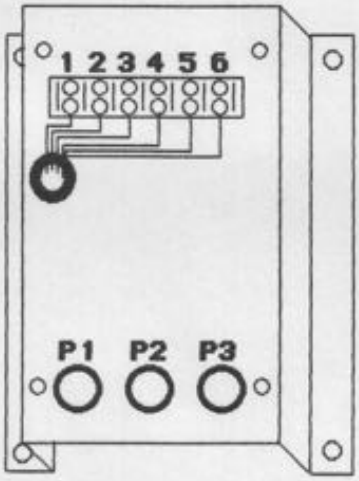
VR504A
DETAILED INSTRUCTION SHEET

PT033191



Manufactured by : POWER-TRONICS, INC.
Corpus Christi, Texas

The VR504A voltage regulator was designed to fill a universal role in replacing older mechanical and electronic as well as the newest digital voltage regulators in use today. It also can be used to control much larger static exciters found in older brush type generators.

Because the VR504A has been designed for such a universal role, it has some very different operating characteristics than the other regulators that are considered the standard industry fare.

The VR504A is designed to let the installer actually adjust the characteristics of the regulator to match the requirements of the generator. This is accomplished by using adjustment potentiometers located on the regulator and selecting the incoming power to the regulator. No dropping resistors or special reactors or transformers are needed.

Special note: Never use a digital volt meter to set up a generator or voltage regulator. It will not indicate real flickers or fluctuations and will not give a true voltage reading either on dc or ac when fluctuations are present. Only use a vane type voltmeter on generators !!!!

There is a special reason that there are no identifications of positions or functions printed on the case of the voltage regulator. This is done to insure that the instruction sheet is present upon each installation.!

Installation and mounting : The VR504A regulator is designed to operate in hostile environments, but for the longest life and best operation, it should be mounted in the cleanest and most vibration free location possible such as the meter package or inside a switchboard.

Minimum field resistance values: 10 ohms at 120vac input, 20 ohms at 240vac input.

Maximum output amperage: 5 amps dc. Higher amperes can be obtained with optional adaptors.

RFI and induced voltages: Never use a multiconductor cord to hook up this regulator. Use loose wiring or a shielded cable with only one end of the shielding connected to ground.

Magnetic interference: Do not mount this regulator near any strong magnetic fields such as within 6 inches of high current conductors or placed next to a magnetic field such as an exciter field or a pmg exciter housing.

High voltage protection of output of generator: The most common failure of all voltage regulators is high and uncontrollable voltage or no voltage at all. The only absolute protection against high voltage is a voltage sensing relay. These relays are available thru most generator service companies.

Low speed operation of generator: If warm up or cool down of the generator engine is desired, a run / idle switch should be placed in series with the input voltage of the regulator. This switch can also be used as an emergency shut down for the generator voltage. Damage to the regulator and generator can result from low rpm operation of the generator.

Incoming supply voltage: This regulator is designed to have an input voltage as high as 250 vac. To determine your input voltage, you should know what the full load exciter voltage of the generator is. If the full load exciter voltage is less than 32 volts, the best input voltage will be somewhere around 120 vac. If the full load exciter voltage is above 32 volts, an input voltage of somewhere around 220 vac is recommended .

If the exciter voltage is unknown, there are several ways to make an educated guess as to what it is. If the field resistance is lower than 15 ohms, it may indicate that the exciter is of the low voltage type. Another way to determine the exciter voltage is to run the generator at rated rpm and momentarily connect a 12 vdc battery to the exciter fields. If the output voltage is too high or correct, the exciter has a low voltage requirement, If the output voltage is too low, the exciter is of the higher voltage requirement.

This is not a foolproof test, but should serve to give you an idea of where to start. The dc voltage at the exciter fields should be checked with the generator at rated speed with no load and then during full load conditions.

Sometimes a generator will not have a residual voltage high enough to create a buildup of the line voltage. This usually occurs on low voltage exciters. If so, simply input 220 volts to the regulator instead of the 120 volts normally required.

Regulator adjustment P1: This adjustment is for setting the desired output voltage of the generator. When the voltage regulator is first installed and run up, the voltage should be pulsing. This is normal because the P1 adjustment is below 80 vac, which is the voltage that is required for the buildup circuit to disengage. When P1 is adjusted above 80 vac, the pulsation will either stop or begin to become mildly erratic.

It is very rare that the voltage will become perfectly set up at this time. Adjust the output voltage to about 80% of what you would like your output voltage to be. Other adjustments will be done at this time. The voltage will rise and fall as these other adjustments are made. Keep the voltage in the 80% range with P1.

