

Model 348
UNIVERSAL
VOLTAGE REGULATOR
Manufactured in the USA by
FLIGHT SYSTEMS
www.flightsystems.com

INSTALLATION and ADJUSTMENT INSTRUCTIONS

Description

The Model 348 Universal Regulator is a fully encapsulated and repairable module suitable 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, does not require field flash* and works with all 240V single phase and 208-240V three-phase (or 12-lead 380-480V), 50 or 60Hz systems by connecting just 4 or 5 wires. Field or brushless exciter current of up to 4A is provided by a phase controlled SCR. The output voltage is automatically reduced during under-speed operation. A soft start feature helps prevent a sudden load on the engine at startup. See specifications and wiring diagrams below.

Specifications

Power Input	190-280VAC
Sensing	208-480VAC
Field Output-Continuous	73 VDC at up to 4.0A (255W cont.)
Field Output-Forcing (240V input)	90 VDC at up to 5.0A (450W, 10 Sec.)
Regulation +/- 1%	
Field (or exciter) Resistance	10 to 100 ohms, isolated
Voltage Adjustment	+/- 20% of nominal voltage
Remote Voltage Adjustment	+/- 5% with 1K external rheostat
Stability Adjustment	
Under Frequency Adjustment	54-60 Hz for 60Hz systems 45-50 Hz for 50 Hz systems
Generator Residual Voltage	* 5 VAC min. for self starting
Protection	Internally Fused at 5A
EMI Suppression	EMI filter and voltage spike suppression
Weight	6.5 oz. [0.18 Kg]
Operating Temperature Range	-40°C to +60°C
Storage temperature Range	-65°C to +85°C
Power Dissipation	8 watts, Max.
Connection	Barrier strip with screw terminals.
Size	2.64" [67] W x 3.89" [99] L x 1.90" [48] H.

Installation

1. If applicable, remove the old regulator and carefully mark the wires. Verify that the field circuit is isolated from all other circuits, including ground, and that the field resistance is between 10 and 100 ohms.
2. Please refer to the dimensioned drawing. Mount (fix) the unit to a flat surface in a suitable location using the two (0.188 [4.8mm]) clear holes provided. Screw size may be #8 or #10. Make sure that the location chosen provides adequate ventilation for cooling and access to the adjustments.
3. Please refer to the appropriate wiring diagram below. 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.

4. Connect terminals A, B and C to the proper points as shown in the appropriate wiring diagram below. The regulator is powered by the voltage between terminals C and B (280 VAC max.). The regulator senses the voltage between terminals C and A (490 VAC max.). Set switches 2 and 3 as shown in the diagrams for your system voltage. *Also see re-connection diagrams under TROUBLESHOOTING at flightsystems.com.*
5. Set SW 1 to the 50Hz or 60Hz position as appropriate for your generator (OFF for 60Hz, ON for 50 Hz).
6. If desired, an external remote voltage adjustment rheostat may be added by connecting it in place of the jumper that is now connected between terminals EXT1 and EXT2. See illustration & adjustment inst. below.

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 50/60Hz switch is in the correct position for your system frequency (OFF for 60Hz). Turn the STAB and U/F pots full CCW. Start the generator and bring it up to rated operating speed (use the Hz function on your DVM). 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 to 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 58 Hz (48 Hz for 50Hz systems). Turn the U/F pot CW until the AC voltage just starts to fall.

Optional Remote Voltage Adjustment

The output voltage of the generator can be remotely adjusted by adding a 1K rheostat in place of the jumper connected between terminals EXT1 and EXT2. Before connecting the remote rheostat, follow all of the steps above for installation and adjustment. The rheostat should be wired so that its resistance decreases with clockwise rotation. See illustration. Perform output voltage adjustment as follows:

1. Set the remote rheostat at its mid point.
2. Start the generator and set the VOLTS pot on the regulator for the desired output voltage (208, 230, 240, etc.). The remote rheostat will now have an adjustment range of approximately +/- 5%.

