R1224 REGULATOR INSTALLATION INSTRUCTIONS P/N 12-1001

RECORD OF REVISIONS

Revision Level	Issue Date	Page(s) Revised	Description
G	09/08/14	1	First release of Drawing No. 12-1001 into Hartzell Engine Technologies Design Data.
H	09/08/14	1	Updated Master Drawing No. 12-1001 Title Block from Plane-Power, LTD to Harzell Engine Technologies, LLC.
J	11/18/14	4	Changed Instruction for Continued Airworthiness to Maintenance Instructions.
K	02/01/17	2	Added website reference to Master Drawing No. 12-1001.
L	04/30/18	ALL	Revised to conform to iSpec 2200 Standard.
		i	Added HET standard cover page;
		ii	Added Record of Revisions;
		iii	Added Table of Contents;
		2-1 thru 2-7	Removed redundant (Table 1) information from Installation Guides A thru M.
M	IN REVIEW 2021	ALL	Update instruction to conform to FAA Order 8110.54A, Appendix A, Part 23, ICA Checklist;
		6-1	Update Table 6-1, Effectivity, pg. 6-1 thru 6-3;
		6-6 & 6-7	Update LAMP function jumper for clarification, steps 7 & 8 where applicable. Add “locally manufactured jumper”;
		6-16	Add Guide N for Jasco regulator replacement R1224J.

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TABLE OF CONTENTS

Thank you for purchasing a PlanePower* R1224 regulator. We encourage you to read this instruction thoroughly. It contains a wealth of information about how to properly install and maintain your regulator so that it may give you many years of safe and reliable service.

Should you have a question regarding your regulator that is not covered in this instruction, Hartzell Engine Technologies Product Support is ready to assist you. We may be reached at the following contact information:

Phone: +1.334.386.5400, option 2

E-mail: techsupport@Hartzell.aero

Fax: +1.334.386.5450

Web: hartzell.aero/contact/

WARNING:

People who fly should recognize that there are various types of risks are involved in this activity; and they should take all precautions to minimize them, since they cannot be eliminated entirely. An electrical system failure could result in an unplanned landing or even more severe consequences creating an unsafe condition that may result in death, serious bodily injury, and/or substantial property damage. It is essential that the components of the aircraft electical system be properly maintained according to the recommended service procedures and monitored to detect impending problems before they become serious. Any unusual operation should be investigated and corrected, as it may be a warning of impending failure.

AIRWORTHINESS LIMITATIONS

A.1 General Information

CAUTION:

THE AIRWORTHINESS LIMITATIONS HEREIN ARE THOSE MANDATED BY HARTZELL ENGINE TECHNOLOGIES. THESE LIMITATIONS ARE THE MINIMUM REQUIRED TO MEET CONTINUED AIRWORTHINESS BUT MAY BE SUPERSEDED BY MORE STRINGENT REQUIREMENTS AS PUBLISHED BY THE FAA, AIRCRAFT, ROTORCRAFT OR OTHER MANUFACTURERS THAT USE THESE COMPONENTS IN THEIR APPLICATIONS. FAILURE TO OBSERVE THESE LIMITATIONS MAY COMPROMISE THE COMPONENT OR THE APPLICATION IT IS USED IN.

A.2 Airworthiness Limitations Statement

A. The Airworthiness Limitations section is FAA accepted and specifies maintenance required under § 43.16 and § 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved.

Airworthiness Limitation Revisions Log

Revision Number	Description of Revision

A.3 Life Limits

A. The FAA establishes specific life limits for certain component parts Such limits require replacement of the identified parts after a specified number of cycles or hours of use.

B. Additions of, or changes to, any life limit for alternator components will be noted in the Airworthiness Limitation Revision Log.

C. Life Limits

(1) R1224 series regulators and their component parts affected by this instruction currently do not have any life limited parts.

(2) There are no new (or additional) Airworthiness Limitation associated with this equipment.

SECTION 1 - INTRODUCTION

1.1 General Information

WARNING:

IMPROPER OR UNAUTHORIZED APPLICATIONS OF THE INFORMATION CONTAINED IN THE INSTRUCTION MAY RENDER THE AIRCRAFT OR THE COMPONENT UNAIRWORTHY AND RESULT IN LOSSES, DAMAGES, OR INJURY TO THE USER.

