Allen-Bradley

DC SCR Precharge Module

User Manual

Rockwell Automation

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. *Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls* (Publication SGI-1.1 available from your local Rockwell Automation sales office or online at **http://www.rockwellautomation.com/literature**) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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Throughout this manual, when necessary we use notes to make you aware of safety considerations.

WARNING: Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

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

ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you:

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

Shock Hazard labels may be located on or inside the equipment (e.g., drive or motor) to alert people that dangerous voltage may be present.

Burn Hazard labels may be located on or inside the equipment (e.g., drive or motor) to alert people that surfaces may be at dangerous temperatures.

This is the first release of this publication.

Table of Contents

Overview

The purpose of this manual is to provide you with the basic information needed to install, start-up, and troubleshoot the DC SCR Precharge Module.

Who Should Use this Manual?

This manual is intended for personnel qualified in the installation, programming, and operation of Adjustable Frequency AC Drives and their use in common DC bus systems.

Installation Requirement

The DC SCR Precharge Module must be installed only within the drive's enclosure.

Reference Materials

The following publications are recommended for general drive information:

Title	Publication
Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives	DRIVES-IN001...
Preventive Maintenance of Industrial Control and Drive System Equipment	DRIVES-TD001...
Reactors and Isolation Transformers	1321-TD001...
Safety Guidelines for the Application, Installation and Maintenance of Solid State Control	SGI-1.1
A Global Reference Guide for Reading Schematic Diagrams	0100-2.10
Guarding Against Electrostatic Damage	8000-4.5.2

Publications can be obtained online at **http://www.rockwellautomation.com/literature**.

Manual Conventions

The following words are used throughout the manual to describe an action:

Word	Meaning
Can	Possible, able to do something
Cannot	Not possible, not able to do something
May	Permitted, allowed
Must	Unavoidable, you must do this
Shall	Required and necessary
Should	Recommended
Should Not	Not recommended

General Precautions

ATTENTION: The DC SCR Precharge Module contains ESD (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing or repairing this Module. Component damage may result if ESD control procedures are not followed. 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.

ATTENTION: An incorrectly applied or installed DC SCR Precharge Module can result in component damage or a reduction in product life. Wiring or application errors, such as incorrect or inadequate DC supply, or excessive ambient temperatures may result in malfunction of the system.

ATTENTION: Only qualified personnel familiar with adjustable frequency AC drives and associated machinery should plan or implement the installation, start-up, and subsequent maintenance of the system. Failure to comply may result in personal injury and/or equipment damage.

ATTENTION: Only connect Allen-Bradley “Common Bus” AC drives with this DC SCR Precharge Module. Failure to comply may result in personal injury and/or equipment damage.

ATTENTION: To avoid an electric shock hazard, verify that the voltage on the DC bus terminals (which are connected to the DC bus capacitors of the drive) has discharged before performing any work on the DC SCR Precharge Module. Measure the DC bus voltage between the “+DC” and “-DC” terminal of the Output Power Terminals. The voltage must be zero.

ATTENTION: A second source of power for the cooling fan and control is present. To avoid an electric shock hazard or moving blades, verify that the AC power supply has been removed before performing any maintenance or repairs.

Part Number Explanation

The available ratings for the DC SCR Precharge Module are shown below:

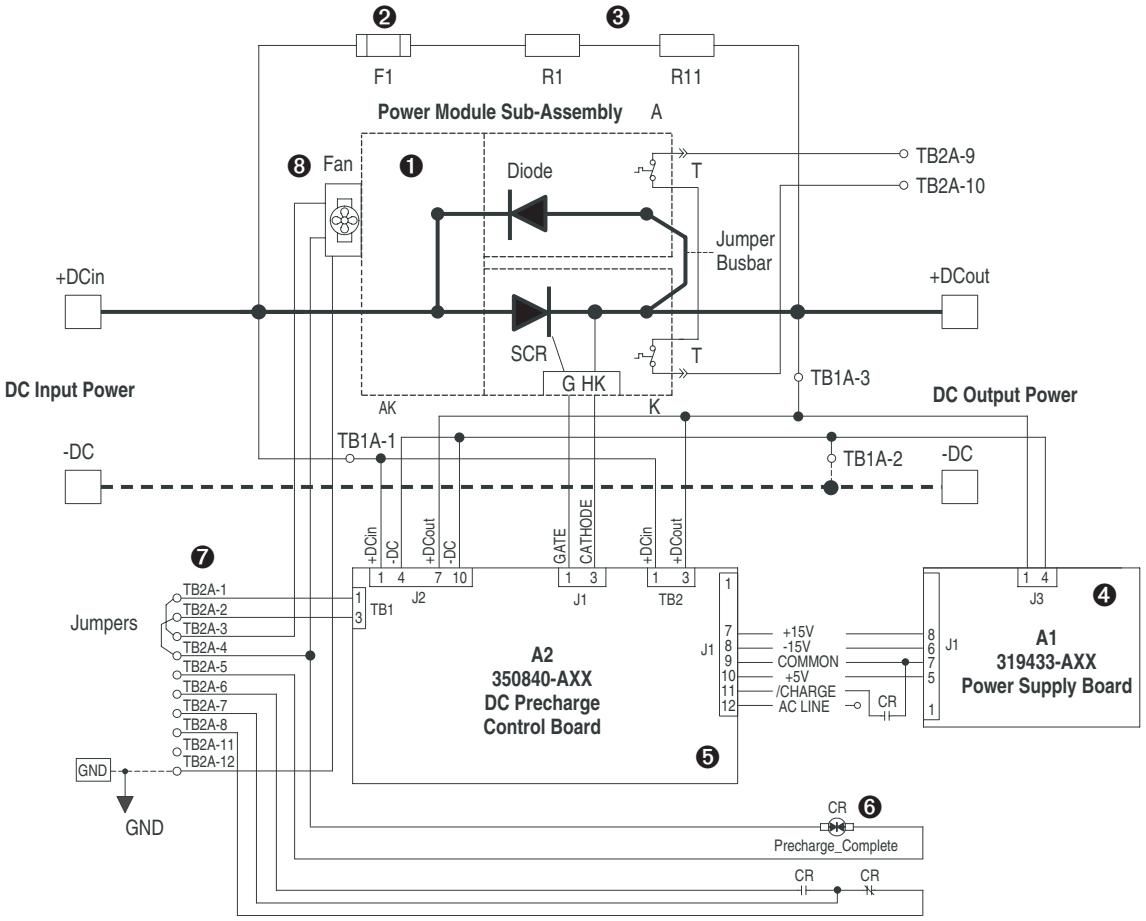
Module Rating (DC Amps)	DC SCR Precharge Module Part Number	
	with Aluminum Heatsink	with Nickel-Plated Heatsink
500A	370696	370724
750A	370711	370729
1000A	370715	370733
1600A	370707	370737

Important: These DC SCR Precharge Modules are available for 380-480 VAC drive applications only.

Description and Block Diagram

The DC SCR Precharge Module has been designed to limit the current draw by the drive's capacitor bank during precharge operation. This is accomplished using precharge resistors. When the operational DC bus voltage has been achieved, the continuous current is then conducted through the SCR in the SCR Power Module. In addition, a diode integrated into the SCR Power Module provides regenerative capability.

