Resistive Brake Module

(Catalog Numbers 2090-XB33-16, 2090-XB33-32, 2090-XB120-01, 2090-XB120-03, and 2090-XB120-06

This publication provides installation instructions for the Allen-Bradley® Bulletin 2090 Resistive Brake Module (RBM). Use these instructions for mounting your RBM to the panel and wiring it to a drive system. For installation and integration instructions specific to a drive system, refer to *Related Documentation* on page 24.

Refer to the *System Design for Control of Electrical Noise* (publication GMC-RM001*x*-EN-P) for greater detail on reducing electrical noise when mounting your RBM.

There are no field replaceable components in an RBM.

Unpacking Your Resistive Brake Module

Remove all packing material, wedges, and braces from within and around the components. After unpacking, check the catalog number on the item(s) nameplate against the purchase order.

Each RBM ships with:

- This installation sheet (publication 2090-IN009*x*-EN-P).
- One set of connectors for wiring the RBM to a drive:
  - TB1 - Drive Connection
  - TB2 - Motor Connection
  - TB3 - I/O Connection
  - TB4 - 230VAC Aux Power Connection (2090-XB120-*xx* only)

Note: Power and I/O cables are not provided with the RBM. Refer to *Accessory Equipment* on page 23 for catalog numbers of items available from Rockwell Automation. I/O cables must be supplied by the user.

ATTENTION

To avoid hazard of electrical shock, perform all mounting and wiring prior to applying power to the RBM or the drive system it connects to. Once power is applied, connector terminals may have voltage present even when not in use.

Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of this control equipment must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards.

The illustrations, charts, sample programs and layout examples shown in this guide are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Allen-Bradley® does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Allen-Bradley publication SGI-1.1, *Safety Guidelines for the Application, Installation and Maintenance of Solid-State Control* (available from your local Allen-Bradley office), describes some important differences between solid-state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication.

Throughout this manual we use notes to make you aware of safety considerations :

ATTENTION

Identifies information about practices or circumstances that can lead to personal injury or death, property damage or economic loss.

Attention statements help you to:

- identify a hazard
- avoid a hazard
- recognize the consequences

IMPORTANT

Identifies information that is critical for successful application and understanding of the product.

Understanding Your Resistive Brake Module

The RBM provides an alternative way to brake a drive system. It provides the control system engineer with the opportunity to design safety controls into a machine's drive system that have two key features:

- Physically and electrically separate the drive power output from its corresponding motor.
- Reduce the stopping time for a motor and its load should a failure occur to the machine in which it is installed.

Drive commands are the preferred and quickest way to bring a drive system to a controlled stop. The RBM provides a non-mechanical method for braking a drive system, by draining motor energy through a resistive load that dissipates the energy as waste heat.

The RBM can resistively brake a motor once per minute with the following inertia mismatch:

Resistive Brake Module	Inertia Mismatch
2090-XB33-16, 2090-XB33-32	15:1 inertia mismatch
2090-XB120-01, 2090-XB120-03, 2090-XB120-06	

Refer to the *Motion Control Selection Guide* (publication GMC-SG001*x*-EN-P) for details on applicable RBM and motor combinations.

A contactor in the RBM physically and electrically separates the motor leads from the drive output, and provides status outputs to a customer designed safety circuit. To maximize the stopping speed, braking resistors are sized to match the motor and load for a specific axis of the drive system. The resistors are placed across the phases and brake the motor by quickly dissipating the energy stored there.

ATTENTION

Implementation of safety circuits and risk assessment is the responsibility of the machine builder. Reference international standards EN1050 and EN954 estimation and safety performance categories. For more information refer to *Understanding the Machinery Directive* (publication SHB-900).

System Mounting Requirements

There are several things that you need to take into account when preparing to mount the Resistive Brake Module:

IMPORTANT Plan the installation of your system so that you can perform all cutting, drilling, tapping, and welding with the system removed from the enclosure. Because the system is of the open type construction, be careful to keep any metal debris from falling into it. Metal debris or other foreign matter can become lodged in the circuitry, which can result in damage to components.

- The panel on which you install your components must be a flat, rigid, vertical surface that is not subject to shock, vibration, moisture, oil mist, dust, or corrosive vapors.
- The RBM must be enclosed in a grounded conductive enclosure offering protection as defined in standard EN 60529 (IEC 529) to IP55 such that it is not accessible to an operator or unskilled person, in order to comply with UL® and CE requirements. A NEMA 4X enclosure exceeds these requirements providing protection to IP66.

ATTENTION

We recommend that all equipment and components of a machine or process system have a common earth ground point connected to their chassis.

A grounded system provides a ground path for short circuit protection. Grounding your modules and panels minimizes the shock hazard to personnel and damage to equipment caused by short circuits, transient overvoltages, and accidental connection of energized conductors to the equipment chassis.

For CE grounding requirements, refer to the appropriate drive system installation manual listed in *Related Documentation*.

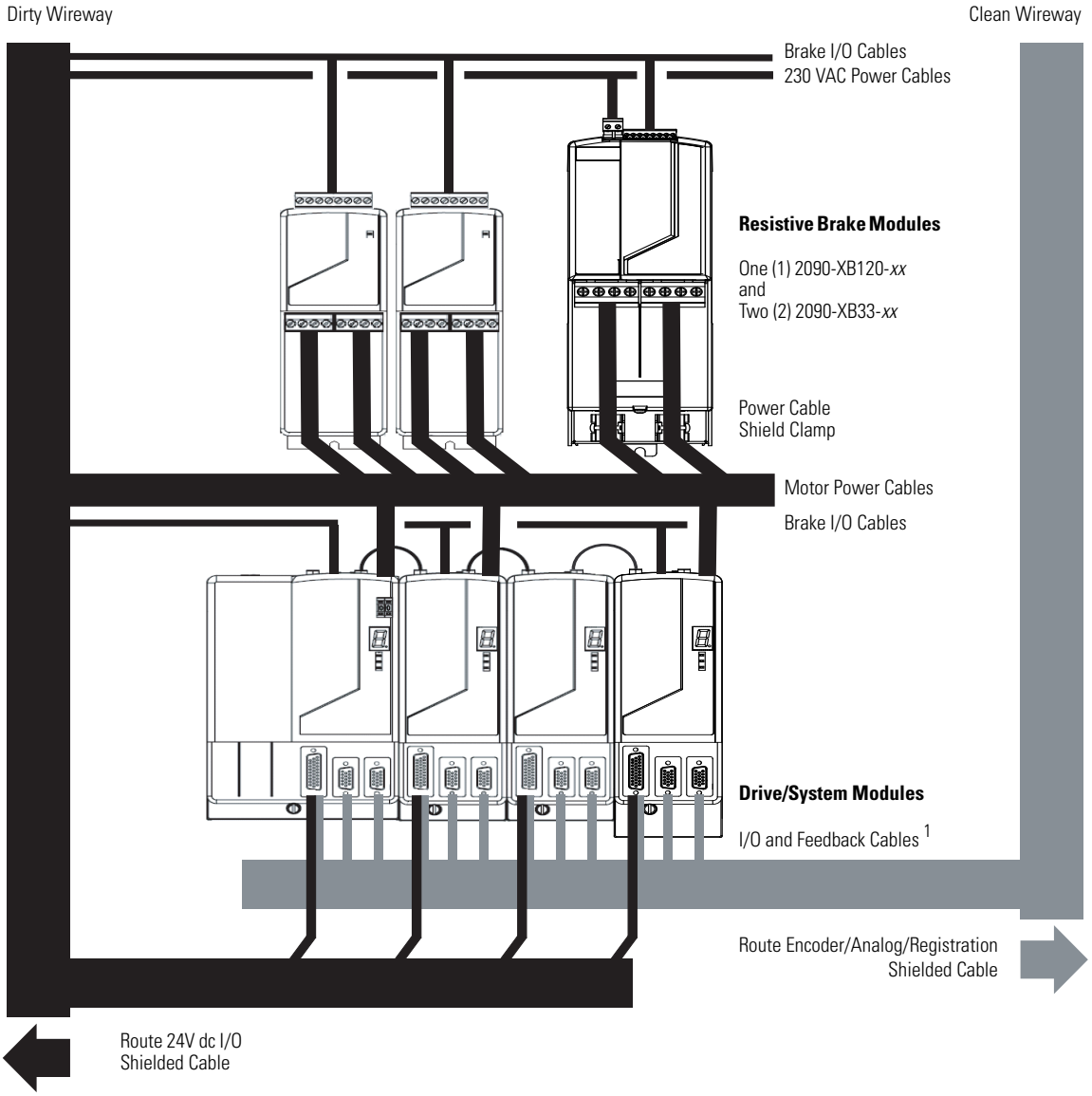
- The ambient temperature of the enclosure in which you install the RBM must not exceed 50° C (122° F).
- You need to maintain minimum clearances (refer to Figure 2 and 3) for proper airflow, easy module access, and proper cable bend radius.
- The RBM can operate at elevations to 1500 m (5000 ft) without derating, however, the continuous current rating must be de-rated by 3% for each additional 300 m (1000 ft) up to 3000 m (10,000 ft). Consult your local Allen-Bradley representative prior to operating at over 3000 m (10,000 ft).

