
# XR5C

## *Specialty Series*

## Universal Voltage Regulator

The Power-Tronics XR5C Universal Voltage Regulator is the latest upgrade to the XR500C product line and features a strengthened regulation system and a redesigned rectifier section to match that of the XR8! The XR5C is also capable of replacing other manufacturers' voltage regulators and has optional Static Exciter Modules to boost its capacity to 30 amps DC!

The XR5C is designed for legacy installations and specialty applications where tolerance to extreme waveform distortion is required or installations where manual tuning of stability is preferred. Manual stability matching is sometimes required on applications with severe waveform distortion due to VFDs, solid-state drives, motor soft-start systems, UPS loading, or generators with extremely slow or non-linear magnetic characteristics. Because the stability is matched manually, the technician can tune the regulator to the generating system, allowing the XR5C to regulate loads that other types of automatic voltage regulators cannot.

Like the XR500C, the XR5C 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. All major electronic components are not encapsulated to facilitate repair while all sensitive components are encapsulated to protect them from contamination and moisture.

PLC and automated Genset control is possible with the XR5C by simply adding an optional, inexpensive digital interface module. This capability makes the XR5C suitable for automated or unattended installations, or large-scale parallel operations. The XR5C is compatible with all previous and current optional modules available for use with Power-Tronics voltage regulators making it extremely simple to upgrade an existing voltage regulator installation.

## Specifications

| | |
|---|---|
| **Input Voltage:** | 120 / 208 or 240vac |
| **Frequency:** | 50 or 60hz |
| **Voltage Regulation:** | ± 1% From NL to FL |
| **Parallel Operation** | Yes |
| **Maximum Output Voltage:** | 52vdc @ 120vac input<br>105vdc @ 240vac input<br>210vdc @ 240vac input |
| **Continuous Output Voltage:** | 32vdc @ 120vac input<br>63vdc @ 240vac input<br>125vdc @ 240vac input |
| **Maximum Continuous Output:** | 5adc |
| **Minimum Field Resistance:** | 10.5Ω @ 52vdc output<br>21Ω @ 105vdc output<br>42Ω @ 210vdc 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 |
| **Cartridge Fuse Type:** | GDB 5A @ 250V Fast-Blow |
| **Optional External Potentiometer:** | 100KΩ @ 2W |
| **External Adjustment Range:** | ±10% of Terminal Voltage |

POWER-TRONICS™
Electrical Power Controls

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# 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 XR5C Universal Voltage Regulator is the result of over 25 years of engineering efforts and offers high-demand features at a competitive price point. The XR5C is a proven design and is engineered to greatly simplify setup while offering extreme reliability in demanding service conditions. When properly installed, the XR5C 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 XR5C contains a time-proven, extremely reliable circuit for build-up functionality, in use for over 25 years. Due to its simplicity, the XR5C is able to build up generators with residual voltages from 3.5VAC without initial overshoot or excessive delay. The patented circuitry contained in the XR5C automatically adjusts the regulator to match the generator's response time, minimizing setup complexity while maximizing load acceptance and rejection performance. The XR5C is a precision voltage regulator and is capable of regulating the terminal voltage of the generator within +/-1% of its initial set point.

The XR5C uses field-replaceable GDB 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 XR5C 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.

# Determining Which Hookup Configuration to Use

**_STOP!_ If you are using an optional SEM250A/B or SE350/450 Static Exciter Module, _DO NOT_ use these instructions for hookup! See the instructions that came with your module instead!**

The XR5C Universal Voltage Regulator is configurable for 3 different output ranges suitable for use on the vast majority of generators available on the market from past and present. It is necessary to choose the proper mode of operation for your generator in order to get the best regulation and fastest response time possible.

**To determine the proper connection for your generator you need to know any two of the following 3 specifications from the rating plate of your generator:**

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

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## Using the specifications obtained from your generator exciter, select a Connection (A, B, or C) from the chart below:

- **Exciter Field Resistance ≥42Ω & Exciter Full-Load Voltage ≤125VDC**
  **Use connection A (See Page 8)**

- **Exciter Field Resistance ≥21Ω & Exciter Full-Load Voltage ≤63VDC**
  **Use connection B (See Page 10)**

- **Exciter Field Resistance ≥10.5Ω & Exciter Full-Load Voltage ≤32VDC**
  **Use connection C (See Page 12)**

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**Note about Field Resistance:**

- When measuring field resistance on a brushless generator, simply measure the resistance of the exciter field through your field leads with a multimeter.

- When measuring field resistance on a brush-type generator, 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 generator has brush and ring contact problems and will need cleaning or maintenance before installing the XR5C. **Failure to correct brush and ring contact problems will result in severe damage to the voltage regulator 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!

***If you do not have any of the specifications of your generator's exciter, or if you don't know where to start when trying to determine your exciter specs, please see the section below for instructions on measuring and calculating your exciter specifications.***

- Measure your exciter field resistance using a multimeter on your field leads. Record this value. If you have a brush-type generator, also take a resistance reading on your slip rings: the value you obtain on the slip rings should be no more than 1% difference from the value you obtained through the field leads.

- Next, start and run the generator and apply 12V from a battery through your field leads and record the AC voltage produced by the generator. To determine your full load exciter field voltage, use the following formula:

$$E_{Exc.} = \frac{E_{Gen.Conf.}}{\left(\frac{E_{Gen.Output}}{E_{Battery}}\right)} * 2$$

Where $E_{Gen.Conf.}$ is your Generator's configured voltage (e.g.: 120, 208, 240, 480V, etc.), $E_{Gen.Output}$ is your recorded output voltage, and $E_{Battery}$ is your battery voltage (12V usually).

- Next, calculate your maximum exciter field amperage using your measured field resistance and your calculated exciter voltage using the following formula:

$$I = \frac{E}{R}$$

Where $I$ is your maximum exciter field current, $E$ is your calculated field voltage from the above formula, and $R$ is your measured field resistance.

