Lamar Technologies LLC

OUTLINE & SPECIFICIATIONS

LOS-A-00310

ADJUSTMENT PROCEDURES

A-00310

BALANCING REGULATOR

DATE WRITTEN	ORIGINAL AUTHOR	LASTEST REVISION DATE	SHEET NO.	NO. OF SHEETS	UPDATED BY:
5/26/76	R.L. MEISENHIEMER	6/16/06	1	6	M. DELANEY
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LATEST CHANGE J

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REVISION HISTORY

REV	DESCRIPTION	RELEASE DATE	APPROVAL
E	Note Rev Page 4	5//26/76	R. L. Meisenheimer
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G	ECN 00037 Changed to match Lamar Format	4/24/01	D. Moore
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1.0 PURPOSE

The purpose of this document is to describe the procedure for adjusting Balance Regulators.

2.0 SCOPE

This document applies to A-00310, Balancing Regulators.

3.0 REFERNECE DOCUEMNTS

- N/A

4.0 ACROYNMS

- N/A

5.0 DEFINITIONS

- N/A

6.0 RESPONSIBILITIES, PROCEDURE MAINTENANCE

- Engineering

7.0 PROCEDURE

7.1 GENERAL

7.1.1 The **LAMAR** Balancing Regulators used on twin-engine aircraft achieve load balancing indirectly through their ability to equalize the separate alternator field voltages. For this reason, alternator output current balance depends on the separate alternators having nearly identical characteristics and further, their field and load wiring and RPM must be approximately the same.

7.1.2 If after performing the balancing adjustments described below, the resulting load current balance is not thought to be satisfactory, please refer to the EXPLANATION/ANALYSIS section, which follows the Adjustment Procedure.

8.0 CAUTION:

8.1 During all tests and adjustments on these regulators make certain that the “FIELD” circuits, including any meter or test leads on these circuits are always protected from accidental contact with ground or other circuits. Even a momentary ground contact for an instant may permanently damage the regulator.

9.0 ADJUSTMENT PROCEDURE: (SEE ADJ. PROCEDURE NOTE, PAGE 4):

9.1 These regulators are normally used in parallel output alternator systems of multi engine aircraft. Their final adjustment should be made in actual operation in the aircraft system.

9.2 The adjustments are made while operating only one engine, either left or right.

9.3 The engine operated must be selected to permit the technician a completely safe access to both of the regulators, so that they may be adjusted while that engine is operating with no danger from the propeller.

9.4 We shall designate the engine selected to be operated as “A: and the inoperative engine as “B” for purposes of the discussion.

9.5 Lift the wire from the “PAR” terminal of either regulator and temporarily secure the free end so it will not contact other circuits or ground during the adjustment procedures. Opening this circuit disables the balancing circuits of both regulators, allowing them to operate independently for the purpose of adjustment.

9.6 Turn <u>off</u> the “B” alternator field switches. All of the “A: alternator switches are to be <u>on</u>.

9.7 Operate the "A" engine and alternator system for a period of 5 to 10 minutes supplying a substantial electrical load current of 15 to 30 amperes at an alternator RPM of 3,000 to 4,000 RPM (medium to fast ground idle RPM of the engine) Do not use cruise or high RPM.

9.8 As required, carefully set the "A" regulator voltage adjustment to the correct value for the aircraft using a precision voltmeter connected to the regulator "BUS" terminal or to the aircraft voltage reference point if specified.

9.9 Replace the snap plug in the "A" regulator adjustment access hole.

9.9.1 DO NOT MAKE ANY FURTHER ADJUSTMENT OF THE "A" REGULATOR

9.10 **NOTE**: Several operations of connecting and disconnecting the "PAR" circuit wire are required by the following steps. For convenience, a switch or a dependable clip connection may be used to accomplish this. No danger of damage exists if this circuit touches any other circuit or ground, however, erroneous results will be obtained if such occurs.

9.11 Shut down the system, including the master electrical switch. Connect a portable voltmeter (non-precision) such as Simpson #260 or equivalent between the "FIELD" terminals of the left and right regulators in addition to the aircraft system wires already on these terminals. The positive terminal of the meter is to be on the "A" regulator terminal. Use a 30V or 50V meter range initially.

9.12 Restore operation of the "A" engine and alternator system using load and RPM as in (d) above, and turn on the "B" alternator system switches. *(HOWEVER, ENGINE "B" IS NOT OPERATING).*

9.13 Now slowly rotate the "B" regulator voltage adjustment while observing the voltmeter connected between the field terminals.

9.14 If a reverse (downscale) reading is obtained with meter polarity as specified, turning the "B" regulator adjustment counterclockwise will bring the meter up scale.