Refer to *Specifications* on page 19 for mounting dimensions, power dissipation, and environmental specifications for the RBM.

Establishing Noise Zones

The figure below depicts noise zones for routing wiring. All wiring for the RBM should be routed in a dirty zone. Refer to the appropriate drive system installation manual listed in *Related Documentation*.

Figure 1
Noise Zones for Electrical Wiring



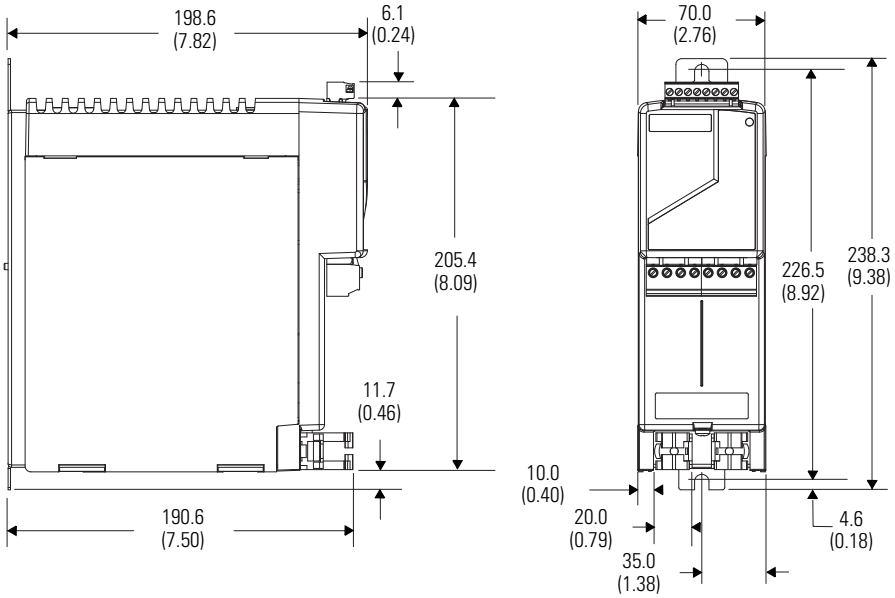
1 If system I/O cables contain dirty (relay, etc.) wires, route these signals with a separate cable in the dirty wireway.

Dimensions and Clearance Requirements

Mounting dimensions and clearance requirements for the 2090-XB33-*xx* are shown in Figures 2 and 3, and for the 2090-XB120-*xx* in Figures 4 and 6.

IMPORTANT The RBM must be mounted vertically, as shown, to ensure proper contactor operation. The vertical mounting tolerance is ±2°.

Figure 2
2090-XB33-*xx* Mounting Dimensions



Dimensions are in millimeters (inches).

