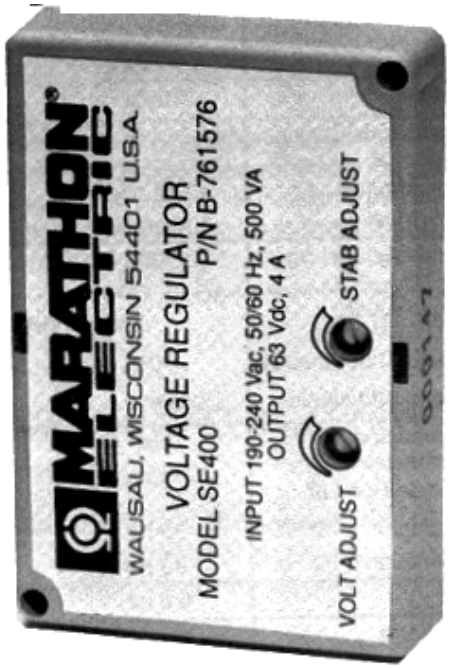
# VOLTAGE REGULATOR




# INSTRUCTION MANUAL FOR

## SE250

## SE400

MARATHON® ELECTRIC

*A Subsidiary of Regal-Beloit Corporation*

## INTRODUCTION

The SE250 and SE400 voltage regulators are partially encapsulated electronic voltage regulators which control the output of a brushless AC generator by regulating the current into the exciter field.

| SPECIFICATION | REGULATOR | |
|---|---|---|
| | SE250 | SE400 |
| Sensing & Power Input | 190-240 Vac | 190-240 Vac |
| Burden | 500 VA | 500 VA |
| Output Power- Continuous | 6 3 Vdc at 2.5 A (158w) | 63 Vdc at 4 A (252w) |
| Output Power - Forcing (240 Vac Input Power) | 105 Vdc at 4.3 A 9452w) | 105 Vdc at 7 A (735w) |
| Regulation | 1 .0% | 1 .0% |
| Exciter field resistance<br>Minimum<br>Maximum | <br>25 ohms<br>100 ohms | <br>15 ohms<br>100 ohms |
| Voltage Adjustment Range | 171 - 264 Vac | 171 - 264 Vac |
| Remote Voltage Adjustment Range<br>1000 ohm rheostat<br>500 ohm rheostat | <br>±10%<br>±5% | <br>±10%<br>±5% |
| Frequency Compensation<br>Roll off frequency | Fixed<br>55 Hz for 60 Hz<br>45 Hz for 50 Hz | Adjustable<br>50-63 Hz for 60 Hz<br>43-53 Hz for 50 Hz |
| Weight | 6.5 OZ. | 7.0 OZ. |
| Operating Temperature | - 40°C to + 60°C | |
| Storage Temperature | - 65°C to + 85°C | |
| Power Dissipation | 8 watts maximum | |
| Size | 3.94'L X 2.66”W X 2.20'H | |
| Voltage Buildup | Internal provisions for automatic voltage build up from generator residual voltage as low as 10 Vac. | |
| EMI Suppression | Internal electromagnetic interference filter (EMI Filter). | |
| Over Excitation Shutdown | The regulator turns off when:<br>1. The exciter field voltage exceeds 100 ± 5 Vdc for a time inversely proportional to voltage, or<br>2. Instantaneously if the exciter field voltage exceeds 15 ± 5 Vdc | |

**WARNING**

**TO PREVENT PERSONAL INJURY OR EQUIPMENT DAMAGE, ONLY QUALIFIED PERSONNEL SHOULD INSTALL, OPERATE, OR SERVICE THIS DEVICE.**

**WARNING**

**Regulator has live terminals and components when in operation. Electrical shock hazard exists if contacted. Disconnect all power to regulator and make sure generator is off before servicing. Use extreme caution when making adjustments.**

**CAUTION: DO NOT megger or high-pot the generator with the regulator connected. DO NOT megger or high-pot the regulator.**

# INSTALLATION

## MOUNTING

The SE 350 voltage regulator can be mounted in any plane. See Figure 1 for mounting dimensions.

