



XR500D-277V

Special Voltage Regulator

The Power-Tronics XR500D Universal Voltage Regulator is the latest upgrade for all UVR and XR series voltage regulators. The XR500D is also capable of replacing other manufacturers' voltage regulators and has optional Static Exciter Modules to boost its capacity to 30 amps DC!

The XR500D is a unique, Universal voltage regulator that is designed specifically for Professional Electrical Generator Service Technicians and the Electrical Generator Repair Industry. It incorporates an easily selectable frequency range for voltage roll-off during under-frequency operation and offers precise voltage regulation regardless of the connected load and ambient temperature. The XR500D is a ruggedized design and is engineered to provide a lifetime of trouble-free operation.

The XR500D contains patented electronic circuitry that automatically matches the regulator's response time to the generator exciter. This unique innovation eliminates the need to manually adjust stability when setting up the voltage regulator and greatly simplifies installation.

PLC and automated Genset control is possible with the XR500D by simply adding an optional, inexpensive digital interface module. This capability makes the XR500D suitable for automated or unattended installations.

Like our previous models, the XR500D is fully repairable! All major electronic components are not encapsulated to facilitate repair while all sensitive components are encapsulated to protect them from contamination and moisture.

The XR500D is compatible with all previous and current optional modules available for use with Power-Tronics voltage regulators making it extremely simple to upgrade an older voltage regulator installation with the modern features offered by the XR500D.

Specifications

Input Voltage:	240-277vac
Frequency:	50 or 60hz
Voltage Regulation:	+/- .25% From NL to FL
Parallel Operation	No
Output Voltage:	0-210vdc @ 240vac input 0-242vdc @ 277vac input
Maximum Continuous Output:	5adc
Minimum Field Resistance:	42Ω @ 210vdc output 46Ω @ 242vdc output
Min Residual Build up Voltage:	3.5vac
Under Frequency Protection:	Yes, VPH reduction
Physical Size:	4.75 x 6 x 1 in.
Weight:	7 oz
Repairable:	Yes
Internal Protection:	Fuses, cartridge type
External Voltage Adjustment:	Yes
System Operating Indicator:	Yes
Optional Static Exciter Modules	Yes
Optional External Controls	Yes



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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 up the regulator

ALWAYS ensure the regulator receives ample airflow

NEVER hold the regulator in your hand when energized

NEVER install the regulator in a place it can get wet or is exposed to the elements

NEVER mount the regulator over a screw, bolt, rivet, welding 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 install a switch in the DC portion of the regulator's wiring

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

Functional Description

The XR500D Universal Voltage Regulator is the result of over 20 years of engineering efforts and offers high-demand features at a competitive price point. The XR500D is a proven design and is engineered to greatly simplify setup while offering extreme reliability. When properly installed, the XR500D Universal Voltage Regulator is designed to provide a lifetime of service.

A Generator voltage regulator has several automated tasks it must perform in order to provide reliable, clean, and regulated electricity. It must build-up the generator, regulate the terminal voltage within its design specifications, and protect both itself and the generator should a fault situation arise.

The XR500D contains a time-proven, extremely reliable circuit for build-up functionality. Due to its simplicity, the XR500D is able to build up generators with residual voltages from 3.5VAC without initial overshoot or excessive delay. The patented circuitry contained in the XR500D automatically adjusts the regulator to match the generator's response time, minimizing setup complexity while maximizing load acceptance and rejection performance. The XR500D is also a precision voltage regulator and is capable of regulating the terminal voltage of the generator within +/- .25% of its initial set point.

The XR500D uses field-replaceable 20mm glass cartridge fuses to protect its internal circuitry should a fault occur and the exciter field current exceeds what the regulator is capable of delivering. It also contains a unique frequency-selectable Volts-Per-Hertz circuit, which helps a turbo-charged engine accept a large load, and also helps to protect the generator rotor and exciter if the engine is idled with the regulator still energized.

Due to its extreme simplicity, the XR500D Universal Voltage Regulator is uncommonly reliable and offers features and regulation accuracy usually only offered by much more complicated and often much more expensive regulators.



PMG, DPE Winding, Auxiliary Winding, and Harmonic/Resonant Winding Use

The XR500D Universal Voltage Regulator is compatible with some of these types of generators but not others. It is necessary to determine which type of generator you have before proceeding since some styles will connect differently than others while the XR500D cannot be used with some of these generators at all.

