



PC2000B

Phase Control

The Power-Tronics PC2000B Phase control is a self-contained complete Phase control designed for continuous operation at up to 210vdc at 200adc!

The PC2000B is uniquely designed to sit in a compact footprint while being passively convection cooled for a long service life. Because of its unique modular design, the PC2000B minimizes downtime should a repair ever be necessary! All serviceable parts are easily removable without the need to remove the chassis from the mounting cabinet or tray. The compact design allows a wide variety of installation methods, including installations where space is at a premium.

Over 25 years of field use and design refinement makes the PC2000B a time-proven design, utilizing high-reliability components, and a unique modular design to simplify repair. The PC2000B is designed to provide a lifetime of service and is specifically built to minimize failures and potential downtime!

The PCMPC-B control module includes an internal 0-10VDC or 4-20mA interface module to allow a wide variety of VAR, PF, or other PLC controls to remotely control the unit. An optional motorized potentiometer allows remote operation by dry contact switching or older pulsed-DC control schemes.

The PC2000B Phase control is the latest upgrade to the PC2000B series of phase controls and replaces all previous Power-Tronics PC2000B and PC2000BX Phase controls!

Specifications

Input Voltage:	208 - 240vac
Frequency:	50 or 60 Hz
Control Range:	0-100%
Output Voltage Range:	0-210vdc @ 240vac input
Maximum Output Voltage:	210vdc @ 200adc
Minimum Field Resistance:	1.05Ω @ 210vdc output
Physical Size:	15 x 20.5 x 7 in.
Weight:	22 lb.
Integrated Control Module:	PCMPC-B
Repairable:	Yes
Internal Protection:	Fuses, cartridge type
External Voltage Adjustment:	Yes
System Operating Indicator:	Yes
Optional External Controls	Yes
Integrated 0-10VDC / 4-20mA Interface:	Yes



Table of Contents

Introduction and Functional Description:	3
Determining Application Sizing:	4
Included Parts & Accessories:	6
Mounting Dimensions & Chassis Ground:	7
Input Power & Field Connection Diagram:	8
PCMPC-B Control Module:	9
Standard Control Wiring Diagram:	10
Fully Automatic Remote Adjustment Wiring Diagram:	11
Automatic / Manual Selectable Remote Adjustment Wiring Diagram:	12
Initial Setup and Commissioning:	13
Bench Check Procedures:	14
Installation Warranty Form:	15
Product Warranty Certificate:	16



Introduction and Functional Description

Caution: Read This Installation Manual Carefully and Entirely!

Warning: Do not use digital equipment to read voltage, Hz, or amperage during this installation. Use only Analog sensing equipment! Failure to do so may result in damage to equipment or in personal injury!

ALWAYS perform all setup procedures off-line

ALWAYS wear eye protection

ALWAYS strip wire insulation properly or use insulated connectors

ALWAYS use analog metering equipment when setting the unit up

ALWAYS ensure the phase control receives ample airflow

ALWAYS use adequate fusing

NEVER hold the phase control in your hand or lap when energized

NEVER install the phase control in a place it can be exposed to the elements or moisture

NEVER mount the phase control over a screw, bolt, rivet, seam, or other fastener

NEVER remove the regulator cover while the unit is in operation

NEVER insert a screwdriver or other object under the regulator cover

NEVER touch any exposed part of the PC2000B during operation (**LIVE HEATSINKS**)

NEVER install a switch in the DC portion of the phase control's wiring

NEVER USE A DIGITAL FREQUENCY METER (*It can give a false reading!*)

Functional Description

The PC2000B Phase Control is the result of over 20 years of engineering efforts and offers high-demand features at a competitive price point. The PC2000B is a proven design and is engineered to greatly simplify setup while offering extreme reliability. When properly installed, the PC2000B Phase Control is designed to provide a lifetime of service.

An automatic phase control has several automated tasks it must perform in order to provide reliable, clean, and regulated electricity. It must maintain a preset setpoint and protect both itself and the connected load should a fault situation arise.

The PC2000B uses field-replaceable cartridge fuses to protect its internal circuitry should a fault occur and the load current exceeds what the phase control is capable of delivering. It also contains reliable circuitry that is designed to maintain a setpoint regardless of outside influences or ambient temperature.

Due to its extreme simplicity, the PC2000B Phase Control is uncommonly reliable and offers features and accuracy usually only offered by much more complicated and often much more expensive phase controls.



Determining Correct Application Sizing

The PC2000B Phase control is designed for use with 208-240VAC input. It contains internal suppression for use with brush-type loads such as synchronous motors. Before installation, it is necessary to verify that the PC2000B is the correct product for your application.