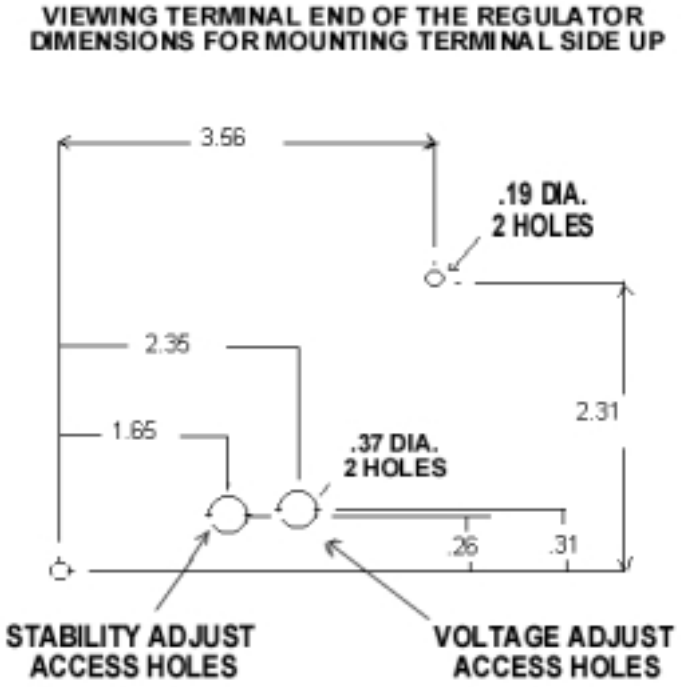



**FIGURE 1**

## EXCITER POWER CIRCUIT

The DC resistance of the exciter field must be greater than 25 ohms for the SE250 and 15 ohms for the SE400; field resistance must be less than 100 ohms for both

Connect the regulator wire F+ to the generator F+ or Fl field terminal.

Connect the regulator wire F- to the generator F- or F2 field terminal.

See Figure 2 for typical connection diagram

## SENSING/POWER INPUT CIRCUIT

Input power and sensing is achieved through terminals 3 and 4. See Figure 2.
**The voltage input requirement is 190 to 240 Vac.**

## FUSE

A 4 Amp, 250 V, 5 X 20 mm fuse is supplied with the regulator (Part A-527066).

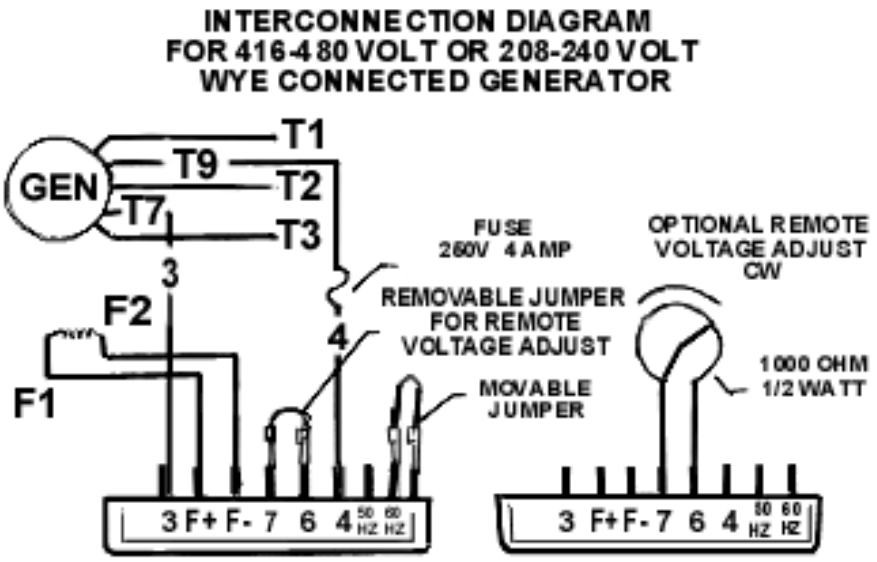



**FIGURE 2**

## VOLTAGE ADJUST

The screwdriver adjustable potentiometer adjusts the generator output voltage. Adjustment clockwise increases the generator output voltage.

When using a remote voltage adjust rheostat, remove the jumper wire across terminals 6 and 7 and install a 1000 ohm 1/2 watt (minimum) rheostat. (See Figure 2.) This will give ±10% voltage variation from the nominal. (For ±5% voltage variation use a 500 ohm 1/2 watt rheostat).

## STABILITY ADJUST

System stability is the ability of the generator to respond to load transients. Decreasing the stability makes the generator less sluggish and faster to respond to toad transients. If the stability of the regulator is decreased too much, the generator will tend to hunt under steady state conditions.

The screwdriver adjustable potentiometer adjusts the system stability. Adjustment clockwise increases the stability. Increasing the stability increases the response time of the generator. Conversely, decreasing the stability decreases the response time of the generator.