Figure 3
2090-XB33-*xx* Minimum Clearance Requirements

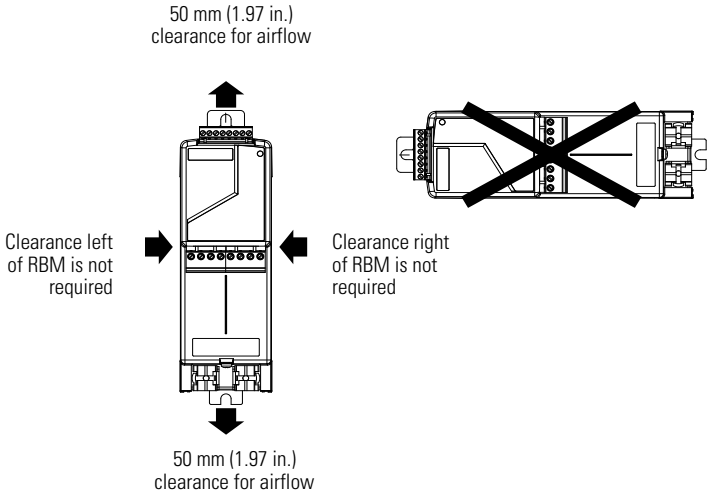
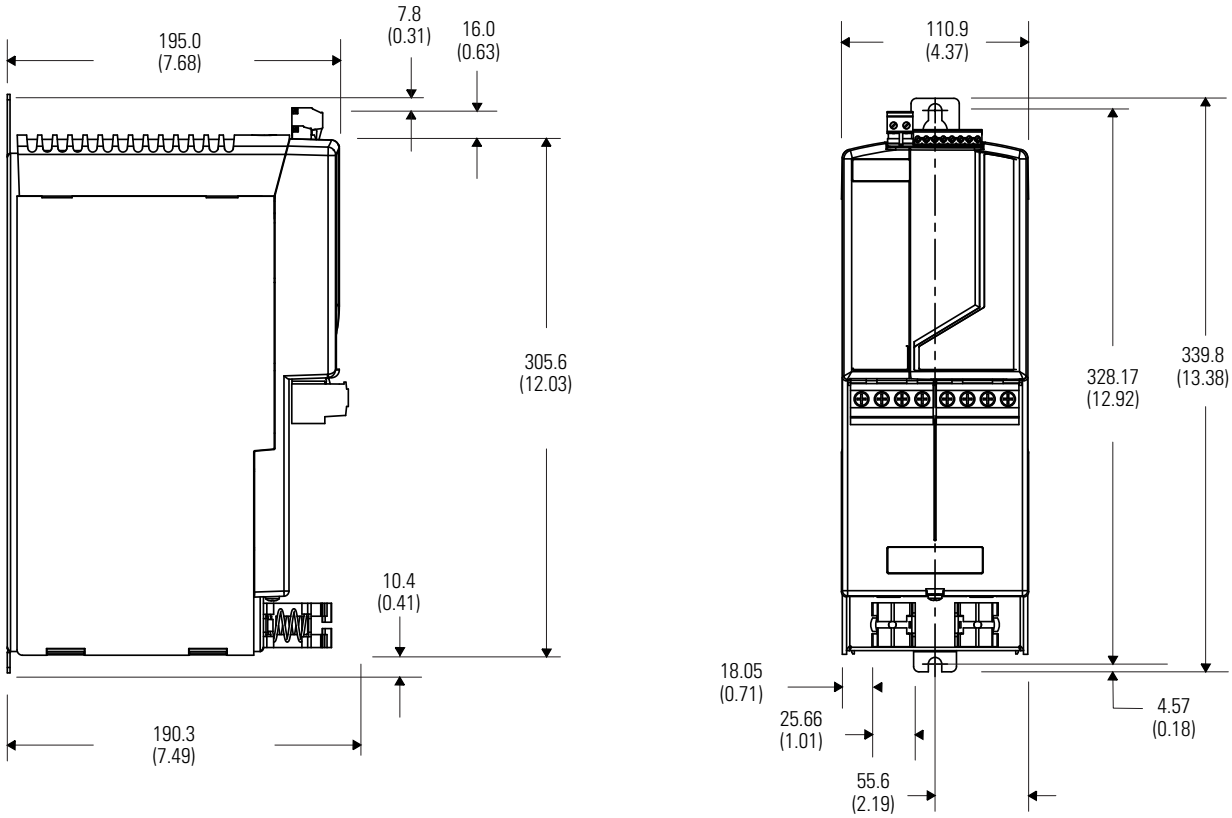
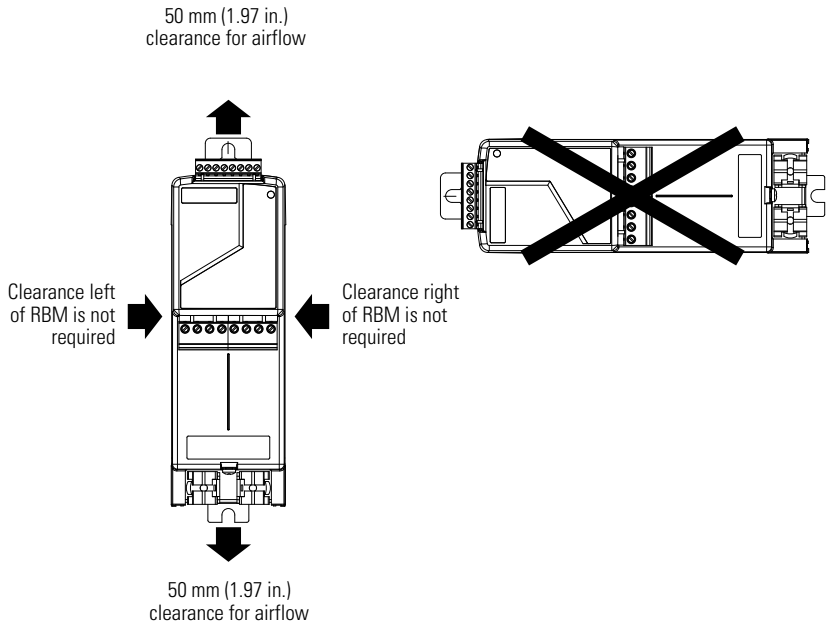


Figure 4
2090-XB120-*xx* Mounting Dimensions



Dimensions are in millimeters (inches).

Figure 5
2090-XB120-*xx* Minimum Clearance Requirements



Installing Your Resistive Brake Module

These procedures assume you have prepared your panel and understand how to bond the groundplane of your system.

ATTENTION

The RBM contains ESD (Electrostatic Discharge) sensitive parts and assemblies. You are required to follow static control precautions when you install, test, service, or repair this assembly. If you do not follow ESD control procedures, components can be damaged. If you are not familiar with static control procedures, refer to Allen-Bradley publication 8000-4.5.2, *Guarding Against Electrostatic Damage* or any other applicable ESD Protection Handbook.

Refer to the *System Design for Control of Electrical Noise Reference Manual* (publication GMC-RM001*x*-EN-P) for HF bonding techniques.

Attaching Your Resistive Brake Module to the Panel

To mount your RBM:

1. Layout the position for your RBM in the enclosure.

IMPORTANT

To improve EMC performance, mount the RBM on the same panel as the drive system, and as close to the drive as possible.

Typically the RBM should be positioned immediately above the module it supports. Refer to *Related Documentation* on page 24 for mounting instructions and restrictions specific to a drive system, and information on use with safety relays.

Refer to the mounting dimensions and clearance requirements for each type of RBM as listed below.

Dimensions for:	2090-XB33-*xx*	2090-XB120-*xx*
Mounting	Figure 2 on page 6	Figure 4 on page 7
Clearance	Figure 3 on page 6	Figure 5 on page 7

2. Attach the RBM to the cabinet. The recommended mounting hardware is two M6 (1/4 in. - 20) bolts. A key-hole tab is at the top of the unit, and a slotted mounting tab is at the bottom of the unit.

Ensure all fasteners are properly bonded to the subpanel. Refer to the *System Design for Control of Electrical Noise Reference Manual* (publication GMC-RM001*x*-EN-P) for HF bonding techniques.

IMPORTANT To improve the bond between the RBM and subpanel, construct your subpanel out of zinc plated (paint-free) steel.

3. Tighten all mounting fasteners. The minimum recommended torque for M6 (1/4 in. - 20) bolts is 1 Nm (9 in-lb).

Understanding RBM Connectors

RBMs have connectors and status indicators as listed in the following table:

RBM Connectors or Indicators	2090-XB33-*xx*	2090-XB120-*xx*
TB1 - Drive Connection	X	X
TB2 - Motor Connection	X	X
TB3 - I/O Connection	X	X
TB4 - 230VAC Aux Power Connection	–	X
Status LED	X	–
24 VDC Status LED	–	X
230 VAC Status LED	–	X

- Connectors and indicators locations are shown in Figure 6 on page 10 for the 2090-XB33-xx, and Figure 7 on page 10 for the 2090-XB120-xx.
- Block diagrams of electrical functions are provided as Figure 8 on page 11 for the 2090-XB33-xx, and Figure 9 on page 12 for the 2090-XB120-xx.
- Connector functions for the 2090-XB33-xx, and the 2090-XB120-xx are described in *RBM Wiring Requirements* on page 13.