**Using the values you just measured and calculated, see the chart on the previous page to determine which connection you should use to connect the XR5C to your generator.**

**For Example:**

Measured Field Resistance: 18Ω
Battery Voltage: 12V
Generator Configuration: 480V Wye

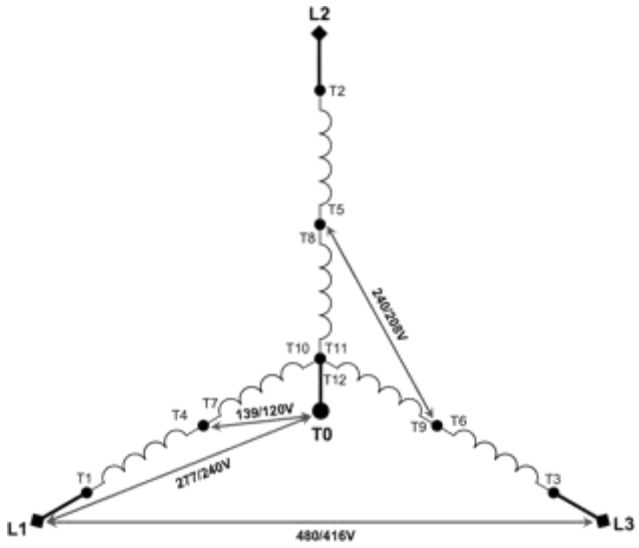
12V applied to the field yields 189VAC L1-L3.

$$E_{Exc.} = \frac{480}{\left(\frac{189}{12}\right)} * 2 = 60.95$$

$E_{Exc.}$ = 60.95VDC (Full-Load Voltage)

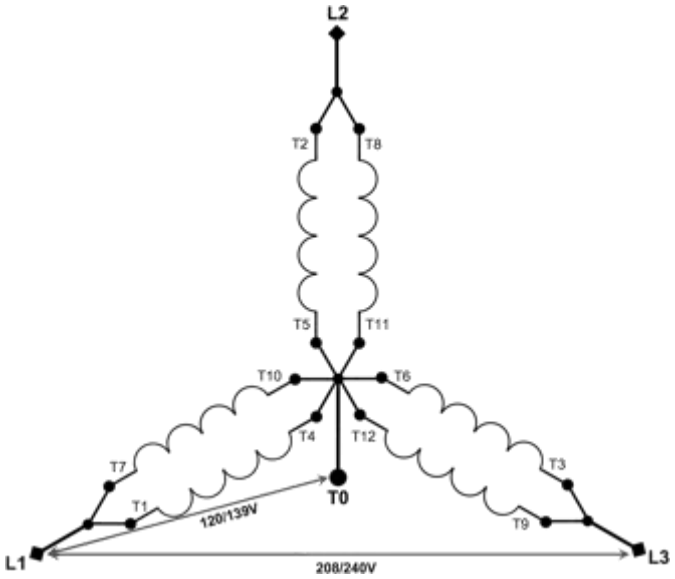
This generator would use **Connection B**.

# Common 12-Lead Generator Wiring Diagrams



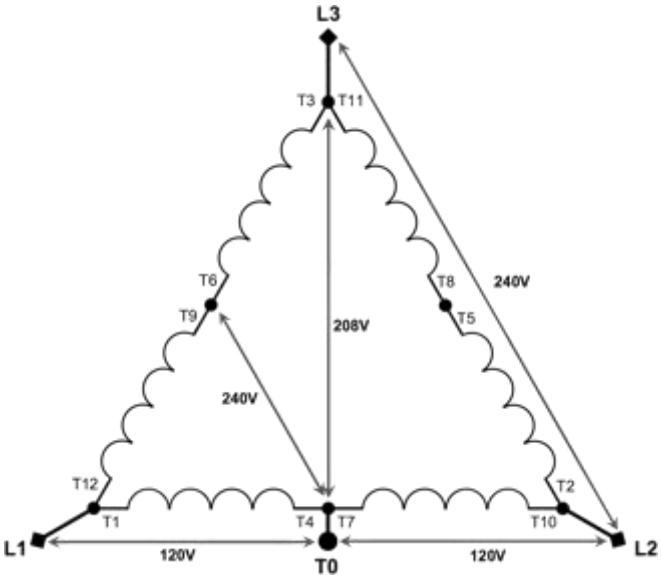

**Series Wye (416/480V 3ø)**

Voltage L-L: 416/480V
Voltage L-N: 240/277V
Voltage CT – N: 120/139V



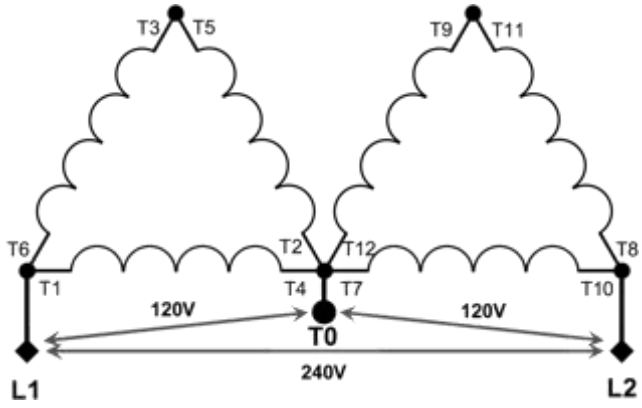

**Parallel Wye (208/240V 3ø)**

Voltage L-L: 208/240V
Voltage L-N: 120/139V
**NOTE:** 208V is Standard Voltage




**Series Delta (240V 3ø)**

Voltage L-L: 240V
Voltage L1/L2-N: 120V
Voltage L3 – N: 208V
**NOTE:** L3-N is a "High Leg"
208V instead of 120V!




**Double-Delta (120/240V 1ø)**

Voltage L-L: 240V
Voltage L-N: 120V
Preferred Single-Phase Connection.
Don't Use Zig-Zag if Possible.
**NOTE:** Derate generator by 1/3 rated capacity when using this connection!

