



**Model 460**  
**UNIVERSAL**  
**VOLTAGE REGULATOR**  
*Manufactured in the USA by*  
**FLIGHT SYSTEMS**  
[www.flightsystems.com](http://www.flightsystems.com)



## **INSTALLATION and ADJUSTMENT INSTRUCTIONS**

### **Description and Specifications**

The Model 460 Universal Regulator is designed for OEM applications as well as an exact replacement for Newage (Stamford) SX 460 (also known as P/Ns E000-24600 and E000-24602) and Kutai EA 460. It is also 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 240V, 50 or 60 Hz by connecting only four wires. It works with brushless exciters or conventional fields. Field excitation of up to 4A and 90 VDC 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 Under-frequency Ramp. Remote voltage adjustment is possible. Voltage regulation is typically +/- 1% or better. 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 460 is self-starting on a residual voltage of 5 volts and does not require field flash. Connection is by means of ¼" push-on terminals. Overall size is 3.94" [100] W x 5.33" [135] L x 1.78" [45] H.

### **Application**

The Model 460 may be used with almost any generator with a system voltage of 100 to 240 volts, 50 or 60 Hz, and a field current requirement of up to 4 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, which must be between 100V and 240V. Sensing voltage range is selected by connecting a jumper (supplied) between the appropriate terminals of TB2 (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 #10 (0.196" [5mm]) clear holes provided. Use #8 or #10 screws. 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. Use ¼" (.250") push-on type terminals. If the old terminals are worn, discolored from heat or damaged, install new ones.
4. Observing polarity, connect the positive field terminal of the generator to X (F+) and the negative field terminal to XX (F-). NOTE: Connecting the field backwards may require re-flashing of the field due to reversal/loss of residual magnetism.

## **Installation (Cont.)**

5. Place the voltage programming jumper in the proper position on TB2 for your system voltage. See illustrations below.
6. Connect terminals 7 and 8 on TB1 to the proper points as shown in the wiring diagrams below.
7. Refer to the illustration for TB3 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 VAR (EXT VOLT) terminals. See illustrations/adjustment instructions below. If external adjustment is not used, the jumper must remain in place.

**CAUTION: Do not come in contact with any part 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 TB2 and the frequency jumper on TB3 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 U/F LED indicator is not on. If it is, turn the U/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 U/F RAMP, reduce the speed of the generator to 56-58 Hz (48 Hz for 50Hz systems). Turn the U/F pot CW until the U/F LED indicator just comes on. At rated speed, this LED should not be on. If so, re-adjust.

## **Optional Remote Voltage Adjustment**

The output voltage of the generator can be remotely adjusted over a narrow range by adding a 1K potentiometer in place of the jumper connected between the VAR (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%.

In some applications where the generator output voltage must be remotely adjusted over a wide range (240V down to 208V, such as on a rental unit), the remote potentiometer should be 2K, 2 Watt, 10-turn, wirewound, industrial quality. We recommend Bourns P/N 3540S-1-202L, or equivalent, available from electronic distributors. For wide range applications, perform output voltage adjustments as follows:

1. Set the remote pot at 1 turn CCW from its full CW position (10% of its resistance, or 200 ohms).
2. Adjust the VOLTS pot on the regulator for the highest nominal voltage desired (such as 240V).

### Optional Remote Voltage Adjustment (Cont.)

3. When the remote pot is at 1 turn CW from its full CCW position (90% of its resistance, or 1800 ohms), the output voltage will have dropped to 208V or below.

### Field Flash

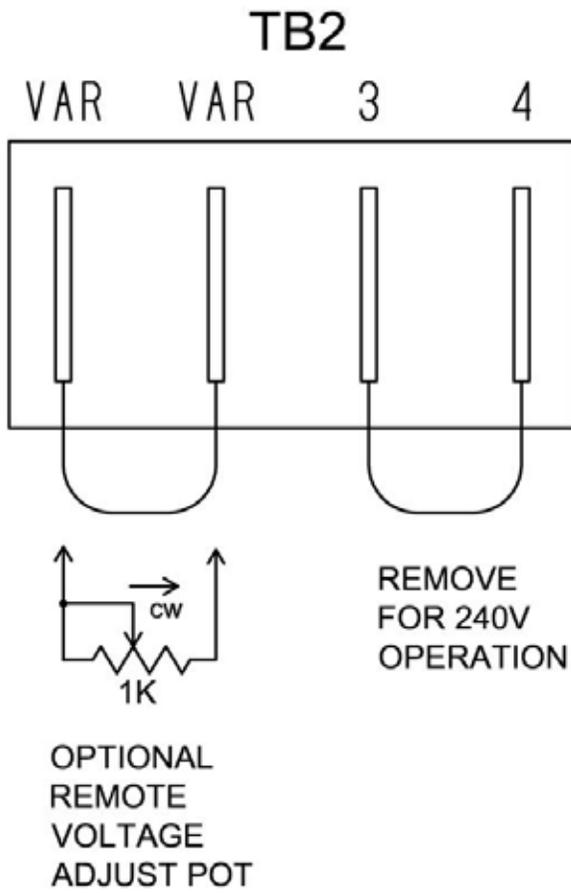
In order for the regulator to start up automatically and build voltage, the residual voltage of the generator should be 5 VAC or higher. If a generator has not been used for a long period of time, has been apart or has had its field inadvertently reversed, it may have lost some or all of its residual 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