Figure 6
2090-XB33-*xx* Resistive Brake Module Connectors and LED Indicator

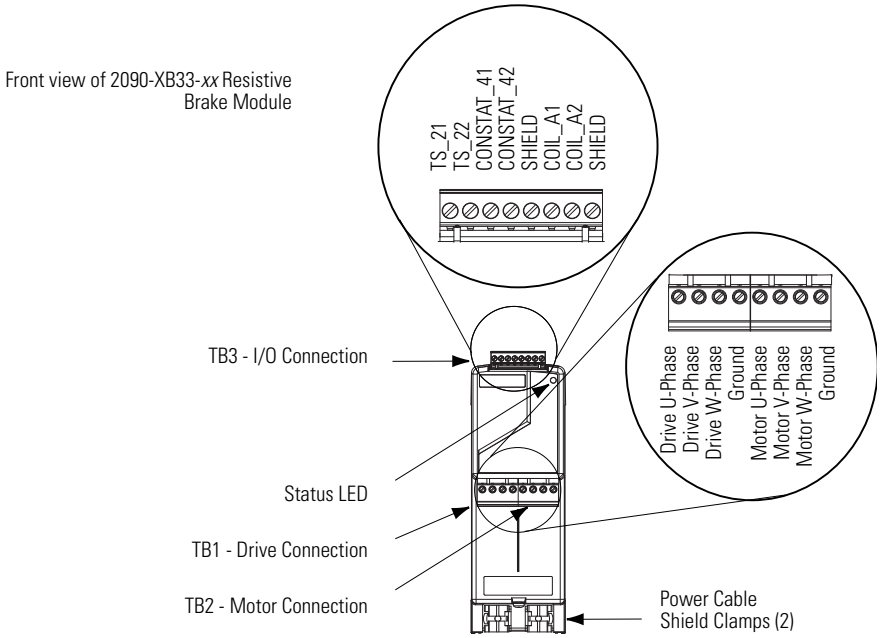
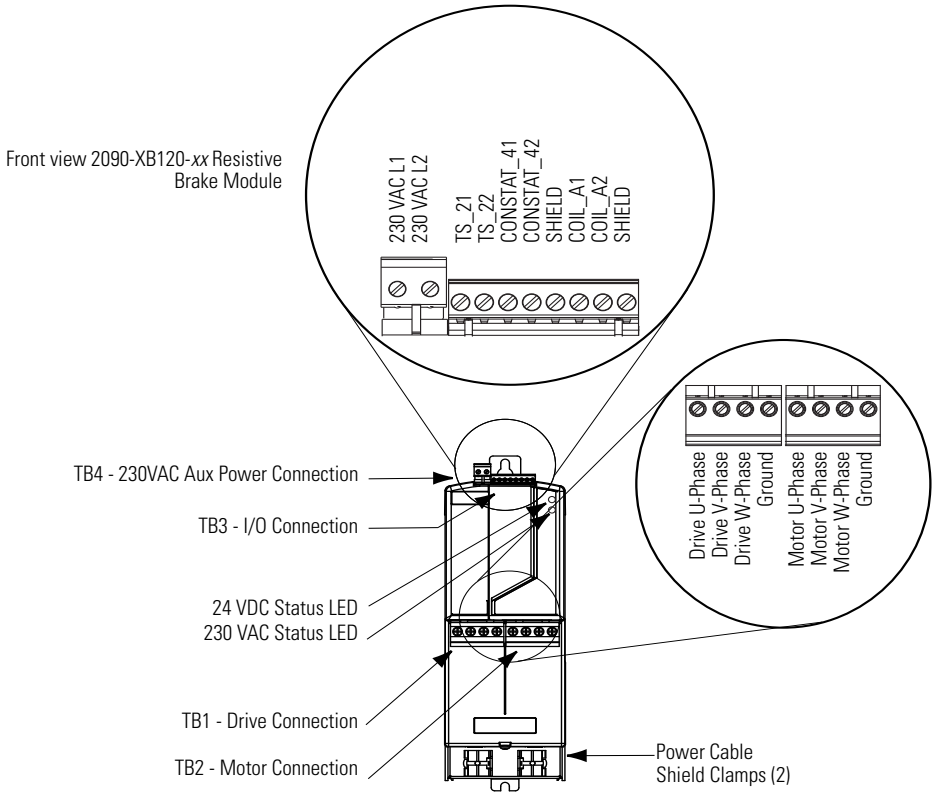


Figure 7
2090-XB120-*xx* Resistive Brake Module Connectors and LED Indicators



Wiring the RBM to a Drive System

This section provides wiring instructions for the Resistive Brake Module within a general drive system. Refer to *Related Documentation* on page 24 for installation and integration instructions containing wiring information specific to a drive system. In addition:

ATTENTION

To comply with UL 508C, a Resistive Brake Module must be protected upstream by a 2.5 kV overvoltage control device.

Kinetix and Ultra servo drives from Rockwell Automation meet this requirement. For additional drive applicability, please consult your Allen-Bradley representative.

- Figure 1 on page 5 depicts suggested routing of RBM wiring within the dirty noise zone.
- Figure 6 and Figure 7 on page 10 show connector locations and provides pinouts for each RBM connector.
- Recommended wire sizes and torque values for I/O signal wires and power wires are provided in *RBM Wiring Requirements* on page 13 and in *Specifications*.