Figure P.1 DC SCR Precharge Module Block Diagram



The primary electrical components for the DC SCR Precharge Module are:

Item	Description
❶	**SCR-Diode Power Module (Sub-Assembly)** conducts the continuous DC bus current once the precharge of the drive's capacitor bank has been achieved. A diode in parallel with the SCR provides energy regeneration up to the SCR Precharge Module nameplate Amp rating.
❷	**Protection fuse** is for over-current protection during precharge.
❸	**Precharge Resistors** limit the current during the charging of the drive's capacitor bank when power is initially applied to the drive.
❹	**Power Supply PCB** provides a logic power to the Precharge Control board.
❺	**DC Precharge Control PCB** generates the gating signal to the SCR Power Module.
❻	**Control Relay** enables the SCR gating signal.
❼	**Terminal Block** for interfacing the SCR Precharge Module with the drive's main control circuit.
❽	**Cooling Fan** connected to a customer-supplied 120 VAC supply. The fan must run when the SCR is gated.

Installation/Wiring

This chapter provides information on installing and wiring the DC SCR Precharge Module.

Most start-up difficulties are the result of incorrect wiring. Every precaution must be taken to assure that the wiring is done as instructed. All information must be read and understood before the actual installation begins.

ATTENTION: The following information is merely a guide for proper installation. Rockwell Automation, Inc. cannot assume responsibility for the compliance or the noncompliance to any code, national, local or otherwise for the proper installation of this module or associated equipment. A hazard of personal injury and/or equipment damage exists if codes are ignored during installation.

Minimum Mounting Clearances

The air inlet and outlet areas for each DC SCR Precharge Module must be a minimum of 200 square centimeters (31 square inches). The Length-to-Width Ratio must not exceed 4:1.

Figure 1.1 Minimum Mounting Clearance for 500A and 750A DC SCR Precharge Modules

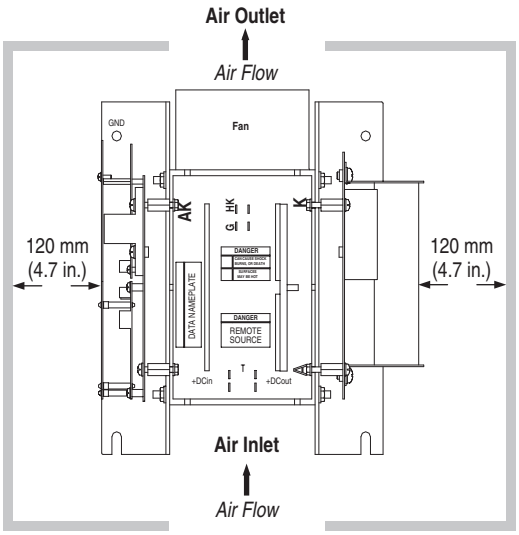
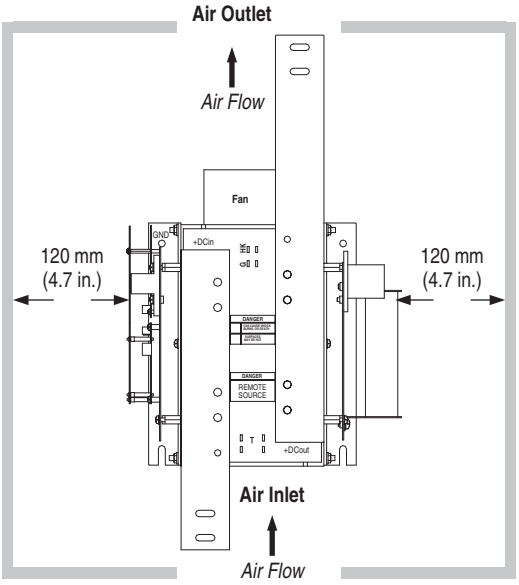


Figure 1.2 Minimum Mounting Clearance for 1000A and 1600A DC SCR Precharge Modules



Ambient Operating Temperature

All DC SCR Precharge Modules are designed to operate at 0° to 50°C (32° to 122°F) surrounding air ambient without derating.

AC Supply Source Considerations

The DC SCR Precharge Modules are suitable for use on a circuit capable of delivering a short circuit rating up to a maximum of 65,000 rms symmetrical amperes.

If a Residual Current Detector (RCD) is used as a system ground fault monitor, only Type B (adjustable) devices should be used to avoid nuisance tripping.

For Unbalanced or Ungrounded Distribution Systems where the potential exists for abnormally high phase-to-ground voltages (in excess of 125% of nominal) or the supply system is ungrounded, please refer to *Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives* (Allen-Bradley Publication No. DRIVES-IN001…).

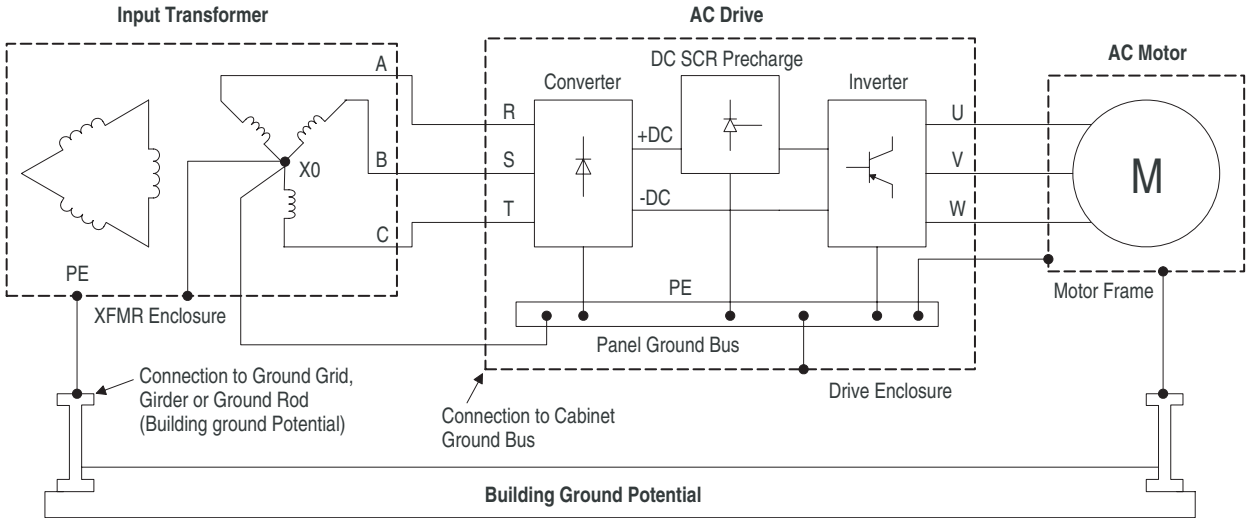
For Input Power Conditioning information, please refer to Chapter 2 of *Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives* (Allen-Bradley Publication No. DRIVES-IN001…).

General Grounding Requirements

The Safety Ground Terminal (PE) must be connected to the building grounding scheme. Ground impedance must conform to the requirements of national and local industrial safety regulations and/or electrical codes. The integrity of all ground connections should be periodically checked.

For installations within a cabinet, a single safety ground point or ground bus bar connected directly to building steel should be used. All circuits including the AC input ground conductor should be grounded independently and directly to this point or bus bar. Figure 1.3 shows a typical grounding scheme.