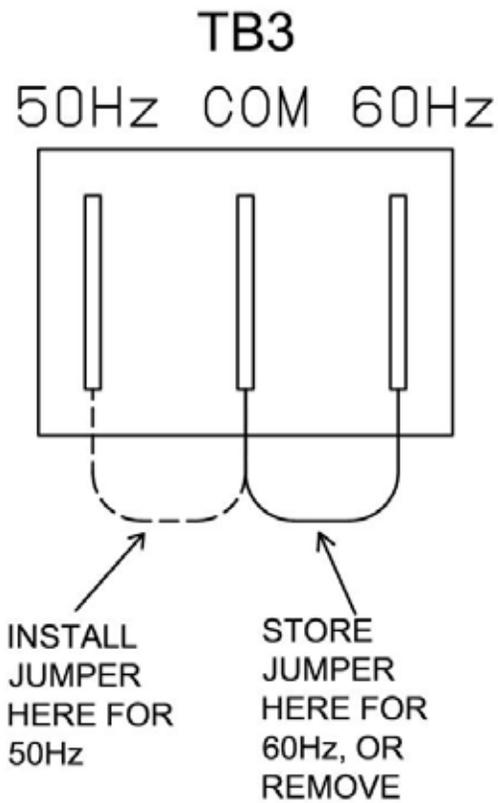
SYMPTOM	CAUSE	SOLUTION
Generator voltage does not build up	Residual voltage below 5 VAC	Flash generator field
	Incorrect wiring	Re-check wiring
	Power wires at 7 or 8 not connected	Re-check power wires
	Field wire at X or XX not connected	Re-check field wires
	Open field or exciter circuit	Check field 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
	U/F pot improperly adjusted	Re-adjust U/F pot
	Voltage programming incorrect	Re-check TB2 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 TB2 jumper position
U/F LED is on at rated speed	U/F pot improperly adjusted	Re-adjust U/F pot
	Running at 50 Hz with 60 Hz selected	Check 50/60 Hz jumper position on TB3
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 4 amps.	Select a higher capacity regulator

### Warranty

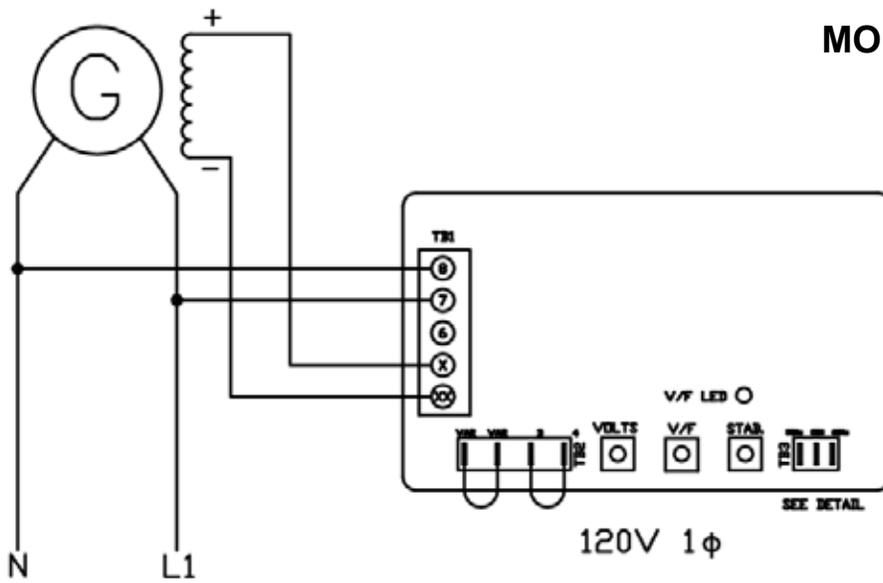
The Model 460 Universal Regulator is warranted against defects in materials and workmanship for a period of two years from the date of shipment. This warranty does not cover damage caused by operation outside of ratings, misapplication or abuse. Flight Systems is not responsible for consequential damage 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.