To determine if the PC2000B is the correct product for your load you need to know any two of the following 3 specifications from the rating plate of your load:

- 1: Control Field Voltage (in DC Volts) [Generally given in full load Voltage on nameplates]
- 2: Control Field Resistance (in Ohms) **[See Note Below]**
- 3: Connected Load Amperage (in DC Amps) [Generally given in full load Amps on nameplates]

Using the specifications obtained from your connected load, verify that your load fits the specifications below:

- Connected load full load voltage is 125VDC or less, and your control field resistance is 1.05Ω or greater.
-



WARNING: BRUSH AND SLIP RING CONNECTION PROBLEMS ARE THE #1 SOURCE OF VOLTAGE CONTROL PROBLEMS AND FAILURE OF PHASE CONTROLS!!! DO NOT INSTALL THE PC2000B IF THE BRUSHES AND/OR SLIP RINGS ARE NOT IN EXCELLENT CONDITION!!!

STOP AND CORRECT BRUSH AND SLIP RING CONNECTION PROBLEMS IF ANY OF THE FOLLOWING CONDITIONS ARE PRESENT:

- GROOVES IN SLIP RINGS
- ROUGH SLIP RING APPEARANCE OR GHOSTING (CHATTERING)
- OIL CONTAMINATION ON BRUSHES OR SLIP RINGS
- DULL, ROUGH, STRIPED, PITTED, OR METALLIC APPEARANCE OF BRUSH FACES
- FIELD RESISTANCE MEASURED BETWEEN SLIP RING BRASS AND FIELD RESISTANCE MEASURED BETWEEN FIELD LEADS EXCEEDS 1-2% DIFFERENCE



Note about Field Resistance

When measuring field resistance on a brush-type device, such as a synchronous motor, measure the resistance through both the field leads as well as directly on the slip rings themselves.

The readings you obtain should ideally be the same, but *no more than 1% difference.*

If you show more than 1% difference in reading your device has brush and ring contact problems and will need cleaning or maintenance before installing the PC2000B.

Failure to correct brush and ring contact problems will result in severe damage to the phase control as well as possible PERMANENT damage to the slip rings themselves!

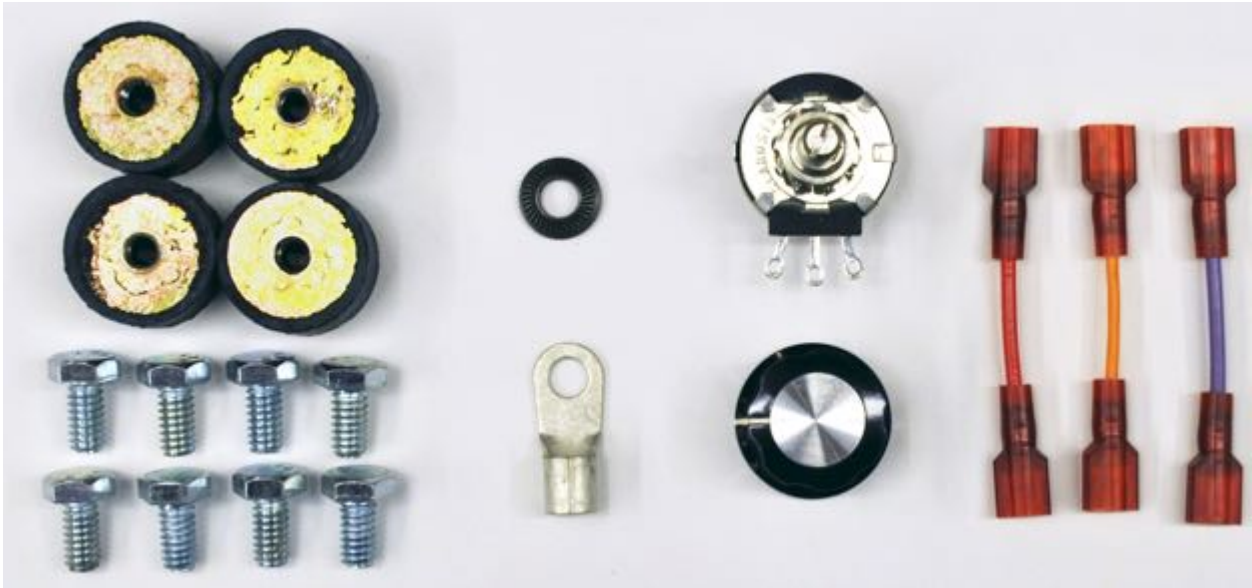
NEVER use emery cloth, carborundum stones, “comm sticks”, or Tuner cleaner to dress or clean slip rings!

They will make a bad problem much, much worse! Only use Garnet or Flint sandpaper and clean with a clean rag soaked with Acetone for best results!