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

**The XR5C 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 XR5C 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 XR5C 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 XR5C to this type of generator, isolate and insulate the PMG leads that were connected to the original voltage regulator. Measure your field resistance and proceed with sizing on **Page 4**.

## 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 XR5C 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 XR5C to this type of generator identify, isolate, and insulate the Auxiliary or DPE wiring that were connected to the original voltage regulator. Measure your field resistance and proceed with sizing on **Page 4**.

## 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 XR5C cannot be used with this type of generator.**

# Connection A

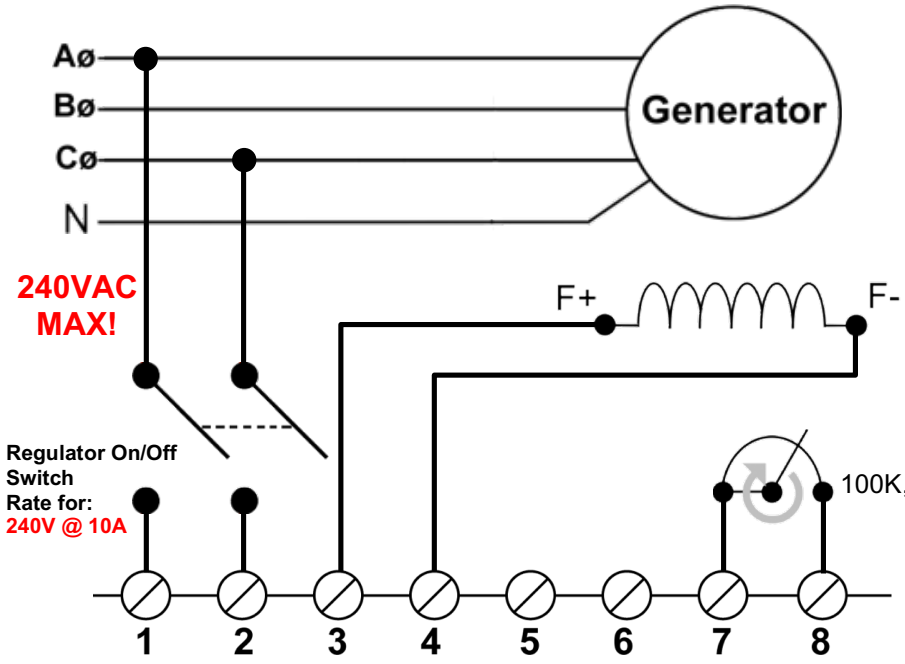
(**See page 9** if the generator will be paralleled using this connection)

**Connection A** is a Full-Wave rectified configuration, which allows a continuous output of **210VDC @ 5A** with an input voltage of 240VAC.

This connection is typically used on higher voltage excitation fields (generally referred to as 125V fields) or on shunt control fields where the full-load excitation voltage is greater than 63VDC.

**Note that the maximum input voltage to the XR5C Universal Voltage regulator is 240VAC! DO NOT input 277VAC into the XR5C!** Severe damage to the unit will result! For use on 480V systems, either connect the regulator to the winding center taps T7 and T9 (**See Page 6**) or use a **480-240V step-down transformer rated at 1KVA.**

*Connecting the input of the XR5C to 2 different legs of the generator as shown in the diagram below will result in greater regulation accuracy than when connecting line-neutral.*




**XR5C Specialty Series**
**Universal Voltage Regulator**

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

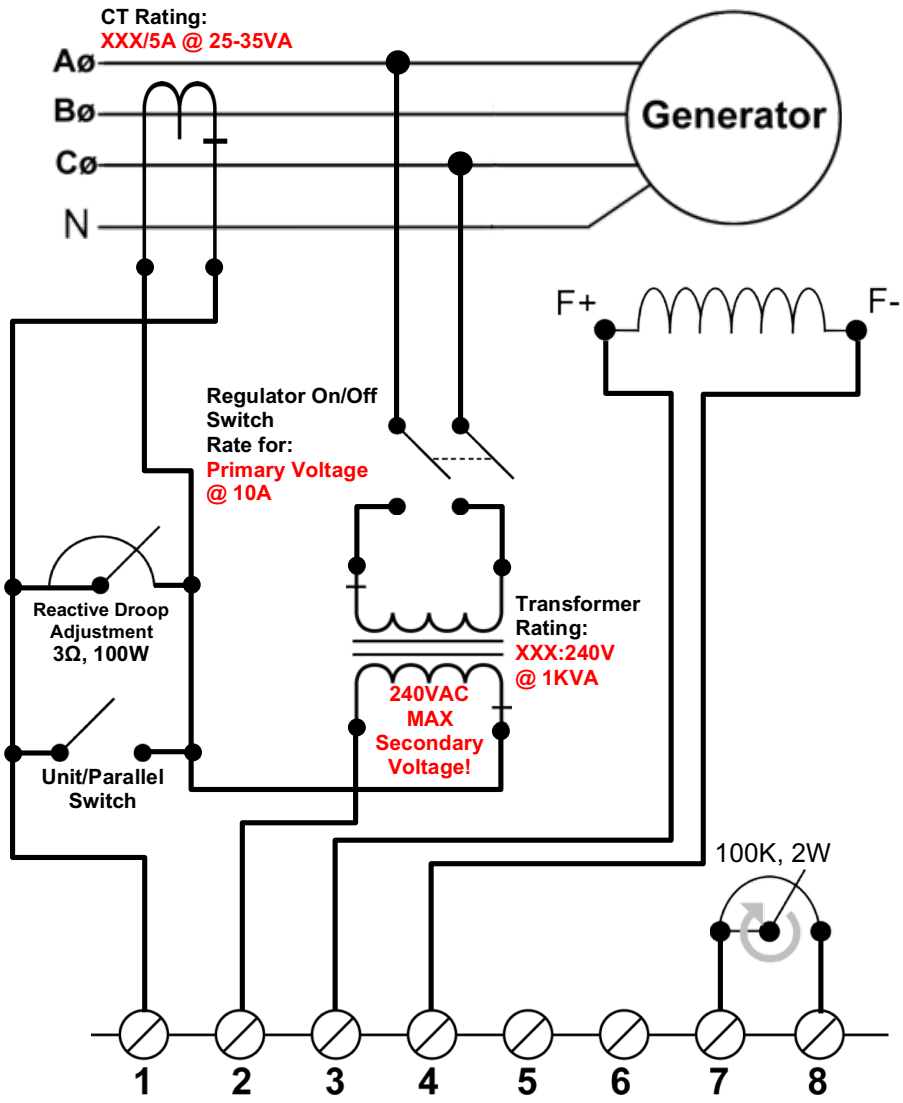
**NOTE:**
If the generator is to be operated below 50/60 Hz, a disconnect or switch should be installed in series with the incoming power to terminals #1 and #2 on the XR5C.

