# Model 480
# UNIVERSAL VOLTAGE REGULATOR

Manufactured by
FLIGHT SYSTEMS
www.flightsystems.com

## INSTALLATION and ADJUSTMENT INSTRUCTIONS

**Description and Specifications**

The Model 480 Universal Regulator is designed for OEM applications as well as an economical replacement for many hard to get or obsolete regulators found on older generator sets. It is easy to install and works with all single and three phase systems from 100V to 480V, 50 or 60 Hz by connecting four or five wires. It works with brushless exciters or conventional fields. Field excitation of up to 5 A is provided by means of a phase-controlled SCR. The unit is internally fused and includes a heavy-duty EMI filter with voltage spike suppression. Adjustments are provided for Voltage, Stability and Voltage/Frequency Ramp. Separate voltage sensing and remote voltage adjustment are supported. Voltage regulation is typically +/- 1%. The output voltage is automatically reduced during under-speed operation. An under-frequency LED indicator shows when the engine speed is low. A soft start feature helps prevent a sudden load on the engine at startup. The Model 480 is self-starting on a residual voltage of 5 volts or less and does not require field flash. Connection is by means of a screw-terminal barrier strip for safety and reliability. The unit is encapsulated in a clear urethane compound for protection and is fully repairable. Overall size is 3.5" [89] W x 5.75" [146] L x 2.30" [58] H. (See Unit Dimensions Diagram, Pg. 6)

**Application**

The Model 480 may be used with almost any generator with a system voltage of 100 to 480 volts, 50 or 60 Hz, and a field current requirement of up to 5 Amps. The field or exciter field resistance must be between 15 and 500 ohms and be isolated from all other circuits. The maximum available field voltage (up to 90 VDC) will depend on the voltage powering the regulator. The regulator powering voltage at terminals B-C must be between 100V and 300V. The sensed voltage at terminals A-C must be between 100 and 480VAC. Sensing voltage range is selected by connecting a jumper (supplied) between the appropriate terminals of TB3 (see illustrations). After the voltage range is selected, the VOLTS adjustment pot is used to precisely set the desired output voltage.

**Installation**

1. If applicable, remove the old regulator and carefully mark the wires. Verify that the field circuit is isolated from all other circuits and that the field resistance is between 15 and 500 ohms.

2. Mount (fix) the unit to a flat surface in a suitable location using the four #8 (0.177 [4.5mm]) clear holes provided. These holes may be enlarged to #10 (0.205 [5.2mm]) if necessary. Make sure that the location chosen provides adequate ventilation for cooling and access to the adjustments.

3. Please refer to the wiring diagrams below and determine which one is appropriate for your generator. Ring or spade type terminals on wires are preferred as they make the most secure connection. The barrier strip can clamp wires without using terminals, however this method is not as secure.

4. Observing polarity, connect the positive field terminal of the generator to F+ and the negative field terminal to F-. NOTE: Connecting the field backwards may require re-flashing of the field due to reversal/loss of residual magnetism.

5. Place the voltage programming jumper in the proper position on TB3 for your system voltage. The voltage programming jumper is not used on 415/240V and 480/277V systems. See illustrations that follow.

6. Connect terminals A, B, and C on TB1 to the proper points as shown in the wiring diagrams below. On 120V single phase systems, connect sensing terminal A to power terminal B using the link supplied. In this configuration, only four wires are needed. All other configurations use five wires without the link.

7. Refer to the illustration for TB2 connections and install the jumper (supplied) in the position that is appropriate for your generator. Note: The jumper **must** be installed for 50 Hz systems but is **not** needed at all for 60 Hz operation. The jumper position shown for 60Hz operation is merely for storage of the jumper.

8. If desired, an external remote voltage adjustment potentiometer may be added by connecting it in place of the jumper that is now connected on TB2 between the EXT VOLT terminals. See illustrations and adjustment instructions on following pages.