Regulator adjustment P2: ***Note: This adjustment is not normally used.*** This adjustment is for correcting a voltage rise which sometimes occurs on very low voltage exciters when the engine speed is reduced during shut down or sloppy governor operation. If an undesirable voltage rise occurs during these conditions, which will be 1 to 5 volts, turn the P2 adjustment cw in small increments to correct the error. As P2 is adjusted, the voltage will lower. Sometimes when P2 is fully cw, the line voltage of the generator will not adjust to full output even with the P1 adjustment fully cw. This is due to over compensating of the voltage regulator. To correct this, slowly adjust P3 cw until the line voltage is at the desired level. It is best not to use this adjustment unless absolutely necessary. All P2 adjustment holes are plugged and to remove the plug, use a pair of needle nose pliers and pinch the locking brackets on each side of the plug and push the plug up and out of the adjustment hole.

Regulator adjustment P3: This adjustment is used to match the reactance time of the generator with the output of the voltage regulator. If the voltage regulator is reacting too fast, the line voltage will be erratic as the regulator tries to overcompensate for its own voltage changes. To slow down the reactance time of the regulator to match the reactance time of the generator, very slowly turn P3 cw until the voltage becomes steady with no flicker. As you turn P3 cw, the voltage will rise, keep the voltage near the 80% range with P1. When the voltage is smooth and there is no flicker, adjust the voltage up to the desired level with P1 and observe the voltage for about 2 minutes. If no flicker occurs, you are ready to place the generator on line. If a flicker is noticed, adjust P3 cw a little more.

Trouble shooting

No build up of voltage: With generator running at operating speed, check the residual voltage at 1 and 2 on the VR504A terminal board. The voltage should be more than 3.5 volts ac. If the voltage is below this value, remove the exciter fields from the regulator and momentarily apply 12vdc to them while the generator is running at speed. The voltage at 1 and 2 should increase to a much higher value during this test. If the voltage does not increase to a much higher value, check all wiring and fusing that lead to the regulator for open circuits. Also make sure that during this test that all of the adjustment potentiometers are set fully cw and that the output dc field voltage at 2 and 3 also increases as this would indicate that the voltage regulator is functioning correctly. After this test, set all adjustment potentiometers fully ccw.

If the voltage at 1 and 2 on the voltage regulator increases during the test, and the dc voltage at 2 and 3 does not increase, this would indicate that the regulator is damaged or defective.

If the line voltage did not increase on the generator when the exciter fields were connected to the 12 vdc, there is an internal problem in the generator such as an open exciter field or shorted or open diodes in the rectifier bank or open rotor.

After this test, disconnect the 12 vdc from the exciter fields and re-connect the field leads to the regulator. Make sure that the lead that was connected to the positive of the 12 volts is connected to 3 and the lead that was connected to negative is connected to 2 on the voltage regulator.

Run the generator up to speed. If the line voltage is pulsing, go ahead and set up the regulator as previously described. If there is no build up and the residual voltage at 1 and 2 is still too low, change the input voltage to 240 vac which should double the residual voltage at 1 and 2. If when hooked up with a 240 vac input, if the residual is still too low for build up, then an external flashing circuit will have to be installed.

Minor flickering of voltage: P3 is not set far enough cw. With generator disconnected from load, slowly turn P3 cw until flickering stops.

Voltage is high and uncontrollable: Voltage regulator is defective or the exciter field is grounded. Another reason for this is that the exciter amperage exceeds the rating of the voltage regulator.

