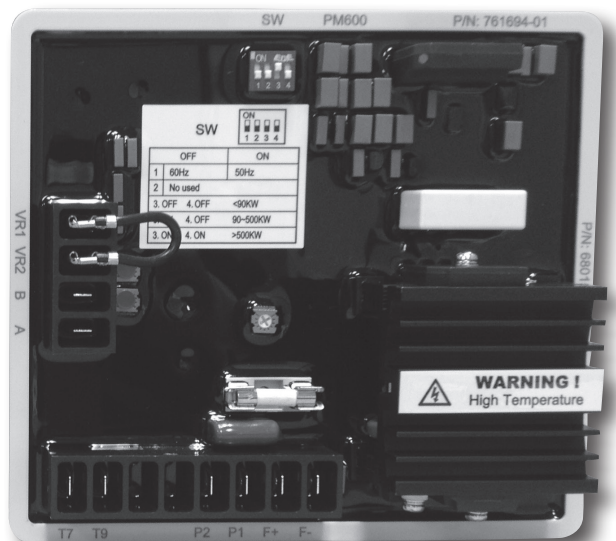


# marathon™

## PM600

### Voltage Regulator User Manual



## INTRODUCTION

The PM600 is an encapsulated electronic voltage regulator intended for use with Marathon Generator's PMG system. The PM600 controls the output of a brushless AC generator by regulating the DC current input to the exciter field. The PM600 is designed as single phase sensing regulator that is capable of accepting analog voltage adjustment input.

## SPECIFICATION

|                                     |                                                                                         |
|-------------------------------------|-----------------------------------------------------------------------------------------|
| Sensing Input                       | 220-600Vac, 50Hz/60Hz                                                                   |
| Power Input, PMG                    | 110-260Vac, 40-500Hz,                                                                   |
| Power Output, Continuous            | 85 Vdc at 5Adc                                                                          |
| Power Output, Forcing               | 170 Vdc at 7Adc for 10 sec. with 220Vac input power                                     |
| Fuse                                | 5 x 20mm S505-5A, Slow Blow Type                                                        |
| Voltage Regulation                  | ± 0.5%, with 4% engine governing                                                        |
| Excitation Resistance               | 9 ohms, minimum                                                                         |
| Remote Voltage Adjustment Range     | ±10% with 1000 ohm rheostat<br>±5% with 500 ohm rheostat                                |
| Analog Voltage Input A & B          | 0-5Vdc bias in 100 steps of 0.05V.                                                      |
| Adjustment Ranges                   |                                                                                         |
| 480V 3 Phase                        | Output changes 1V per each 0.05V input<br>Voltage range = 100 volts ± 2V from 400-500V  |
| 240V 3 Phase                        | Output changes 0.5V per each 0.05V input<br>Voltage range = 50 volts ± 1V from 200-250V |
| 208V 3 Phase                        | Output changes 0.5V per each 0.05V input<br>Voltage range = 50 volts ± 1V from 200-250V |
| 240V 1 Phase                        | Output changes 0.5V per each 0.05V input<br>Voltage range = 50 volts ± 1V from 200-250V |
| Roll-Off Frequency Factory Settings | 47Hz preset for 50Hz operation<br>57Hz preset for 60Hz operation                        |
| Voltage Build-up                    | Automatic voltage build up from generator residual<br>voltage ≥ 5Vac at 25Hz.           |
| Response Time                       | <1 Cycle                                                                                |
| Weight                              | 16.6 oz.                                                                                |
| Operating Temperature               | -40°C to +70°C                                                                          |
| Storage Temperature                 | -40°C to +85°C                                                                          |
| Power Dissipation                   | 12 watts, maximum                                                                       |
| Size                                | 5.9" L x 5.3" W x 2.2" H                                                                |
| Thermal Drift                       | 0.05% / °C change in AVR ambient temperature                                            |

### WARNING

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

### CAUTION

**DO NOT megger or high-pot the generator with the regulator connected. DO NOT high-pot the regulator. All voltage readings are to be taken with an average-reading voltmeter.**

## INSTALLATION

### MOUNTING

The PM600 is mounted through a keyed hole in the generator conduit box and secured with a plastic mounting nut.

The PM600 should be mounted directly to the conduit box panel with the rubber gasket positioned between the outside of the conduit box panel and the mounting nut.