Figure 1.3 Typical Grounding Scheme



Safety Ground Terminal – PE: The DC SCR Precharge Module safety ground (PE) must be connected to the customer grounding scheme or earth ground. This is the safety ground for the DC SCR Precharge Module that is required by code. This point must be connected to adjacent building steel

(girder, joist), a floor ground rod, bus bar or building ground grid. Grounding points must comply with national and local industrial safety regulations and/or electrical codes.

Fuses

The DC SCR Precharge Module is designed for internal application inside the drive(s) enclosure. The customer may install the external DC bus fuses if the fuse protection does not exist inside the drive. National and local industrial safety regulations and/or electrical codes may determine additional requirements for these installations.

Minimum Capacitance

To operate and test the module, at least one drive must be connected at the power terminals "+DCin" and "+DCout" to provide a minimum DC bus capacitance (470 microfarads). One 7.5 kW (10 HP) PowerFlex® 700H or PowerFlex 700S drive provides the required minimum capacitance.

Important: If the drive (inverter) is disconnected from the DC bus, the DC SCR Precharge Module internal fault detection circuit will not interpret the condition as a "Precharge Not Completed" and will not stop gating the SCR.

Maximum Loading

To avoid overloading the DC SCR Precharge Module, the following requirements apply:

- The DC input current sum (Normal Duty rating at 50°C/122°F) of the connected drive(s) must not exceed the continuous DC bus output current rating of the DC SCR Precharge Module at 50°C/122°F.
- Multiple drives may be connected as long as the maximum current rating is not exceeded.

For the DC input current values of the drives (PowerFlex 700H, PowerFlex 700S or 1336 PLUS™ II), please refer to tables in Appendix A of their respective User Manuals.

Table 1.A shows examples for maximum loading of the DC SCR Precharge Module when it is used for PowerFlex 700H or PowerFlex 700S drive applications.

Table 1.A Maximum Loading when Used with PowerFlex 700H/700S Drive(s)

DC Input Rating of Connected Drive(s)			DC SCR Precharge Module		Drive(s)	
700H/700S Frame Size	Normal Duty Input DC Amps	Input DC Voltage	Rated Cont. DC Amps	Part Number	Normal Duty Output AC Amps	Output AC Volts
10	490A	650V	500A	370696	460A	460V
11	690A	650V	750A	370711	650A	460V
12	870A	650V	1000A	370715	820A	460V
13	1507A	650V	1600A	370707	1421A	460V

Power Wiring

ATTENTION: National Codes and standards (NEC, VDE, BSI, etc.) and local codes outline provisions for safely installing electrical equipment. Installation must comply with specifications regarding wire types, conductor sizes, and disconnect devices. Failure to do so may result in personal injury and/or equipment damage.

Cable Trays and Conduit

If cable trays or large conduits are to be used, please refer to guidelines presented in *Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives* (Publication No. DRIVES-IN001…).

ATTENTION: To avoid a possible shock hazard caused by induced voltages, unused wires in the conduit must be grounded at both ends. For the same reason, if a drive sharing a conduit is being serviced or installed, all drives using this conduit must be disabled. This will help minimize the possible shock hazard from “cross-coupled” motor leads. Failure to observe these precautions could result in bodily injury.

General Notes

- The DC bus cable to the drive(s) should be kept as short as possible to avoid electromagnetic emission and capacitive currents. Therefore, the drive should be located in the same cabinet or next to the cabinet with the DC SCR Precharge Module. If the connection leads between the DC bus and drive are leaving the cabinet, shielded cables must be used.
- Conformity of the drive with CE EMC requirements does not guarantee that an entire machine installation complies with CE EMC requirements. Many factors can influence total machine/installation compliance.

Power Connection for 500A and 750A DC SCR Precharge Modules

Figure 1.4 shows typical locations of bus bars and terminals on 500A and 750A DC SCR Precharge Modules for customer wiring.

Figure 1.4 Bus Bar and Terminal Locations for Wiring 500A and 750A Modules

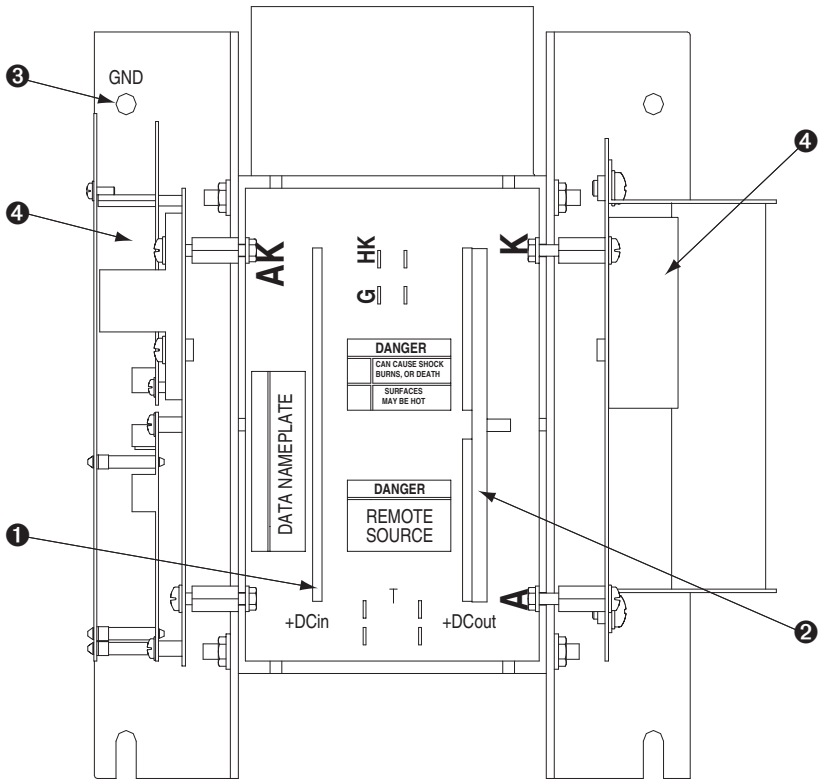


Table 1.B Power Connection Specifications for 500A and 750A Modules

Item	Name	Amps	Bus Bars [1]	Holes
❶	DC Bus +DCin	500	50mm x 5mm (1.968 x 0.197 in.)	6 x 10mm (0.393 in.)
		750	50mm x 5mm (1.968 x 0.197 in.)	6 x 10mm (0.393 in.)
❷	DC Bus +DCout	500	50mm x 13mm (1.968 x 0.512 in.)	4 x 10mm (0.393 in.)
		750	50mm x 13mm (1.968 x 0.512 in.)	4 x 10mm (0.393 in.)
❸	Protective Earth (GND)	500	Bolt M10 x 25mm (0.984 in.)	Torque 10Nm (88 lb-in.)
		750	Bolt M10 x 25mm (0.984 in.)	Torque 10Nm (88 lb-in.)
❹	Control Terminal Blocks	Refer to Table 1.D on page 1-8.		

[1] Input/output power bus bar connections require the use of either lug-type connectors to terminate field-installed conductors or bus bars.

Power Connection for 1000A and 1600A DC SCR Precharge Modules

Figure 1.5 shows typical locations of bus bars and terminals on 1000A and 1600A DC SCR Precharge Modules for customer wiring.

