



# R15V00 Rev A

## 14V ELECTRONIC ALTERNATOR CONTROLLER

**Features:**

- Voltage Regulation, Remote Voltage Sensed
- Low- Over Voltage Warning Light Output
- Over-Voltage Protection
- Field-to-Ground Fault Protection (GFP)
- Trouble-Shooting Light (TSL)

**Benefits:**

- \* Increased Regulator life. Reduced panel lights flicker
- \* Warns the Pilot of Low & OV Conditions
- \* Protects system loads against overexcited alternator
- \* Protects against grounded alternator field
- \* Identifies grounded field. Reduce trouble-shooting time.

Voltage Regulation: 14.2V  $\pm$  0.2V. Max Field Current: 5A. OV: 16.0  $\pm$  0.4V

**VOLTAGE REGULATION.**

The Voltage Regulator, with Remote Voltage sense of the Alternator output, keeps the bus voltage constant by controlling the alternator's field current: increasing it when the system load increases and decreasing it when the load drops.

**OVER VOLTAGE (OV) PROTECTION. Built-in**

The OV Protector (OVP) deactivates (turns off) the Voltage Regulator and the alternator if the bus voltage exceeds 16V to protect sensitive avionics equipment and the battery.

**LOW-OV & FIELD-GROUND SHORT WARNING.**

A warning light connected between pin I and the bus comes on to warn the pilot if the bus voltage exceeds the OV level or the alternator is off-line due to Field-to-Ground Fault Protection (GFP).

**FIELD TO GROUND SHORT PROTECTION.**

An alternator field-to-ground short will cause the field-to-ground short protector to deactivate the Controller and switch on the unit's Red TSL, and the LV-OV indicator on the instrument panel.

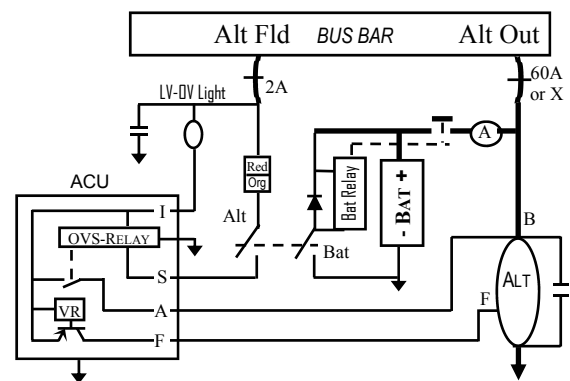
**TROUBLE-SHOOTING LIGHT (TSL) -on the unit**

The TSL (on the unit) is designed to alert the user to the condition of the Alternator / ACU system.

Without the engine running but Bat switch only on, **Red TSL** indicates a ground short in the alternator field circuit or no power to pin S.

Without the engine running but master switch on, **Green TSL** indicates that the ACU is supplying current to the alternator's field, or if the Bus voltage remains at 12V, alternator field or field wire is open.

With the engine running, master switch on, and bus voltage @ about 14V, **Green TSL** indicates correct alternator output voltage.



The R15V00 Rev A replaces

- CESSNA P/N: C611001-0201, -0101, -0102 & OVS
- BEECH P/N 33-380010 & OVS
- ELECTRODELTA P/N VR 600 & os60
- PFT/LAMAR P/N: DGR 6 & OVS
- FORD P/N: D4FF-10316-BA, CA. & OVS

*Trouble-Shooting Light Continued ....*

With the engine running, master switch on, and bus voltage remains @ about 12V, **Green TSL** indicates that current is flowing from the ACU but the alternator field or field wire to it is open.

With the master switch on, if the **TSL is off**, that indicates that one power input device (e.g. switch, circuit breaker, or wiring) is open or the ACU is defective.

**LOW/HIGH VOLTAGE WARNING LIGHT in the cockpit**

A light connected between Bus and pin I will illuminate (turn on) if the power to pin S is removed or if Over Voltage situation occurs in a system. This light is off during normal voltage regulation.