**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!**

# Parallel Configuration for Connection A

To use the XR5C Universal Voltage Regulator in a parallel configuration either with another generator or with a buss such as a utility, use the diagram below for proper hookup with the XR5C configured for Connection A.

***NOTE:*** Power-Tronics products parallel using the Reactive Droop compensation method. This allows our products to parallel with existing systems easily while also allowing islanded operation with the flip of a switch. When initially installing the droop resistor, set it for approximately 2Ω before final adjustment later. If the droop is excessive when load testing, reduce the resistance a bit at a time until satisfactory droop is achieved. **CT should be sized at 25-35VA burden!**




**XR5C Specialty Series**
**Universal Voltage Regulator**

**Setup Tips:**

- Isolation Transformer is recommended for best results, but is optional if 208/240V is present on generator.
- Size CT as closely to rated generator output amperage as possible for best paralleling results. **An oversized CT will result in poor paralleling or loss of control!**
- If generator terminal voltage rises, or if generator exports VARS excessively under load, reverse CT leads.
- If the reactive droop resistor/rheostat gives erratic results or inconsistent resistance, lightly sand the exposed wire with 400 grit sandpaper to improve connection between wire and slider.

# Connection B

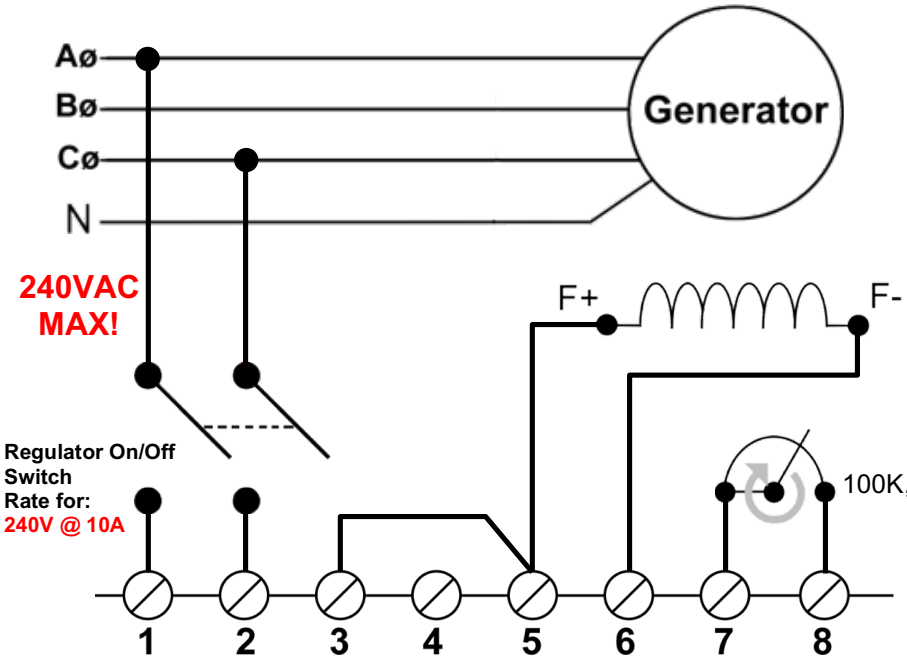
(**See page 11** if the generator will be paralleled using this connection)

**Connection B** is a Half-Wave rectified configuration, which allows a maximum output of **105VDC @ 5A** with an input voltage of 240VAC.

This connection is typically used on a majority of brushless generator excitation fields (generally referred to as 63V fields) or on shunt control fields where the full-load excitation voltage is greater than 32VDC, but less than or equal to 63VDC.

**Note that the maximum input voltage to the XR5C Universal Voltage regulator is 240VAC! DO NOT input 277VAC into the XR5C!** Severe damage to the unit will result! For use on 480V systems, either connect the regulator to the winding center taps T7 and T9 (**See Page 6**) or use a **480-240V step-down transformer rated at 750VA.**

*Connecting the input of the XR5C to 2 different legs of the generator as shown in the diagram below will result in greater regulation accuracy than when connecting line-neutral.*