Protect front panel adjustment pots by installing clear plastic cover.

Mounting nut torque is 26 – 43 lbf-in.

Refer to the Figure 1 for dimensions.

## WIRING AND CONNECTIONS

### EXCITER FIELD POWER CIRCUIT

The exciter field resistance must be  $\geq 9$  ohms.

If the exciter field resistance is less than 9 ohms and the full load field current does not exceed the maximum continuous current rating of the AVR, add a resistor in series of sufficient wattage to increase the total resistance to 9 ohms.

Connect the generator F+ (F1) field lead to the regulator F+ terminal. Connect the generator F- (F2) field lead to the regulator F2 terminal. Refer to Figure 3 for typical connection points.

### POWER INPUT CIRCUIT

The PM600 is designed to be powered by a PMG and capacitor. A 7.5 $\mu$ f capacitor is to be connected in parallel between the PMG leads and the regulator power input terminals.

The regulator power input terminals are labeled P1 and P2. Connect leads P1 and P2 to the capacitor terminals.

When a PMG system is not present or is not functional, the PM600 may be shunt powered from the generator output leads. Connect regulator terminal P1 to generator lead T9 and regulator terminal P2 to generator lead T7. The capacitor is not used when the PM600 is shunt powered.

Refer to Figure 3 for typical connection points.

### SENSING AND CONTROL CIRCUITS

Connect regulator terminal T7 to generator lead T7 and regulator terminal T9 to generator lead T9.

Regulator terminals A & B may be connected to the output of an analog gen-set controller. Jumper VR1 & VR2 when an analog gen-set controller is used.

In lieu of an analog gen-set controller a 1000 or 500 ohm, 1 watt rheostat may be connected to VR1 and VR2 to provide voltage adjustment.

