G1XX0N

GENERATOR CONTROLLER: VREG, REVERSE CURRENT, CURRENT LIMIT

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

Features:	Benefits:
• Voltage Regulation, IC Sense Referenced	* Increase Regulator Life. Not Temperature Sensitive
• Electronic Controlled Generator Build-up	* Prevents Regulator cycling at low RPM
• Electronics Field Controller/Switching	* Increase Regulator Life & Eliminate Regulator Noise
• Current Limit, IC Sensed & Controlled	* More Precise Current Limit
• Reverse Current Protection	* Prevents Battery Current Flowing to the Generator
• GCU induced Over Voltage (OV) Protected	* GCU will not cause OV fault in the system
• Trouble-Shooting Lights on Unit	* Reduce Trouble-Shooting Time
• Footprint Compatible to Delco-Remy's VR	* Ease of Installation

Voltage Regulation: 14.2V ± 0.4V. Max Field Current: 3A.

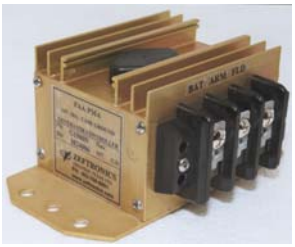
The Generator provides power used in charging the battery and running other electrical systems in the aircraft. The current flowing through the field of a Generator controls its output current. The **Generator Control Units (GCU)** have **Voltage Regulation with Generator Build-up, Current Limiter, and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

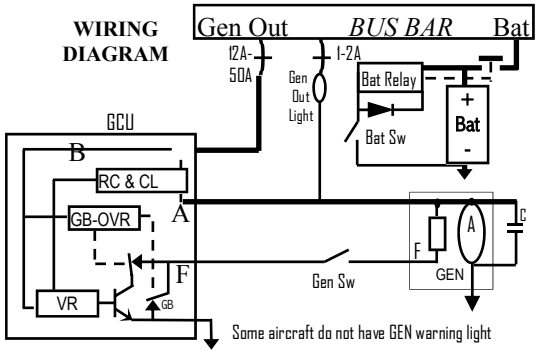
The **Voltage Regulator (VR)** controls the Generator's field to keep the aircraft electrical system voltage at a specific level. This controller has a "Type A" regulator which excites the field of the alternator by providing controlled ground to one side of the field (F), with the other side internally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

The **Current Limiter (CL)** controls the maximum output current the generator can produce. It turn off the field excitation when the output current exceed 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.



WIRING DIAGRAM



Part No	Volt	Amp	Replaces Delco-Remy P/N
G1120N	14	12	1118383, 1118902
G1200N	14	20	1118736, 1118904, 1119226
G1250N	14	25	1118384
G1350N	14	35	1118704, 1118892, 1119220
G1500N	14	50	1118713, 1118884, 1119224

The GCU's design will cause the field current path (between the field and ground) to open if the field control device becomes internally ground shorted. This means that the GCU will not induce Over-Voltage (OV) problem into the system. The GCU does not protect the system against externally induced OV faults.

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ZEFTRONICS
Electrical Charging Systems Solutions

G1XX0N

GENERATOR CONTROLLER: HOW THE SYSTEM WORKS

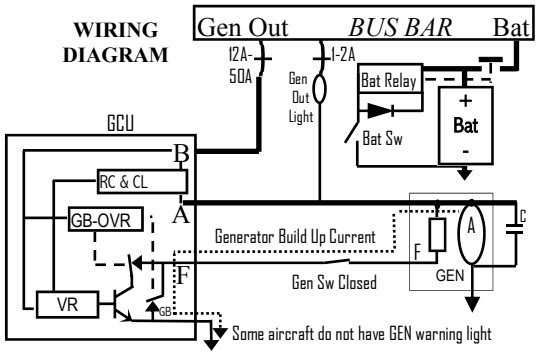
The Generator provides power used in charging the battery and running other electrical systems in the aircraft. The current flowing through the field of a Generator controls its output current. The **Generator Control Units (GCU)** have **Voltage Regulation with Generator Build-up, Current Limiter, and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

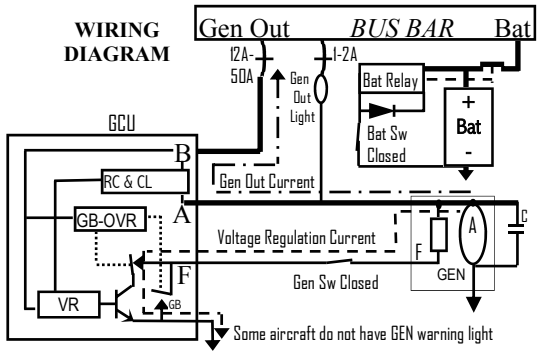
The **Generator Build-up** (or automatic field flashing) function allows the rotating generator to build-up its output from a low residual voltage to the system's voltage regulation point. Closing the Gen (Field) switch when the a generator is rotating causes current to flow from its armature through the field to ground in the GCU. This 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 exceed 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.