Figure 1.5 Bus Bar and Terminal Locations for Wiring 1000A and 1600A Modules

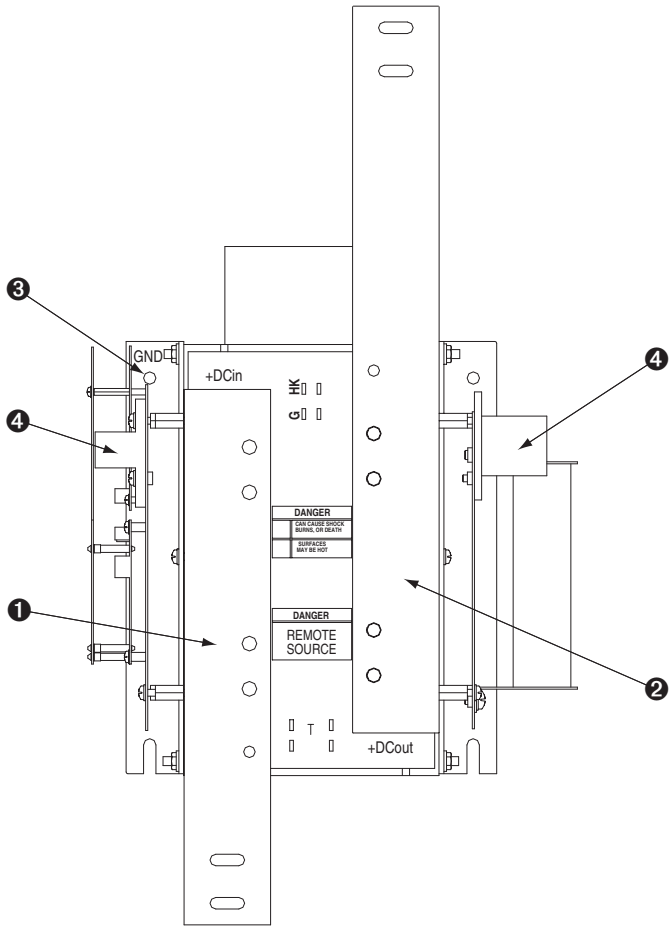


Table 1.C Power Connection Specifications for 1000A and 1600A Modules

Item	Name	Amps	Bus Bars [1]	Holes
❶	DC Bus +DCin	1000	76.2mm x 12.7mm (3.0 x 0.5 in.) 4 holes x 12.7mm (0.5 in.)	2 slots: 10mm x 20mm (0.4 x 0.8 in.)
		1600	76.2mm x 12.7mm (3.0 x 0.5 in.) 4 holes x 12.7mm (0.5 in.)	2 slots: 10mm x 20mm (0.4 x 0.8 in.)
❷	DC Bus +DCout	1000	76.2mm x 12.7mm (3.0 x 0.5 in.) 4 holes x 12.7mm (0.5 in.)	2 slots: 10mm x 20mm (0.4 x 0.8 in.)
		1600	76.2mm x 12.7mm (3.0 x 0.5 in.) 4 holes x 12.7mm (0.5 in.)	2 slots: 10mm x 20mm (0.4 x 0.8 in.)
❸	Protective Earth (GND)	1000	Bolt M10 x 25mm (0.984 in.)	Torque 10Nm (88 lb-in.)
		1600	Bolt M10 x 25mm (0.984 in.)	Torque 10Nm (88 lb-in.)
❹	Control Terminal Blocks	Refer to Table 1.D on page 1-8.		

[1] Input/output power bus bar connections require the use of either lug-type connectors to terminate field-installed conductors or bus bars.

Control Wiring and Terminals

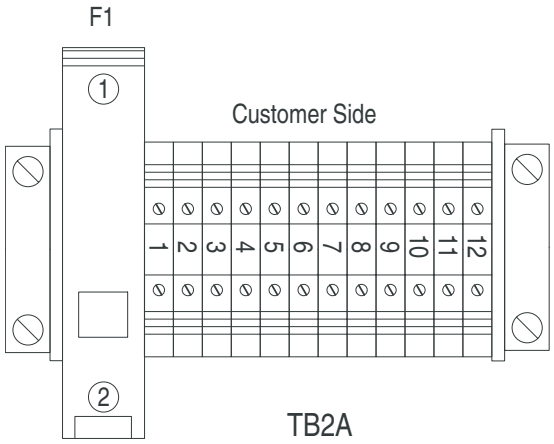
Terminal blocks TB1A and TB2A contain connection points for control wiring of the DC SCR Precharge Module.

Table 1.D Control Terminal Specifications for TB1A and TB2A

Name	Wire Size Range (1)		Torque
	Maximum	Minimum	
Control Terminal Blocks	2.5 sq. mm (14 AWG)	0.25 sq. mm (22 AWG)	0.8 Nm (7 lb.-in.)

(1) Maximum/minimum sizes that the terminals will accept – these are not recommendations.

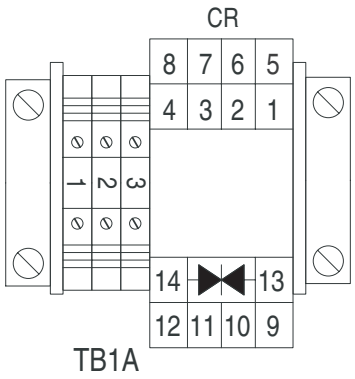
Figure 1.6 Control Terminal Block TB2A (located on precharge control board)



Terminal No.	Wiring	Description	Polarity	Notes
1	Customer-supplied	120 VAC or 24 VDC Input	Phase	For interlocking with input system power. See Start-Up on page 2-2 for voltage selection.
2			Neutral	
3	Customer-supplied	120 VAC	Phase	For supplying 120 VAC power to a cooling fan
4			Neutral	
5	Customer-supplied	120 VAC	Phase	From external Normally Open contact that energizes the Precharge Control Relay “CR”
6	Customer-supplied	Normally Open contact (1)	—	Output contacts from the Precharge Control Relay “CR”
7				
8	—	Normally Closed contact (1)	—	Output contacts from the Precharge Control Relay CR - “Precharge Enable”
9	Customer-supplied	Normally Closed contact (1)	—	Thermo switch’s contacts that open if the Power Module has over-temperature failure
10				
11	—	—	—	Spare
12	Customer-supplied	Ground (GND)	GND	Ground for a cooling fan

(1) Refer to Appendix A for contact rating.

Figure 1.7 Control Terminal Block TB1A (located on precharge control board)



Terminal No.	Wiring	Description	Notes
1	—	+DCin (1) (2)	+DC (positive) Bus Input Power
2	—	-DC (1) (3)	-DC (negative) Bus Power
3	—	+DCout (1) (2)	+DC (positive) Bus Output Power

(1) Refer to Appendix A for contact rating.

(2) Terminal TB1A-1 is supplied jumpered to +DCin, and TB1A-2 is supplied jumpered to +DCout. Wiring to these terminals by the user is not required.

(3) Terminal TB1A-2 must be wired to -DC of the drive by the user.