PMG (Permanent Magnet Generator/Exciter):

This type of generator generally has a permanent magnet generator mounted on the main shaft along with a brushless exciter and finally the main rotor itself. The XR500D is a very fast responding regulator (1/2 cycle response time) and low enough burden on the main stator that it can be used on these generators without any need for the PMG input.

To connect the XR500D to this type of generator, isolate and insulate the PMG leads that were connected to the original voltage regulator.

DPE Winding and Auxiliary Winding:

These generators use an extra winding in the main stator as a power supply for the voltage regulator in an attempt to give the regulator a clean power source that isn't affected by load. The XR500D has proprietary filtering circuitry in its sensing stage that is largely unaffected by generator load. Because the regulator isn't affected by loading, these types of windings are not needed.

To connect the XR500D to this type of generator identify, isolate, and insulate the Auxiliary or DPE wiring that were connected to the original voltage regulator.

Harmonic and Resonant Windings:

This type of generator rarely has a voltage regulator, and instead relies on a phase-shifted "harmonic" winding and a capacitor to adjust the terminal voltage with load. They often have a brushless "exciter", but because they operate on harmonics from the AC waveform, they do not operate like a typical brushless exciter.

Because these generators rely on AC waveform phasing for their voltage regulation, the XR500D cannot be used with this type of generator.

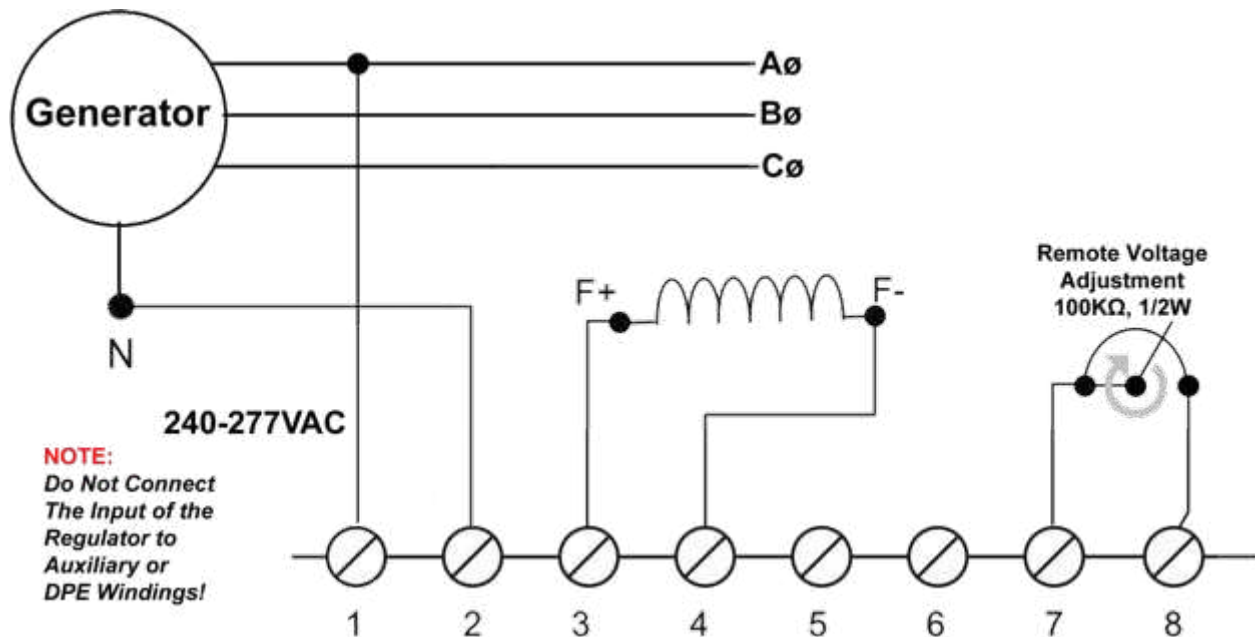


Hookup Diagram

The XR500D-277V uses a Full-Wave rectified configuration, which allows a maximum of 210VDC at 5 ADC continuous with an input voltage of 240VAC, or 242VDC at 5 ADC continuous with an input voltage of 277VAC..

This connection is typically used on higher voltage excitation fields or on shunt control fields where the full-load excitation voltage is greater than 150VDC.