Included Parts & Accessories

The PC2000B Static Exciter includes the following parts and accessories to ensure a quick and easy installation:

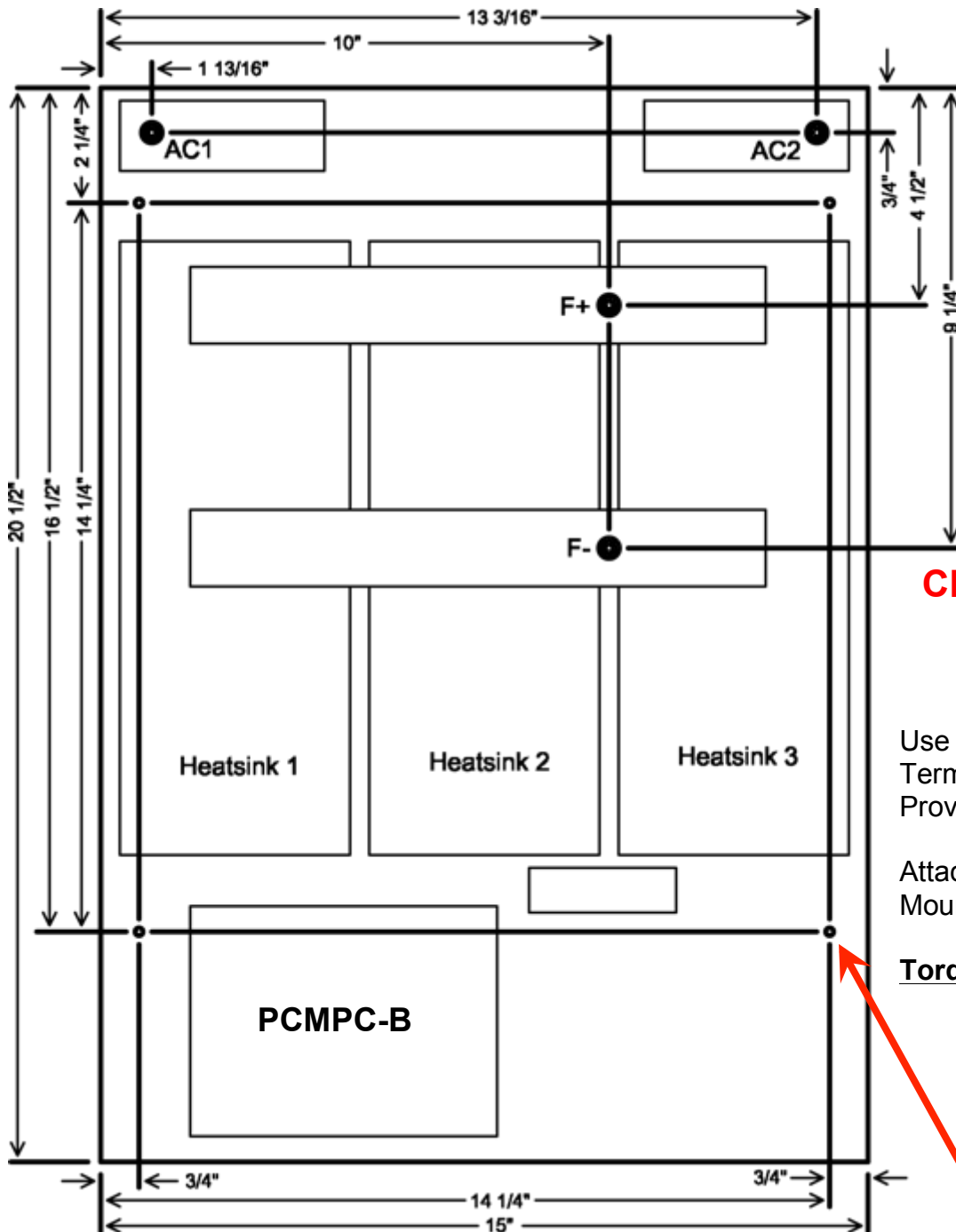


Included Parts List:

- | | |
|---|---------------|
| • Vibration Isolators | Qty: 4 |
| • 1/4-20 X 1/2" Bolts | Qty: 8 |
| • #8-6AWG Compression Terminal | Qty: 1 |
| • 1/4" Bellville Washer | Qty: 1 |
| • 100K 2W Long-Life Potentiometer: | Qty: 1 |
| • Panel Knob for Potentiometer: | Qty: 1 |
| • #22-18AWG .250 Female Terminals: | Qty: 4 |
| • Red Jumper Wire: | Qty: 1 |
| • Orange Jumper Wire: | Qty: 1 |
| • Purple Jumper Wire: | Qty: 1 |



Mounting Dimensions & Chassis Ground



**Chassis Should Be
Grounded
For Safety!!!**

Use Supplied Compression
Terminal And Bellville Washer
Provided In Accessories Kit

Attach to Bottom Right
Mounting Point.