Control Wiring Requirements

Important points about control wiring:

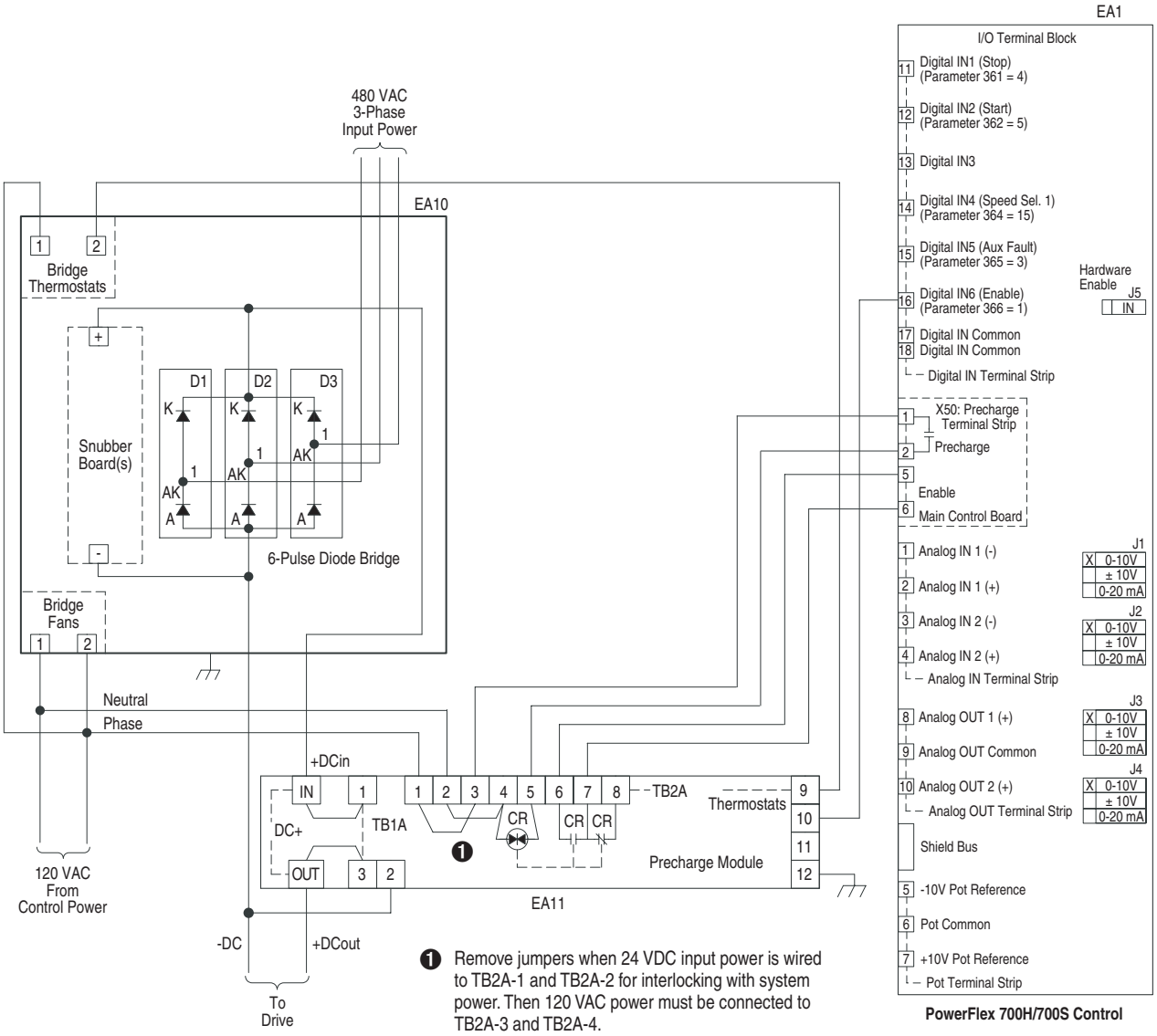
- Use Tinned-Copper wire only. Wire gauge requirements and recommendations are based on 75°C (168°F). Do not reduce wire gauge when using higher temperature wire.
- Wire with an insulation rating of 600V or greater is recommended.
- Control wires outside the cabinet should be separated from power wires by at least 0.3 meters (1 foot).

Drive Run Interlock

To protect the DC SCR Precharge Module from over-temperature failure, the normally closed contacts of the thermo-switches on the DC SCR Precharge Module should be wired to the Drive Run interlock circuit (“Enable Input” or “Auxiliary Input”). This will ensure that the drive(s) are stopped if a DC SCR Precharge Module over-temperature failure occurs.

Typical Power and Control Wiring Examples

Figure 1.8 Typical Power and Control Wiring of DC SCR Precharge Module for PowerFlex 700H/700S Drive Applications

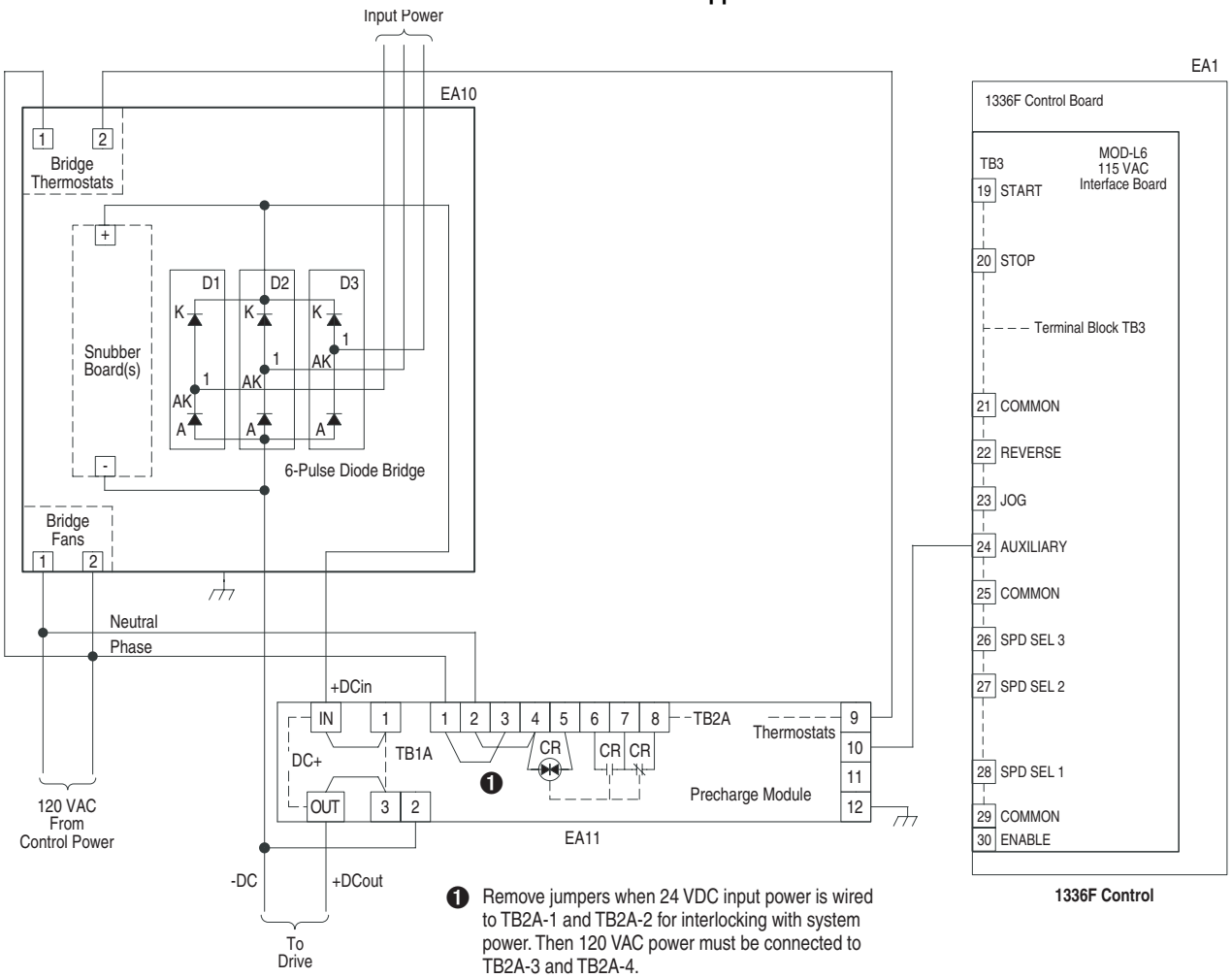


A2 Precharge Board Jumper Settings

(W1) JMP1			(W2) JMP2			(W3) JMP3		
24 VDC	1-2		INTLK	1-2	X	NORMAL	1-2	X
120 VAC	2-3	X	BYPASS	2-3		BYPASS	2-3	

For jumper locations, see Figure 2.1.