DO NOT USE OBSOLETE OR OUTDATED INFORMATION. PERFORM ALL INSPECTIONS OR WORK IN ACCORDANCE WITH THE MOST RECENT REVISION OF THE APPLICABLE AIRCRAFT/ENGINE SERVICE OR MAINTENANCE MANUAL. INFORMATION CONTAINED IN THESE INSTRUCTIONS MAY BE SIGNIFICANTLY CHANGED FROM EARLIER REVISIONS. USE OF OBSOLETE INFORMATION MAY CREATE AN UNSAFE CONDITION THAT MAY RESULT IN DEATH, SERIOUS BODILY INJURY, AND/OR SUBSTANTIAL PROPERTY DAMAGE.

The accuracy and applicability of this instruction has not been verified for any assembly, component or part not manufactured by Hartzell Engine Technologies LLC (HET). Any use of the instruction for other than its intended or implied purpose is prohibited. The use of the instruction for the purpose of performing any installation, maintenance, replacement, adjustment, or inspection of any assembly, component or part not manufactured by HET is not approved, endorsed, or sanctioned by HET.

This instruction has been approved by Hartzell Engine Technologies LLC as the proper methods and procedures that FAA or other airworthiness authority Certificated Repair Stations and A/P Mechanics should use in the inspection and maintenance of Hartzell Engine Technologies LLC regulators.

No liability will be assumed by Hartzell Engine Technologies LLC for actual, consequential, incidental or other types of damages directly or indirectly resulting from the unauthorized use of this instruction for other than its stated purposes.

The liability for use of the authorized data herein for the maintenance, or return to service is limited to the specific terms and conditions stated under the applicable Limited Warranty in effect for each piece part, component, assembly or whole unit sold by HET.

Because of the numerous modifications, Supplemental Type Certificates (STC), Parts Manufacturing Approvals (PMA), or Form 337 Field Approvals that may apply, it is the responsibility of the repairman, mechanic or maintenance facility to determine the proper engine or aircraft application of this regulator assembly. Please refer to the appropriate aircraft Type Certificate (TC), Supplemental Type Certificate (STC), aircraft equipment list, maintenance manuals, and/or Log Book entries for determination.

When performing installation, maintenance, replacement, adjustment, or inspection of any HET assembly, component or part, it is imperative that the latest revision of this instruction or other product support document be referenced. Reference the HET website to be sure you have the latest revision before performing any work. (http://www.hartzell.aero/maintenance-manuals/)

All reasonable attempts were made to make this instruction as complete and accurate as possible. If you have any questions, comments, corrections or require clarification of any information contained herein, please write to Hartzell Engine Technologies LLC, 2900 Selma Highway, Montgomery, Alabama, 36108 USA. TEL +1.334.386.5400, FAX +1.334.386.5410, or http://hartzell.aero/contact/.

1.2 General Specification (Instruction)

A. This instruction is written in the English language and follows guidelines outlined in ATA 100 standards. Principle units of measure used in this instruction are U.S. units with International System of Units (SI) in parentheses.

B. The R1224, R1224B, and R1224J regulator models are considered herein.

C. All aircraft, rotorcraft, or engine applications are limited to the holder of the TC, STC, PMA or TSO and only at the date of that document publication or revision.

D. Only approved, competent persons with the necessary skills may do maintenance tasks described in this instruction. This may include a certified pilot doing “preventative maintenance” as defined in FAR 43, Appendix A, paragraph C with guidance from AC 43-13-1B and AC 43-13-2B or latest change.

E. This instruction describes maintenance on components as they are installed on aircraft and tasks that should be accomplished in a properly equipped service facility.

F. Maintenance tasks and subtasks are referenced in the instruction but will have no specific identification numbers.

G. The instruction contains: Description of operation, Troubleshooting, Instruction for Continued Airworthiness (ICA) and Maintenance information along with part numbers required for basic maintenance tasks.

H. Changes and updates to this instruction can be found at www.PlanePower.aero*. Revisions will be tracked and recorded in the Record of Revisions section of this document.