Figure 8
2090-XB33-xx Resistive Brake Module Block Diagram

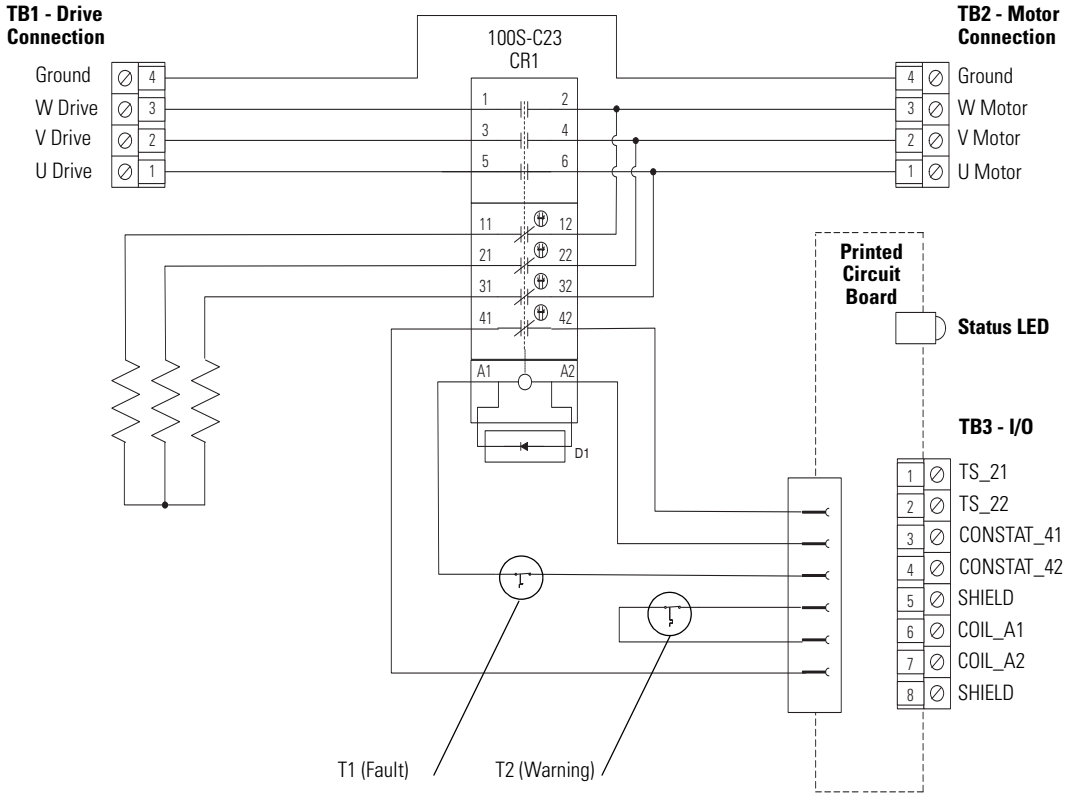
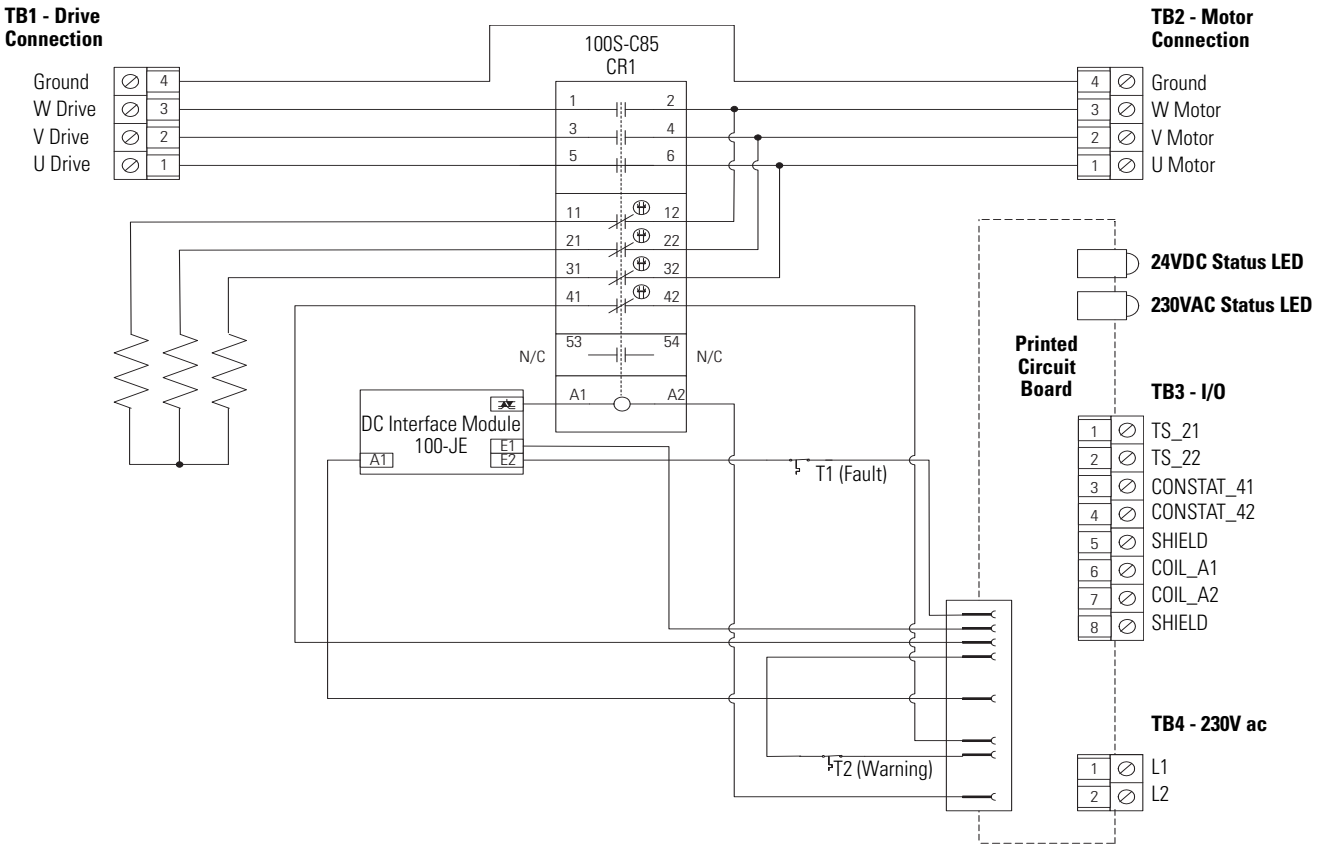


Figure 9
2090-XB120-*xx* Resistive Brake Module Block Diagram



RBM Wiring Requirements

Connector	Connects to:			Description and Usage	Recommended Wire Size [4] mm^2 (AWG)	Insulation Strip Length mm (in.)	Torque Value Nm (lb-in.)
	Terminal -Pin	Signal	Input/ Output				
Drive Connection [1]	TB1-1	U Drive	–	230/460V power input from drive	Minimum gauge for power cable is dependent on the motor/drive combination, 2090-XB33-*xx* 6 (10) maximum 2090-XB120-*xx*: 25 (3) maximum	2090-XB33-*xx* 10.0 (0.375) 2090-XB120-*xx*: 16.0 (0.63)	2090-XB33-*xx*: 0.5 - 0.6 (4.4 - 5.3) 2090-XB120-*xx*: 2.5 - 2.9 (22.1 - 25.7)
	TB1-2	V Drive	–				
	TB1-3	W Drive	–				
	TB1-4	⏚ [2]	–				
Motor Connection [1]	TB2-1	U Motor	–	230/460V power output to motor		2090-XB33-*xx* 10.0 (0.375) 2090-XB120-*xx*: 16.0 (0.63)	2090-XB33-*xx*: 0.5 - 0.6 (4.4 - 5.3) 2090-XB120-*xx*: 2.5 - 2.9 (22.1 - 25.7)
	TB2-2	V Motor	–				
	TB2-3	W Motor	–				
	TB2-4	⏚ [2]	–				
I/O Signals [5,6]	TB3-1	TS_21	In	RBM output with integral thermal warning Customer use of this auxiliary contact may include: • PLC or control string input that RBM is nearing its thermal limit	1.5 - 0.08 (16 - 28)	6.0 (0.25)	0.22 - 0.25 (1.9 - 2.2)
	TB3-2	TS_22	Out				
	TB3-3	CONSTAT_41	In	RBM output of a normally closed contact (Closed = motor disconnected from drive) Customer use of this auxiliary contact may include: • PLC input connection, indicating RBM contactor status • Safety relay input for safety string • Part of RBM safety string for mechanical redundancy			
	TB3-4	CONSTAT_42	Out				
	TB3-5	SHIELD [3]	–	I/O Shield internally terminated at chassis ground			
	TB3-6	COIL_A1	In	RBM contactor coil with integral thermal fault. Applying 24V Coil Power picks-up the contactor, which connects drive power to motor leads (i.e., motor rotates). Customer use may include: • Control from a safety relay output or signal relay output indicating system is clear for rotation			
	TB3-7	COIL_A2	Out				
	TB3-8	SHIELD [3]	–	I/O Shield internally terminated at chassis ground			
230V Power [7] (2090-XB120-*xx* only)	TB4-1	L1	–	Auxiliary power input from external 230 VAC power source (2090-XB120-*xx* only)	4.0 - 0.2 (10 - 24)	7.0 (0.28)	0.5 - 0.6 (4.4 - 5.3)
	TB4-2	L2	–				

1 Connectors are keyed to prevent misconnection of power interface cables to and from the RBM.
2 Ground connection for the motor cable passes through the drive and motor connectors.
Cable shielding must be grounded to the chassis via the spring-loaded cable clamps.
3 I/O Shield terminations are connected internally to chassis ground.
4 Wire supplied by user should be stranded copper with 75° C (167° F) minimum rating. An earth ground connection is required for safe and proper operation. Local agency rules apply.
5 For additional contactor applications, refer to the Allen-Bradley Safety Product Catalog (Publication S114-CA001A-EN-P).
6 I/O is powered by an external 24V (22.4 - 26.4), 0.5A power supply.
7 Provided by an external 230V (207 - 253), 1A power supply.