Torque to 125 in•lbf (15N•M)





Input Power & Field Connection Diagram

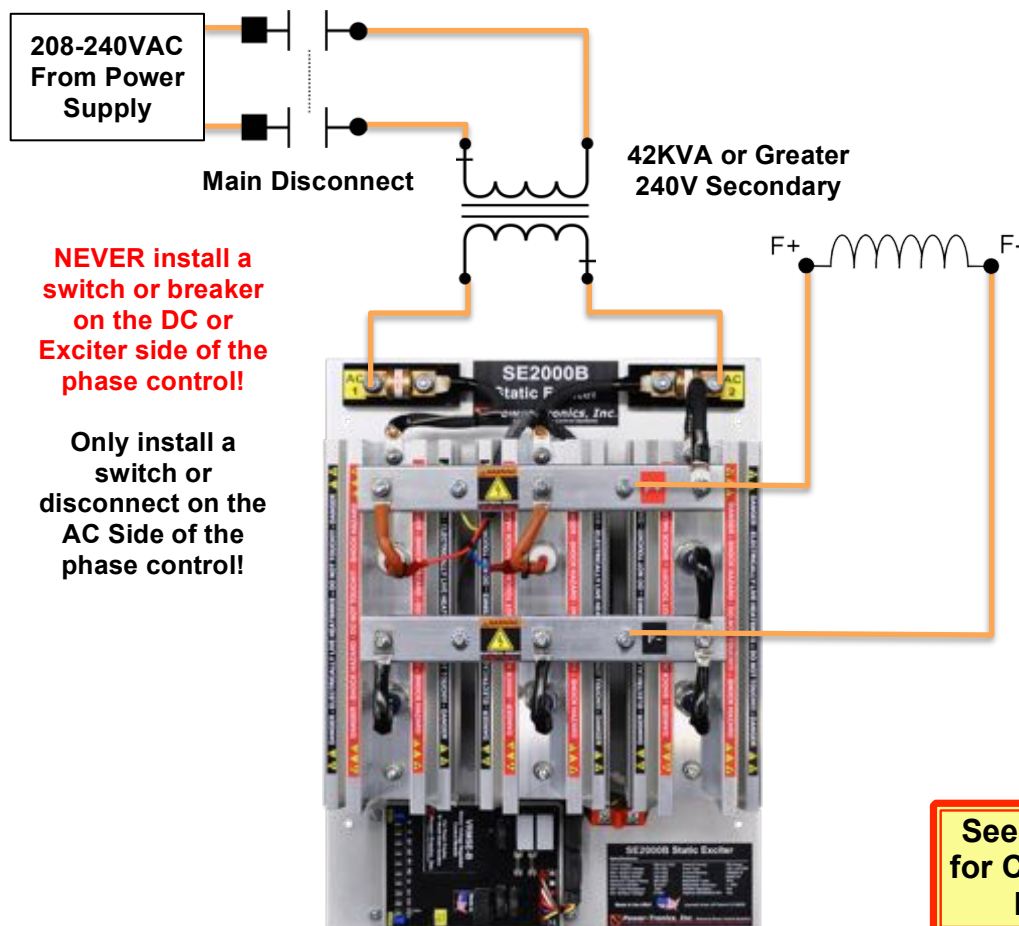
(See page 10 for control wiring information)

WARNING: The PC2000B Phase Control is NOT Suitable for use on Electrical Generators Without a Suitable Voltage Control Source!!!

The PC2000B is a Full-Wave rectified phase control, which allows a maximum of 210VDC at 200 ADC continuous with an input voltage of 240VAC.

This product is typically used on slip-ring synchronous motors or on inductive loads with full load control field voltages of 125VDC or less and full load exciter field amperage between 90 and 140ADC.

Note that the maximum input voltage to the PC2000B Phase control is 240VAC! DO NOT input 277VAC into the PC2000B! Severe damage to the unit will result! For use on 480V or higher systems, connect the PC2000B to an appropriate step-down transformer to supply 240VAC to the PC2000B.



NEVER install a switch or breaker on the DC or Exciter side of the phase control!

Only install a switch or disconnect on the AC Side of the phase control!

Torque All Terminal Connections to 125 in•lbf (15 N•M)

Diagram Assumes a 208-240V Input Voltage
For 480V Systems, use a 42KVA (or larger) Transformer with a 240V

NOTE:
Diagram shows an isolation transformer, which is recommended for ALL installations. An isolation transformer will save your bearings should the rotor ever short to ground!

See Pages 10-12 for Control Wiring Diagrams



PCMPC-B Control Module

The PCMPC-B Control Module is an integrated device designed to replace multiple discrete components in previous generations of Phase Controls. It incorporates a Phase Control Module, AC Input Filtering, and integrated 0-10VDC / 4-20mA Interface Module.

The unitary design simplifies installation in the field, and greatly simplifies replacement if a fault occurs with the control module. The unit has 5 color-coded wires with quick-connect terminals, and can be quickly swapped out in less than 5 minutes without the need to remove the chassis from its enclosure or tray.



Power
Status
Lamp

Manual Internal
Voltage Control
25 Turn Pot!

Base Voltage
Trim Control
25 Turn Pot!