* Plane-Power is a trademark of Hartzell Engine Technologies LLC.

1.3 Measurements

The measurements given in this instruction are taken from original manufacturing drawings.

1.4 Units of Measure

A. SI Units

A	Ampere
A · h	Ampere hours
g	Gram
N	Newton
N · m	Newton meter
V	Volt
°C	Degree Celsius
Ω	Ohm
W	Watt
Hz	Hertz
m	Meter
cm	Centimeter
kg	Kilogram

B. U.S. Units

ft	Foot
in	Inch
lb	Pound
lbf · in	Pound-force inch
lbf · ft	Pound-force foot
ºF	Degree Fahrenheit

C. Multiplying Prefixes

µ	Micro
m	Milli
k	Kilo
M	Mega
p	Pico

1.5 Abbreviations

A. The abbreviations given below are used in this instruction: (upper or lower case)

AC	Advisory Circular
AFM	Aircraft Flight Manual
ALT	Alternator
ATA	Air Transport Association of America
CB	Circuit Breaker
DIA	Diameter
FAA	Federal Aviation Administration (USA)
FIG.	Figure
GAMA	General Aviation Manufacturers Association
HET	Hartzell Engine Technologies LLC
MAX	Maximum
MFR	Manufacturer
MIN	Minimum
NO.	Number
N/A	Not Applicable
P/N	Part Number
PARA.	Paragraph
POH	Pilots Operating Handbook
REF.	Refer To
TS	Troubleshooting

1.6 Definitions

A. This paragraph defines the warnings and notifications used in this instruction. **WARNINGS** place critical attention to use of tools, materials, procedures, or limitations, which must be followed without deviation to avoid injury to the technician or other persons. **CAUTIONS** place immediate attention to use of tools and procedures which must be followed to avoid injury, damage to equipment and/or facilities. **Notes** call attention to procedures which make the job easier.

B. The following are basic definitions of the terms used herein: (as related to this instruction)

ALTERNATOR: The complete unit which transforms rotational energy from a powerplant into electrical energy . At a given voltage, produces alternating current (AC) which is converted to direct current (DC).

CONTINUITY: The continuous path for the flow of current in an electrical circuit.

EMI: Electro Magnetic Interference. A disturbance in the radio-frequency spectrum that is generated by an external source that affects electrical devices or circuits by electromagnetic induction, electrostatic coupling, or conduction.

OPEN: Electrical term for a complete disruption of a conductive path in an electrical circuit. Will read infinite resistance.

VOLTAGE REGULATOR: The voltage regulator controls system voltage by controlling the electrical circuit (called the field circuit) that energizes the electromagnet of the alternator rotor.

ROTOR: Rotating electro magnet used to create a magnetic field.

TERMINALS: Studs, screws or other devices that provide connections for electrical power.

1.7 Disposal

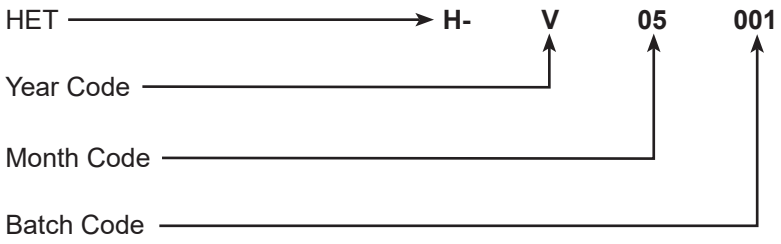
A. Disposal of unairworthy parts and assemblies as well as required replacement parts should be as follows: Rejected parts should be tagged and scrapped per FAA requirements. Any part deemed unairworthy must be rendered unusable prior to discard. Rectifiers and PCB components may be considered hazardous waste and should be discarded whole through your local hazardous waste management system.

1.8 Storage

A. If unused, the regulator has no special preservation procedures and should be stored in its original packaging in a clean and dry environment. No storage limits are applicable if stored properly.

B. If the regulator is installed and has been in service, follow the recommendations of the engine and aircraft manufacturer regarding storage and preservation.

1.9 Serial number Identification



Example above: 2021, May, first unit of the month (batch). The year code advances one letter in alphabetical order for each succeeding year.

