



G1XXVN: OVER VOLTAGE PROTECTED GENERATOR CONTROLLER

VREG, REVERSE CURRENT, CURRENT LIMIT, OV PROTECTION, LV-OV WARNING

FOR TYPE A 12 TO 50 AMP DELCO-REMY GENERATOR SYSTEMS

Features:

- Voltage Regulation, IC Sense Referenced
- Electronic Controlled Generator Build-up
- Current Limit, IC Sensed & Controlled
- Reverse Current Protection
- Low-Over Voltage (LV-OV) Sensor & Warning
- OV Protection.
- Trouble-Shooting Lights on Unit
- Footprint Compatible to Delco-Remy's VR

Benefits:

- * Increase Regulator Life. Not Temperature Sensitive
- * Prevents Regulator cycling at low RPM
- * More Precise Current Limit
- * Prevents Battery Current Flowing to the Generator
- * Lights warns the pilot of LV and OV condition
- * Protects system from Generator caused OV fault
- * Reduce Trouble-Shooting Time
- * Ease of Installation

Voltage Regulation: 14.2V \pm 0.4V. Max Field Current: 3A; OV: 16.0V \pm 0.4V

The Generator provides power used in charging the battery and running other electrical systems in the aircraft. The current flowing through the field of a Generator controls its output current. The **Generator Control Units (GCU)** have **Voltage Regulation with Generator Build-up, Current Limiter, LV-OV Sensor –Warning, Reverse Current & OV Protection.**

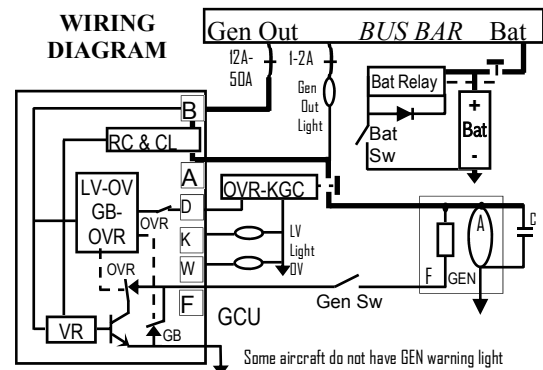
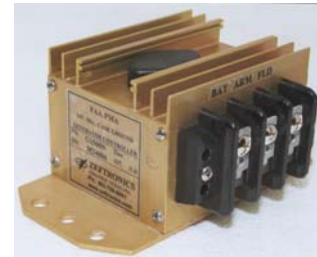
The **Generator Build-up** function allows the rotating generator to build-up its output from a low residual voltage to the system's voltage regulation point.

The **Voltage Regulator (VR)** controls the Generator's field to keep the aircraft electrical system voltage at a specific level. This controller has a "Type A" regulator which excites the field of the generator by providing controlled ground to one side of the field (F), with the other side internally connected to the armature.

The **Current Limiter (CL)** controls the maximum output current the generator can produce. It turns off the field excitation when the output current exceeds the CL set point. It allows normal field excitation when the generator output is below the GCU CL set point.

The **Reverse Current (RC) Protection** circuit allows it to flow from the generator to the battery and the system but blocks it from flowing backwards.

The **OV Protection (OVP)**. With the Bat Sw on, the GCU closes the external KGC relay to tie the generator to the system. The OVP opens the current path between the GCU and generator's armature and the field terminals. This isolates the generator from the



Part No	Volt	Amp	Replaces Delco-Remy P/N
G112VN	14	12	1118383, 1118902
G120VN	14	20	1118736, 1118904, 1119226
G125VN	14	25	1118384
G135VN	14	35	1118704, 1118892, 1119220
G150VN	14	50	1118713, 1118884, 1119224

The **LV-OV Sensor and Warning** functions alerts the pilot to low and over voltage conditions in the system.

The **Trouble-Shooting Lights on Unit** alerts the mechanic to voltage regulation, current limit, and generator build-up problems in the system.