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-C not connected	Re-check power wire at B-C
	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
	External voltage adjust jumper between EXT1-EXT2 missing.	Install external voltage adjust jumper between terminals EXT1 & EXT2.
Generator output voltage high	VOLTS pot adjusted too high	Re-adjust VOLTS pot
	Defective regulator	Replace regulator
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 348 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.

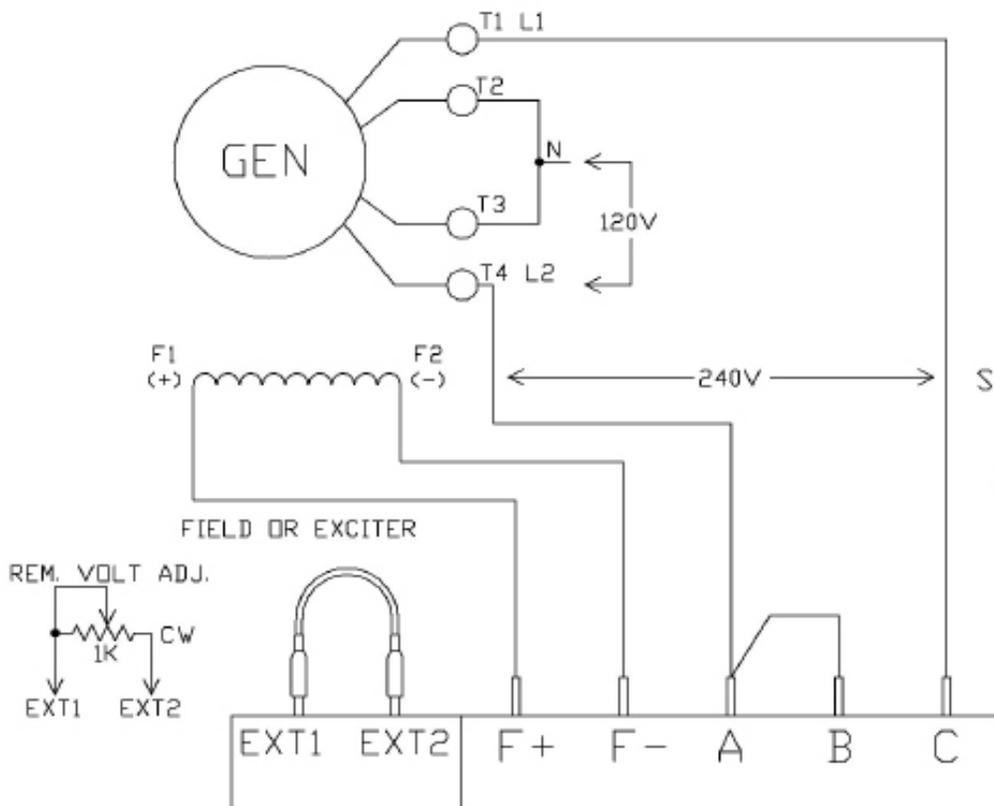
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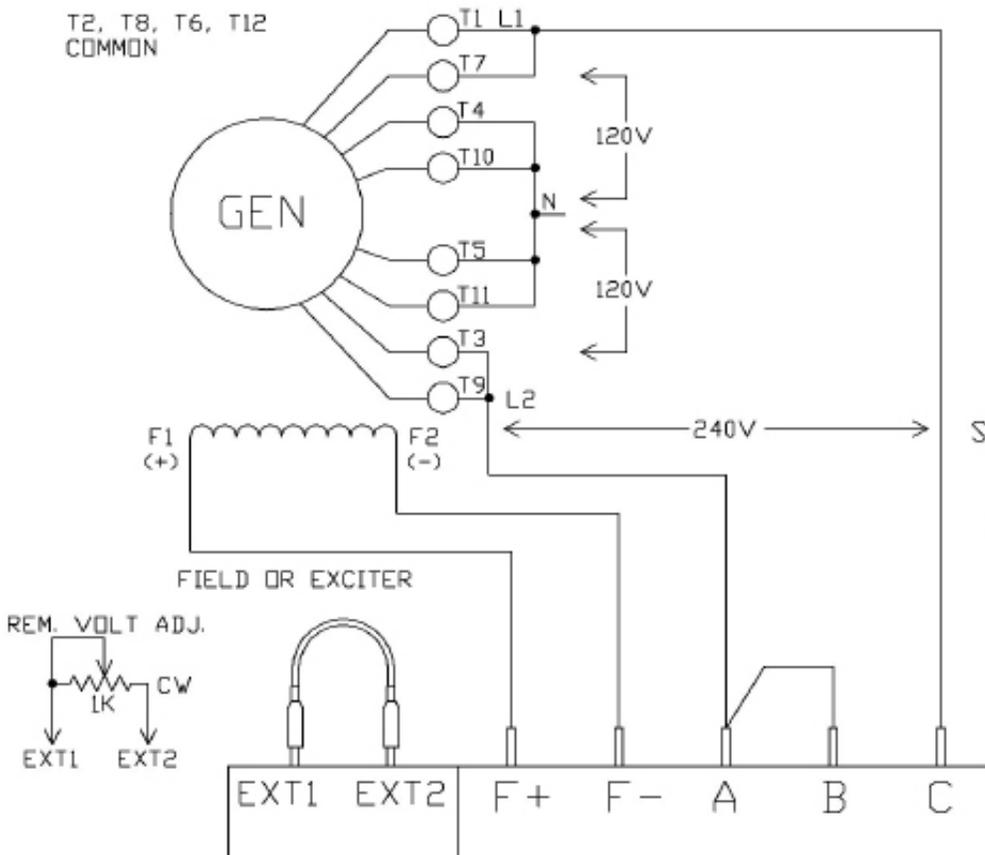
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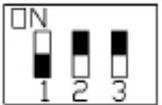
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 SWITCH SETTINGS FOR
 120/240V 60Hz
 (SW1 ON FOR 50Hz)