Note that the maximum input voltage to the XR500D Universal Voltage regulator is 277VAC! DO NOT input 480VAC into the XR500D! Severe damage to the unit will result! For use on 480V systems, either connect the regulator from Line to Neutral or use a 480-277V step-down transformer.



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NOTE:

If the generator is to be operated below 50/60 Hz, a disconnect or switch should be installed in series with the incoming power to terminals #1 and #2 on the XR500D.

NEVER install a switch or breaker on the DC or Exciter side of the voltage regulator! Only install a switch or disconnect on the AC Side of the regulator!

NOTE:

It is not necessary to jumper terminals 7 and 8 if not using the Remote Voltage Adjustment!



Initial Setup and Commissioning

1. Install the regulator and wire up to the wiring diagram on page 5.
2. If installing the XR500D on a brush-type generator, verify that the brushes and brush riggings are isolated, ungrounded, and connected ONLY to the XR500D.
3. Turn the internal voltage control 15 or more turns counter clockwise (left) or until you hear the screw click. This procedure is necessary in case the original factory settings have been altered.

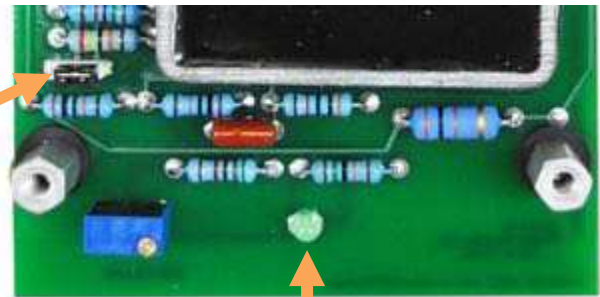


Internal
voltage
adjustment

Frequency Selection

Remove jumper for 50Hz operation. This product's default setting is 60Hz.

(Pull up to remove)



System
indicator light

4. If you are using a remote voltage adjustment, set it at 50% of adjustment.
6. Start up the prime mover and bring up to operating speed and turn on the regulator switch (if used).
7. Set the internal voltage adjustment to the desired voltage setting for the generator output by turning the adjustment screw clockwise (right).
Note that the voltage adjustment is a 25-turn pot!
8. Place the generator on line and observe the frequency and voltage.
9. Observe voltage regulation during no-load and full-load conditions. Once the voltage is set and regulating characteristics are satisfactory the installation procedure is complete.



Optional Power-Tronics Add-On Modules

Power-Tronics offers a wide array of optional add-on modules for the XR series voltage regulators from static exciter modules to digital interface cards. For more information on any of the modules below, visit our online catalog at:

www.power-tronics.com



SE350

Static Exciter Module

Converts the XR500D into a 105VDC 30ADC Static Exciter!



SE450

Static Exciter Module

Converts the XR500D into a 210VDC 30ADC Static Exciter!



AFM500X

Automatic Flash Module

Adds Automatic Flash or Battery Flash to installations with low residual or requiring guaranteed buildup!



UIC200

Optical Interface Module

Allows the XR500D to be controlled externally by virtually any digital load-sharing controller, VAR controller, genset controller, or digital governor controller!



MP12/24

Motorized Potentiometer

Allows the XR500D to be externally controlled by older automated controllers using pulsed signals or dry contacts for control!