**XR5C Specialty Series**
**Universal Voltage Regulator**

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

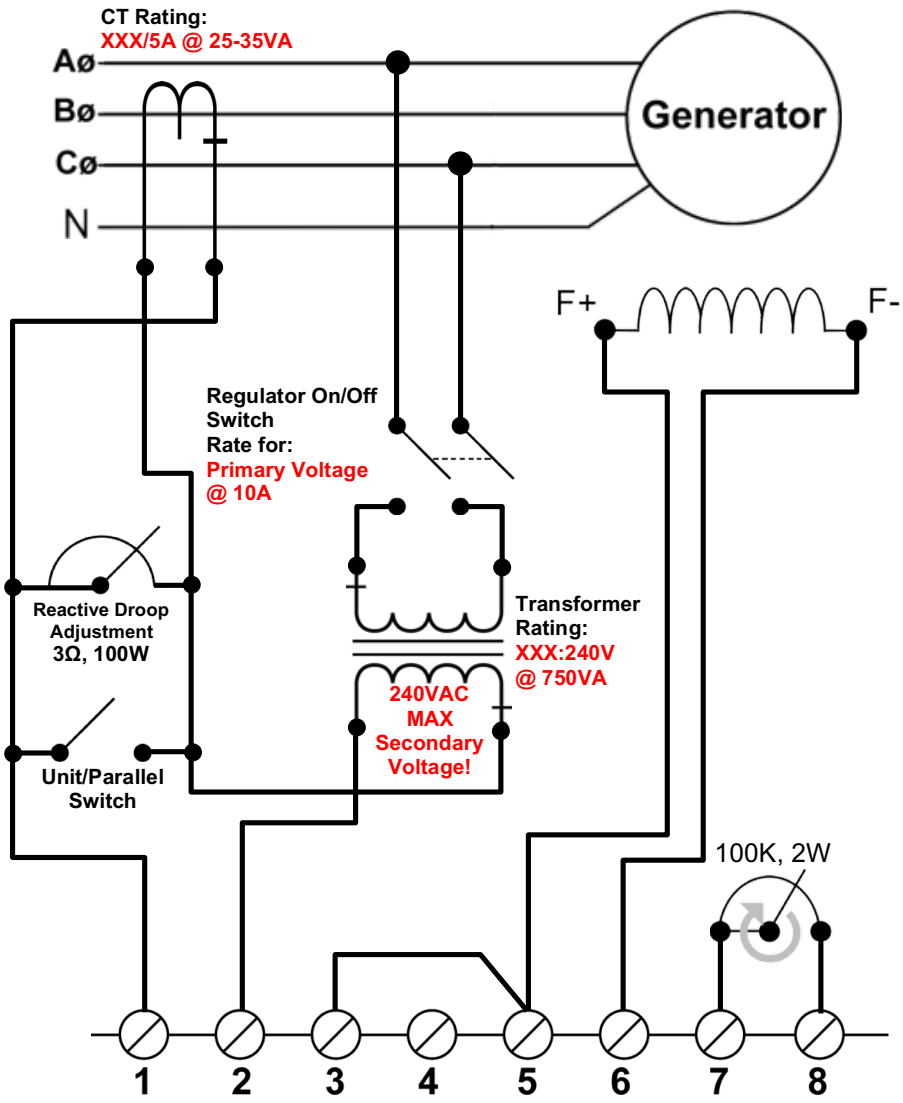
**NOTE:**
If the generator is to be operated below 50/60 Hz, a disconnect or switch should be installed in series with the incoming power to terminals #1 and #2 on the XR5C.

**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!**

# Parallel Configuration for Connection B

To use the XR5C Universal Voltage Regulator in a parallel configuration either with another generator or with a buss such as a utility, use the diagram below for proper hookup with the XR5C configured for Connection B.

***NOTE:*** Power-Tronics products parallel using the Reactive Droop compensation method. This allows our products to parallel with existing systems easily while also allowing islanded operation with the flip of a switch. When initially installing the droop resistor, set it for approximately 2Ω before final adjustment later. If the droop is excessive when load testing, reduce the resistance a bit at a time until satisfactory droop is achieved. **CT should be sized at 25-35VA burden!**




**XR5C Specialty Series**
**Universal Voltage Regulator**

## Setup Tips:

- Isolation Transformer is recommended for best results, but is optional if 208/240V is present on generator.
- Size CT as closely to rated generator output amperage as possible for best paralleling results. **An oversized CT will result in poor paralleling or loss of control!**
- If generator terminal voltage rises, or if generator exports VARS excessively under load, reverse CT leads.
- If the reactive droop resistor/rheostat gives erratic results or inconsistent resistance, lightly sand the exposed wire with 400 grit sandpaper to improve connection between wire and slider.

# Connection C

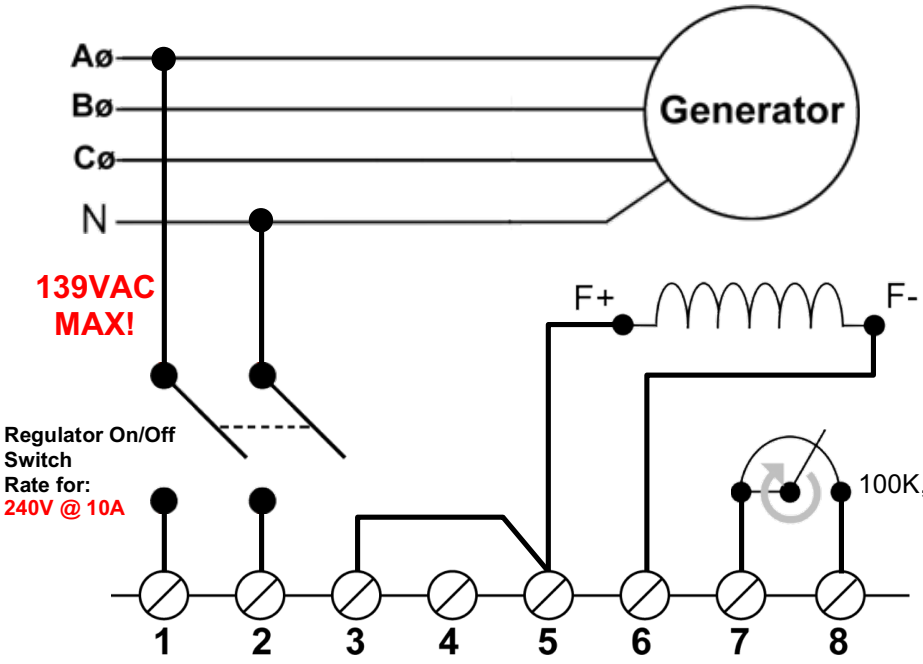
(**See page 13** if the generator will be paralleled using this connection)

**Connection C** is a Half-Wave rectified configuration, which allows a maximum output of **52VDC @ 5A** with an input voltage of 120VAC.

This connection is typically used on low voltage excitation fields (generally referred to as 32V fields) or on shunt control fields where the full-load excitation voltage is less than 32VDC.