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GENERATOR CONTROLLER: HOW THE SYSTEM WORKS

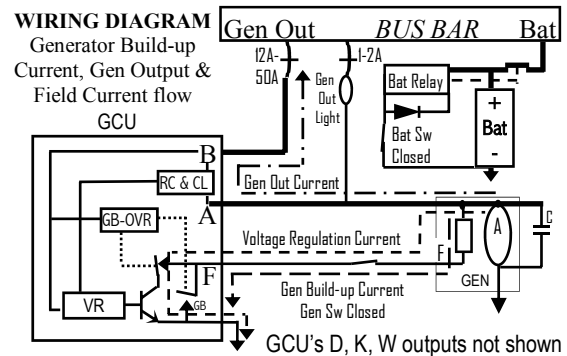
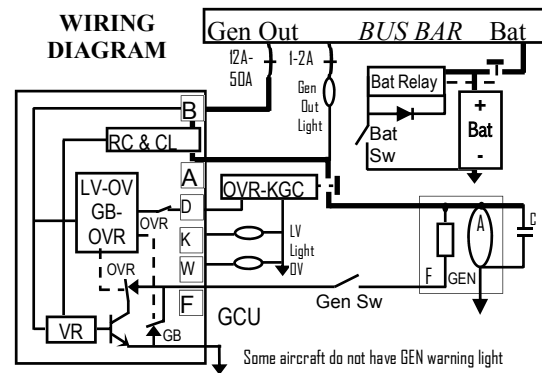
The Generator provides power used in charging the battery and running other electrical systems in the aircraft. The current flowing through the field of a Generator controls its output current. The **Generator Control Units (GCU)** have **Voltage Regulation with Generator Build-up, Current Limiter, LV-OV Sensor –Warning, Reverse Current & OV Protection.**

The **Generator Build-up** (or automatic field flashing) function allows the rotating generator to build-up its output from a low residual voltage to the system's voltage regulation point. Closing the Gen (Field) switch in a rotating generator causes current to flow from its armature through the field to ground in the GCU. This generator build-up current flow rapidly increases the generator output voltage from a few volts until the build-up cut off occurs and the voltage regulator takes over the control of the generator. At the build-up cut off point, the GB switch inside the GCU opens and stays open until the Gen Field switch and Bat switches are reset. This prevents generator cycling problems seen in other voltage regulators.

The **Voltage Regulator (VR)** controls the Generator's field to keep the aircraft electrical system voltage at a specific level. This controller has a "Type A" regulator which excites the field of the generator by controlling the grounding of one side of the field (F), while the other side is internally connected to the armature. The VR electronics switch turns the field current on/off so fast (several times a second) that the output voltage of the generator stays at the VR set point. As long as the generator's output voltage is less than the VR set point the switch is closed, current flows, and the Generator's output increases. When the generator's output voltage exceeds the VR set point, the switch opens, current flow stops, and the generator's output decreases.

The **Current Limiter (CL)** controls the maximum output current the generator can produce. It turns off the field excitation when the output current exceeds the CL set point (determined by the generator's current rating). It allows normal field excitation when the generator output is below the GCU CL set point.

The **Reverse Current (RC) Protection** circuit blocks the battery current from going back to the generator. It allows current to flow only from the generator to the battery and system.



OV Protection. If the generator field is internally or externally shorted to ground, to completely isolate the a runaway generator from the bus and the GCU: the GCU will switch off the VR, open the current path between the field and ground and the path between the generator and bus. The GCU will not cause OV problems in the system and helps protect the system against OV faults.

One reason generator systems experience OV fault is when the field wire (between the field and generator) or field post become grounded internally or externally.

The **LV-OV Sensor and Warning** functions alerts the pilot to low and over voltage conditions in the system.

The **Trouble-Shooting Lights on Unit** alerts the mechanic to voltage regulation, current limit, and generator build-up problems in the system.

Caution: Check the condition of the battery. A depleted /discharged battery will draw excessive current and could trigger the Current Limiter function to turn off the GCU's voltage regulator. Connecting power to the GEN field to excite it will reverse its polarity. **DO NOT connect power to the field of the generator.** Follow the Field flashing procedure outline in the trouble-shooting section of this document.



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GENERATOR CONTROLLER: TROUBLE-SHOOTING THE SYSTEM

CHECKING THE RESIDUAL VOLTAGE AND POLARITY OF THE GENERATOR

Connect a voltmeter between the generator's ARM and ground. At 1300 RPM, the generator's output or residual voltage should be positive (greater than +1.6V).