HVD1

High Voltage Disconnect Module

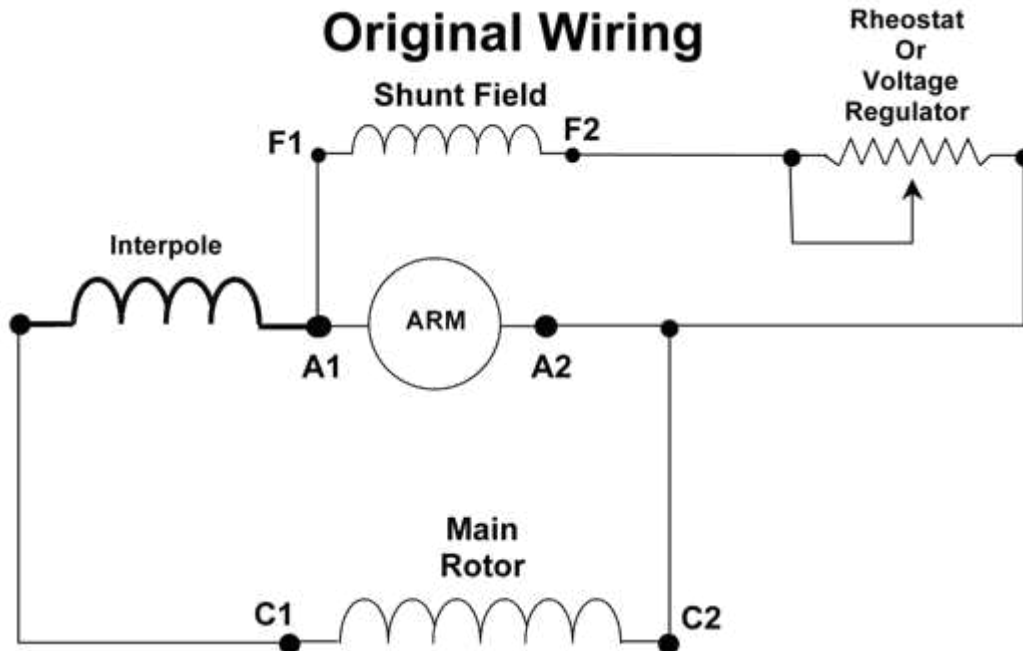
Saves your generator and connected equipment from runaway voltage conditions! Disconnects power to the voltage regulator instantly in the event of high voltage!



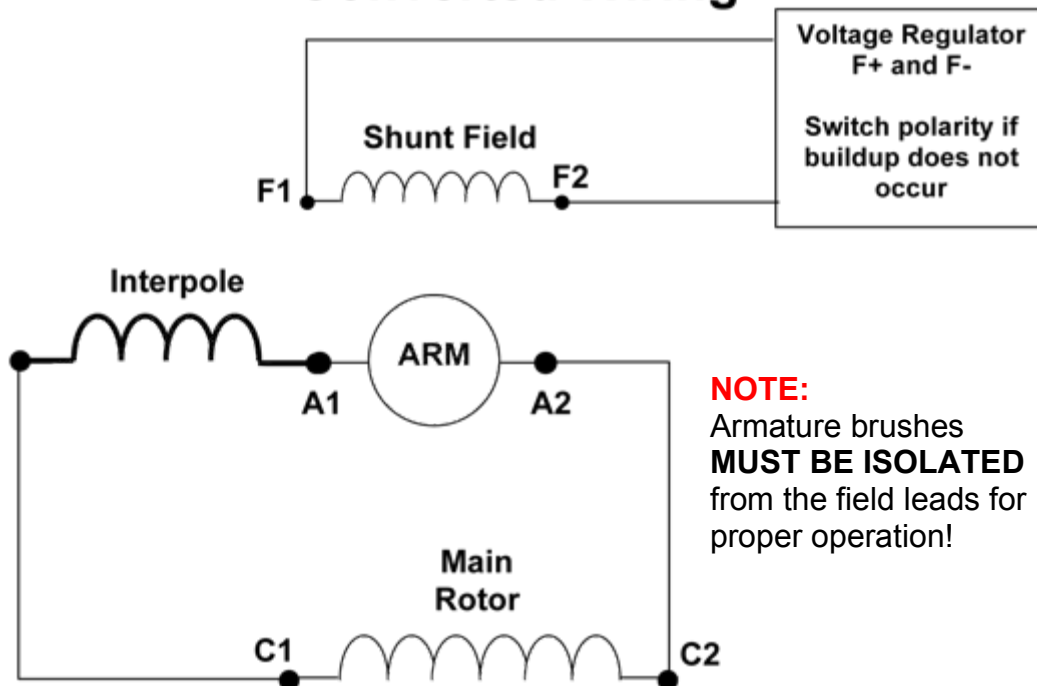
Conversion From Older Shunt-Wound Voltage Regulation to Modern Solid-State Voltage Regulation

It is possible to use the XR500D Universal Voltage regulator with older Shunt-Wound exciters that originally had manual or mechanical voltage regulators by converting the wiring as in the diagrams below. If the generator will not build up after conversion, try switching your F+ and F- leads at the regulator and try starting up again.

Original Wiring



Converted Wiring



NOTE:

Armature brushes
MUST BE ISOLATED
from the field leads for
proper operation!