9.15 Then slowly set the "B" adjustment to a point where the voltmeter will read a low value. Any reading from zero to 8 volts is acceptable. A stable reading should not be expected. A lower meter range such as 10V may be used for this adjustment. Now reconnect the wire to join the "PAR" terminals of the two regulators and observe that the voltmeter drops to a very low value (0.2 to .5 Volt) and it will be stable. Continue operation in this manner for 5 to 10 minutes to establish initial warm-up of the "B" regulator and alternator system.

9.16 After the warm-up period make a final adjustment of the balance. This is done by again briefly opening the "PAR" circuit between regulators and touching up the "B" adjustment for a low reading of the voltmeter between field terminals. Again any value from zero to 8 volts is acceptable. And again it will not be stable while the "PAR" circuit is open.

9.17 Remove the adjustment screwdriver and replace the snap plug in the "B" regulator adjustment hole.

9.18 Shut down the "A" engine and master switch. Remove all voltmeter leads. Reconnect the "PAR" circuit wire removed in step b) and check all terminal screws for security.

9.19 The adjustment is now completed.

10.0 EXPLANATION AND ANALYSIS:

10.1 The correct principle of adjusting these regulators as described above is based on bringing the two equally warmed up systems to the point where they are independently set to nearly the same voltage without benefit of the auto balance circuit corrective action. This is the reason for making the balance adjustment with the "PAR" circuit disconnected, and it yields the maximum amount of automatic control range under operating conditions.

10.2 Each regulator is capable of nearly 1.0 V of automatic control in the positive direction. This is in terms of the input voltage at the "BUS" terminal. Because of high gain in the regulator (exceeding 80:1) the field voltage difference of 5 to 8 volts that occurs when the "PAR" circuit is open corresponds to only a small percentage of the available automatic compensation range. Thus there is no valid reason for attempting a near zero adjustment of field voltage balance

during the procedure with the "PAR" circuit open, but the lower the better, especially with 14V systems.

10.3 No adjustment of either regulator should be made while the wire circuit between "PAR" terminals of the regulators is closed, unless it is followed by the adjustment procedure described above with the "PAR" circuit open. In the event that an unsatisfactory balance results between load currents of left and right alternators after the adjustment procedure is completed, several tests can be made to isolate the cause.

NOTE: *10.3.1 Tests for balance should always be made with a substantial load on the aircraft system. The reason is that the regulators require a certain amount of voltage at the field terminals (about 2V) in order for the balancing action to become active. It is characteristic of this system that with very high RPM and very low loads the balancing action ceases and in the extreme case, one alternator may be entirely cut off.*

10.4 A basic analytic test to identify the cause of a load unbalance is to reconnect the portable meter between the "FIELD" terminals of the regulators (step e above) and observe this meter when the unbalance is occurring. If the meter remains at a low value of 0.5V or less while the unbalance of load current exists, regulators are OK.

10.5 To demonstrate the balance in the aircraft system independent of regulators, temporarily connect both alternator field wires to one regulator ("PAR" circuit open) and observe load currents as before.

10.6 Eccentric slip rings causing brush jumping, also brushes not fitted to slip rings have been known to cause unbalance. Ammeters and shunts should also be checked.

10.7 Electronic digital voltmeters are not recommended for the adjustment of balance, e) above.

NOTE: **11.1 SPECIAL ADJUSTMENT PROCEDURE—SEE BELOW FOR AIRCRAFT APPLICABILITY.**

11.1.1 THIS PROCEDURAL DETAIL APPLIES ONLY TO CERTAIN AIRCRAFT IN WHICH POWER DIODES ARE INSTALLED BETWEEN THE ALTERNATOR OUTPUT AND THE AIRCRAFT BUS, AND ONLY THEN IF THE ALTERNATOR FIELD EXCITATION (INPUTS TO THE REGULATORS) IS TAKEN FROM THE ANODE (ALTERNATOR) SIDE OF THESE DIODES.

11.1.2 PRIOR TO STARTING THE ADJUSTMENT PROCEDURE, ADD A TEMPORARY LOW RESISTANCE

11.1.4 STRAP ANODE-TO-ANODE ON THESE DIODES.

11.1.5 AFTER COMPLETING THE ADJUSTMENT PROCEDURE, REMOVE THE TEMPORARY STRAP.

11.1.6 THE APPLICABILITY OF THIS DETAIL IS TO BE DETERMINED BY THE RESPONSIBLE PERSONS 11.1.4 PERFORMING THE ADJUSTMENTS.

11.1.7 AIRCRAFT IN WHICH THIS IS LIKELY TO BE REQUIRED INCLUDE:

- ROCKWELL
- AEROSTAR

11.1.8 OTHER AIRCRAFT HAVING DIODES AS DESCRIBED BUT WITH FIELD EXCITATION TAKEN FROM THE UTILIZATION BUS DO NOT REQUIRE THIS PROCEDURE.

11.0 FORMS

- N/A

12.0 RECORDS

- N/A

13.0 FLOWCHART

- N/A