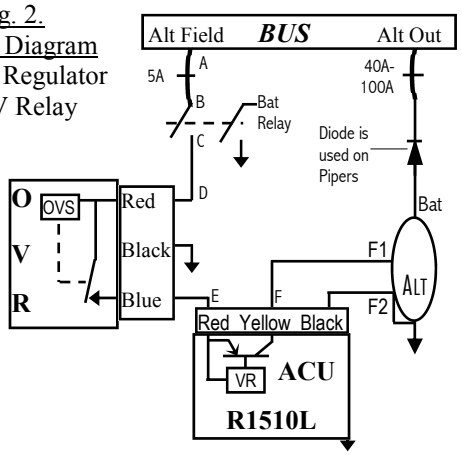
TROUBLE-SHOOTING THE SYSTEM

14V Type B alternator system on Beech, Commander, Grumman, Maule, Piper, etc

By: Femi G. Ibitayo

Fig. 2.
Wiring Diagram
Voltage Regulator
& OV Relay



OVERVIEW OF THE ACU/REGULATOR

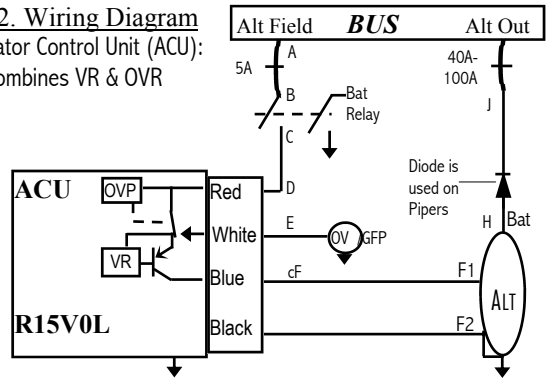
The alternator provides power used in charging the battery and running other electrical systems in the aircraft. The current flowing through the field coils of the alternator controls its output current and voltage. The field current increases or decreases with an increase or decrease in the system load demand. The power to excite the alternator's field comes form the aircraft bus through the field circuit breaker, alternator switch, Over Voltage Relay **(OVR)** and Voltage Regulator **(VR)**. The field and alternator circuit breakers protect against a ground

The OVR supplies the power to the VR when the two are separate units, but when the two are combine into one unit (the ACU), the bus provides the power. If the system voltage exceeds the over voltage trip point the relay will open, removing power from the VR.

The VR controls the excitation of the alternator field to keep the aircraft electrical system voltage at a specific level. An alternator control unit (**ACU)** combines the voltage regulator with other functions, such as over voltage protection. A "Type B" regulator excites the field of the alternator by providing controlled power to one side of the alternator field, with the other side grounded.

The aircraft charging system uses the alternator to convert the mechanical energy from the engine to electricity used in charging the battery and running other electrical systems in the aircraft. All things being equal, as long as the field circuit of the alternator is excited, the alternator will produce an output.

Fig. 2. Wiring Diagram
Alternator Control Unit (ACU):
Combines VR & OVR



TROUBLESHOOTING

Whenever there is an electrical charging system problem, it is tempting to replace components until the problem goes away. This often unsuccessful and expensive method can overlook the reason the component failed. A better method is a systematic approach that locates and solves the problem. A good way to start analyzing a charging system problem is: *Pre-voltage regulator checks, voltage regulator checks, post voltage regulator checks.*

PRE-VOLTAGE REGULATOR *(Refer to figures 1 & 2)*
Check the alternator switch (B-C), field circuit breaker (A-B), wires and terminals, and the OV relay (D-E, Figure 1 only) for contact resistance build-up: resistance should be less than 0.1Ω.

AT VOLTAGE REGULATOR *(Refer to figures 1 & 2)*
Confirm that there is power coming into and going out of the voltage regulator. In this type B system: Without the engine running, with Master switch ON, measure bus voltage at A and the field voltage at F. The bus voltage should be 0.5-1.5V more than the field voltage.