**Note that the maximum input voltage to the XR5C Universal Voltage regulator is 139VAC in this configuration!** **DO NOT input 240VAC into the XR5C!** Severe regulation problems may result! For use on 480V systems, either connect the regulator to the winding center taps T7 to T0 (**See Page 6**) or use a **480-120V step-down transformer rated at 500VA (Preferred for superior regulation accuracy).**

*Connecting the input of the XR5C to 2 different legs of the generator through a transformer will result in greater regulation accuracy than when connecting line-neutral as shown in the diagram below.*




**XR5C Specialty Series**
**Universal Voltage Regulator**

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

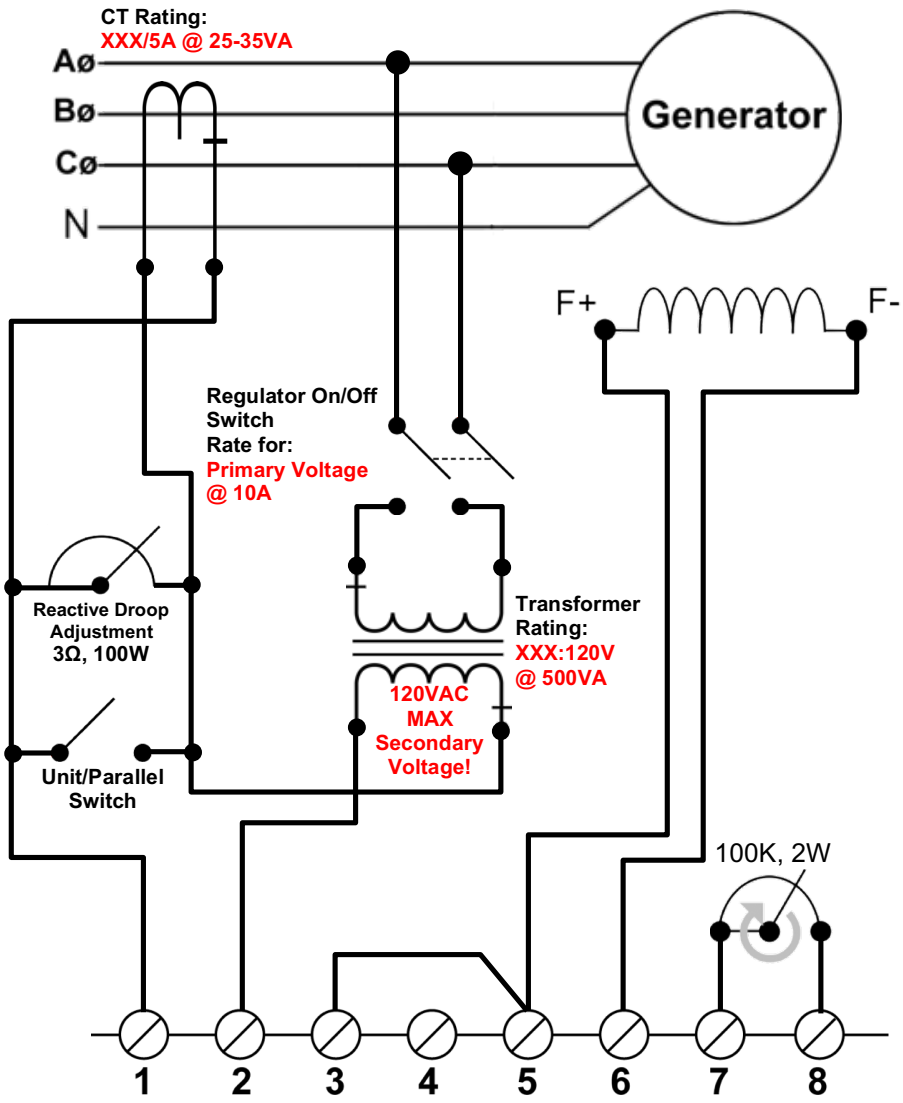
**NOTE:**
If the generator is to be operated below 50/60 Hz, a disconnect or switch should be installed in series with the incoming power to terminals #1 and #2 on the XR5C.

**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!**

# Parallel Configuration for Connection C

To use the XR5C Universal Voltage Regulator in a parallel configuration either with another generator or with a buss such as a utility, use the diagram below for proper hookup with the XR5C configured for Connection C.

***NOTE:*** Power-Tronics products parallel using the Reactive Droop compensation method. This allows our products to parallel with existing systems easily while also allowing islanded operation with the flip of a switch. When initially installing the droop resistor, set it for approximately 2Ω before final adjustment later. If the droop is excessive when load testing, reduce the resistance a bit at a time until satisfactory droop is achieved. **CT should be sized at 25-35VA burden!**




**XR5C Specialty Series**
**Universal Voltage Regulator**

## Setup Tips:

- Isolation Transformer is recommended for best results even if 120/139V is present on generator.
- Size CT as closely to rated generator output amperage as possible for best paralleling results. **An oversized CT will result in poor paralleling or loss of control!**
- If generator terminal voltage rises, or if generator exports VARS excessively under load, reverse CT leads.
- If the reactive droop resistor/rheostat gives erratic results or inconsistent resistance, lightly sand the exposed wire with 400 grit sandpaper to improve connection between wire and slider.

# Initial Setup and Commissioning

1. Install the regulator and wire up to the correct wiring diagram (Connection A, B, or C).

2. If installing the XR5C on a brush-type generator, verify that the brushes and brush riggings are isolated, ungrounded, and connected ONLY to the XR5C.

3. Turn the internal voltage and stability controls 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.

4. If you are using a remote voltage adjustment, set it at 50% of adjustment.

5. If the generator is to be paralleled, set the droop resistor to 2Ω.

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).
**The voltage adjustment is a 25-turn pot!** You may notice unsteady or pulsating voltage. If so turn the Stability adjustment clockwise until the pulsation stops. **As you turn the stability adjustment, the terminal voltage will rise. Always keep your voltage within 10% of the desired setpoint with the voltage adjustment pot.**

8. Place the generator on line and observe the frequency and voltage.

9. If the generator is being paralleled, measure the droop during loading and adjust the droop resistor as necessary. Reducing droop resistor resistance will reduce droop.
**NOTE: Loading the generator with a purely resistive load-bank may cause undesirable droop characteristics such as no droop, very slight droop, or even rising terminal voltage. Measure droop with a mixed load for best results.**

10. If paralleling and the terminal voltage rises or excessive amperage exportation occurs during loading with a mixed load connected, reverse the CT leads and try again.