**CAUTION: Do not come in contact with any metal parts of the regulator, including the heat sink, as dangerous voltages are present when the generator is running.**

## Adjustment

Verify the wiring before proceeding with adjustment. Make sure that the voltage programming jumper on TB3 and the frequency jumper on TB2 are in the correct position for your system voltage and frequency. Turn the STAB pot full CCW. Start the generator and bring it up to rated operating speed (use the Hz function on your DVM). Make sure that the V/F LED indicator is not on. If it is, turn the V/F pot CCW until the LED just goes off. Adjust the VOLTS pot until the desired output voltage is obtained. The object of the STABILITY adjustment is to obtain the best dynamic response to changes in load without instability. Under no-load conditions, turn the STAB pot slowly CW until the output voltage starts to fluctuate, then CCW until it becomes stable. Repeat if necessary. To adjust the V/F RAMP, reduce the speed of the generator to 58 Hz (48 Hz for 50Hz systems). Turn the V/F pot CW until the V/F LED indicator just comes on. At rated speed, this LED should **not** be on.

## Optional Remote Voltage Adjustment

The output voltage of the generator can be remotely adjusted by adding a 1K potentiometer in place of the jumper connected between the EXT VOLT terminals on TB2. Before connecting the remote potentiometer, follow all of the steps above for installation and adjustment. The potentiometer should be wired so that its resistance decreases with clockwise rotation. See illustration for TB2. Perform output voltage adjustment as follows:

1. Set the remote potentiometer at its mid point.

2. Start the generator and set the VOLTS pot on the regulator for the desired output voltage (120, 230, etc.). The remote potentiometer will now have an adjustment range of approximately +/- 6%.

**Field Flash**

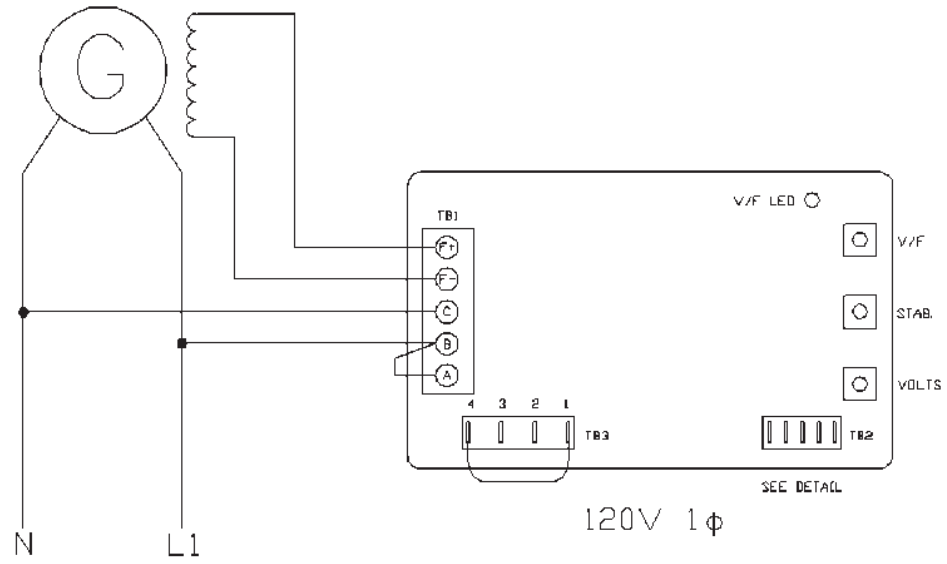
In order for the regulator to start up automatically and build voltage, the residual voltage of the generator should be 5 VAC or higher. If a generator has not been used for a long period of time, has been apart or has had its field inadvertently reversed, it may have lost some or all of its residual magnetism. In this case, it may require field flashing. To flash the field, the generator must be stopped and the field leads disconnected. Momentarily connect the field leads to a 12 volt battery for 3-5 seconds, observing polarity (positive to F+, negative to F-). Repeat a few times. CAUTION: Do not come in contact with the field circuit because a high-voltage "kickback" will occur each time the circuit is interrupted.