Wiring Instructions

1. Allow five minutes for the power supplies to completely discharge before proceeding.

ATTENTION

To avoid hazard of electrical shock, verify that all voltage on the capacitors has been discharged before attempting to service, repair, or remove this unit. This product connects to stored energy devices. You should only attempt the procedures in this document if you are qualified to do so and familiar with solid-state control equipment and the safety procedures in publication NFPA 70E.

2. Separate the I/O signal cable and the power cables as shown in Figure 1 on page 5 and described below:

   - I/O signal connections are at the top of the RBM (TB3).
   - Power cable connections enter (TB1) and exit (TB2) at the bottom of the RBM.
   - Auxiliary power connections (2090-XB120-*xx* only) are at the top of the RBM (TB4)

IMPORTANT

To ensure correct wiring, verify connector orientation on the RBM before wiring each connector. Figure 6 and Figure 7 on page 10 show connector locations and pinouts.

3. Prepare your I/O signal wires by stripping the appropriate length of insulation from the end of the wire. Use caution not to nick, cut, or otherwise damage strands as you remove the insulation.

   Insert the wires into the TB3 terminal and torque the screws to the specified value. Gently pull on the wire to make sure it does not come out of its terminal. Re-insert and test any loose wires.

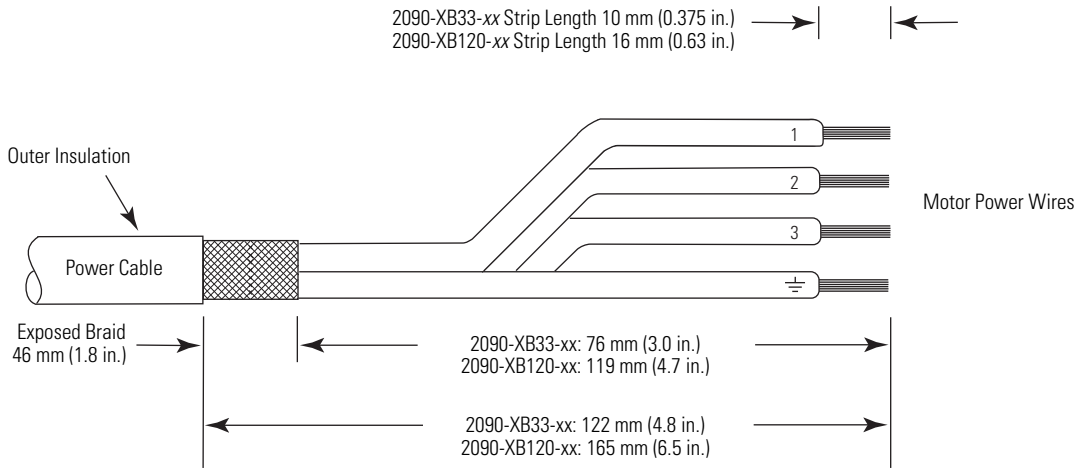
If RBM is:	Strip this length of insulation from the I/O wire:	Torque TB3 terminal screw within this range:
2090-XB33-*xx*	6.0 mm (0.25 in.)	0.22 - 0.25 Nm (1.9 - 2.2 in-lbs)
2090-XB120-*xx*	7.0 mm (0.28 in.)	

4. Prepare your power cables as shown in Figure 10. by stripping the appropriate length of insulation from the end of the wire. Use caution not to nick, cut, or otherwise damage strands as you remove the insulation.

   Insert the wires into the proper terminal (TB1 or TB2) and torque the screws. Gently pull on the wire to make sure it does not come out of its terminal. Re-insert and test any loose wires.

If RBM is:	Strip this length of insulation from the power wire:	Torque TB1 or TB2 terminal screw within this range:
2090-XB33-*xx*	10.0 mm (0.375 in.)	0.5 - 0.6 Nm (4.4 - 5.3 lbs-in.)
2090-XB120-*xx*	16.0 mm (0.63 in.)	2.5 - 2.9 Nm (22.1 - 25.7 lbs-in.)

Figure 10
Shielded Power Cable Preparation



5. Prepare your 230VAC auxiliary power cables (2090-XB120-*xx* only) by stripping the appropriate length of insulation from the end of the wire. Use caution not to nick, cut, or otherwise damage strands as you remove the insulation.

   Insert the wires into the TB4 terminal and torque the screws to the specified value. Pull on each wire to ensure it is secured to the terminal. Re-insert and test any loose wires.

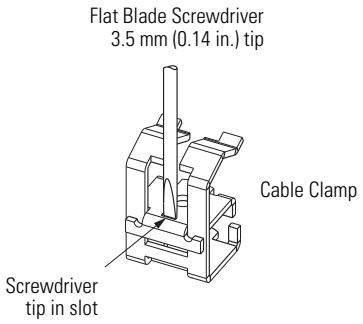
If RBM is:	Strip this length of insulation from the I/O signal wire:	Torque TB4 terminal screws within this range:
2090-XB33-*xx*	This terminal is not present	
2090-XB120-*xx*	7.0 mm (0.28 in.)	0.5 - 0.6 Nm (4.4 to 5.3 lbs-in.)

Applying the Power Cable Shield Clamp

To apply your power cable shield clamp:

1. Use a small flat blade screwdriver to depress the spring loaded clamping plate as shown in Figure 11.

Figure 11
Depressing the Spring Clamp

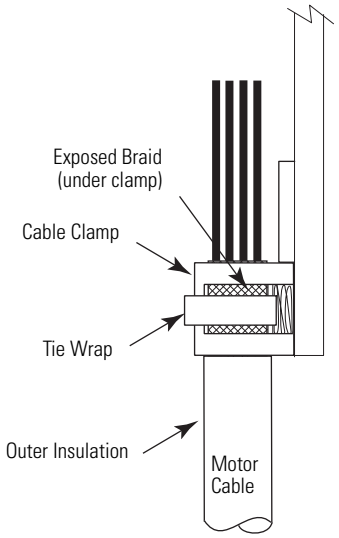


2. Position the exposed portion of the cable braid directly in line with the clamp.

3. Release the spring, making sure the cable and cable braid are held secure by the clamp.

4. Attach tie wrap around cable and clamp, if additional strain relief is required (refer to Figure 12).

Figure 12
Motor Cable and Clamp



Troubleshooting

There are no field replaceable components in an RBM. If problems persist after attempting to troubleshoot the system, contact your Allen-Bradley representative for further assistance.

24 VDC Status LED

The Status LED is ON when 24V is applied between COIL_A1 and COIL_A2 (e.g., a Brake Enable signal is received from a drive).
Use the table below for troubleshooting the RBM using the 24 VDC Status LED.

If 24 VDC Status LED is:	RBM Contactor Status is:	Potential Cause is:	Possible Resolution is:
Steady Green	Contactor engaged – direct connection between drive and motor	No faults or failures	N/A
	Contactor disengaged – no connection between drive and motor	Contactor failure	Verify by monitoring CONSTAT_41/42 status (output is NC) Contact AB representative
Blinking Green (audible clicking)	Contactor rapidly engaging/disengaging	Recommended grounding not followed	• Verify grounding • Route wires away from noise sources • Refer to GMC-RM001*x*-EN-P
		Control circuit improperly wired	Verify control wiring and programming
Off (intended)	Contactor disengaged (connection open between drive and motor)	No faults or failures	N/A
Off (unintended)		+24V not applied between COIL_A1 and COIL_A2	• +24V supply is off • Verify wiring • Drive not enabled • Contact AB representative
		T1 (Fault) thermostat open	Duty cycle: exceeded; allow RBM to cool.

