R25V0N

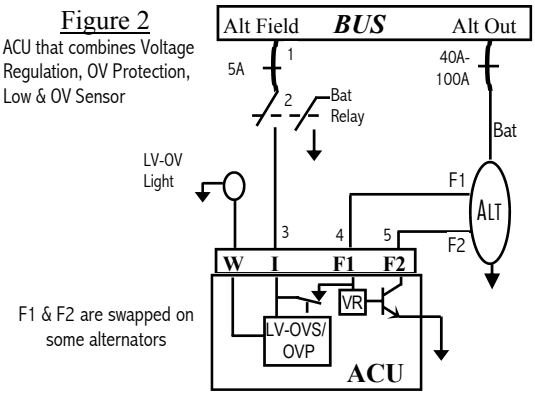
ALTERNATOR CONTROLLER: VREG, OV RELAY, LOW-OV WARNING

FOR TYPE A 28V ALTERNATOR SYSTEMS

Features:	Benefits:
• Voltage Regulation, IC Sense Referenced	* Increase Regulator Life. Not Temperature Sensitive
• Over Voltage (OV) Protection	* Protects System Against Overexcited Alternator Field
• Low Voltage & OV Sensor & Light Output	* Warns of Low & OV Conditions
• Field Controller Generates Low Heat	* Increase Regulator Life
• Externally Adjustable Voltage Regulation	* Increased Ease of Ownership
• Light Weight and Repairable	* Reduced Long-term Ownership Cost

Voltage Regulation: 28.4V ± 0.4V. Max Field Current: 7A.

Figure 2
ACU that combines Voltage Regulation, OV Protection, Low & OV Sensor



VOLTAGE REGULATION

Using the voltage sensed from the OV Relay output, the Regulator 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. The Regulator controls the field by grounding or opening the one side of the field connected to pin F.

The R25V0N works in the one alternator (single engine) application as well as in the dual alternator (single or dual engine application. It is the best replacement for the Prestolite VSF7403 type Voltage Regulator.

OVER VOLTAGE (OV) PROTECTION (NOT IN THE UNIT)

The external OV Protector (OVP) or OV Relay deactivates the Voltage Regulator by removing power to its input and one side of the field if the bus voltage exceeds 32V. This removes the alternator field excitation and thus protect sensitive avionics equipment and the battery.

TYPE A VOLTAGE REGULATION:

This controller has a "Type A" regulator which excites the field of the alternator by providing controlled ground to one side of the alternator field (F2), with the other side (F1) powered by the OVR output.

The R25V0N replaces
- PRESTOLITE: VSF7403,2,1,4 & OV RELAY
- ELECTRODELTA: VSF7403A & OS75-28
- TCM: 649684-2, 649440-2 & OV RELAY
- LYCOMING: LW101079, 77347 & OV RELAY
- PIPER: 550-581 & OV RELAY

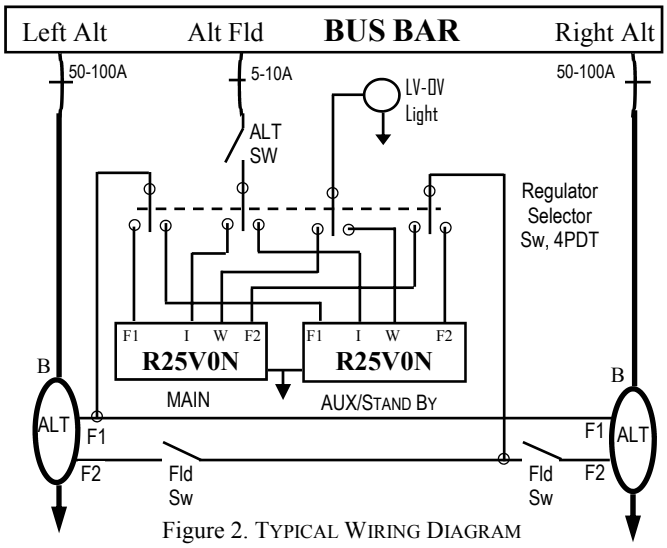


Figure 2. TYPICAL WIRING DIAGRAM
DUAL ALTERNATOR SYSTEM

By Femi G. Ibitayo

1622 E. Whaley St., Longview, TX 75601. USA
Ph: 903-758-6661; Fax: 903-236-9766. E-mail: Tech@zeftronics.com
Ph: 1-800-362-8985. Web Site: www.zeftronics.com

ZEFTRONICS
Electrical Charging Systems Solutions

R25V0N ALTERNATOR CONTROLLER
FOR TYPE A 28V ALTERNATOR SYSTEMS

HOW THE SYSTEM WORKS:
REFER TO FIGURE 1 & 2 PAGES 1 & 3

Turning on the master switch applies battery voltage to the input of the Alternator Controller or Voltage Regulator (VR) through the Over-Voltage Relay (OVR).