## TROUBLESHOOTING CHART

| SYMPTOM | CAUSE | SOLUTION |
|---|---|---|
| Generator voltage does not build up | Residual voltage below 5 VAC | Flash generator field |
| | Incorrect wiring | Re-check wiring |
| | Power wire at (B) not connected | Re-check power wire at (B) |
| | Field wire(s) not connected | Re-check field wires |
| | Open field or exciter circuit | Check field continuity |
| | Field polarity reversed | Re-check field polarity |
| | Generator speed too low | Run generator at correct speed |
| Generator output voltage low | VOLTS pot adjusted too low | Re-adjust VOLTS pot |
| | V/F pot improperly adjusted | Re-adjust V/F pot |
| | Voltage programming incorrect | Re-check TB3 jumper position |
| | External voltage adjust jumper missing on TB2 | Install external voltage adjust jumper on TB2 |
| Generator output voltage high | VOLTS pot adjusted too high | Re-adjust VOLTS pot |
| | Voltage programming incorrect | Re-check TB3 jumper position |
| | Sensing wire at (A) not connected | Connect sensing wire at (A) |
| V/F LED is on at rated speed | V/F pot improperly adjusted | Re-adjust V/F pot |
| | Running at 50 Hz with 60 Hz selected | Check 50/60 Hz jumper position on TB2 |
| Generator output voltage unstable | STAB pot set too far CW. | Re-adjust STAB pot slightly CCW. |
| Fuse Blows | Incorrect wiring | Re-check wiring |
| | Field resistance too low | Re-check field resistance |
| | Required field current above 5 amps. | Select a higher capacity regulator |

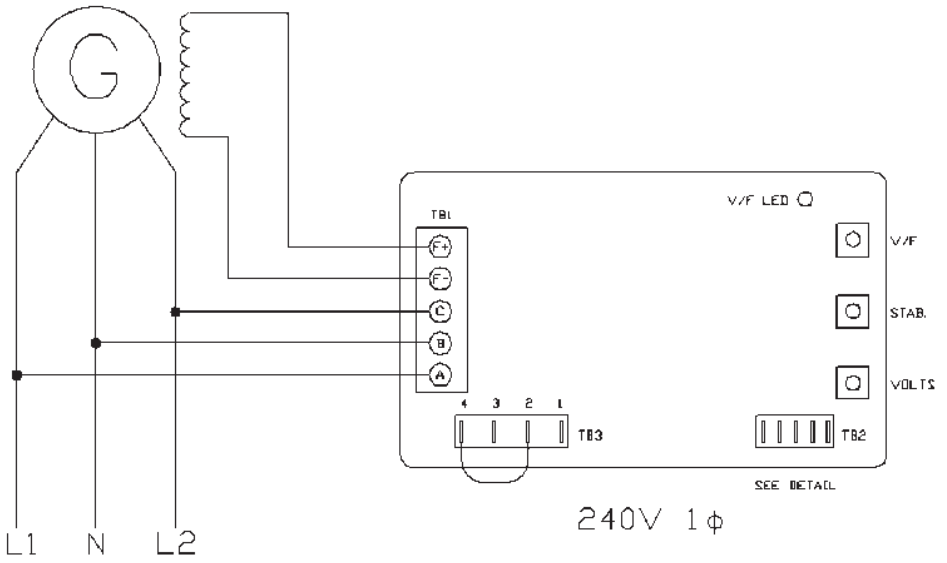
**Warranty**

The Model 480 Universal Regulator is warranted against defects in materials and workmanship for a period of two years from the date of shipment. This warranty does not cover damage caused by operation outside of ratings, misapplication or abuse. Flight Systems is not responsible for consequential damage to other equipment, loss of use, spoilage of product, labor or travel costs, or injury to personnel as a result of its use. Warranty service is limited to repair or replacement of product that we determine is defective, otherwise our standard repair rates will apply.