1.10 Warranties

A. Hartzell Engine Technologies LLC (HET) offers a Limited warranty with each new, overhauled, or rebuilt regulator assembly or component (parts) it sells through it's distribution system. **NO expressed or implied warranty exists** when repairing, overhauling, or rebuilding any assembly or component using this instruction except as it may apply to any new HET replacement part purchased. If you suspect that any warranty applies to the regulator assembly, it must be returned through an authorized HET distributor in a manner prescribed by that specific distributor. The affected regulator must be received by the factory fully assembled and not altered in any way for disposition by the HET warranty department. (**Warranty shall be denied for any regulator received altered, modified, or disassembled.**)

B. The HET Limited warranty policy in affect for your voltage regulator was delivered with the unit at the time of purchase. (As the Warranty policy is revised from time to time, you must check the policy delivered with your unit for specific terms and conditions should a warranty condition occur. If needed for reference, obtain the most current policy from the authorized HET distributor nearest you -or- visit our website at www.hartzell.aero.

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SECTION 2 - DESCRIPTION OF OPERATION

2.1 Description

A. The Plane Power R1224 Voltage Regulator is a solid-state voltage regulator with over-voltage protection, field short (over current) protection, and reverse battery protection. The R1224 regulator is designed to be set up for 14 or 28 volt configurations.

2.2 Basic Component Description

Refer to Figure 2-1

A. Connection Strip

(1) **GRND** - Aircraft ground

(2) **FLD** - Connects to one of the two alternator rotor brushes to engergize the rotor allowing the alternator to generate power.

(3) **ENABLE** - Connects to the aircraft bus to supply electrical power to the regulator. Overvoltage protection works by shorting the Enable pin to ground, tripping the the circuit breaker connected in series.

(4) **AUX** - Senses the functional voltage of the alternator in order to trigger the LAMP circuit when a fault is detected.

(5) **LAMP** - Will illuminate an indicator lamp in the case that a fault is detected by the regulator. The LAMP circuit is rated to sink a maximum of 100mA of current.

(6) **OUT** - Used to control a second regulator in a dual alternator configuration.

(7) **IN** - Connection from the primary regulator (OUT) in a dual alternator configuration. If the signal from the primary regulator is lost, the secondary regulator will resume independent operation.

(8) **SENSE** - The R1224 regulator will apply power to the alternator's rotor when voltage at the SENSE terminal is below the regulator set point.

2.3 Theory of Operation

A. **Field-drive:** The regulator senses the voltage at the SENSE terminal and provides power to the alternator rotor. Energizing the rotor allows the alternator to generate power.

B. **Overvoltage Protection:** In the event that the voltage supplied to the ENABLE pin exceeds the normal operating voltage range the regulator will trigger a circuit breaker connected in series with the ENABLE pin. The regulator will connect the ENABLE pin to the GRND pin, bypassing the field circuit and causing the circuit breaker to trip due to an over current event.

C. **Lamp Circuit:** The regulator will complete the circuit between the LAMP terminal and GRND when either a high or low voltage is detected at the AUX terminal. Note this circuit does not function if the regulator is not powered.

D. **Primary/Secondary Operation:**

(1) In a dual alternator configuration, one alternator/regulator is designated as "Primary" and one alternator/regulator is designated as "Secondary". The voltage control circuit of the "Primary" R1224 regulator controls both regulators. If the Primary regulator fails, the "Secondary" alternator/regulator will operated independently from the "Primary" alternator/regulator.