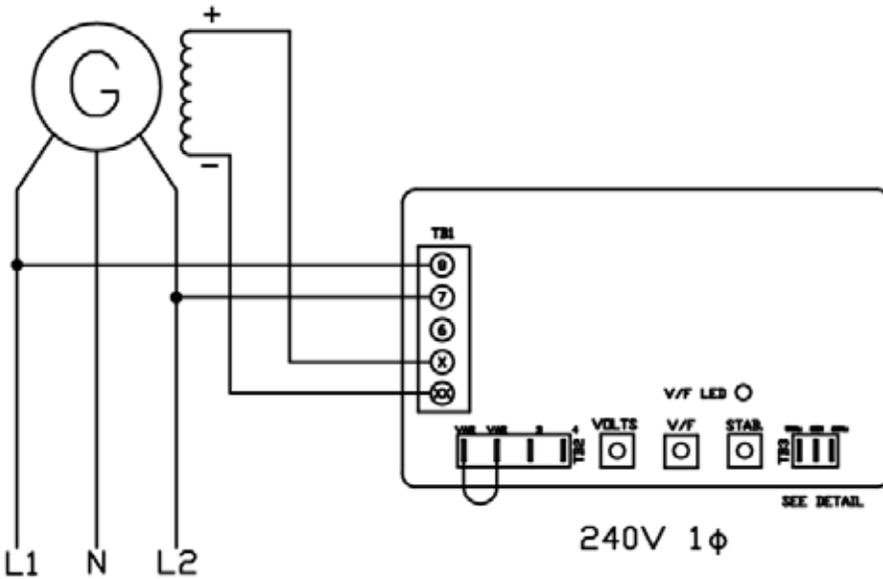
**TB2/TB3 CONNECTIONS  
DIAGRAM**



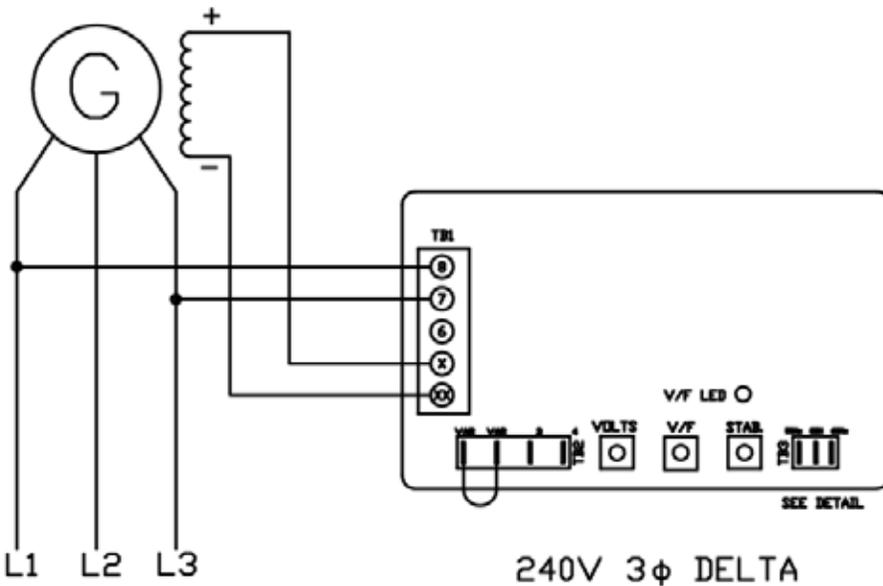
# MODEL 460 WIRING DIAGRAM



SYSTEM VOLTS
100 - 120V 1 $\phi$

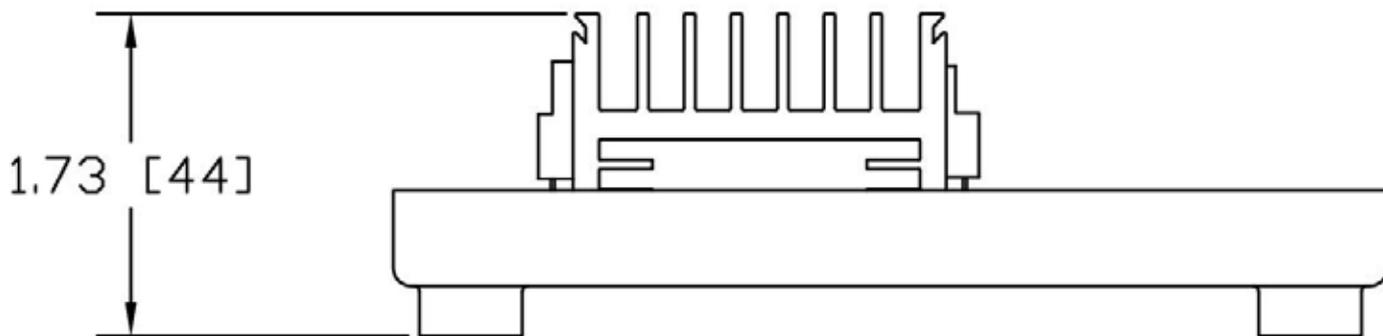