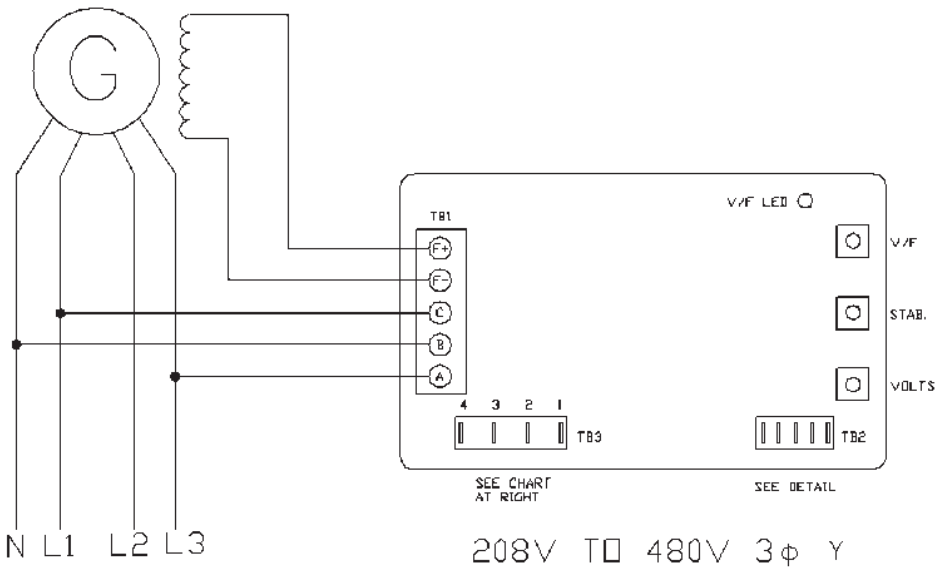

120V 1φ

| SYSTEM VOLTS | TB3 |
|---|---|
| 100 - 120V 1φ | 1-4 |



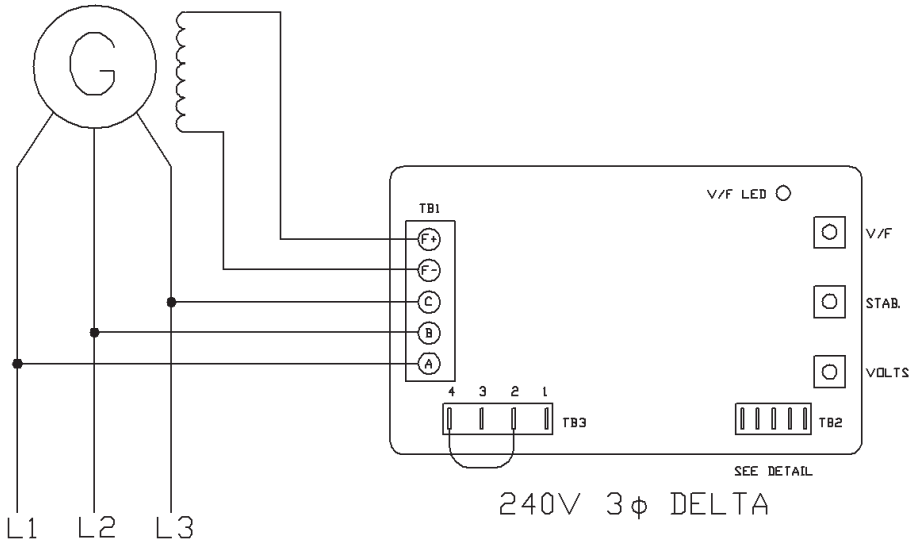

240V 1φ

| SYSTEM VOLTS | TB3 |
|---|---|
| 200 - 240V 1φ | 2-4 |

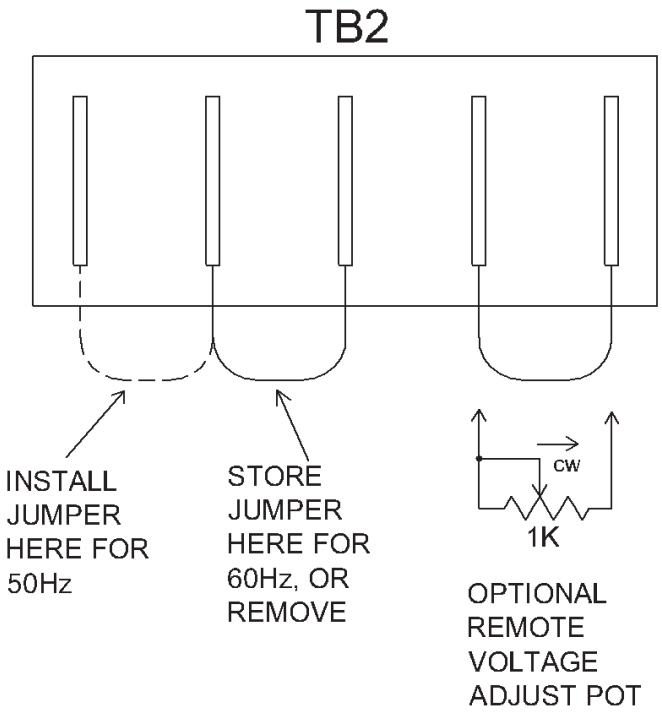



208V TO 480V 3φ Y