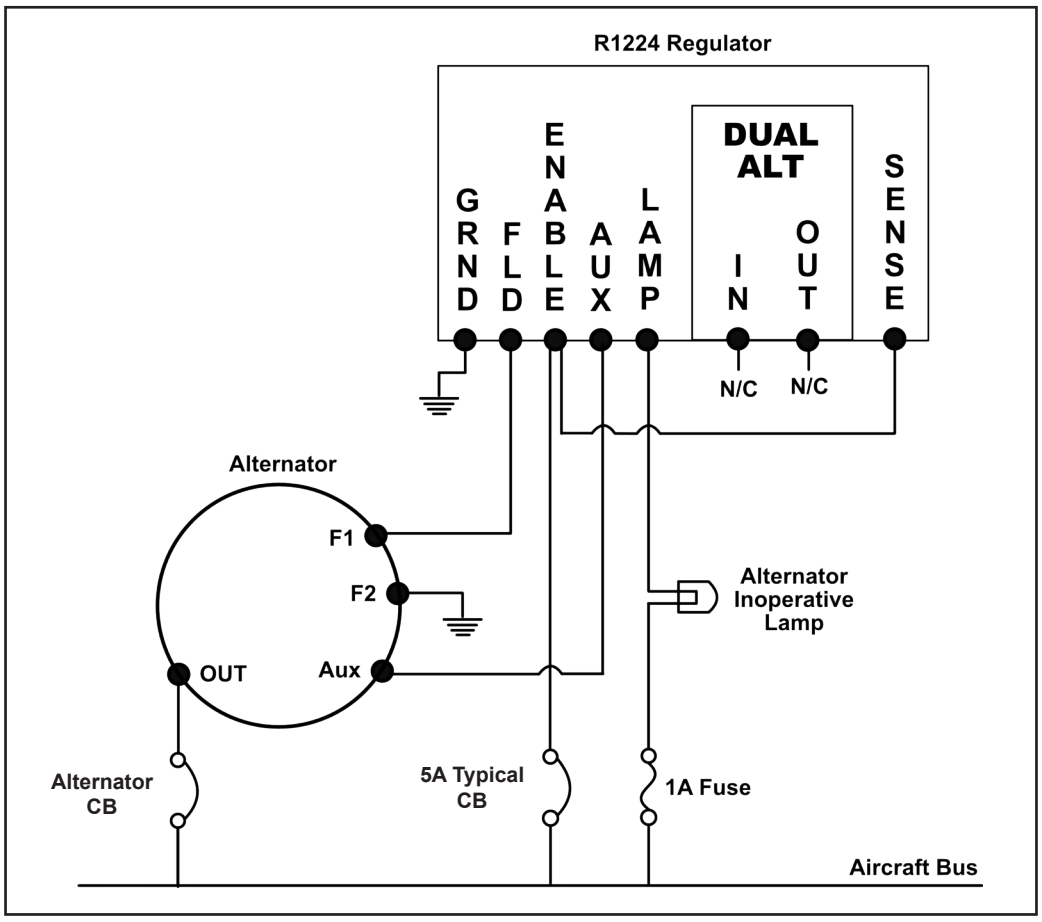


Figure 2-1 - Typical R1124 Wiring Diagram

SECTION 3 - TROUBLESHOOTING

3.1 General

A. In the event of malfunction in electrical power, it should not be assumed to be a regulator fault before employing proper troubleshooting procedures. The overall objective of troubleshooting is to find the cause of trouble and take corrective action to prevent a recurrence.

B. This section provides general troubleshooting procedures for the R1224 regulator assembly for unscheduled maintenance. It gives procedures to follow to determine the best course of action prior to replacement.

3.2 Procedure

WARNING

WHILE TROUBLESHOOTING THE REGULATOR, GREAT CARE AND CAUTION MUST BE TAKEN TO AVOID HAZARDOUS SITUATIONS. THE REGULATOR POSSESSES A HIGH ELECTRICAL CURRENT OUTPUT AND PRESENTS AN ELECTRICAL SHOCK HAZARD THAT CAN RESULT IN SERIOUS INJURY IF PROCEDURES IN THIS MANUAL OR THE AIRCRAFT/ROTORCRAFT SERVICE MANUALS ARE NOT FOLLOWED.

NOTE:

It is required to reference the aircraft or rotorcraft AFM or POH as well as the applicable service or maintenance manual as required.