# R15V00 Rev A

## 14V ELECTRONIC ALTERNATOR CONTROLLER

### HOW THE SYSTEM WORKS

Closing the Bat switch applies the battery voltage to *pin A* of the alternator controller (voltage regulator). With voltage at *pin A* (Alt switch off), the LV light comes on, indicating that the alternator is off-line.

Closing the Alt switch applies battery voltage to *pin S*. The internal Over Voltage Sensor's (OVS) output controls a relay inside the alternator controller. With power applied to *pin S*, that relay's normally open (NO) contacts connects *pin A* and *pin I*.

With power on *pin S*, current flows from the alternator's Bat terminal through the controller's voltage regulator to the alternator's field. The regulator keeps the bus voltage constant (around 14V) by controlling the alternator's field current. It increases the field current with increase in system load and decreases it, with a decrease in the system load.

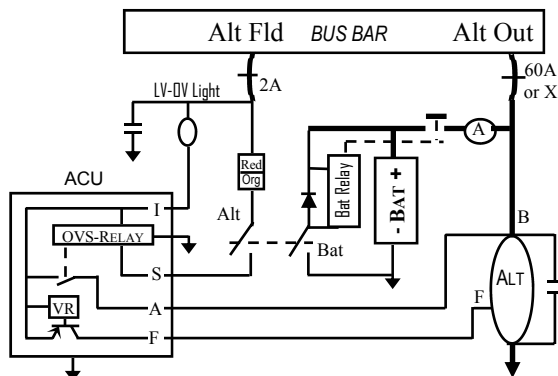
Since the whole field current (max about 3.5 Amps) flows from the alternator's Bat terminal to pin A of the controller, abnormal increases in wire, connection, or junction resistances will cause poor voltage regulation and or fluctuating charge meter, panel lights, and bus voltage.

If the field of the alternator shorts to ground, the controller will turn itself off as described under the section **field to ground short protection**.

If the bus voltage exceeds about 16V, the Over Voltage Sensor (OVS) will open and thus remove power from *pin S*. Removing power from *pin S* will turn off the controller and take the alternator off line.

### Trouble-Shooting Light (TSL) & LV-OV Light

The TSL on the ACU and the LV-OV light on the instrument panel, indicate the condition of the charging system to the mechanic and the pilot. See the trouble-shooting section for how this function operates.



### INSTALLATION INSTRUCTION

1. Disconnect and remove the present ACU/VR.
2. Measure the Alternator's Field Resistance between the field wire of airframe's VR connector and Ground. 3.5 to 6Ω is normal resistance. If is less than 3Ω or greater than 8Ω, check the alternator field or the field wire for problems. 0Ω means Fld-Gnd short.
3. Check the ALT switch resistance: 0.1Ω is normal.
4. Mount and connect the new ACU to the system.
  - Remove the OVS. Connect the wire from the field breaker to the wire from Alt switc.
1. Perform the Post Installation Test Procedure.

### POST INSTALLATION TEST PROCEDURE

1. With the engine off, turn on the Alt & Bat switches, on the instrument panel, observe that the LV-OV light is off. On the ACU the TSL should be Green. *If the TSL is Red, the Field is shorted to ground or pin S has no power to it. If the TSL is Off there is an open circuit or high resistance from pin A to the alternator BAT terminal.*
2. Verify that the voltage drop across the alternator switch and 5 Amp circuit breaker is less than 0.2V.
3. Verify that the voltage drop from the alternator BAT terminal to pin A is less than 0.2V.
4. If the steps 1 to 3 are successful, perform steps 5 & 6.
5. Turn off all the avionics and any other voltage sensitive devices.
6. Start the engine, and at 1500 RPM measure a bus voltage of 13.9-14.4V. If the bus voltage exceed these limits, check for voltage drops from the alternator BAT terminal to pin A and wires/ connection from the ACU (F) to the alternator's field.

### TROUBLE-SHOOTING THE SYSTEM

For help on how to solve problems in the system, see the Trouble-Shooting Notes (TSN) page and or TechCards.

### 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.

Contact us with tech support questions that are not addressed at [www.zeftronics.com](http://www.zeftronics.com) or in the TSN or TechCards.