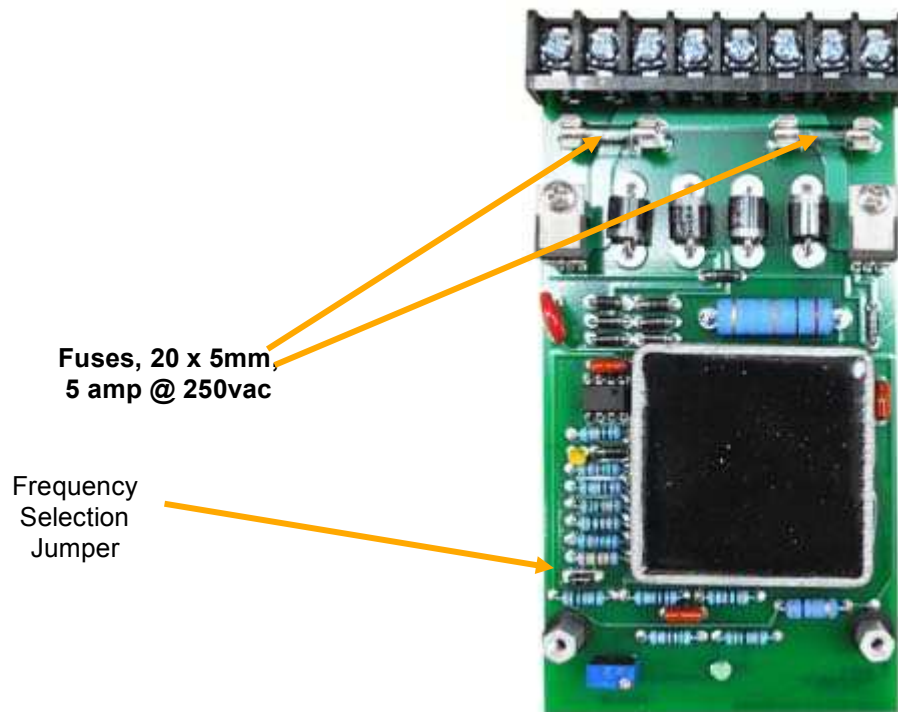
Fuse Replacement

The XR500D contains two 20mm cartridge fuses located for quick and convenient replacement should they blow. To replace the fuses, follow the instructions below.

Fuse size is 20mm x 5mm rated at 5A at 250VAC.

Power-Tronics Part Number: 5R3-403 (Comes as a package of 10 fuses)

Cooper-Bussmann Part Number: BK/GDB-5A



Fuse Replacement Procedure:

(Refer to the image above for easy reference)

- Remove the 2 screws located on the front of the mounting can near the terminal board.
- Loosen the 2 screws located on the front of the mounting can near the voltage adjustment hole. (There is no need to completely remove these screws!)
- Partially separate the top of the regulator printed circuit card from the mounting housing. (Separate just enough to reach in and replace the fuses.)
- Replace open fuses then replace and re-tighten all screws.
- Fuse size is 20mm x 5mm, 5A @ 250VAC. **(DO NOT REPLACE WITH ANY OTHER TYPE OR RATING OF FUSE! YOU WILL VOID YOUR WARRANTY AND SEVERE DAMAGE AND PERSONAL INJURY COULD RESULT BY DOING SO!)**



Application Troubleshooting

Problem:	Possible Cause
No Voltage	1 3 5 7 9 11 13 15 20
Pulsating Voltage	4 5 6 12 16
Flickering Voltage	4 6 7 14
High Voltage	6 7 8 9 12 13 17 18 20
Voltage Drop on Load	5 8 10 12 16
Low Voltage	5 8 12 13
Poor Voltage Regulation	2 4 10 12 13 16
No Voltage Control	13 19 20

Possible Causes:

1. Residual input voltage to the voltage regulator is below 3.5vac or fuses are open in the regulator.
2. Unbalanced generator load.
3. Open exciter field or defective generator.
4. Non linear load or defective connection in exciter field.
5. Open diode in exciter or shorted rotor in generator.
6. Loose component in voltage regulator.
7. Loose wiring connections.
8. Input voltage to regulator is too low.
9. Exciter field is grounded.
10. Non linear load or wrong selection for regulator hookup.
11. Exciter fields are reversed.
12. Wrong selection of regulator wiring configuration.
13. Defective voltage regulator.
14. SCR or Inverter drive effecting generator waveform.
15. Regulator needs external flashing circuit.
16. Isolation transformer is too small.
17. Isolation transformer is needed.
18. Exciter fields are not isolated from other circuits.
19. Input and field circuit are being fed by a common cable or conduit.
20. Incorrect hookup or wiring.