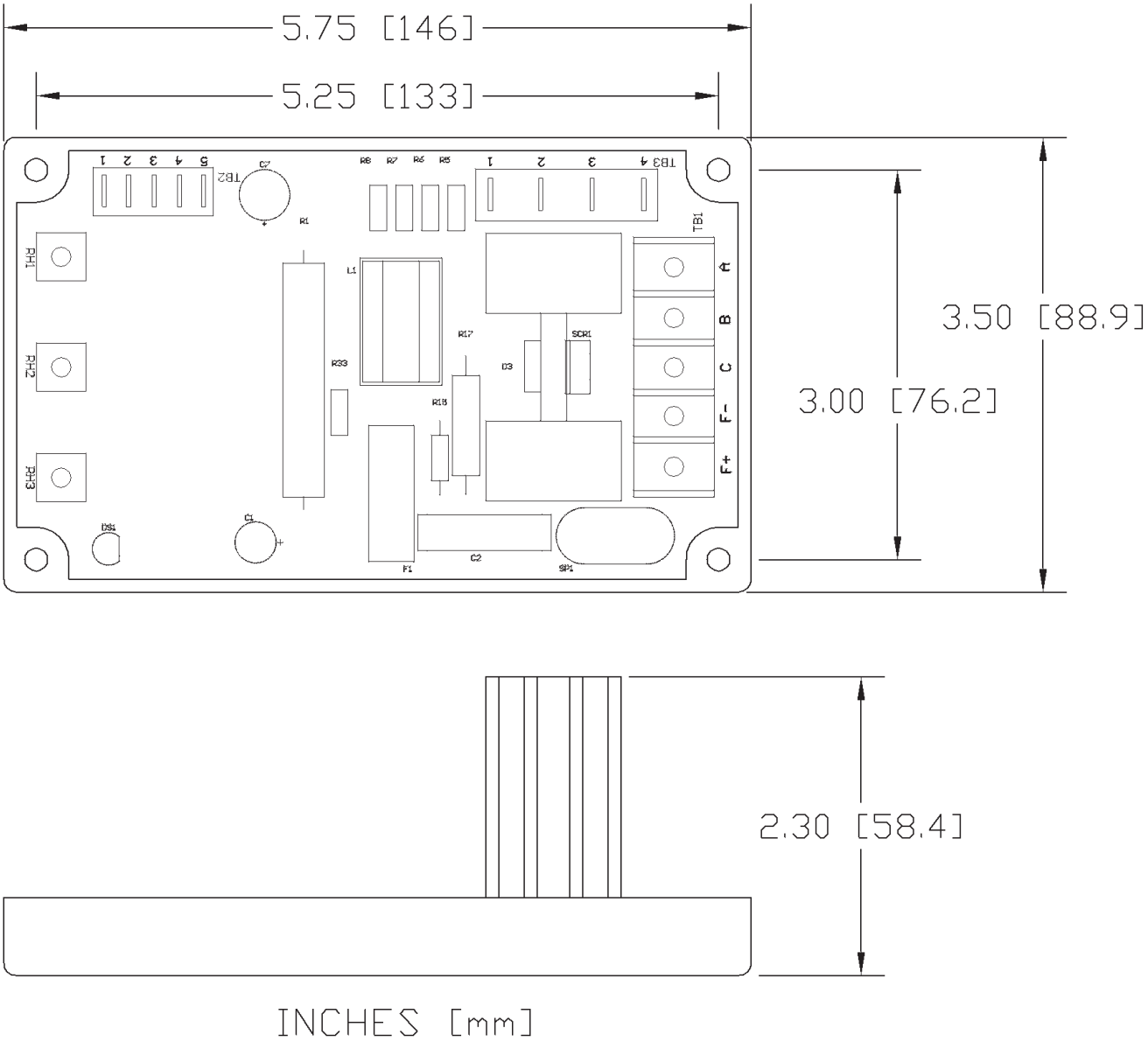
| SYSTEM VOLTS | TB3 |
|---|---|
| 200/240V 3φY<br>220V 3φY | 2-4 |
| 380/220V 3φY | 3-4 |
| 415/240V 3φY<br>480/277V 3φY | NONE |




| SYSTEM VOLTS | TB3 |
|---|---|
| 240V 3φ DELTA | 2-4 |



## MODEL 480 UNIT DIMENSIONS





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