Terminal Descriptions:

Colored Terminals:

Chassis Wiring (Color-Coded)

G1 & G2:

Gate Enable Pins
Short G1 & G2 To Operate
Switch or Relay Recommended
If No Switch, Install Red Jumper

R1 & R2:

Remote Adjustment Input

U- & U+:

Output From Internal Analog
Input Module

CV- & CV+:

Input for 0-10V or 4-20mA Signal



Standard Control Wiring Diagram

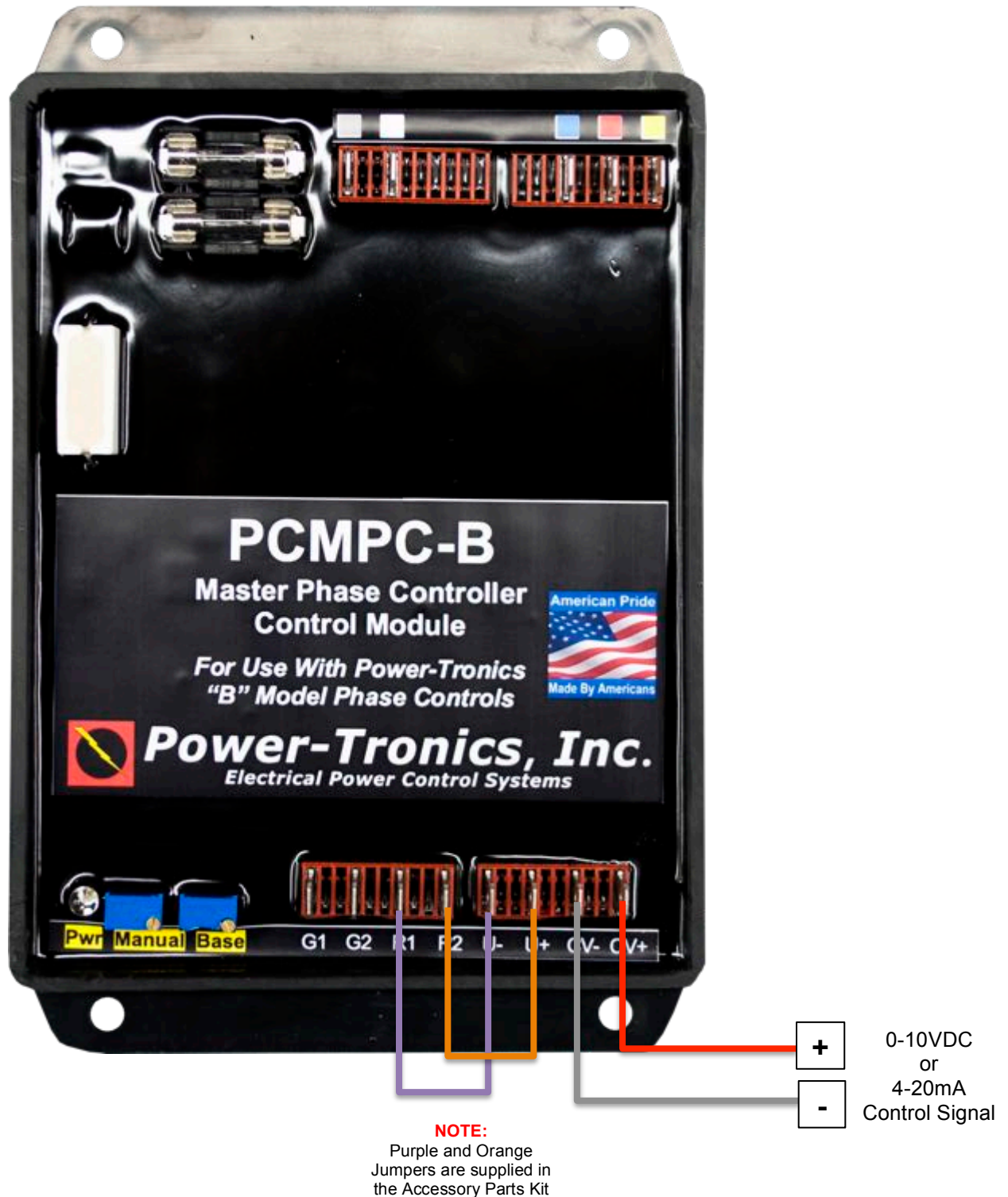
This wiring diagram shows the default control wiring configuration for the PC2000B and assumes manual control with a remote potentiometer. **Power wiring is shown on Page 8.**