Figure 1.9 Typical Power and Control Wiring of DC SCR Precharge Module for 1336 PLUS II Drive Applications



❶ Remove jumpers when 24 VDC input power is wired to TB2A-1 and TB2A-2 for interlocking with system power. Then 120 VAC power must be connected to TB2A-3 and TB2A-4.

A2 Precharge Board Jumper Settings

(W1) JMP1			(W2) JMP2			(W3) JMP3		
24 VDC	1-2		INTLK	1-2		NORMAL	1-2	
120 VAC	2-3	X	BYPASS	2-3	X	BYPASS	2-3	X

For jumper locations, see Figure 2.1.

Notes:

Start-Up / Troubleshooting

This chapter describes how to start up the DC SCR Precharge Module and provides basic troubleshooting information.

ATTENTION: To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged before removing the connection. Measure the DC bus voltage at the "+DCin" and "+DCout" terminals of the Power Module, and at the "+DCin," "+DCout," and "-DC" terminals of terminal block TB1A. The voltage must be zero.

ATTENTION: Power must be applied to the DC SCR Precharge Module and the drive to perform the following start-up procedure. Some of the voltages present are at incoming line potential. To avoid electric shock hazard or damage to equipment, only qualified service personnel should perform the following procedure. Thoroughly read and understand the procedure before beginning. If an event does not occur while performing this procedure, **do not proceed**. **Remove power** including user-supplied control voltages. User-supplied voltages may exist even when main DC power is not applied to the DC SCR Precharge Module. Correct the malfunction before continuing.

ATTENTION: There is a second source of power used for the cooling fan. To avoid an electric shock hazard or moving blades, verify that the AC-power supply has been removed before performing any maintenance or repairs.

Start-Up

Before Applying Power to the DC SCR Precharge Module

❑ **1.** Verify that a minimum of one drive is connected to the DC bus. See Minimum Capacitance on page 1-4 for details.

❑ **2.** Verify that all inputs are connected to the correct terminals and are properly torqued.

❑ **3.** Using an ohmmeter or other continuity testing device, verify that shorts do not exist between the "+DCin," "+DCout," and "-DC" terminals.

❑ **4.** Verify that AC line power at the disconnect device is within the rated value of the DC SCR Precharge Module. See Appendix A for product electrical specification.

❑ **5.** Verify that control power voltage is correct.

❑ **6.** Verify that the enable precharge relay coil "CR" is correctly wired.

❑ **7.** Verify that these two outputs are correctly wired:

- DC SCR Precharge Overtemperature (TB2-9 and TB2-10)
- Precharge Enable (TB2-6 and TB2-7)

These NC (normally closed) and NO (normally open) contacts are used to set alarms and to stop the drive(s). Verify that they have been wired correctly according to the user's specification. Refer to Figure 1.8 on page 1-10 or Figure 1.9 on page 1-11.

❑ **8.** Verify that the "W1", "W2," and "W3" jumpers on the Precharge Control Board A2 are set to the positions shown in Table 2.A.

Jumper	Function
W1	System control voltage selection
W2	Interlock enable/bypass
W3	Handshake normal/bypass

Table 2.A A2 Precharge Board Jumper Settings

(W1) JMP1			(W2) JMP2			(W3) JMP3		
For PowerFlex 700H/700S Drive Applications								
24 VDC	1-2		INTLK	1-2	X	NORMAL	1-2	X
120 VAC	2-3	X	BYPASS	2-3		BYPASS	2-3	
For 1336 PLUS II Drive Applications								
24 VDC	1-2		INTLK	1-2		NORMAL	1-2	
120 VAC	2-3	X	BYPASS	2-3	X	BYPASS	2-3	X

❑ **9.** Verify that the jumpers between control terminals TB2A-1 and TB2A-3, and TB2A-2 and TB2A-4 are present.

Important: When supplying 24 VDC control power, these jumpers must be removed from the terminals on TB2A, and 120 VAC power must be wired to terminals TB2A-3 and TB2A-4.

Applying AC Power to the Drive with the DC SCR Precharge Module

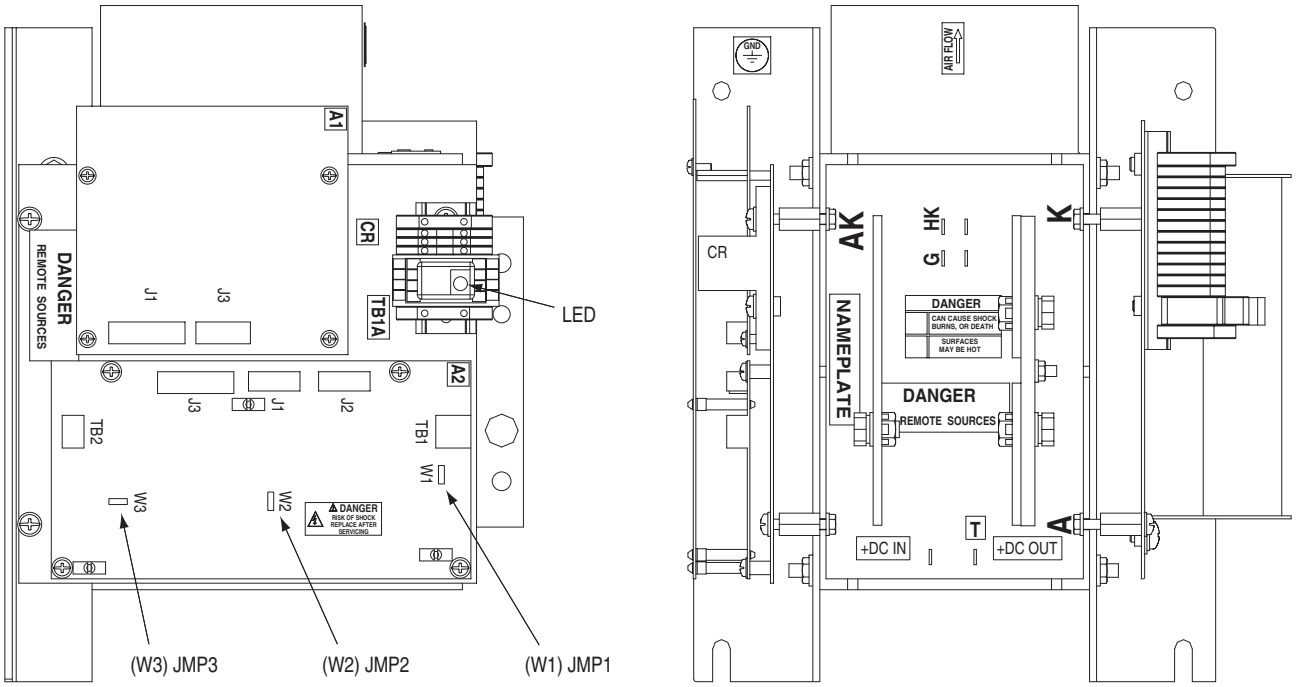
❑ **10.** Apply AC power and control voltage (115 VAC) to the DC SCR Precharge Module. The green LED on the Precharge Control Relay CR should be on if the drive control logic completes precharge and the SCR control starts gating the SCR power module.