In this "Type A" charging system configuration, the VR applies controlled grounding to one side of the alternator's field while the other side has power on it from the OVR. Without the engine running, the field voltage is typically 0-2V. With the engine running, the field voltage is 27-0.5V while the bus voltage is at 28V. *The field voltage starts out high and decreases with increased system load.* If the field voltage becomes 0, the system will experience an OV condition, and the OV Relay will open to turn off the VR thereby removing excitation from the alternator's field.

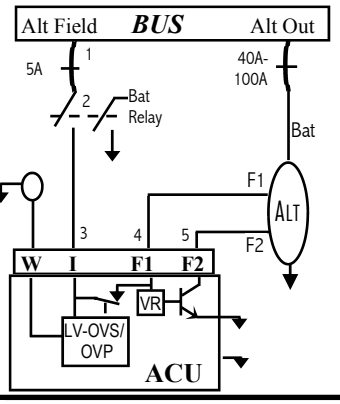
Over Voltage Protection

The OV Relay is a normally closed switch which opens when the bus voltage exceeds 32V. It has a time delay that prevents nuisance tripping caused by system noise or voltage spikes.

The regulated bus voltage is normally about 28V unless the alternator is self-current limiting[1] or if there is voltage drop in the alternator field circuit breaker, alternator switch, OV Relay, or wiring and connections between the bus and the red wire on the VR. These voltage drops across the different components and connections occur when current, up-to 3 Amps in some instances, passes through the resistance built-up in them. *The resistance build-up causes flickering ammeter and instrument panel lights.*

[1] self-current limiting—Internal characteristics of the alternator that causes it to limit its current and voltage output at a given speed.

Figure 2
ACU that combines Voltage Regulation, OV Protection, Low & OV Sensor



INSTALLATION INSTRUCTION

1. Disconnect and remove the present ACU/VR.
2. At the ACU/VR, measure the alternator's field resistance: i.e. resistance between the F1 (I) and F2 (F). A resistance of 10 to 18Ω is normal. If the measured resistance is outside the specified range, check the alternator field and the connections/wire from the alternator's field wire (at the ACU/VR) to field wire to the OVR ouput wire. 0Ω indicates a field to ground short. Correct fault found.
3. Verify that the input (Alt Switch, Field breaker, etc) resistance to the OVR is below 0.1Ω. Correct faults found.
4. Mount the ACU/VR and connect the OVR and ACU/VR to the system.
5. Perform the Post Installation Test Procedure.

POST INSTALLATION TEST PROCEDURE

1. Turn on the Master switch and measure
   - Bus voltage _____V. _____V.
   - I voltage _____V. _____V.
   - F1 voltage _____V. _____V.
   - F2 voltage _____V. _____V.
   - W voltage _____V. _____V.

   The inputs should read bus voltage. VR output voltage on the "type A" should read 0-2V.
2. If the step 1 is successful, perform step 3.
3. Turn Off all the avionics. Start the engine. At 1500-1600 RPM measure bus voltage: It should read 27.5V - 28.5V. If the bus voltage exceed these limits, check for voltage drop in the 5A breaker, the Alt switch, and pre-ACU/VR wires.

TROUBLE-SHOOTING THE SYSTEM

See the Trouble-Shooting Notes (TSN) page and or TECHCARDS for information on how to solve problems in the system.

WIRING DIAGRAMS

See pages 1 and 3 for wiring diagrams of the dual alternator system.

1622 E. Whaley St., Longview, TX 75601. USA
Ph: 903-758-6661; Fax: 903-236-9766. E-mail: Tech@zeftronics.com
Ph: 1-800-362-8985. Web Site: www.zeftronics.com

TROUBLE-SHOOTING THE SYSTEM WITH R25V0N

24V Type A alternator system on Beech, Cessna, Piper, Twin Commander etc

TROUBLE-SHOOTING

1. With BAT, ALT, REG & FLD switches on and the engine off, the voltage on pin I of the R2510N will be the same as the bus voltage. If it is more than 0.2V less, look for high resistance in the 5-10A breaker, the Alt switch, the OV Relay, the Reg selector switch, or connections at any of those devices). None of the devices should have a voltage drop that is higher than 0.1V.
2. Turn Off all the avionics. Start the engine, and at 1500 RPM measure a bus voltage of 27.5-28.5V. If the bus voltage exceed these limits, verify the voltage adjustment on the controller and the voltage drops of the power input devices.