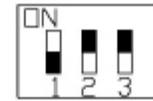
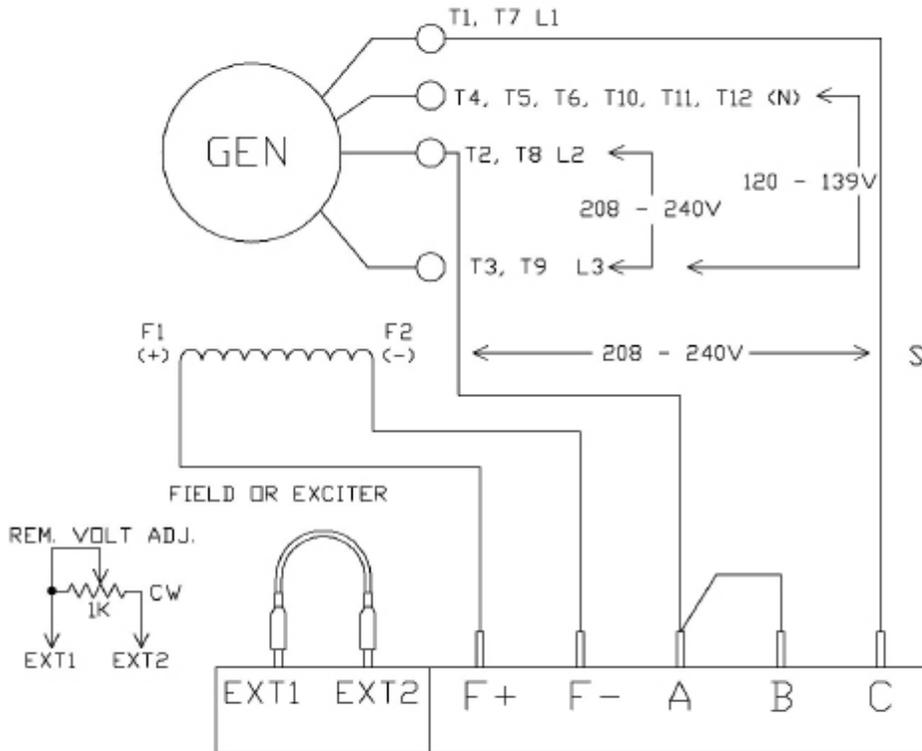
CONNECTIONS FOR 120/240V
 SINGLE PHASE OUTPUT FROM
 SINGLE PHASE GENERATOR