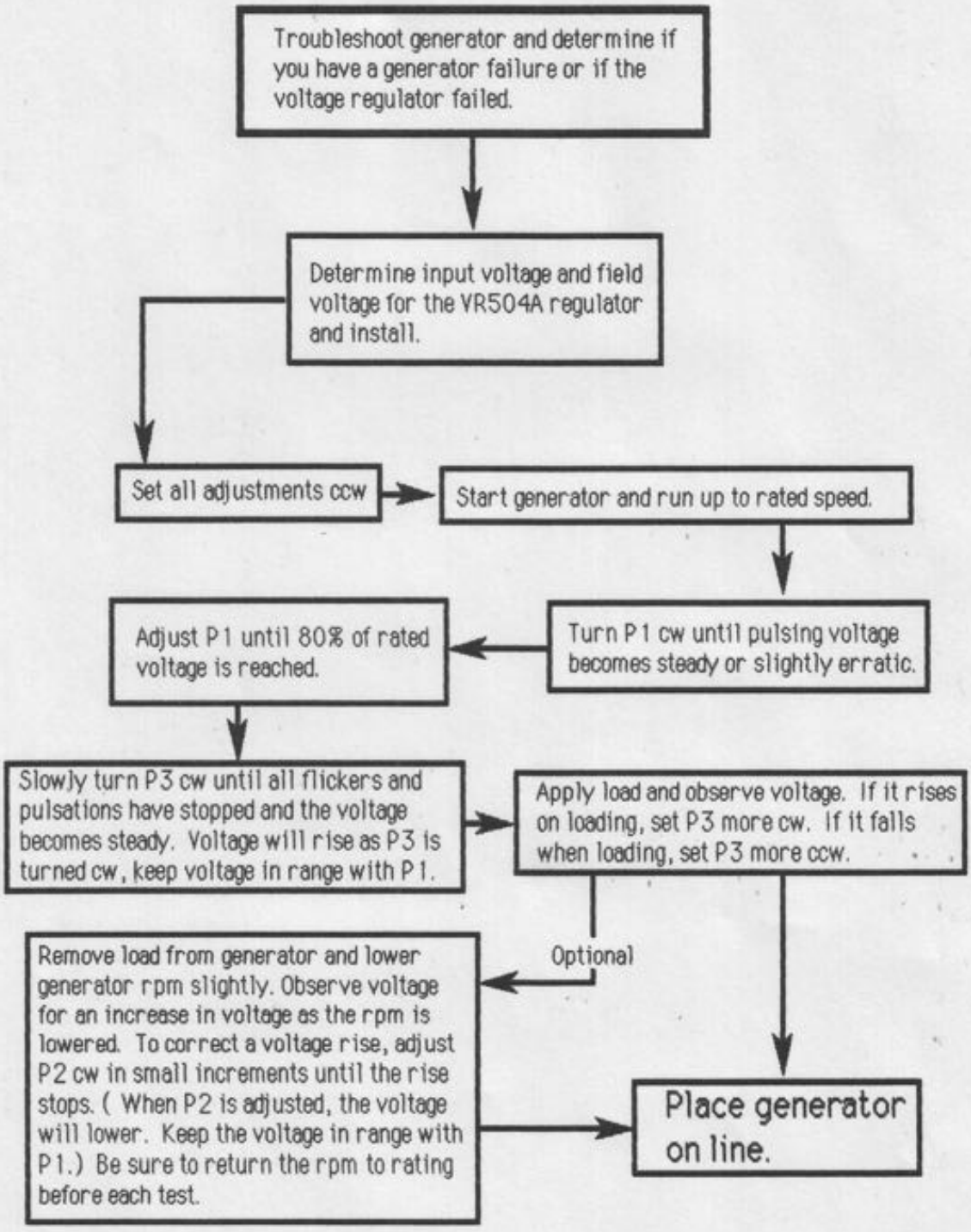
Intermittent flashes or glitches in voltage: Loose connection to regulator ac input or a defective exciter field with a carbon track or intermittent open in field coil or loose components in the voltage regulator due to excessive vibration.

Voltage rises with load: Unbalanced loading of generator leads or P3 needs to be adjusted more cw.

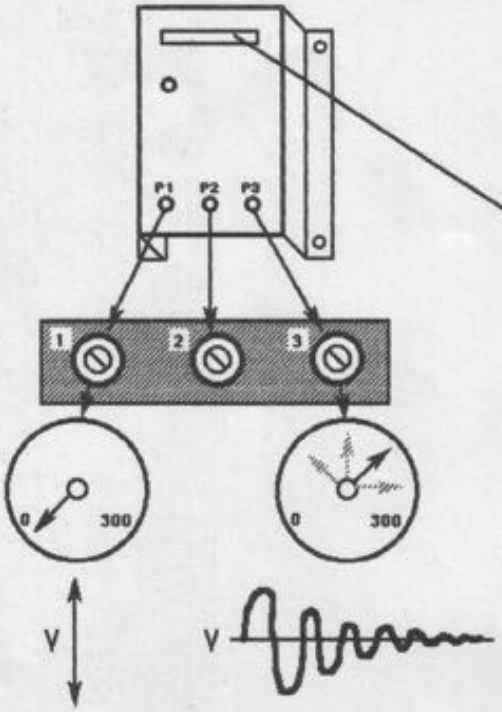
Voltage falls off with load: P3 is adjusted too far cw, adjust ccw until voltage droop is satisfactory.

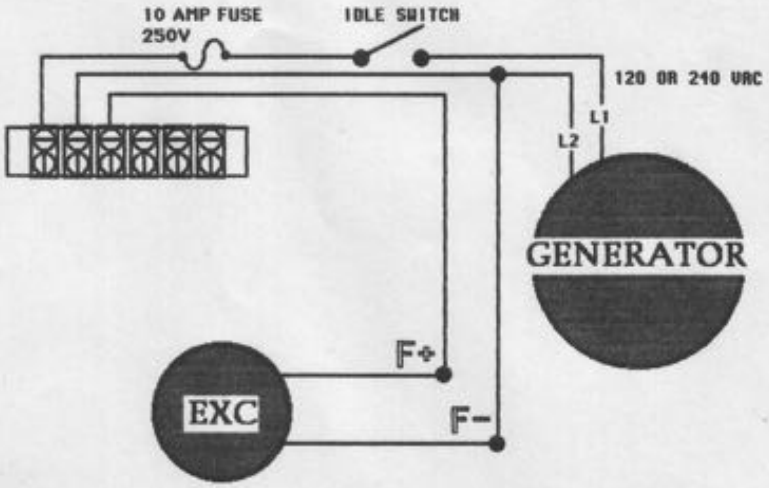
Voltage rises too much during shut down: P2 needs to be adjusted cw to correct the rise. Turn just enough to correct the rise.