Fully Automatic Remote Adjustment Wiring Diagram

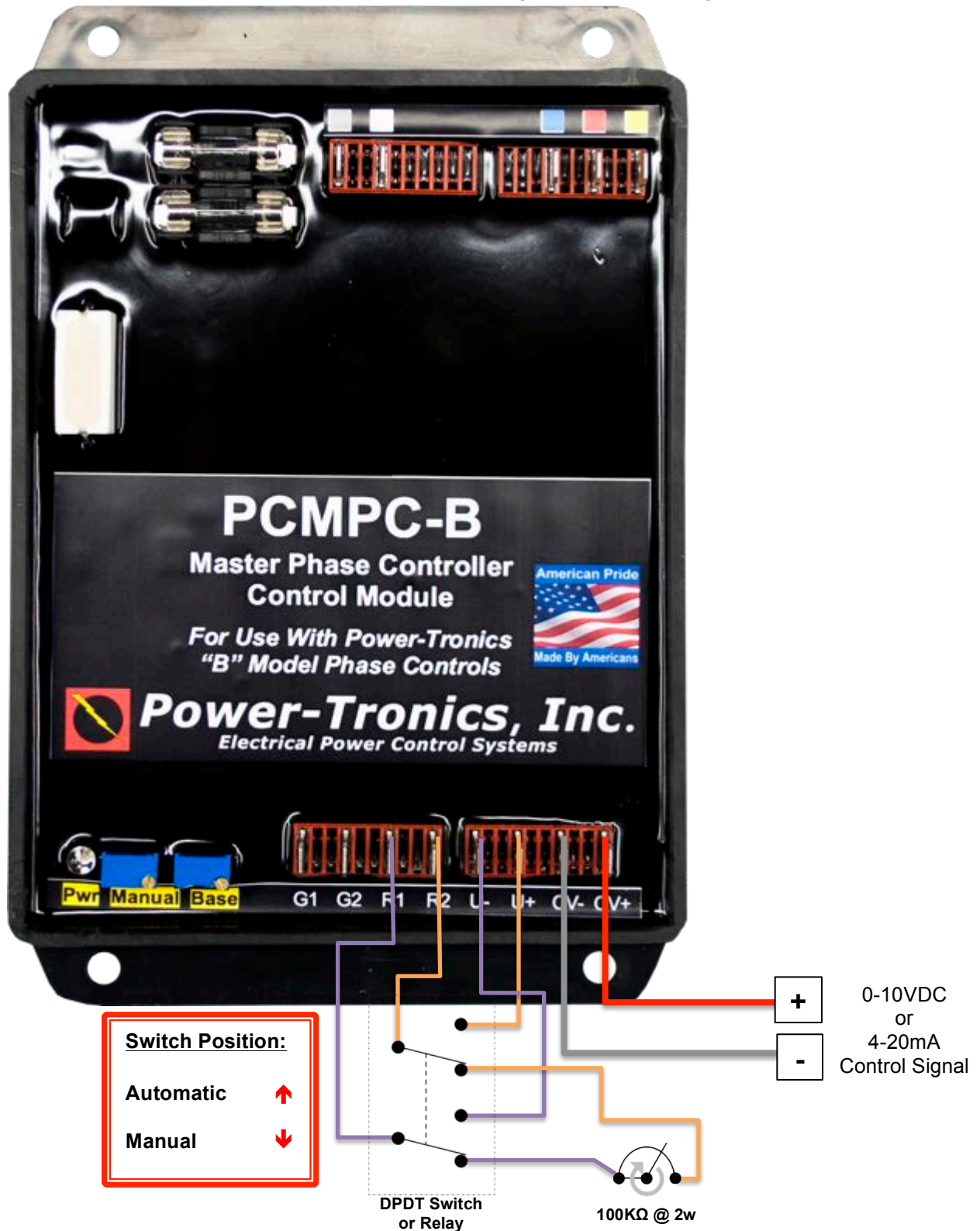
This wiring diagram shows ONLY the control wiring configuration for fully-automatic Remote Control of the PC2000B. **Control wiring is shown on Page 10.**





Automatic / Manual Selectable Remote Adjustment Wiring Diagram

This wiring diagram shows ONLY the control wiring configuration for selectable fully-automatic or manual Remote Control of the PC2000B. **Control wiring is shown on Page 10.**