3.3 R1224 Regulator Troubleshooting

A. Refer to Table 3.1 troubleshooting guide to test the R1224 regulator.

B. Perform all tests under the following conditions:

(1) Alternator switch - **ON**

(2) Master switch - **ON**

(3) Engine - **OFF**

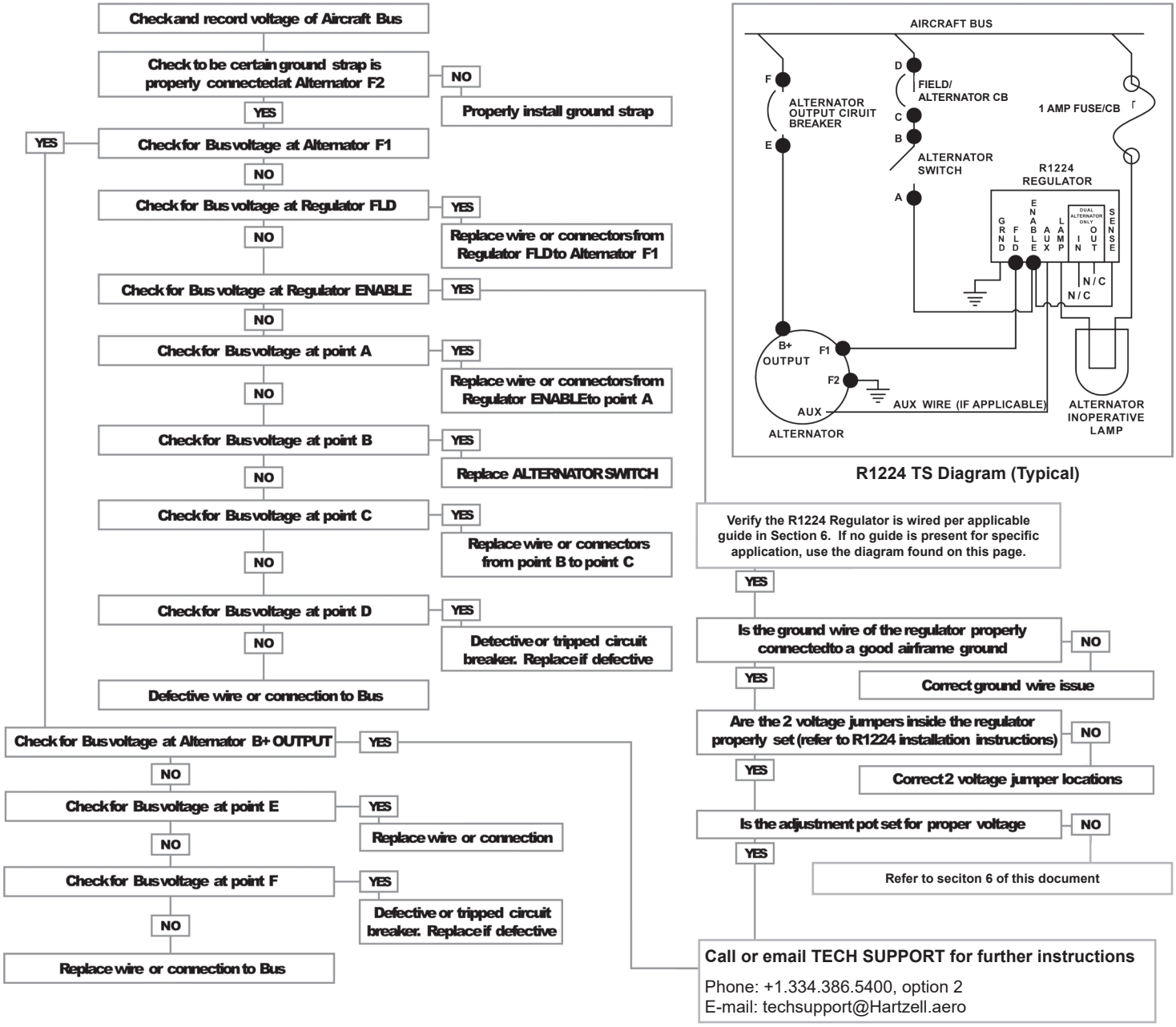
(4) Magnetos - **OFF** or **Grounded**

C. Consideration During Tests

(1) Voltage drop of 1.5V MAX at all points except across the voltage regulator.

(2) Voltage drop of .5V MAX across regulator is acceptable.

(3) MAX resistance of .2Ω at ground points across switches and conductors.