 SWITCH SETTINGS FOR
 120/240V 60Hz
 (SW1 ON FOR 50Hz)

CONNECTIONS FOR 120/240V
 SINGLE PHASE OUTPUT FROM
 3 PHASE GENERATOR
 (PARALLEL ZIGZAG)

T4, T5, T6, T10, T11, T12 COMMON (NEUT)



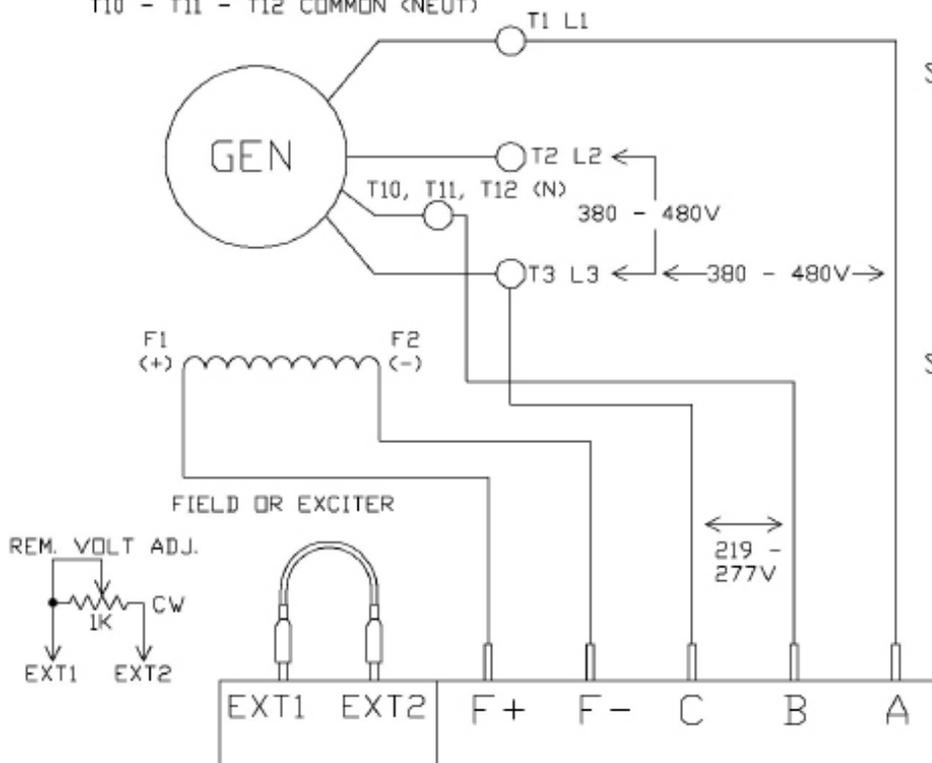
SWITCH SETTINGS FOR 208/240V 60Hz

(SW1 ON FOR 50Hz)

CONNECTIONS FOR 208-240V 3 PHASE OUTPUT (PARALLEL WYE)

T6 - T9 COMMON
T4 - T7 COMMON
T5 - T8 COMMON

T10 - T11 - T12 COMMON (NEUT)



SWITCH SETTINGS FOR 380, 415V 60Hz



SWITCH SETTINGS FOR 440-480V 60Hz

(SW1 ON FOR 50Hz)

CONNECTIONS FOR 380-480V 3 PHASE OUTPUT (SERIES WYE)