❑ **11.** If the green LED on the Precharge Relay CR is not on at this point, disconnect incoming power and refer to Table 2.B for troubleshooting.

Precharge Control Relay CR LED Indicator

The DC SCR Precharge LED (Figure 2.1) on the Precharge Control Relay CR is visible from the board's side of the Module, depending on the position of the Module. The Precharge Control Relay CR is mounted on the terminal block TB1. When the LED is lit solid green, it indicates that the DC SCR Precharge Module is gating properly and the precharge sequence is complete.

Figure 2.1 Location of LED on the Precharge Control Relay CR and W* Jumpers



ATTENTION: The DC SCR Precharge Module is only operational when the unit is energized. Servicing energized equipment can be hazardous. Severe injury or death can result from electrical shock, burn, or unintended actuation of the controlled equipment. Follow safety-related practices of NFPA 70E, ELECTRICAL SAFETY FOR EMPLOYEE WORKPLACES. DO NOT work alone on energized equipment!

Troubleshooting

Table 2.B provides information for troubleshooting the DC SCR Precharge Module.

Table 2.B Possible Symptoms and Corrective Actions

Symptom	Cause/Indication	Corrective Action
DC output voltage loss	DC bus: • Short circuit or • Low line	1. Check 3-phase AC incoming power for undervoltage or phase loss. 2. Check the protection Precharge fuse F1. 3. After precharge is completed, verify that the values of the "+DCin" and "+DCout" voltages are within 1 volt. 4. Contact your local RA Sales Office.
	Loss of 120 VAC or 24 VDC supply voltage	1. Verify 120 VAC or 24 VDC supply input voltage is present at control terminals TB2A-1 and TB2A-2. 2. Enable the contactor function. 3. Contact your local RA Sales Office.
Heat sink overtemperature (contacts TB2A-9 and TB2A-10 have opened)	Heat sink temperature exceeds maximum rating	1. Verify that the maximum ambient temperature has not been exceeded. 2. Check Overtemperature Switch "T" at control terminals TB2A-9 and TB2A-10 that has normally closed contacts. 3. Verify 120 VAC supply input voltage at control terminals TB2A-3 and TB2A-4. 4. Verify fan for correct operation. Airflow should be outward from the unit. 5. Check for excess load on the DC SCR Precharge Module. 6. Check for proper spacing around the DC SCR Precharge Module. 7. Contact your local RA Sales Office.

Specifications and Dimensions

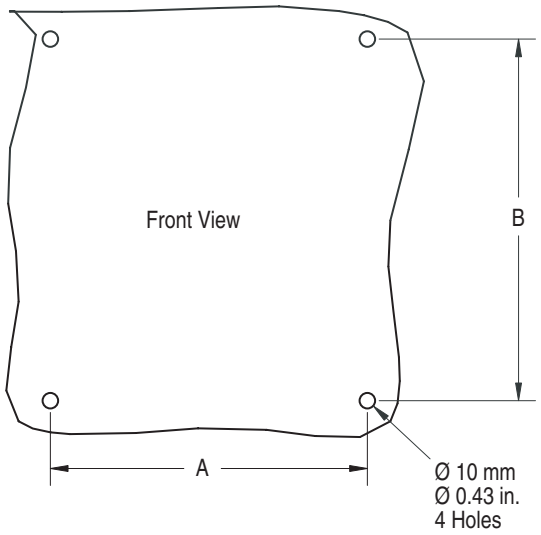
Specifications

Category	Specification	
Environment	Ambient Operating Temperature: IP00, Open:	 0 to 50°C (32 to 122°F)
	Storage Temperature:	–40 to 70°C (–40 to 158°F)
	Atmosphere:	**Important:** The DC SCR Precharge Module **must not** be installed in an area where the ambient atmosphere contains volatile or corrosive gas, vapors or dust. If the Module is not going to be installed for a period of time, it must be stored in an area where it will not be exposed to a corrosive atmosphere.
	Relative Humidity:	5 to 95% non-condensing
	Altitude:	1000 m (3300 ft.) without derating
	Shock:	15G peak for 11 ms duration (±1.0 ms)
	Vibration:	0.152 mm (0.006 in.) displacement, 1G peak
Application	Packaging:	Internal (inside enclosure only)
Electrical	DC Bus Voltage for: 400 VAC Input Voltage: 480 VAC Input Voltage:	Nominal / Maximum 540V / 810V 650V / 810V
	DC Bus Current:	500A-1600A
	Overload Capability: Continuous Amps: 3 Seconds Every Minute:	 100% 150%
	Efficiency:	99.5% typical at rated current
	Control Inputs: Control Relay CR Coil: Fan Current Consumption:	 Single-phase 120 VAC, 30 VA (pick-up), 4.5 VA (hold) Single-phase 120 VAC ±10%, 50/60 Hz, 1A
	Control Outputs: Heatsink Temperature Sensor with NC Contact: Control Relay CR with NO and NC Contacts:	 Trip Temperature: 100°C Resistive Rating: 15A at 125 VAC, 10A at 250 VAC, 7A at 24 VDC Inductive Rating: 10A at 125 VAC, 6A at 250 VAC Resistive Rating: 7A at 24-277 VAC, 7A at 30 VDC Inductive Rating: 15A at 120 VAC, 7.5A at 240 VAC
Cooling	Forced Ventilation: 500A and 750A Modules: 1000A and 1600A Modules:	 7.447 cub. m/min (263 CFM) 17.18 cub. m/min (607 CFM)
Compliance	UL Recognized to:	UL508C and CAN/CSA-C22.2

Dimensions

Figure A.1 shows the recommended dimensions for panel mounting the DC SCR Precharge Module.