Protection against GCU induced OV fault. The GCU's design will cause the field current path (between the field and ground) to open and the VR switch off if the field control device becomes internally ground shorted. This means that the GCU will not induce Over-Voltage (OV) problem into the system. The GCU does not protect the system against externally induced OV faults.

The generator system experiences OV fault when the field wire (between the field and generator) or field post become grounded. Such OV fault require the placement of a Line Contactor or OV Disconnect relay between the generator and the armature terminal of the GCU. The ZEFTRONICS G1XXVN GCUs provide this prescribed OV protection.

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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G1XX0N

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 generate 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

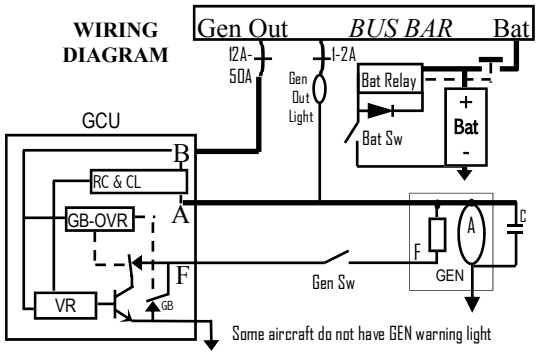
Refer to the Trouble-Shooting Diagram

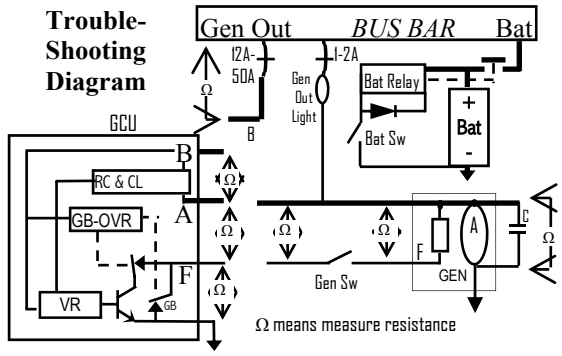
1. Disconnect the GCU from the system.
2. On the wires removed from the GCU, with the field switch open measure the resistances at the points indicated by Ω. Record the values.

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

At the GCU Measured	Typical Value
ARM to BAT _____Ω	>250Ω
ARM to GND _____Ω	>2KΩ
FLD to ARM _____Ω	>2KΩ
FLD to GND _____Ω	1Ω (Max)
BUS to B _____Ω	0.1Ω (Max)

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





POST-INSTALLATION CHECK AND TESTS (WITH GCU CONNECTED)

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.
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.*

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Frequently Asked Questions & TECHCARD Notes

GENERATOR CONTROLLER: TROUBLE-SHOOTING THE SYSTEM

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

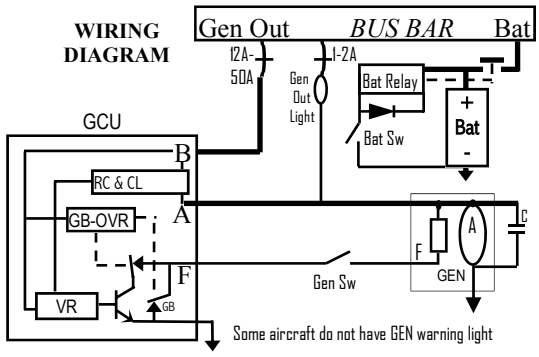
No voltage regulation or Generator not Coming on-line

- With the Bat & Field switches on, engine off, and Battery voltage measured on the BAT terminal, look for 0-2V on the GCU FLD terminal and 0 volt on the ARM. If the measured values are as specified, perform the resistance measurements called for on this page or follow the procedure stipulated page three (TROUBLE-SHOOTING THE SYSTEM).
- If the generator is coming on line after 1400 RPM, remember that s*ome Generator overhaul shops use armature windings with excessively high resistance. A high Armature resistance will cause the generator to come on-line at engine speed above 1400 RPM. A 50A generator with ARM to GND resistance of 0.4Ω 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.*

CAUTION & REMINDERS

1. 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, GCU, etc. This practice will not always identify a defective voltage regulator because it may hide field or armature defects that can damage a regulator/GCU.
2. DO NOT PUT POWER TO THE FIELD OF THE GENERATOR. Doing so will reverse its polarity.
3. 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 speed above 1400 RPM.

Remember, charge Gell-Cell or discharged batteries before installing the GCU.



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 and 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 this unit.
- ☐ 4. Turn on the Gen Field switch
- ☐ 5. Check the Residual Voltage and Polarity of the Generator.
  - a. Connect a voltmeter between the Generator's ARM and ground.
  - b. At 1200 RPM, check the generator's output. The output should be positive (>1.6V). If it is negative, the generator has a reverse polarity. Do NOT connect the GCU to such generator. Turn off the engine, and flash the field.
- ☐ 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

- ☐ 7. If the measured values are out of the specified ranges (listed on page 2), check your wiring, switches, circuit breakers or generator for problems.
- ☐ 8. If the measured values are in the specified range connect the unit and perform the post installation tests.

For tech help & tech cards,
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