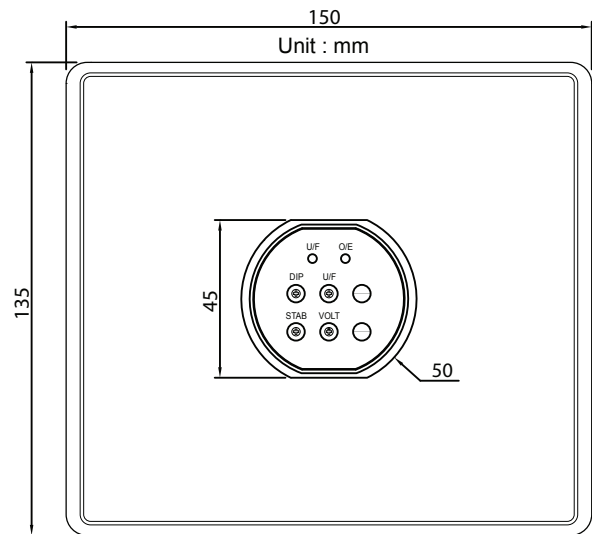


Figure 1

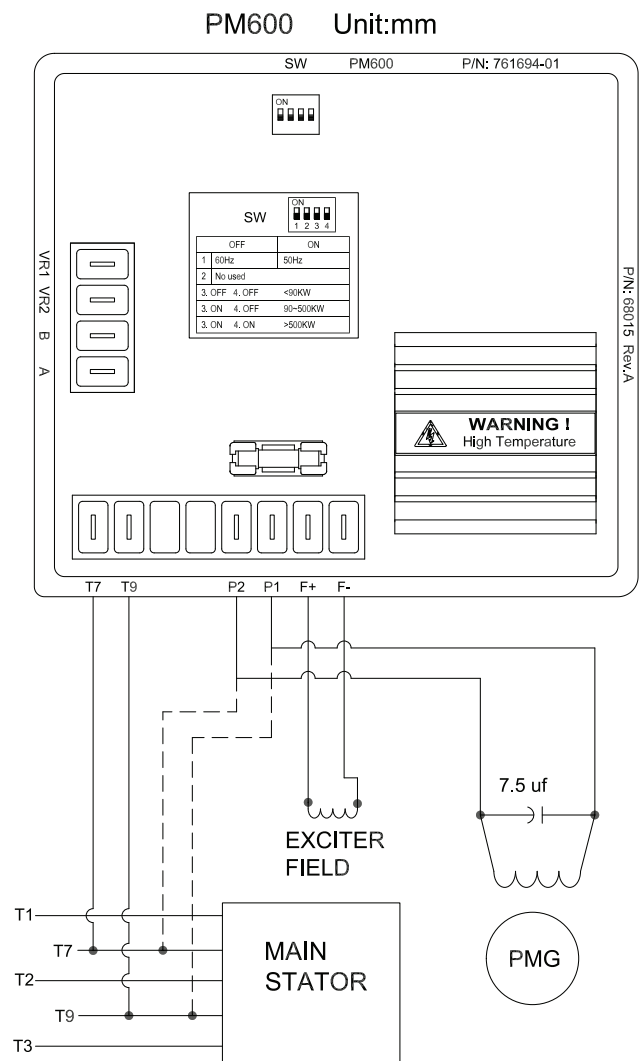


Figure 2

## DIP SWITCH PROGRAMMING

Four DIP switches are located on the back panel of the regulator and must be set appropriately for correct generator operation. Refer to Figure 3.

Switch (S1) – Sets Generator Frequency

S1 – OFF = 60Hz operation.

S1 – ON = 50Hz operation.

Switch (S2) – Not Used.

Switches (S3 & S4) – Set Generator Size in kW

S3 – OFF, S4 – OFF : < 90kW rating.

S3 – ON, S4 – OFF : 90 - 500kW rating.

S3 – ON, S4 – ON : > 500kW rating.

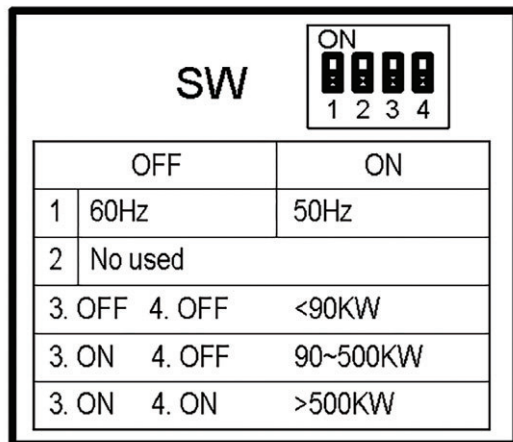


Figure 3

## OPERATING ADJUSTMENTS

Four screwdriver adjustable potentiometers are accessible on the front panel of the PM600. These are: VOLT, STAB, U/F and DIP.

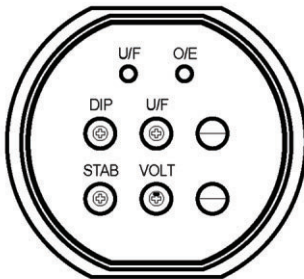


Figure 4

## VOLTAGE ADJUST (VOLT)

The screwdriver adjustable potentiometer adjusts the generator output voltage directly. When an analog gen-set controller is not installed, a 1000 ohm, 1 watt rheostat may be connected to VR1 and VR2 to provide a  $\pm 10\%$  voltage adjustment range.

## STABILITY ADJUST (STAB)

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

Correct Stability adjustment must be conducted while the generator is operating unloaded.

Adjust the STAB potentiometer clockwise until the voltage becomes unstable, then slightly adjust counterclockwise (Approximately 1/5 of a turn) until the voltage becomes stable.

## UNDER FREQUENCY ROLL-OFF ADJUST (U/F)

The Roll-Off point is the frequency at which the generator voltage is allowed to decrease. This reduces the load on the engine, which allows the engine RPM to recover.

The Roll-Off frequency is factory preset at 57Hz for 60Hz operation and 47Hz for 50Hz operation.

To change the roll-off point, adjust engine speed to the required speed – 1500RPM or 1800RPM.

Set desired voltage. Adjust engine speed to the new roll-off point. Next, adjust the potentiometer clockwise until the voltage starts to drop off. Then adjust the potentiometer counterclockwise until the voltage returns to rated voltage. Re-adjust engine speed to rated speed.

## U/F DIP ADJUST (DIP)

When Under Frequency (U/F) protection is activated, the voltage dip follows a linear Volts / Hertz curve. The voltage dip ratio may be adjusted via the DIP potentiometer with an adjustable range of 3-10V/Hz.

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