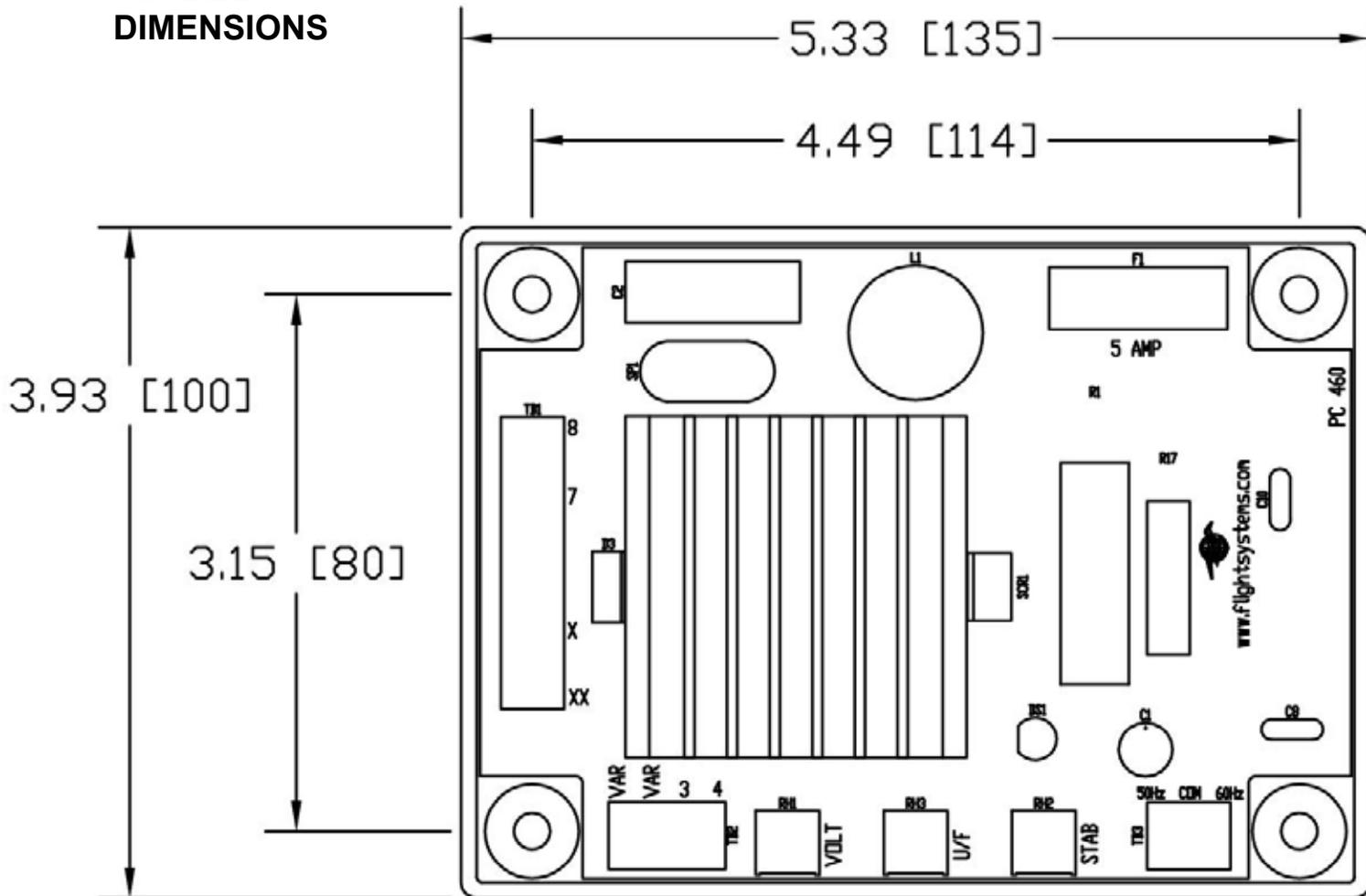


SYSTEM VOLTS
200 - 240V 1 $\phi$



SYSTEM VOLTS
240V 3 $\phi$ DELTA

**MODEL 460  
DIMENSIONS**



INCH [mm]

*This product is proudly  
Manufactured in the USA by*



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