Voltage will not adjust to lower values: Input wiring to voltage regulator is supplied thru a cord or cable that is unshielded. Use loose wiring or shielded cables.


Troubleshoot generator and determine if you have a generator failure or if the voltage regulator failed.
Determine input voltage and field voltage for the VR504A regulator and install.
Set all adjustments ccw
Start generator and run up to rated speed.
Turn P1 cw until pulsing voltage becomes steady or slightly erratic.
Adjust P1 until 80% of rated voltage is reached.
Slowly turn P3 cw until all flickers and pulsations have stopped and the voltage becomes steady. Voltage will rise as P3 is turned cw, keep voltage in range with P1.
Apply load and observe voltage. If it rises on loading, set P3 more cw. If it falls when loading, set P3 more ccw.
Optional
Remove load from generator and lower generator rpm slightly. Observe voltage for an increase in voltage as the rpm is lowered. To correct a voltage rise, adjust P2 cw in small increments until the rise stops. (When P2 is adjusted, the voltage will lower. Keep the voltage in range with P1.) Be sure to return the rpm to rating before each test.
Place generator on line.

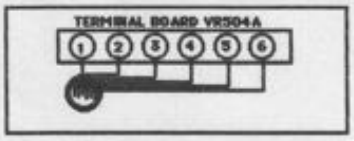
VR504A
ELECTRONIC VOLTAGE REGULATOR





INPUT VOLTAGE	80 TO 250 VAC
OUTPUT VOLTAGE F+	.8 TO 105 DC
MAXIMUM DC AMPERAGE	5 ADC / 25 ADC WITH A504
FREQUENCY	45 TO 70 HZ.
VOLTAGE DROOP	ADJUSTABLE TO 10%
REGULATION ACCURACY	LESS THAN 1% OF SETTING
SIZE	6IN. X 5IN. X 2IN.
WEIGHT	8 OZ.

START UP PROCEDURE



A. INSTALL A JUMPER BETWEEN 3 AND 4 IF THIS REGULATOR IS TO BE USED ON A LOW VOLTAGE EXCITER FIELD. 32 VOLTS OR LESS.

B. INSTALL A JUMPER BETWEEN 5 AND 6 IF NO EXTERNAL 2,000 OHM VOLTAGE ADJUSTMENT IS USED.

C. MAKE SURE THAT THE EXCITER FIELDS ARE IN GOOD CONDITION AND HAVE NO CONTACT WITH GROUND OR OTHER CIRCUITRY.

D. SUPPLY THE REGULATOR WITH 120 VOLTS FOR EXCITERS OF 32 VOLTS OR LESS. SUPPLY THE REGULATOR WITH 240 VOLTS FOR EXCITERS OF 32 VOLTS OR MORE.

NOTE: AS ADJUSTMENTS ARE MADE, THE VOLTAGE WILL RAISE AND LOWER, KEEP THE VOLTAGE ADJUSTED TO 80% OF DESIRED VOLTAGE WITH P1. WHEN FIRST INSTALLED THE VOLTAGE WILL PULSE UNTIL P1 IS TURNED CW. MAKE ALL ADJUSTMENTS VERY SLOWLY!

1. TURN ALL VOLTAGE ADJUSTMENT POTS FULLY CCW.
2. START GENERATOR, RUN UP TO SPEED, DO NOT IDLE.
3. TURN P1 CW UNTIL 80% OF DESIRED VOLTAGE IS OBTAINED.
4. IF THE VOLTAGE IS STABLE AND NOT PULSATING, TURN P1 CW UNTIL THE DESIRED VOLTAGE IS REACHED. NO OTHER ADJUSTMENT WILL BE NEEDED.

IF THE VOLTAGE IS PULSATING, VERY SLOWLY TURN P3 CW UNTIL THE PULSATION STOPS , (KEEP VOLTAGE IN RANGE WITH P1), IF PULSATION DOES NOT STOP, THIS REGULATOR WILL NOT BE SUITABLE FOR THE APPLICATION.

HOOKUP WITH OPTIONAL A504 ADAPTOR.