## TROUBLE-SHOOTING THE SYSTEM

### 14V Type B alternator system on Beech, Cessna, Grumman, Maule etc

Check the condition of the ACU

1. With the master switch (Bat & Alt) on, at the ACU connector, measure the indicated voltages.

Pin I: \_\_\_\_\_ Pin A: \_\_\_\_\_ Pin S: \_\_\_\_\_  
 Pin F: \_\_\_\_\_ Bus \_\_\_\_\_

The voltages on pins I, A, S should equal bus'.

The voltage pin F should be 0.5-2V less than the bus'. If the pin I voltage is less than bus voltage, look for bad LV-OV light, broken wire from LV-OV light, grounded pin I or damaged controller. If the pin A voltage is less than bus', look for corrosion on the BAT terminal, socket for pin A on the airframe ACU connector, or wire (from ALT Bat to pin A) with high resistance. This may cause fluctuating charge meter or bus voltage, and may cause over-voltage and nuisance tripping (i.e. alternator dropping off-line).

If the pin S voltage is less than bus', look for a grounded pin S or damaged controller. Pin S to ground on the controller is about 400Ω.

If the pin F voltage is the same as the bus voltage, look for a damaged or un-grounded controller. If it is 0V, look for a grounded ALT field.

2. If the Master switch is a split type, turn off the Alt Sw and measure the indicated voltages.

Pin I: \_\_\_\_\_ Pin A: \_\_\_\_\_ Pin S: \_\_\_\_\_  
 Pin F: \_\_\_\_\_ Bus \_\_\_\_\_

The voltages on pins I, S & F should be 0-2V, pin A should be battery or bus voltage.

If pin I has bus voltage on it, look for a short between pins A & I (internal or external to the controller).

Disconnect the controller, a resistance of 0-1K between pins A & I indicates a damaged controller.

Check the alternator Field & Power input wire

3. Disconnect/Remove the connector on the ACU. Measure the resistance at the identified points.

Pin F to Gnd \_\_\_\_\_ Ω. FLD to Gnd \_\_\_\_\_ Ω  
 Pin A to ALT Bat \_\_\_\_\_ Ω

The normal Alt field resistance is 3-6Ω.

A lower or higher resistance may indicate problems with the alternator. Field resistance below 3Ω may indicate a short to ground, while higher than 6Ω dirty brushes or intermittently open field.

*TROUBLE-SHOOTING LIGHT (TSL) –ON THE UNIT.*

The unit's TSL alerts the user or mechanic to the conditions of the field circuit breaker, alternator switch, Voltage Regulator, and alternator's field by allowing a systematic approach to trouble-shooting. This approach to trouble-shooting looks at the condition of the pre-controller, controller, and post-controller components.

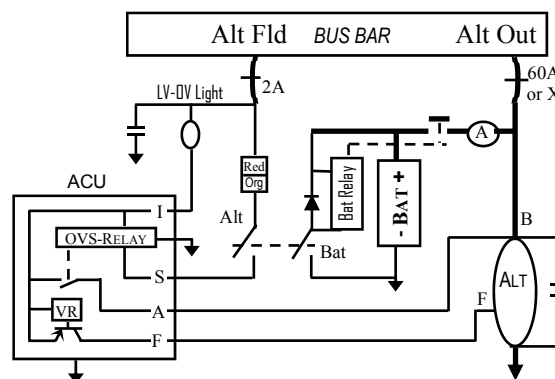
**PRE-CONTROLLER CONDITION:** The TSL is off if either the alternator switch, the field circuit breaker, or the wiring from the Alt Bat to pin A on the controller is open.

**VOLTAGE REGULATOR CONDITION:** The TSL is Red if the Bat switch is on and the Alt switch off to indicate that the alternator is off-line.

The TSL is Green when both Alt and Bat switches are on, to indicate that the Regulator is passing current to the field.

**ALTERNATOR FIELD CONDITION:** With the engine running and both Alt and Batt switches on, if the TSL is Red the alternator's field is grounded internally or externally.

If the TSL is Green with alternator output at about 12V (or battery voltage), the wire from the Voltage Regulator to the field or the alternator field is Open.