Initial Setup and Commissioning

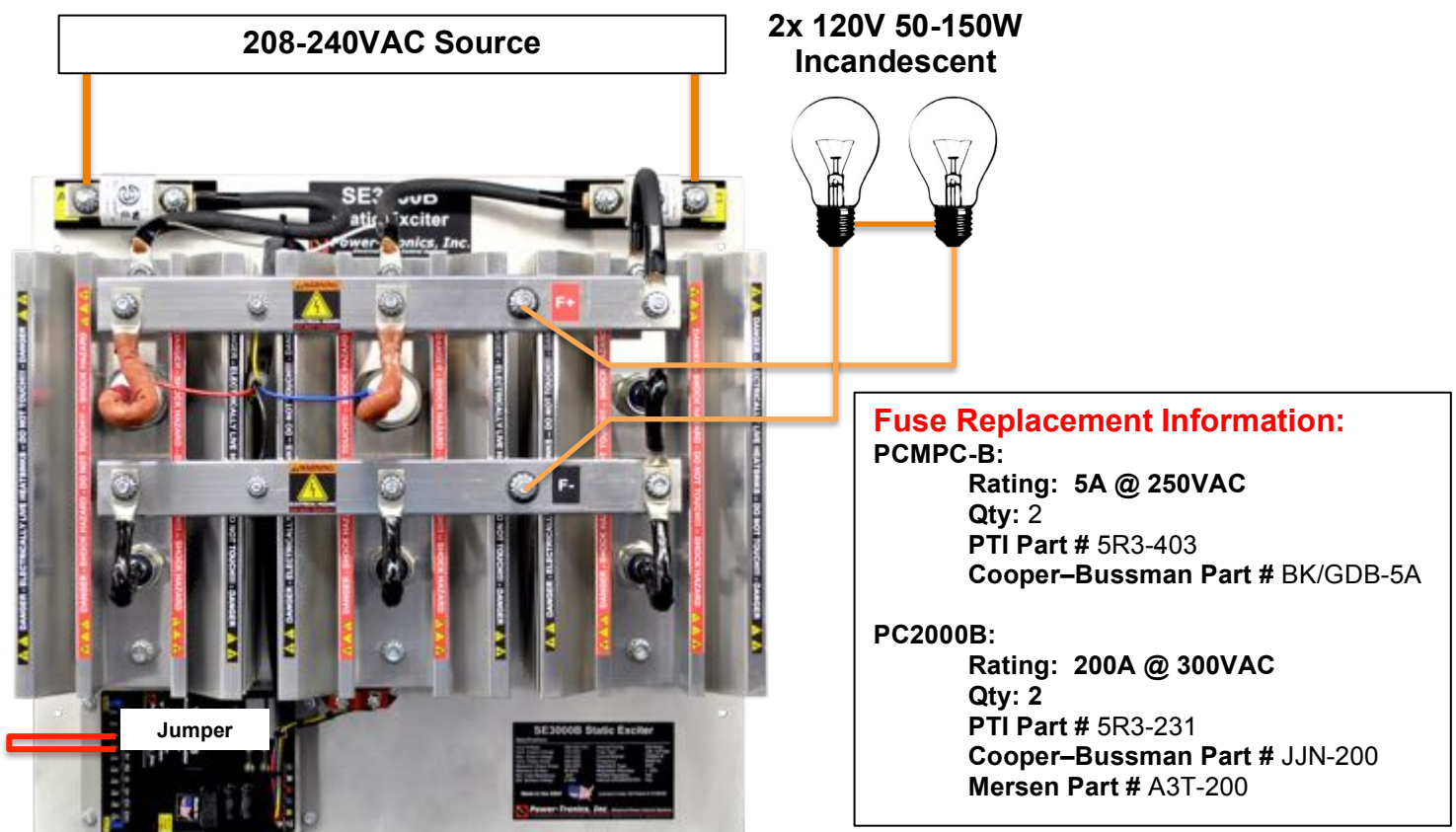
1. Install the PC2000B and wire according to the correct wiring diagram and control wiring diagram (**Pages 8-12**).
2. If installing the PC2000B on a load containing slip rings and brushes, verify that the brushes and brush riggings are isolated, ungrounded, and connected **ONLY** to the PC2000B.
3. Base Voltage and Manual Internal Voltage adjustments are preset from the factory for use with a remote adjustment potentiometer or the internal 0-10V interface module.
4. If you are using a remote voltage adjustment, set it at 0% of adjustment.
5. If you are using the PC2000B on a synchronous motor, bring the motor up to operating speed and turn on the phase control switch (if used).
6. If you are using an external voltage adjustment potentiometer or the internal 0-10V interface module, adjust the remote control until reaching the desired voltage setting for the connected load.
7. If you are using the PC2000B as a fixed voltage source (non-adjustable), turn the Manual Internal Voltage control potentiometer (**MANUAL**) clockwise until the desired voltage setting for the connected load is reached. **Note that the control potentiometer is a 25-turn Pot!**
8. Observe operation during no-load and full-load conditions. Once the voltage is set and adjustment characteristics are satisfactory the installation procedure is complete.

NOTE: Tolerances in remote potentiometers and control arrangements can cause the base voltage to rise preventing the PC2000B from reaching 0VDC output. If this occurs, the base voltage can be adjusted using the **BASE** adjustment potentiometer on the PCMPC control module. Turn the external control to 0%. If the PC2000B is still outputting DC voltage, slowly turn the **BASE** adjustment CCW until 0VDC output is achieved.