   At that speed, depending on the system load, the voltage on the field will decrease from about 27V to 0.5V. Loading the alternator beyond its rating (for a given speed) will cause it to self current limit. Current limit is indicated by a drop in bus voltage which occurs as system load current exceeds a certain point.

One or Both Alternators Drop Off-line

Make sure that the 5-10A breaker is okay. Then check the condition of the Alt switch, the OV Relay, and Reg switch. Verify that the voltage on pin I is the same as the bus voltage.

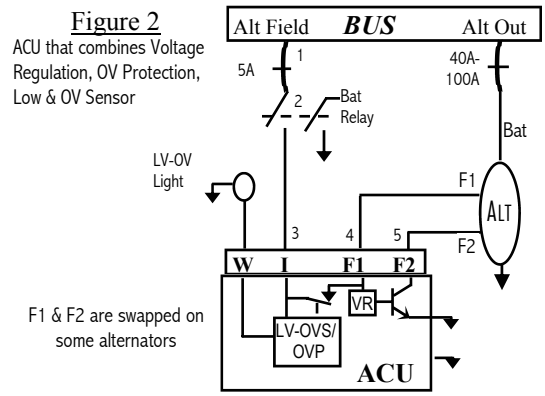
Check one unit at a time. On the R25V0N, if there is no voltage on pin F1, the OVR may have tripped due to a grounded ALT field or field wire. At the R25V0N and at the alternator's field, check the field resistance: it is normally 10 to 18Ω. If the resistance is out of range, check the ALT field or wires/connections/switches/ fuses from the regulator to the field. An alternator with a grounded field/field wire will cause an OV fault**.** Test the system again with only one alternator field switch on at a time.

Fluctuating Charge-meter / Flickering Panel Lights

This problem is usually caused by a resistance build-up in the ALT switch or OV Relay, the 5Amp breaker, or bad wires/connections between the Bus and the Red wire on the Regulator.

With the master switch On, verify that the voltage drop across the alternator switch and 5-10Amp circuit breaker is less than 0.2V. Another way to do it is to verify that the Alt switch & OV Relay resistance is 0.1Ω or less. If either measurement is higher than indicated, replace the bad part.

Figure 2
ACU that combines Voltage Regulation, OV Protection, Low & OV Sensor



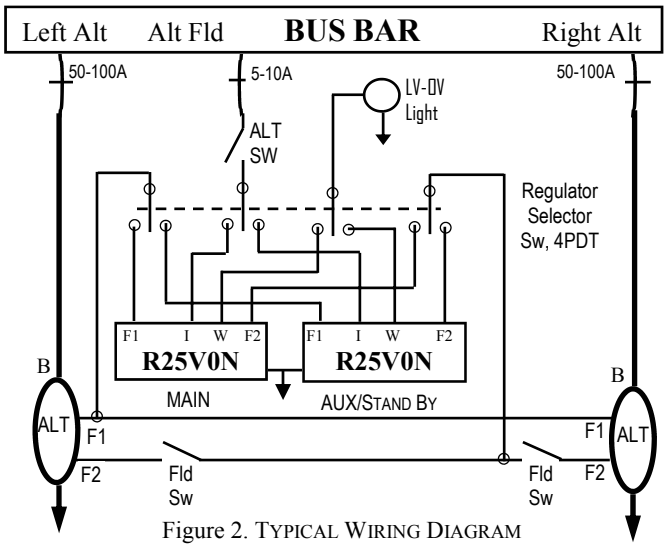


Figure 2. TYPICAL WIRING DIAGRAM
DUAL ALTERNATOR SYSTEM

TROUBLE-SHOOTING

Checking the condition of the voltage regulator/controller & OVR

1. With the Bat & Alt switches on, engine off, measure the voltages at the indicated (refer to the wiring diagram).

Single Alt /figure 1. BUS: _____ 5A Bkr: _____ I PWR: _____
F1 : _____ F2: _____ W:_____ R Fld: _____ R Fld: _____

Dual Alt /figure 2.
Main Reg Selected. BUS: _____ 5A Bkr: _____ I PWR: _____
F1 : _____ F2: _____ W:_____ R Fld: _____ R Fld: _____

Aux Reg Selected. BUS: _____ 5A Bkr: _____ I PWR: _____
F1 : _____ F2: _____ W:_____ R Fld: _____ R Fld: _____

Checking the condition of the alternator Field & Power input devices

2. Disconnect pin F1 & F2 on the controller. Measure the resistances indicated below:

F2 to F1 ALT _____Ω. Pin I to BUS _____Ω. F2 to F1 ACU _____Ω
The field resistance is normally 10 to 18Ω.If the resistance is out of that range, check the alternator field or wires/connections/switches/fuses. The resistance from pin I to bus should be 0-0.1Ω. A higher resistance may lead to fluctuating ammeter or panel lights or erratic bus voltage.