## V/HZ ROLL-OFF FREQUENCY SELECTION

The roll off point is the frequency where the generator voltage starts to decrease. This reduces the Kilowatt load to the engine, which allows the engine to recover in speed under any load transient condition.

### SE250

For 60 Hz operation, connect the frequency jumper wire to the terminal labeled "60 Hz". This will give a roll-off frequency of about 55 Hz
For 50 Hz operation, connect the frequency jumper wire to the terminal labeled "50 Hz". This will give a roll-off frequency of about 45 Hz

### SE400

Use jumper to select 50 HZ or 60 Hz. The screwdriver adjustable potentiometer sets the roll-off frequency from 50-63 Hz in the 60 Hz setting or from 43-53 Hz in the 50 Hz setting.

The SE400 has the roll-off point preset to 54 Hz in the 60 Hz mode and 45 Hz in the 50 Hz mode. To change the roll-off point, adjust engine speed to the desired rated speed. (50 or 60 Hz). Set the voltage to the desired setting at rated speed. Adjust engine speed to the desired roll-off point. Turn the potentiometer counterclockwise until the voltage starts to drop off. Then adjust the potentiometer clockwise until the voltage returns to rated. Re-adjust engine speed to rated speed.

## OVER EXCITATION SHUTDOWN

This feature turns the regulator off if the exciter fiewl exceeds 100±5 Vdc incorporating an inverse voltage / time characteristic. If the voltage exceeds 135 ±5 Vdc the regulator is turned off instantaneously. The regulator will remain latched off until the input power is removed, (or until the generator is stopped and restarted).

## PRELIMINARY SET-UP

Ensure the voltage regulator is correctly connected to the generator. Refer to the specific connection diagram supplied with the generator.

Be sure the proper fuse is installed.

Set the regulator voltage adjust to full counter-clockwise (minimum voltage level).

Set the remote voltage adjust (if used) to the center position.

Set the stability control full clockwise (maximum stability level).

Connect the positive lead of a 100 V D.C. voltmeter to Fl and the negative lead of the voltmeter to F2 or use an appropriate AC voltmeter on the generator output leads.

## SYSTEM START-UP

Start and run the generator at no load and rated speed. The generator voltage should build up to a minimum level. (Actual level is dependent upon connection). If it does not build up, refer to field flashing section in generator manual.

Slowly adjust the voltage control until the generator voltage reaches the nominal value. If used, adjust the remote voltage rheostat to set the generator voltage to the exact value desired.

Turn the stability adjust counter-clockwise until instability is shown on either of the voltmeters mentioned in the “PRELIMINARY SET-UP” section. With the system operating in an unstable condition, slowly adjust the stability control clockwise until generator stability is reached.

Interrupt regulator power for a short time (approximately 1-2 seconds).

If the generator remains stable, no further adjustment is necessary. If the generator does not remain stable, increase the stability slightly and interrupt regulator power again.

This procedure should be repeated until system stability is reached and maintained.

## TROUBLESHOOTING

| Symptom | Cause | Action |
|---|---|---|
| **Residual Voltage -No Output** | Residual voltage at regulator power input wires 3 & 4 below 10 V ac. | Check wiring diagram for proper connections. Flash generator field. Refer to field flashing section in generator manual. |
| | Field leads Fl, F2 not connected. | Connect field leads Fl, F2. |
| | Power input leads not connected. | Connect power-input leads 3,4. |
| | Blown or missing fuse. | Replace fuse. |
| | Defective regulator. | Replace regulator. |
| | Defective generator. | Consult generator manual. |
| **Output Voltage Low** | Incorrect connections. | Check wiring diagram for proper connections. |
| | Voltages adjust turned down. | Rotate voltages adjust CW until desired voltage is reached. |
| | Remote voltage adjust is turned down. | Rotate remote voltages adjust CW until desired voltage is reached. |
| | Defective regulator. | Replace regulator. |
| **Output Voltage High** | Voltages adjust turned too high. | Rotate voltages adjust CCW until desired voltage is reached. |
| | Remote voltage adjust is turned too high. | Rotate remote voltages adjust CCW until desired voltage is reached. |
| **Output Voltage High -No Adjustment** | Defective regulator. | Replace regulator. |
| **Remote Voltage Adjust Operates Backwards** | Voltages adjust wire backwards. | Reverse the wiring of the remote voltage adjust. |
| **Generator Output Voltage Hunting** | Stability adjusts not set properly. | Rotate the stability adjusts in a CW direction until hunting stops. |
| **Poor Regulation** | Excessive load on unit.<br>Defective regulator. | Reduce load to nameplate rating or less.<br>Replace regulator. |