R1224 TS Diagram (Typical)

Table 3.1 - R1224 Regulator Troubleshooting

SECTION 4 - CHECK

4.1 General

A. This section defines the various checks and inspections needed to assure reliable and safe operation of the alternator while in service. They are listed in hours time in service (TIS) or in calendar time, whichever is applicable and are the first to occur when offered a choice. Some maintenance is one time initial and others are recurring.

B. HET recommended maintenance and checks including TIS may be superseded by the aircraft or engine manufacturer's established time limits and schedules based on experience and/or unique requirements under engine or airframe Type Certificate.

4.2 Inspection Checks

100 Hours TIS & each 100 hours thereafter. (or each annual/event, the first to occur)

(1) Check voltage level output. If the voltage level does not meet the Aircraft Manufacturer's requirement, adjust the voltage as per section 6-1 step 9.

(2) Inspect Regulator and wiring for secure electrical connections and physical connection to the air frame.

(3) Check connection between terminal 1 (GND) and airframe ground is found to be less than 0.1 OHM.

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SECTION 5 - TESTING

5.1 General

A. Perform all tests and checks in accordance with appropriate aircraft/engine maintenance manuals and service instructions. Alternatively, Table 3.1 of Section 3 may be utilized to test the regulator for proper function.

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SECTION 6 - INSTALLATION

6.1 Effectivity

A. General

Some aircraft models were manufactured with different regulators and different wiring arrangements, plugs, etc. Some installations can be accomplished using the basic R1224 Installation Instructions in paragraph 6.2 and 6.3 , this section. Supplemental information for individual regulators is provided where necessary. To account for model differences follow the steps below to ensure proper replacement:

(1) Find your aircraft model and OEM P/N in Table 6-1.

(2) Follow basic Installation Instructions/Supplement Infromation, this section, for applicable aircraft model/ OEM P/N.

Note: All twin engines must replace both regulators	OEM Regulator P/N	Plane Power Regulator P/N	Supplement Information
Aircraft Parts and Development Corp			
A	InterAV 625-61623	R1224	Guide M
Alexandria Aircraft, LLC			
14-19	InteraAv 625-61623	R1224	Guide M
American Champion			
7ECA, 7GCAA, 7GCBC, 7KCAB, 8GCBC, 8KCAB	FVR-4224, Lamar B-00371-14, VR371	R1224	Guide B
Augustair, Inc			
2150A	InterAv 625-61623	R1224	Guide M
Beechcraft			
V35B, V35B-TC, 36, A36, A36TC, B36TC	Beechcraft P/N 60-389017-3, 36- 380056-5, 36-380096-1 **	R1224	Guide E
23, H35, J35, K35, M35, N35, P35, 35-33, 35-A33, 35-B33, 35-C33, 35, A35, B35, C35, D35, E35, F35, G35, 35R	InterAv 625-61623	R1224	Guide M
35, A35, B35, C35, D35, E35, F35, G35, 35R with STC SA999WE installed	J12M20SP	R1224J	Guide N
Bell			
47G & 47G2 w/ STC SH191WE installed	J12M24SP	R1224J	Guide N
47G-2A, 47G-2A-1, 47G-3, 47G-3B, 47G-3B-1, 47G-3B-2, 47G-3B2A, 47G-4, 47G-4A, 47G-5, 47G-5A w/ STC SH193WE installed			
47J, 47J2, 47J2A, 47K w/ STC SH194WE installed			
Camair Aircraft Corporation – Fred Garcia			
480	InterAv 625-61623	R1224	Guide M

Table 6-1 - Effectivity (cont.)