Residual Voltage _____ V @ _____ RPM

A negative voltage reading indicates a generator that has a reverse polarity. **Do not connect the GCU to a generator with reversed polarity.**

Turn off the engine and Polarize the generator by flashing the field.

HOW TO FLASH THE GENERATOR'S FIELD:

1. With the engine off, disconnect the Generator Controller (GCU) / Regulator
2. Ground the Field wire removed from the GCU and turn on the GEN FLD switch

At the GCU: Touch the battery wire to the generator's armature wire 5 times for 3-5 seconds. Caution: Take safety precaution to prevent being hurt by electrical sparks generated by touching the two wires.

3. Connect a voltmeter between the generator's ARM and ground. At 1300 RPM, the generator output or residual voltage should be $>+1.6V$.
ARM Voltage _____ V @ _____ RPM

Refer to the Trouble-Shooting Diagram

1. Disconnect the GCU from the system.
2. On the wires removed from the GCU, with the field switch open, measure the resistances at the points indicated by Ω . Record the values.

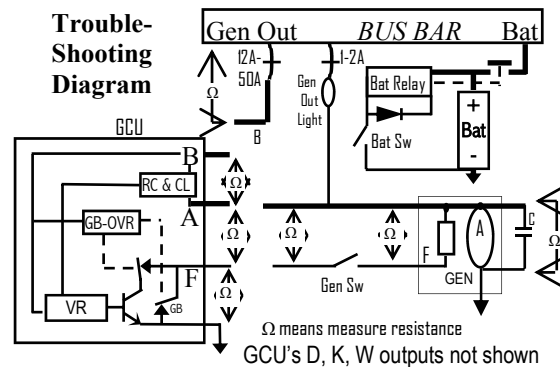
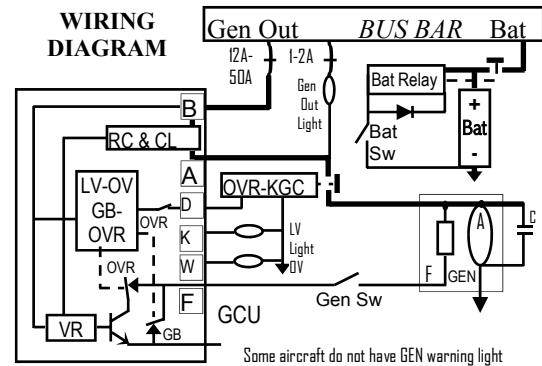
At the Generator Measured	Typical Value
ARM to GND _____ Ω	0.1 Ω (Max)
FLD to ARM _____ Ω	7-10 Ω
FLD to GND _____ Ω	7-10 Ω

At the GCU Measured	Typical Value
ARM to BAT _____ Ω	$>250\Omega$
ARM to GND _____ Ω	$>2K\Omega$
FLD to ARM _____ Ω	$>2K\Omega$
FLD to GND _____ Ω	1 Ω (Max)

BUS to B _____ Ω 0.1 Ω (Max)

If all the measurements are as specified, connect the GCU to the system and retest the Generator Electrical Charging System (GECS).

Turning on the Bat Sw should cause GCU's terminals B (BAT), D (OV Disconnect), and K (LV Caution) to have battery voltage on them as well as close the KGC relay. When OV fault occurs in a rotating generator, terminals W and K go from 0 to battery voltage, while D goes to 0 volt.



No voltage regulation or Generator not Coming on-line

With the Bat & Field switches on, engine off,

- Measure Battery voltage on the GCU BAT, D, and K terminals, 0-2V on the FLD, 0 volt on the ARM and W terminals.
- If the measured values are as specified, perform the resistance measurements called for on this page (TROUBLE-SHOOTING THE SYSTEM).
- If the generator is coming on line after 1400 RPM, remember that *some Generator overhaul shops use armature windings with excessively high resistance. A high Armature resistance will cause the generator to come on-line at engine speeds above 1400 RPM. A 50A generator with ARM to GND resistance of 0.4 Ω may not come on line until the generator's residual voltage overcomes that internal resistance at a higher speed. That is just Ohm's law.*



Installation & Continued Airworthiness Maintenance Instructions

GENERATOR CONTROLLER: TROUBLE-SHOOTING THE SYSTEM

CAUTION:

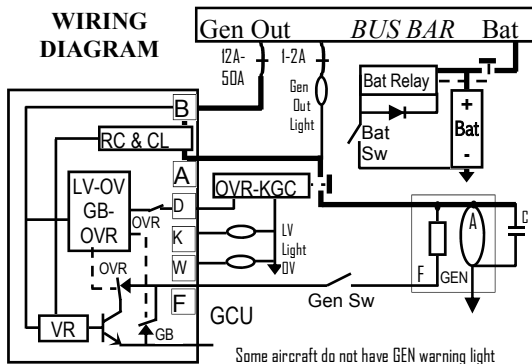
Grounding the field to see if the generator produces current is not a good indication that it is working properly. Doing so can lead to excessive system voltage, which may damage batteries, radios and GCU. This practice will not always identify a defective voltage regulator because it can and does often hide field or armature defects.

PRE-INSTALLATION TESTS.

BEFORE INSTALLING THIS UNIT, PERFORM TESTS:

1. Read the documents that came with the unit.
2. Disconnect the current voltage regulator or GCU.
3. Charge Gell-cell batteries before installing the unit.
4. Turn on the Gen Field switch
5. Check the Generator Residual Voltage & Polarity:
 - a. Connect a voltmeter between the Generator's ARM and ground.
 - b. At 1200 RPM, the generator's output should be positive (>1.6V). If it is negative, the generator has a reverse polarity. Turn off the engine, and flash the field. Do NOT connect the GCU to the generator.
6. Measure and record the following resistances separately, at the generator & the wires to the GCU, list them below.

	At Generator	At GCU Wire
a. Gen Arm to Case-Ground	_____Ω	_____Ω
b. Gen Fld to Case-Ground	_____Ω	_____Ω
c. Gen Fld to ARM	_____Ω	_____Ω
d. Bus-GCU BAT	_____Ω	_____Ω
7. If the measured values are out of the specified ranges (listed on page 3), check the wiring, circuit breakers, switches, connection or generator .
8. If the measured values are as specified, install the unit and perform the post installation tests.



OUR GOAL IS TO HELP YOUR SYSTEM OPERATE BETTER AND HELP YOU BETTER UNDERSTAND ITS OPERATION.

INSTALLATION INSTRUCTION & TESTS.

1. Mount the GCU in place of the removed regulator. Mount the KGC Relay and LV-OV lights.
2. Connect the KGC Relay to the Generator's ARM and the GCU's ARM terminal. Connect the KGC Relay's D to the GCU's D terminal. Properly ground the GCU & KGC Relay. Connect the LV & OV lights to the GCU's K and D terminals.
3. With the engine off, turn on the Bat & Gen Field switches; on the GCU measure & record the following voltage:

	12V Values	Typical Values
A. BAT	_____V	11 – 13V
B. FLD	_____V	0 – 2.5V
C. ARM	_____V	_____V
D. D (OV Disconnect)	_____V	0 – 0.2V
E. K (Low Volt Light)	_____V	11 – 13V
F. W (OV Volt Light)	_____V	0 – 0.2V

4. If the measured values are as specified, connect the unit & perform the post installation tests.

POST-INSTALLATION CHECK AND TESTS

1. With the BAT and FLD switches on and engine off, on the GCU the GO (Gen Out*), VR (Voltage Regulator), and CL (Current Limit) lights should be on. If the CL light is OFF remove the GCU and check the generator for correct polarity and wiring.
2. With the BAT and FLD switches on and engine running, the generator should come on line at 1100 - 1400 RPM: the bus voltage should be 13.8V to 14.4V. At 1800 RPM the bus voltage should remain at 13.8V to 14.4V until about 5 Amps below the generator's current rating

*On units that have serial numbers starting with M or N, the GO light may be off until the bus voltage exceeds 12.3V-13.3V. On units with serial numbers starting with P, the GO light will come on only when the GEN voltage is less than bus voltage.

INSTRUCTIONS FOR CONTINUED AIRWORTHINESS MAINTENANCE

This device is not field repairable or serviceable. For all service, repair or overhaul needs, return it to ZEFTRONICS or a ZEFTRONICS approved repair station.

For all periodic inspection and test requirement, use the pre and post installation procedure listed above.