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ZEFTRONICS
Electrical Charging Systems Solutions

Frequently Asked Questions & TECHCARD Notes

Troubles –Shooting 28V Type A alternator system on Beech, Cessna, Piper, etc

Flickering / oscillating ammeter and panel lights.

Check the components and connections between A and D for high resistance or intermittent connection.

No voltage regulation

With the master switch on and Battery voltage measured on the OV Relay output, look for Bus voltage on the VR input and out put.

- If the is no Bus voltage on the ACU input, look for a broken wire between the ACU and the OVR.
- If the input voltage is more than 0.2V lower than the bus voltage, look for & correct the device (5A breaker, ALT switch, OVR or connection or wire) that is causing it.
- If the output voltage is 0 and the input has battery voltage, look for a grounded alternator field or field wire. If the field resistance is correct as shown in step 5 of the installation tests send the VR in for test/repair.
- If it is internally shorted, repair the field ground fault or replace the alternator.
- If the output voltage is the same as the input voltage, look for an open alternator field or field wire. If the field resistance is higher than what is shown in step 5 of the installation tests, send the alternator in for test/repair. If the field resistance is correct, send the VR in for test/repair.

Bus voltage remains at battery voltage (about 24V)

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. In some Piper aircraft, check the condition of the diode between the bus and alternator output. Check the shunts and alternator output wires. indicating an alternator that is current limiting.

Bus voltage drops with load increase

See *Alternator carries only about half its rated output.*

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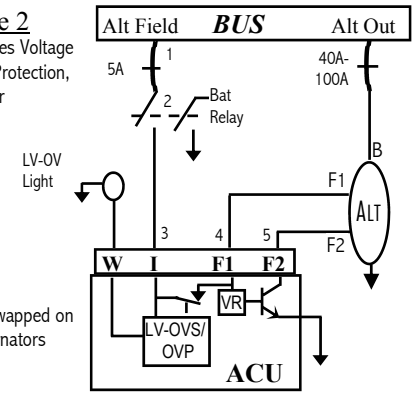

OUR GOAL IS TO HELP YOUR SYSTEM OPERATE BETTER AND HELP YOU BETTER UNDERSTAND ITS OPERATION.

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-shorted alternator field. Most 24V alternators have 10-18Ω field resistance. Ground shorted alternator field will damage most Voltage Regulators/ACU. **If the alternator has a field to ground short, do not connect the ACU/Regulator to it.**

☐ 4. With the engine off: Check voltage drops across the field and Alt circuit breakers, and OV relay. 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**:

		24V Values		Typical Values
A.	Field resistance at ALT	_____Ω	_____Ω	10 – 18Ω
B.	Field resistance at ACU	_____Ω	_____Ω	10 – 18Ω
C.	Field SW resistance	_____Ω	_____Ω	0 – 0.1Ω
D.	Field C/BKR resistance	_____Ω	_____Ω	0 – 0.05Ω
E.	ALT C/BKR resistance	_____Ω	_____Ω	0 – 0.05Ω

☐ 6. Perform and record the following tests with the **Master Switch On**:

		24V Values		Typical Values
F.	BUS Volt Engine Off	_____V	_____V	24 – 26V
G.	ACU/Reg input Volt	_____V	_____V	24 – 26V
H.	Field Voltage	_____V	_____V	Vbus to 0.5V

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

		24V System		Typical value
I.	Bus voltage	_____V	_____V	27.4 – 28.5V

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

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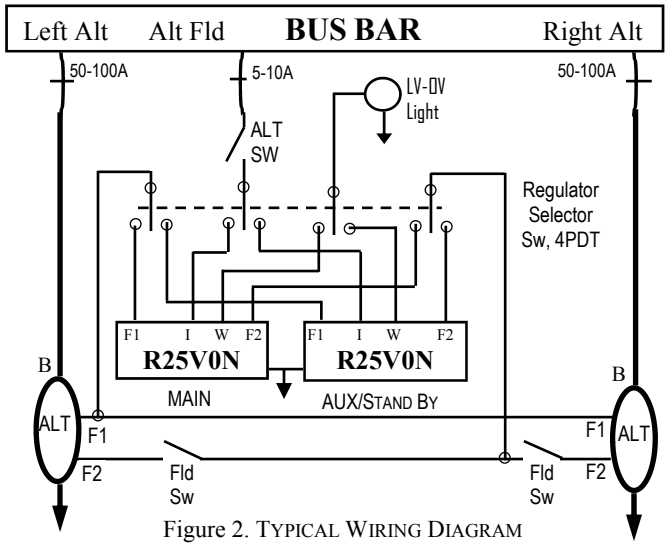

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