In this **Type B** system: the controller is between the Bus and the Alt field. To control the bus voltage, the unit switches power to the field several times a second. The OVP opens when OV occurs.



## Frequently Asked Questions & TECHCARD Notes

### 14V Type B alternator system on Beech, Cessna, Grumman, Maule, etc

### **TROUBLE-SHOOTING THE SYSTEM**

#### Flickering / oscillating ammeter and panel lights.

Check the connections between the Alternator Bat terminal and the pin A input to the controller for high resistance, corrosion, dirt, loose or intermittent connection..

#### No voltage regulation

With the engine off and the Master switch on. Pins I, A, and S should measure Battery voltage, pin F should be 0.5 to 2V less the bus voltage.

- If the measured voltage is different, see The voltages on pins I, A, S should equal bus' on page 3 for probable causes for the problem.
- If the pin F voltage is the same as the bus voltage, look for and correct open circuit or high resistance in the alternator's field or the wire between the field and pin F. The controller might not be properly grounded.
- If the pin F voltage is 0V and pins I, A, S have battery voltage, look for a grounded alternator field or field wire (as indicated by a Red ACU Trouble-Shooting Light TSL). If the field resistance is correct as shown in step 5 of the installation tests and the TSL is off, send the ACU in for test/repair.
- If the TSL is Red, repair the field ground fault or replace the alternator.
- If the TSL is Red, repair an open circuit or intermittent connection between the bus and pin S.

#### Bus voltage remains at battery voltage (about 12V)

To solve this problem, see No voltage regulation.

#### Alternator carries only about half its rated output.

Look for an open stator wire or open diode in the alternator. Check the shunts and alternator output wires indicating an alternator that is current limiting.

#### Bus voltage drops with load increase

To solve this problem, see Alternator carries only about half its rated output and or the condition of the wire/connections between pin A and the alternator Bat terminal.

#### LV-OV light does not work, everything else works

Disconnect the ACU/Regulator. Turn on the Bat switch. On the airframe ACU connector ground pin I. The light should illuminate. If it does not, the lamp is defective or the wires to or from it are broken

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

INSTALLATION TESTS. BEFORE INSTALLING THIS UNIT, PERFORM TESTS:

1. Read pages 1 to 3 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-shortened 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 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**:
 

	12V Values	Typical Values
A. Field resistance at ALT	_____ Ω	3 – 6Ω
B. Field resistance at ACU	_____ Ω	3 – 6Ω
C. Field SW/C-BKR resistance	_____ Ω	0 – 0.1Ω
D. ALT Bat to Pin A resistance	_____ Ω	0 – 0.05Ω
E. ALT Out C/BKR resistance	_____ Ω	0 – 0.05Ω
6. Perform and record the following tests with the **Master Switch On**:
 

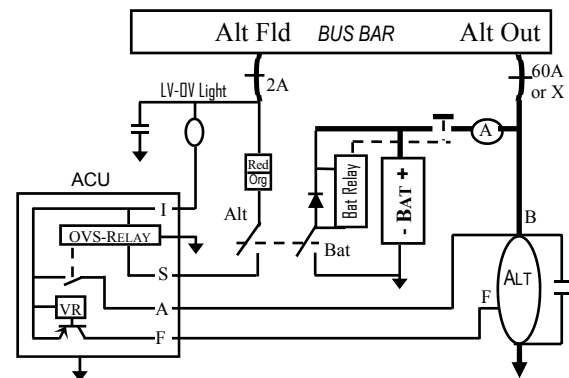
Engine Off	Bat Switch on	Alt Switch on	Typical Values
A. Bus Voltage _____ V	_____ V	_____ V	12 – 13V
D. Pin I Voltage _____ V	_____ V	_____ V	12 – 13V
E. Pin A Voltage _____ V	_____ V	_____ V	12 – 13V
F. Pin S Voltage _____ V	_____ V	_____ V	12 – 13V
F. Field Voltage _____ V	_____ V	_____ V	0.5-2V <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	_____ V	13.8 – 14.3V

For tech help & other TechCards, call: **903-758-6661**

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Electrical Charging System Solutions



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