230 VAC Auxiliary Power Status LED (2090-XB120-*xx* RBM only)

The 230 VAC Status LED is ON when 230V AC is applied to L1 and L2 (TB4) and the contactor is engaged by applying 24V DC across COIL_A1 and COIL_A2 (e.g., a Brake Enable signal is received from a drive).
Use the table below for troubleshooting the RBM using the 230 VAC Status LED. ‘1

If 230 VAC Status LED is:	RBM Contactor Status is:	Potential Cause is:	Possible Resolution is:
Steady Green	Engaged	No faults or failures	N/A
	Disengaged	Contactor failure	Verify by monitoring CONSTAT_41/42 Contact AB representative
Blinking Green (audible clicking)	Rapidly engaging/disengaging	Grounding	• Verify grounding • Re-route wires • Refer to GMC-RM001*x*-EN-P
		230VAC is varying	• Check VAC Loading • Check VAC Source • Verify wiring
		Control circuit improperly wired	Verify control wiring and programming
Off (intended)	Engaged	Contactor failure (contacts welded together)	Verify by monitoring CONSTAT_41/42 Contact AB representative
	Disengaged	No faults or failures	N/A
Off (unintended)	Engaged	Contactor failure (contacts welded together)	Verify by monitoring CONSTAT_41/42 Contact AB representative
		LED failure	Verify by monitoring CONSTAT_41/42 Contact AB representative
	Disengaged	+24V signal not functioning properly	See other Troubleshooting tables
		Contactor failure (coil damaged)	Contact A-B representative
		No 230V signal	• Verify wiring • Verify 230VAC source

General Troubleshooting

Use the table below for troubleshooting motor faults that may result from the RBM on a specific axis.

Condition:	Potential Cause is:	Possible Resolution is:
No Rotation (drive faults)	Improper timing	Adjust delay times of brake output signals
	Improper wiring	Verify wiring
No Rotation (no fault action)	Improper wiring	Verify wiring
	RBM contactor disengaged (connection open between drive and motor)	• +24V supply is off • Verify wiring • Drive not enabled • Duty cycle: exceeded; allow RBM to cool. • Contact AB representative
	RBM contactor engaged (direct connection between drive and motor)	• Verify wiring • Contact AB representative

Specifications

Specifications for the Resistive Brake Module are provided below.

Catalog No.	Drive Voltage	Power Specifications (per phase):				
		Resistance [1]	Peak Energy	Peak Drive Current		Continuous Power
	Volts	Ohms	Joules	$Amps_{0\text{-}pk}$ [2]	$Amps_{rms}$	Watts
2090-XB33-16	230 or 460	16	150	33	23	30
2090-XB33-32	230 or 460	32				
2090-XB120-01	230 or 460	1	290	106	75	45
2090-XB120-03	230 or 460	3				
2090-XB120-06	230 or 460	6				

1 Tolerance = +10%, - 10%

2 0-pk refers to peak of sine wave

Environmental Specifications		Value
Vibration • operating		0.35 mm (0.014 in.) max. displacement at 5-53 Hz 2g max. acceleration at 53 to 500 Hz
Shock • operating		15g, 11 msec half sine
Altitude		1500 m (5000 ft)
Humidity		5% to 95% non-condensing
Storage temperature		-25° C (-13° F) 70° C (158° F)
Ambient operating temperature [1] • minimum • maximum		 0° C (32° F) 50° C (122° F)
Air flow clearance • above and below • left and right		 50 mm (1.97 in.) 0 mm (0 in.)
Temperature limits • T1 (Fault) • T2 (Warning output)		 80°±5° C (176±9° F) 65°± 5° C (119°±9 ° F)
Duty cycle: • 2090-XB33-16 • 2090-XB33-32 • 2090-XB120-01 • 2090-XB120-03 • 2090-XB120-06	Complete stop with [2] 15:1 inertia mismatch	60 per hour, or [2] once per minute

1Power performance increases about 5.5W for every 1°C (3.1W/°F) drop in ambient temperature.

2 Refer to the *Motion Control Selection Guide* (publication GMC-SG001x-EN-P) for proper sizing.

Connectors	Type	Torque Nm	(lbs-in.)
2090-XB33-*xx*			
Drive Connection (TB1)	4-position plugable Phoenix-type (7.62mm spacing)	0.5 - 0.6	(4.4 - 5.3)
Motor Connection (TB2)		0.5 - 0.6	(4.4 - 5.3)
I/O Terminals (TB3) [1]	8-position plugable Phoenix-type (5.08mm spacing)	0.22 - 0.25	(1.9 - 2.2)
2090-XB120-*xx*			
Drive Connection (TB1)	4-position plugable 42 Series Molex (12mm spacing)	2.5 - 2.9	(22.1 - 25.7)
Motor Connection (TB2)		2.5 - 2.9	(22.1 - 25.7)
I/O Terminals (TB3)	8-position plugable Phoenix-type (5.08mm spacing)	0.22 - 0.25	(1.9 - 2.2)
230V Power Terminals (TB4)	2-position plugable Phoenix-type (7.62mm spacing)	0.5 - 0.6	(4.4 - 5.3)

Wiring		Requirements	
Material		Stranded copper	
2090-XB33-*xx*			
TB1 - Drive Connection and TB2 - Motor Connection	maximum [1] minimum [1]	6 mm^2 –	(10 AWG) –
TB3 - I/O	maximum minimum	1.5 mm^2 0.08 mm^2	(16 AWG) (28 AWG)
2090-XB120-*xx*			
TB1 - Drive Connection and TB2 - Motor Connection	maximum [1] minimum [1]	25.0 mm^2 2.50 mm^2	(3 AWG) (14 AWG)
TB3 - I/O	maximum minimum	1.50 mm^2 0.08 mm^2	(16 AWG) (28 AWG)
TB4 - 230V Input	maximum minimum	4.0 mm^2 0.20 mm^2	(10 AWG) (24 AWG)
Voltage			
Drive, Motor, and 230V Aux		600V	
I/O		250V	
Temperature (per UL) [2] • preferred • manufacturer minimum • field wiring minimum		 105° C 90° C 75° C	 (221° F) (194° F) (167° F)
Maximum Length • TB1 - Drive • TB2 - Motor • TB3 - I/O • TB4 - 230V Input		See system level requirements for power cable length restrictions. [3] N/A for I/O.	

1 Specific gauge of motor power cable depends on motor/drive combination.

2 Separate UL standards exist for manufactured and field wiring. Installation must comply with local regulations.

3 If this product is installed within the European Union or EEC regions and requires the CE mark or is installed in Australia and New Zealand and requires C-tick marking, refer to *Related Documentation* on page 24 for installation and integration instructions defining total length restrictions on a system level.

Mechanical Specifications		Value	
Mounting [1] • Hex cap screws • Torque	 metric (english) minimum	 M6 1 Nm	 (1/4 in. - 20) (9 in-lb)
Mounting position		Vertical, within ±2°	
Product Outline 2090-XB33-*xx* • Height • Depth • Width		 238.3 mm 198.6 mm 70.0 mm	 (9.38 in.) (7.82 in.) (2.76 in.)
2090-XB120-*xx* • Height • Depth • Width		 339 mm 195 mm 110 mm	 (13.38 in.) (7.68 in.) (4.37 in.)