11. 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


### SEM250A
**Static Exciter Module**
Converts the XR5C into a 63VDC 25ADC Static Exciter!


### SEM250B
**Static Exciter Module**
Converts the XR5C into a 125VDC 25ADC Static Exciter!


### ABF10
**Automatic Battery Flash Module**
Adds Automatic Battery Flash to installations with low residual or requiring guaranteed buildup!

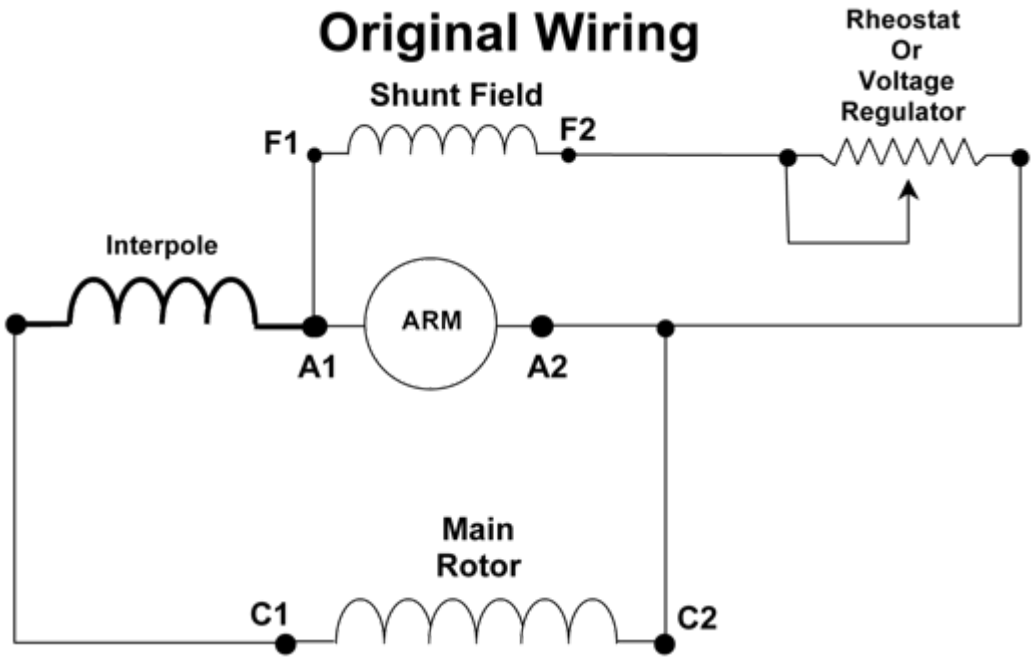

### EIM1020VM
**External Interface Card**
Allows the XR5C to be controlled externally by virtually any digital load-sharing controller, VAR controller, genset controller, or digital governor controller!

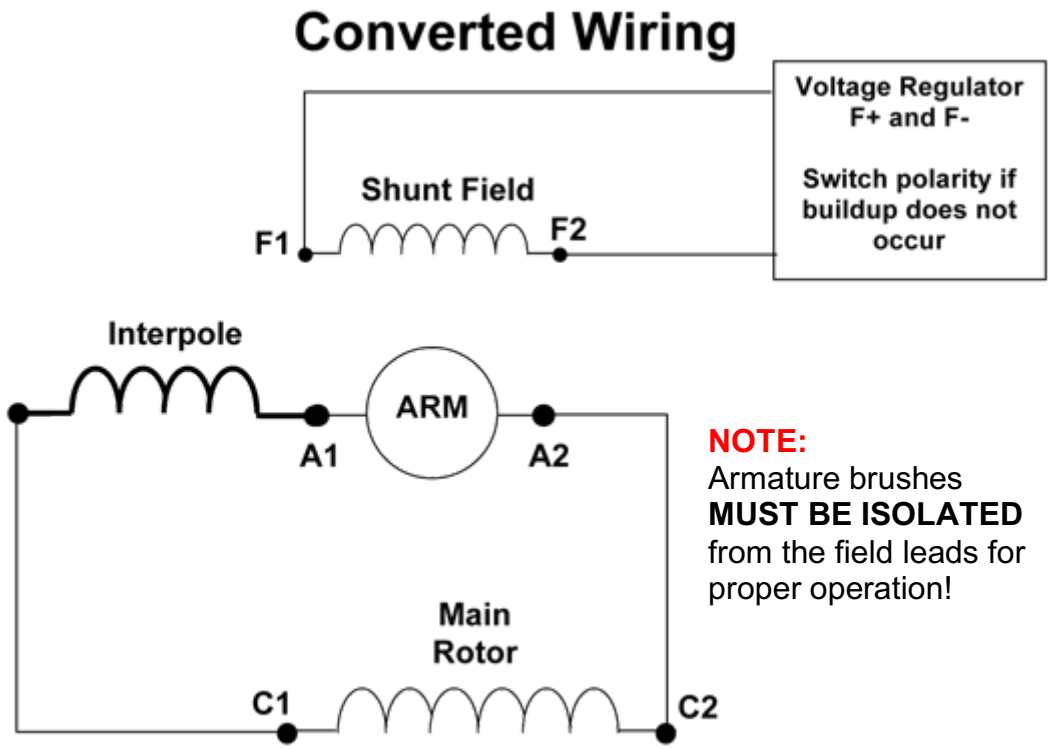

### MOP1224HD
**Motorized Potentiometer**
Allows the XR5C to be externally controlled by older automated controllers using pulsed signals or dry contacts for control!