POST VOLTAGE REGULATOR *(Refer to figures 1 & 2)*

- Check your alternator by measuring the resistance of the field. The alternator field to ground resistance should be 3.5 to 6.0Ω. **Check the resistance of the meter leads before measuring field.**
- Check for a "flying" short and other intermittent problems by slowly rotating the alternator while measuring the field resistance. A drop below 3Ω could indicate a bad alternator that might damage an unprotected regulator.
- Check the condition of the alternator's field, pulley, gear/ belt, terminals, and wires connecting it to the VR and the aircraft charging system.
- Check the battery relay for proper operation and connections.Check the fluid levels and charging capacity of the battery

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SYSTEM DIAGRAMS

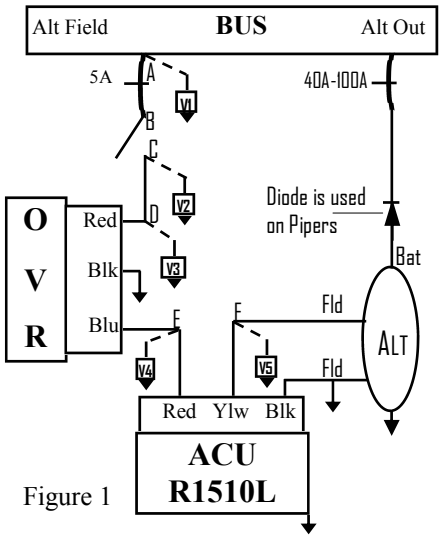

Figure 1

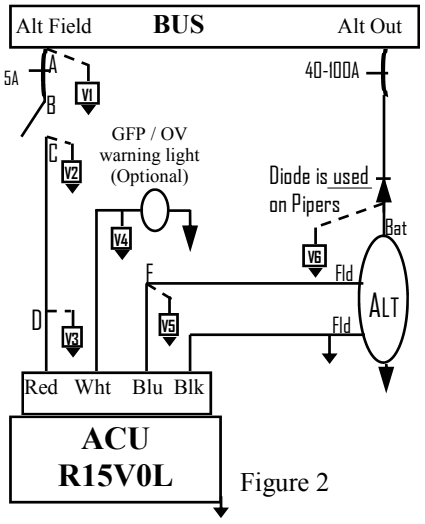

Figure 2

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

INSTALLATION TESTS. BEFORE INSTALLING THE UNIT (ALTERNATOR CONTROLLER, VOLTAGE REGULATOR), PERFORM TESTS:

1. Read page 1 and this page.
2. Check for and replace open, frayed, or broken wires. Clean thoroughly or replace corroded, dirty, or oxidized connections, terminals, contact, or poorly soldered wire junction.
3. Check for Open or Ground-shorted alternator field. Most 12V alternators have 3-6Ω field resistance. Ground shorted alternator field will damage most Voltage Regulators/ACU. Repair or replace an alternator that has a field to ground short, do not connect the ACU to it.
4. With the engine off: Check voltage drops across the Field, Alt switch, Alt field circuit breaker and ACU. High voltage-drop means excessive junction resistance and will lead to many problems like: fluctuation ammeters, charge-meters and panel lights.
5. Perform and record the following tests with the **Master Switch Off & ACU disconnected**:

	12V Values	Typical Values
A. Field resistance at ALT (F-Gnd)	_____Ω	3.5 – 6Ω
B. Field resistance at ACU (F-Gnd)	_____Ω	3.5 – 6Ω
C. Field SW/C-BKR resistance	_____Ω	0 – 0.1Ω
D. ALT Bat to Bus resistance	_____Ω	0 – 0.05Ω
E. ALT Out C/BKR resistance	_____Ω	0 – 0.05Ω

6. Perform & record these tests with the ACU connected **Master Switch On &** Engine Off**.**

	Bat Switch on	Alt Switch on	Typical Values
A. Bus Voltage	_____V	_____V	12 – 13V
D. Alt Bat Voltage	_____V	_____V	12 – 13V
E. TP B Voltage	_____V	_____V	12 – 13V
F. TP E Voltage	_____V	_____V	12 – 13V
F. Field Voltage	_____V	_____V	0.5-2V <VBus

7. **Post Installation.** If all tests are correct to or per steps 5 & 6, run the engine and record:

	12V System	Typical value
A. Bus voltage	_____V	13.8 – 14.3V

For more technical assistance:
Call us, fax us or email us with your questions and test result

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