Mechanical Specifications	Value	
Clearances [2] • Top • Side • Bottom	 50 mm 0 mm 50 mm	 (1.97 in.) (0 in.) (1.97 in.)
Weight • 2090-XB33-16 • 2090-XB33-32	1.91 Kg	(4.22 lbs)
• 2090-XB120-01 • 2090-XB120-03 • 2090-XB120-06	2.75 Kg	(6.06 lbs)

1 Additional dimensional information is provided in Figure 2 on page 6.
2 Combustible material adjacent to the brake module may require additional restrictions (i.e., Clearance based on ambient temperature of the brake module within the application).

Safety Contactor Specifications - Allen-Bradley 100S Series

The information in this section is adapted from the Allen-Bradley *Safety Product Catalog* (Publication S114-CA001*x*-EN-P). That document should be referred to for the most recent information on the 100S Series Contactors.

24V Coil Power Specifications	**Voltage Range** Vdc	**Coil Consumption** Watts	**Operating Time** milliseconds
Pickup	19.2 to 26.4	9.2	40 to 70
Dropout	2.4 to 14.6	0	17 to 23
Hold-In	14.6 to 26.4	9.2	N/A

I_e		**Ratings for Switching AC Motors - AC-2, AC-3, AC-4**									
[A]		**kW (50 Hz)**				**HP (60 Hz)**					
AC-3	**AC-1**	**230V**	**380V, 415V, 400V**	**500V**	**690V**	**1∅**		**3∅**			
						115V	**230V**	**200V**	**230V**	**460V**	**575V**
23	32	7.5	11	11	11	2	3	5	7.5	15	15

230V Coil Power Specifications	**Voltage Range** Vac	**Coil Consumption** VA/W	**Operating Time** milliseconds
Pickup	195.5 to 253.0	200/110	20.0 to 40.0
Dropout	69.0 to 138.0	0	10.0 to 60.0
Hold-In	138.0 to 253.0	16/4.5	N/A

I_e		**Ratings for Switching AC Motors - AC-2, AC-3, AC-4**									
[A]		**kW (50 Hz)**				**HP (60 Hz)**					
AC-3	**AC-1**	**230V**	**380V, 415V, 400V**	**500V**	**690V**	**1∅**		**3∅**			
						115V	**230V**	**200V**	**230V**	**460V**	**575V**
85	100	25	45	45	45	7.5	15	25	30	60	60

Auxiliary Contact Specifications

Auxiliary Contacts in Contactor Catalog Number 100-S [1]										
Current Switching										
AC-1/th		V	n/a							
	at 40° C (104° F)	A	10							
	at 60° C (10°0 F)	A	6							
AC-15 at Rated Operating Voltage		V	24	48	120	240	400	500	600	690
		A	6	6	6	3	2	1.5	1.2	0,7
DC-13 at Rated Operating g Voltage		V	24	48	125	220	440			
		A	3	1.5	0.6	0.3	0.2			
Short-Circuit Protection gG Fuse Type 2 Coordination		A	n/a							
Rated Impulse Voltage U_{imp}		kV	n/a							
Insulation Voltage (between control and load circuit DIN,VDE 0106,Part 101 (NAMUR recommendation)		V	Between auxiliary contacts: 250 V Between load and direct-connected aux. circuits: 690 V							
Positively Guided Contacts			Yes, NO and NC mutually unrestricted, including N.C. in relation to N.O.							

1 Information adapted from the Allen-Bradley *Safety Product Catalog* (Publication S114-CA001A-EN-P), page 53.

Accessory Equipment

The cables provide an interface between the Resistive Brake Module and drive power terminals. Refer to *RBM Wiring Requirements* on page 13 for pin, description, and signal information about the connector kit.

Description	Catalog Number
Kinetix® 6000 Drive Interface Cable, Resistive Brake - 14 AWG, 66cm	2090-XXNRB-14F0P7
Kinetix 6000 Drive Interface Cable, Resistive Brake - 4, 8, or 10 AWG	2090-XXNRB-*a*F*xx*P*yy* [1, 2]
Ultra™ Drive Interface Cable, Resistive Brake - 14 AWG, 132cm	2090-XXNRB-14F1P3
Ultra Drive Interface Cable, Resistive Brake - 6, 8 or 10 AWG	2090-XXNRB-*a*F*xx*P*yy* [1,2]
Connector Kit, Resistive Brake, 33A (TB1, TB2, TB3 Connectors)	2090-XNRBM-1
Connector Kit, Resistive Brake, 106A (TB1, TB2, TB3, TB4 Connectors)	2090-XNRBM-2

1 Where a = wire gauge in AWG.
2 Where *xx* = cable length in full meters, and *yy* = length in decimeters.

Related Documentation

These publications provide additional information concerning related Allen-Bradley products. To order printed copies, contact your Allen-Bradley Distributor. To view and download, go to Literature Library at **http://www.rockwellautomation.com/literature**.

For Information About	Read This Document	Publication Number
Installing, wiring, and troubleshooting a Kinetix 6000 drive	*Kinetix 6000 Installation Manual*	2094-IN001*x*-EN-P
Configuring a Kinetix 6000 drive and system	*Kinetix 6000 Integration Manual*	2094-IN002*x*-EN-P
Programming a motion application using Logix	*Logix Controller Motion Instruction Set Reference Manual*	1756-RM007*x*-EN-P
ControlLogix™ motion and application examples	*ControlLogix Motion Module Programming Manual*	1756-RM086*x*-EN-P
Configuring and troubleshooting ControlLogix motion modules	*ControlLogix Motion Module Setup and Configuration Manual*	1756-UM006*x*-EN-P
Minimizing and controlling system-level noise	*System Design for Control of Electrical Noise*	GMC-RM001*x*-EN-P
Sizing and configuring an application	*Motion Book Servo Sizing CD (v4.0 or above)*	Motion Book-*mmmyy*
Servo drives, motor, and accessories, including general technical specifications	*Motion Control Selection Guide*	GMC-SG001*x*-EN-P
Information about international standards EN1050 and EN954 estimation and safety performance categories.	*Understanding the Machinery Directive*	SHB-900

For more information refer to our web site: **www.ab.com/motion**
For Allen-Bradley Technical Support information refer to: **www.ab.com/support** or Tel: (1) 440.646.5800

www.rockwellautomation.com

Corporate Headquarters
Rockwell Automation, 777 East Wisconsin Avenue, Suite 1400, Milwaukee, WI, 53202-5302 USA, Tel: (1) 414.212.5200, Fax: (1) 414.212.5201

Headquarters for Allen-Bradley Products, Rockwell Software Products and Global Manufacturing Solutions
Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444
Europe: Rockwell Automation SA/NV, Vorstlaan/Boulevard du Souverain 36-BP 3A/B, 1170 Brussels, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640
Asia Pacific: Rockwell Automation, 27/F Citicorp Centre, 18 Whitfield Road, Causeway Bay, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

Headquarters for Dodge and Reliance Electric Products
Americas: Rockwell Automation, 6040 Ponders Court, Greenville, SC 29615-4617 USA, Tel: (1) 864.297.4800, Fax: (1) 864.281.2433
Europe: Rockwell Automation, Brühlstraße 22, D-74834 Elztal-Dallau, Germany, Tel: (49) 6261 9410, Fax: (49) 6261 1774
Asia Pacific: Rockwell Automation, 55 Newton Road, #11-01/02 Revenue House, Singapore 307987, Tel: (65) 351 6723, Fax: (65) 355 1733

Publication 2090-IN009F-EN-P — November 2004 319232-P06
Supersedes Publication 2090-IN009E-EN-P