### HVD2
**High Voltage Disconnect**
Adds passive protection for your generator and connected equipment from runaway and high 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 XR5C Universal Voltage regulator with older Shunt-Wound exciters that originally had manual, mechanical, or series solid-state 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.



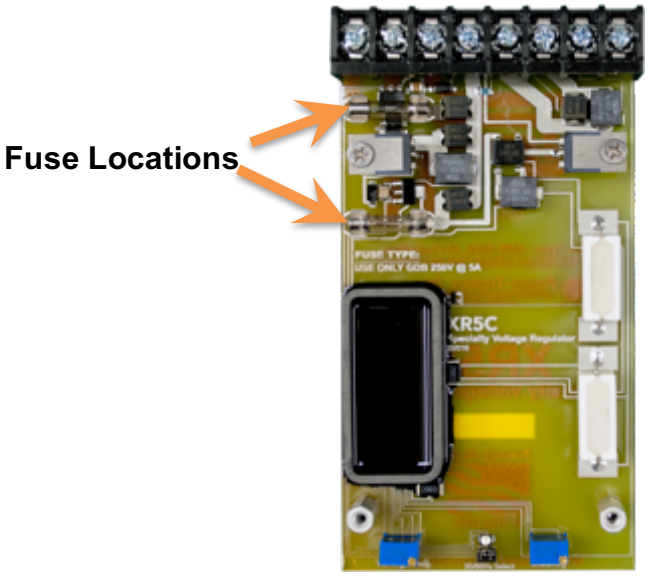




**NOTE:**
Armature brushes
**MUST BE ISOLATED**
from the field leads for
proper operation!

# Fuse Replacement

The XR5C contains two 20mm GDB 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 4 screws located on the front of the aluminum mounting can to allow removal of the can.
- Remove the aluminum mounting can from the circuit card.
- Use a continuity tester or multimeter to test the fuses (A good fuse will read continuity or 0Ω resistance)
- 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 (Inverter) 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 (Inverter) 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 the regulator as shown in Figure A below.

2. Connect a 120 volt 50 to 150 watt light bulb as shown.

3. Adjust the internal voltage and stability pots 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)

5. **Observation:** The green status light should be on and the incandescent light bulb 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. SLOWLY turn the internal voltage adjustment CW until the incandescent light bulb turns fully on, then adjust the internal voltage adjustment CCW until the light bulb is off.

7. **Observation:** You should be able to taper the incandescent light bulb on and off in a relatively smooth manner. **If the light flashes on or off quickly, the regulator has an internal fault, do not continue this test!**

8. Remove the 120vac from the regulator.

9. Reconnect 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!***

10. **If you were able to successfully perform all of these tests, the regulator is good.** ***IF ANY SINGLE STEP FAILED, THE REGULATOR IS DEFECTIVE!***

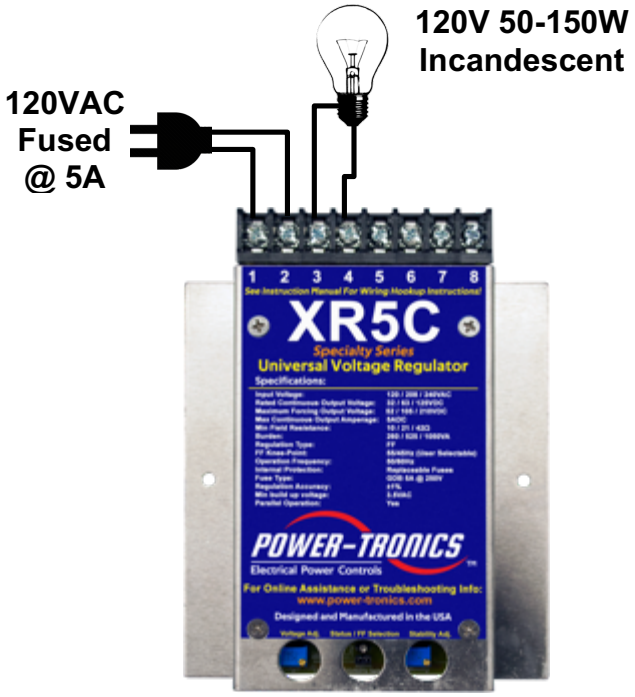



**Figure A**

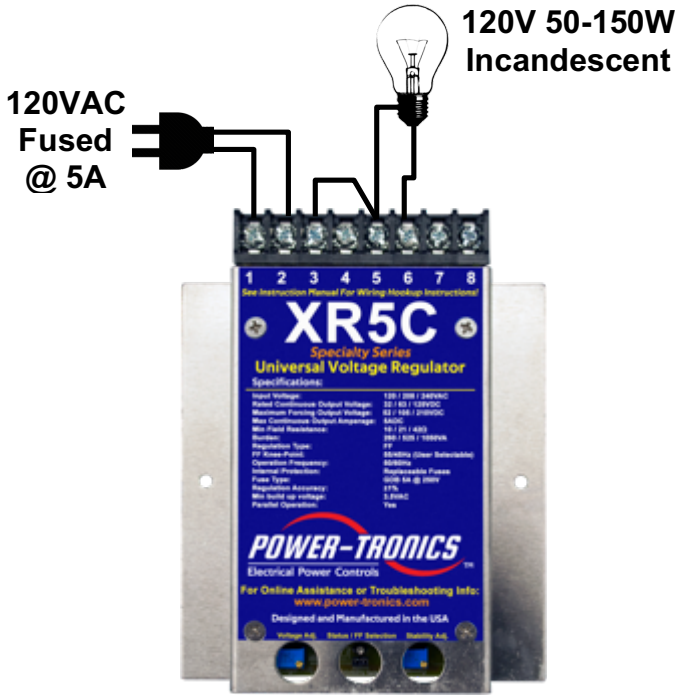



**Figure B**

# 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!**

Submit Online at: www.power-tronics.com/warranty

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

Submit Online at: www.power-tronics.com/warranty

# 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(s) 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.