 (140)	V1093661	6.82(173)	5.52(140)
B	D	4.3 (109)	V1093681	12.10(307)	11.03(280)
B	B	4.2 (106)	V1093671	5.24(133)	4.18(106)
B	C	4.2 (106)	V1093671	5.24(133)	4.18(106)



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