Bench Check Procedures

1. Wire up the PC2000B as shown in the figure below.
2. Connect up two 120 volt 50 to 150 watt incandescent light bulbs in series to the F+ and F- Terminals.
3. Install a temporary jumper wire between terminals G1 and G2 on the PCMPC-B Control Module.
4. Turn the internal voltage adjustment (MANUAL) on the PCMPC-B Control Module fully Counter-Clockwise (Left) before beginning the testing procedures below.
5. Input 208-240VAC fused at no more than 5A into the PC2000B. **The test light should be OFF.**
6. Slowly turn the Manual internal voltage (MANUAL) adjustment on the PCMPC-B Control Module Clockwise (Right) until the lights glow. **The test light should light to FULL Brightness. NOTE: It may take several turns of the adjustment screw before the lights illuminate!**
7. Slowly turn the Manual internal voltage (MANUAL) adjustment on the PCMPC-B Control Module Counter-Clockwise (Left) until the lights go dark. **The test light should be OFF. NOTE: It may take several turns of the adjustment screw before the lights go dark!**
8. Turn off power and disconnect the PC2000B from your power source. Inspect all electronic components on the PC2000B to ensure they are isolated from touching any part of the PC2000B housing.
9. **Steps 4-8 may be repeated using an external 100KΩ potentiometer attached to R1 and R2 to test the external input ability of the PC2000B. Instead of turning the internal voltage adjustment potentiometer, turn the external 100KΩ potentiometer when performing steps 5 and 6.**
10. If you were able to successfully perform all of these tests, the PC2000B is good.





Installation Warranty Form

It is very important that you fill out this form completely when installing a voltage regulator.

This form serves as a history record on the application. This form also contains the information needed by Power-Tronics, Inc., for repair and troubleshooting of any product you may be having problems with.

Failure to fill out this form during installation will result in a cancellation of your warranty coverage! Filling out this form takes only minutes but will save hours or days later on if your product should require service!

Product Model:	Additional Module(s) or Options:
Serial #:	
Date of Installation:	
<u>This Section for Brushless Generators Only</u>	
Exciter Field Voltage:	Exciter Field Resistance:
<u>This Section for Brush-Type Generators Only</u>	
Shunt-Field Voltage:	Shunt-Field Resistance:
Rotor Resistance @ Brush Leads:	Rotor Resistance on Slip-Rings:
Rotor Excitation Voltage:	
<u>Generator Wiring/Usage Information</u>	
Generator Leads (Check One:) <input type="checkbox"/> 12 <input type="checkbox"/> 10 <input type="checkbox"/> 6 <input type="checkbox"/> 4 (3Ø) <input type="checkbox"/> 4 (1Ø) <input type="checkbox"/> 3	
Generator Wiring Mode (Check One:) <input type="checkbox"/> High-Wye <input type="checkbox"/> Low-Wye <input type="checkbox"/> Series Delta <input type="checkbox"/> Zig-Zag <input type="checkbox"/> Double-Delta <input type="checkbox"/> Single-Phase <input type="checkbox"/> Other	
Terminal Voltage:	Residual AC Voltage:
Rated KW:	Rated KVA:
Primary Load (Please Explain):	
<u>Repair/Warranty Request Information</u>	
Company Name:	
Contact Person:	
Telephone Number:	
Email Address:	
Ship-To Address (City, State, Zip, Country):	
Problem Description/History (Please be detailed!!!):	



PRODUCT WARRANTY

Power-Tronics, Inc., assumes no liability for damages due to incorrect voltage or other voltage related damages resulting from either output of the generator or input to the generator exciter system. These problems should be protected with external devices provided by the customer such as **fuses, surge suppressors, over/under voltage and frequency controls**.

Power-Tronics, Inc., warranties **only parts and workmanship** of this product for a **period of 3 years from the original date of purchase from Power-Tronics, Inc.** Under warranty, Power-Tronics, Inc. will replace, exchange or repair the defective product **without labor or parts cost to the customer**. Remaining warranty of the original product will be transferred to the replaced or repaired product. To obtain warranty, a copy of the original Installation Warranty Form must be sent in with the defective product, which clearly shows the purchase date and serial number of the defective part. A repair request form must be sent in with the product before repairs will begin. You can obtain this form by contacting Power-Tronics, Inc.

Send repairs to: Power-Tronics, Inc., 2802 Cobbler Ln., Kerrville Texas USA 78028.

Send in repairs only by UPS or FedEx. USPS will NOT deliver to our facility!

Any one of the following conditions will void the warranty:

- ❖ Overheating of the power supply resistor on the printed circuit card.
- ❖ Overheating of the SCR or freewheeling diode.
- ❖ Physical damage to the printed circuit card, housing or components.
- ❖ Unauthorized repair or alteration of printed circuit card.
- ❖ Installation by anyone other than a qualified professional generator service technician.
- ❖ Conductive or corrosive contamination of the circuit card.
- ❖ Removal of our company identification from the product.
- ❖ Removal of any conformal coating of the printed circuit card or components.
- ❖ Overheating of foil on the printed circuit card.
- ❖ Inappropriate or infeasible application.
- ❖ Use with any external device other than manufactured by Power-Tronics, Inc.
- ❖ Failure to fill out the attached warranty card during installation

No other warranty is expressed or implied.