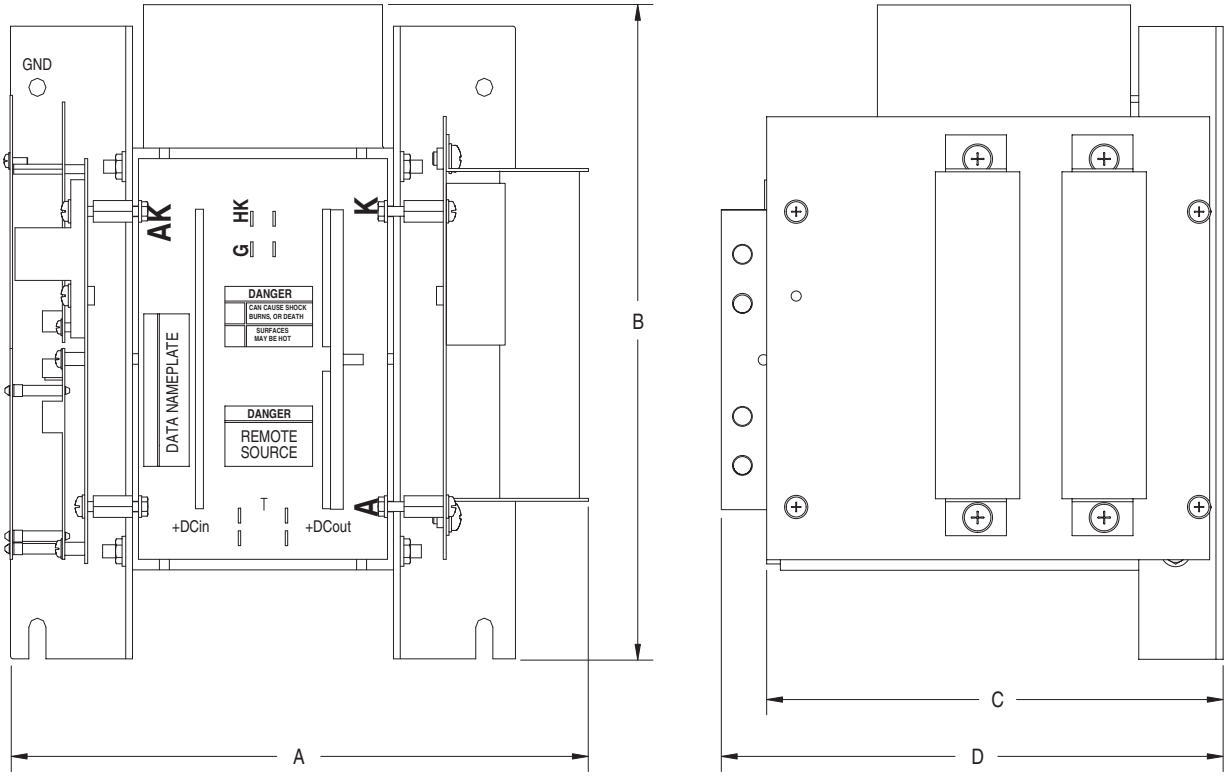
Figure A.1 DC SCR Precharge Module Panel Mounting Dimensions



Precharge Module DC Rating	Dimensions		Weight
	A	B	
500A	285 mm (11.22 in.)	325 mm (12.8 in.)	17 kg (37 lbs.)
750A	285 mm (11.22 in.)	325 mm (12.8 in.)	17 kg (37 lbs.)
1000A	285 mm (11.22 in.)	325 mm (12.8 in.)	29 kg (64 lbs.)
1600A	285 mm (11.22 in.)	325 mm (12.8 in.)	29 kg (64 lbs.)

Figure A.2 and Figure A.3 show the overall dimensions for the DC SCR Precharge Modules.

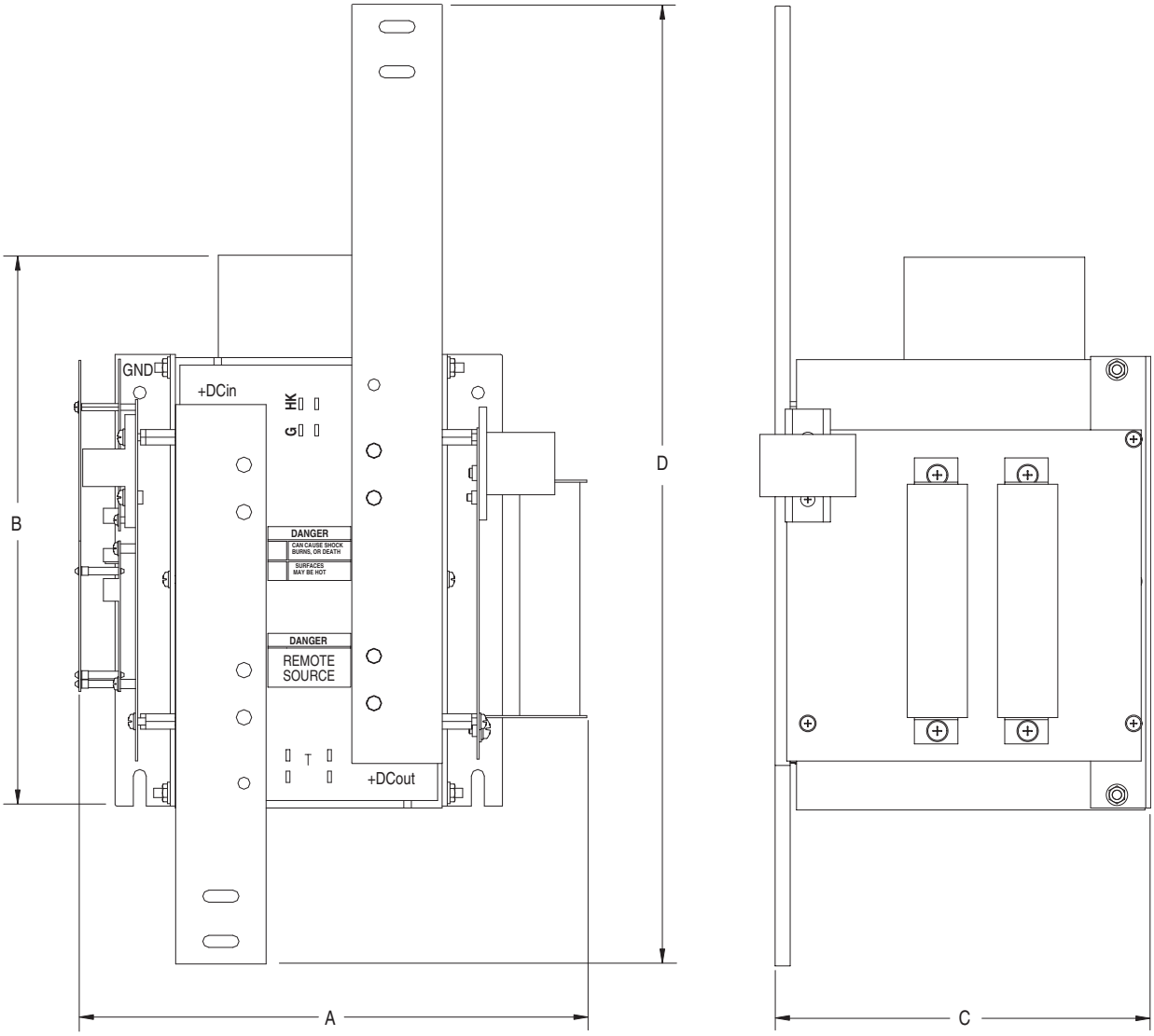
Figure A.2 Overall Dimensions for 500A and 750A Precharge Modules



Front View **Side View**

Precharge Module DC Rating	Dimensions			
	A	B	C	D
500A	369 mm (14.5 in.)	394 mm (15.5 in.)	275 mm (10.8 in.)	302 mm (11.9 in.)
750A	369 mm (14.5 in.)	394 mm (15.5 in.)	275 mm (10.8 in.)	302 mm (11.9 in.)

Figure A.3 Overall Dimensions for 1000A and 1600A Precharge Modules



Front View **Side View**

Precharge Module DC Rating	Dimensions			
	A	**B**	**C**	**D**
1000A	428 mm (16.8 in.)	465 mm (18.3 in.)	317 mm (12.5 in.)	810 mm (31.9 in.)
1600A	428 mm (16.8 in.)	465 mm (18.3 in.)	317 mm (12.5 in.)	810 mm (31.9 in.)

S

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Publication DRIVES-UM002A-EN-P – March, 2006