Bench Check Procedures

1. Wire up the regulator as shown in Figure A.
2. Connect up a 120 volt 50 to 150 watt light bulb to the F+ and F- Terminals.
3. Adjust the internal voltage pot fully CCW (25 turns) or until a click is heard.
4. Input 120vac into the regulator at #1 and #2. (Fuse this input with fuses rated at 120 volts or higher and not more than 5 amps ac)
5. **Observation:** The green status light should be on and the light bulb across F+ and F- should be off. **If the green status light is not on**, the internal fuses are blown in the regulator or there is internal damage to the regulator! **If the green status light is not on, do not continue this test!**
6. Turn the internal voltage adjustment CW until the light bulb across F+ and F- turns fully on, then adjust the internal voltage adjustment CCW until the light bulb is off.
7. Remove the 120vac from the regulator.
8. Connect up the regulator as shown in Figure B and perform all of the previous steps again. **In this mode, the light bulb will only glow at half brightness!**
9. **If you were able to successfully perform all of these tests, the regulator is good.**

Figure A

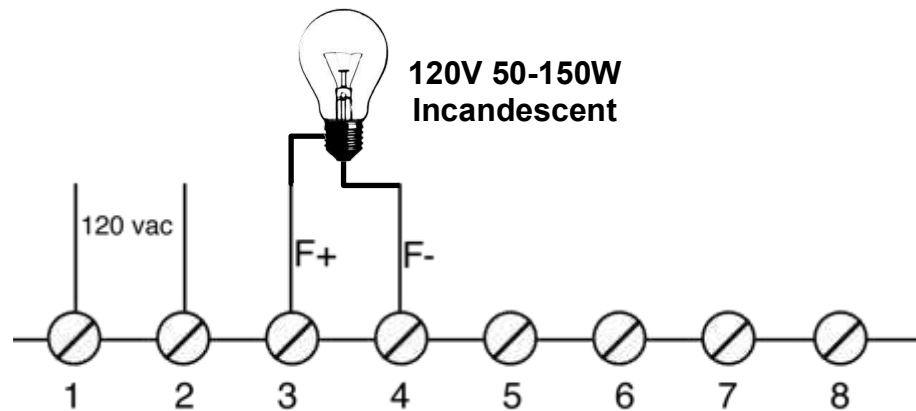
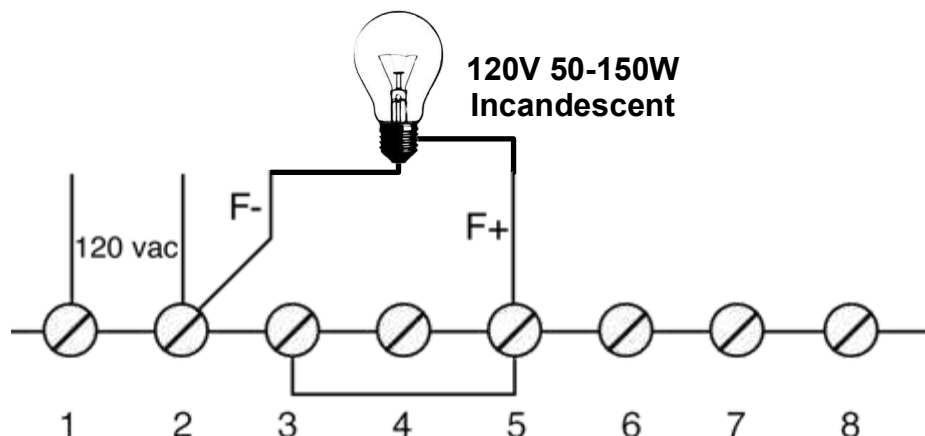


Figure B





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		Other options			
Serial Number					
Date of Installation					
Type of Generator				Model #	
	Brush type	[]			
	Brushless	[]			
AC Stator Information					
Wired for	Volts	Phase	Hz		
Generator Configuration: Lead					
Exciter/Rotor Information					
Exciter field resistance	Ω		@	F+ / F- Slip Rings	Ω
Exciter field volts	vdc		@		Ω
Description of problem with product or generator					
Your phone number			Name:		
Your fax number			Ship to Address:		
Your email address			Ship to City, State, Zip:		



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 2 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.