Note: All twin engines must replace both regulators	OEM Regulator P/N	Plane Power Regulator P/N	Supplement Information
Cessna Aircraft Company			
182, 182A, 182B, 182C, 182D, 182E, 182F, 182G, 210, 210A, 210B, 210-5 (205), 185, 185A, 185B, 185C, 180, 180A, 180B, 180C, 180D, 180E, 180F, 180G, 206, P206	InterAv 625-61623	R1224	Guide M
152, A152, 172I, 172K, 172L, 172M, 172N, 172P, R172, 172RG, R172K, FR172, 177, 177A, 177B, 177RG, 180H, 180J, 180K, 182G, 182H, 182J, 182K, 182L, 182M, 182N, 182P, 182Q, 182R, R182, T182, TR182, 185D, 185E, 188, 188A, 188B, A188, A188A, A188B, T188C, P206A, P206B, P206C, P206D, P206E, TP206A, TP206B, TP206C, TP206D, TP206E, U206, U206A, U206B, U206C, U206D, U206E, U206F, U206G, P206A, P206B, P206C, P206D, P206E, TU206A, TU206B, TU206C, TU206D, TU206E, TU206F, TU206G, 207, T207, 210B, 210C, 210D, 210E, 210F, 210G, 210H, 210K, 210L, 210M, 210N, P210N,T210F, T210G, T210H, T210J, T210K, T210L, T210M, 182Q, 182R, T182, R182, TR182, 188, 188A, 188B, A188, A188A, A188B	Cessna 0750216-1, 611001-0101, C611001-0102, C611001-0201	R1224	Basic
	(Two Wire) Cessna C611004, 611005-0101, C611005-0102, C611005- 0103	R1224	Guide B
	(Four Wire) Cessna C611501-0102, 611504-0103 **	R1224	Guide C
	C611002-0102, 611002-0105, 611004-0101, C611004-0102,	R1224	Guide L
	337F, 337G, 337H, FT337P, T337F, T337G, T337H, F337H, F337G, P337H	R1224	Guide B
	310R, T310R, 335, 340, 340A, 402C,404, 414, 421, 421A, 421B, 421C	R1224	Guide H
150, 170, 172, 175 WITH STC SA971WE installed	J12M20SP, J12M24SP	R1224J	Guide N
Commander			
114, 114A, 114B, 114TC	Rockwell B-00331-1	R1224	Guide A
114B, 114TC	(4 Wire Regulators) Electrodelta VR515G **	R1224	Guide C
Grumman			
G-164A with STC SA2015WE installed	J12M20SP, J12M24SP	R1224J	Guide N
Helio Aircraft LLC			
H-250, 500	InterAv 625-61623	R1224	Guide M
Interceptor			
200, 200A, 200B, 200C, 200D	InterAv 625-61623	R1224	Guide M
KAWAD Company			
Super-V	Interav 625-61623	R1224	Guide M
Lockheed Aircraft			
402-2	InterAv 625-61623	R1224	Guide M
Lake			
LA4-200, Serial 500 and on, Lake Model 250	Electrodelta VSF-7202, VSF-7204	R1224	Guide G
LA-4, Colonial C1 & C2	InterAv 625-61623	R1224	Guide M
**** Requires purchase of adapter plate P/N: 12-1021**			

Table 6-1 - Effectivity (cont.)

Note: All twin engines must replace both regulators	OEM Regulator P/N	Plane Power Regulator P/N	Supplement Information
LAVIA			
PA-25, PA-25-235, PA25-260, PA-25, PA-25-235, PA-28-260	InterAv 625-61623	R1224	Guide M
Mooney			
M20, M20A, M20B, M20C, M20D, M20E, M20F, M20G	InterAv 625-61623	R1224	Guide M
NAVION			
Navion D, Navion E, Navion F, Navion G	InterAv 625-61623	R1224	Guide M
Navion A with STC SA1246WE installed	J12M20SP	R1224J	Guide N
Piper			
PA-16, PA-16S, PA-18, PA-18S, PA-18 “105” (Special), PA-18S-105 Special, PA-18A, PA-18 “125” (Army L-21A), PA-18S “125”, PA-18AS “125”, PA-18-135, PA-18A”135”, PA-18S-135, PA-18AS “135”, PA-18-150, PA-18A-150, PA-18S-150, PA-18AS “150”, PA-19, PA-19S, PA-20, PA- 20S, PA-20 “115”, PA-20 “135”, PA-22, PA-22-108, PA-22-135, PA-22S-135, PA-22-150, PA-22S-150, PA-22-60, PA-22S-160, PA-28-140, PA-28-150, PA-28-160, PA-28-180, PA-28-235, PA-28S-160, PA-28S-180, PA-28R-180, PA-28R-200, PA-12, PA-12S, PA-18A (Restricted), PA-8A-135Restricted, PA-18A “150” Restricted PA-30	InterAv 625-61623	R1224	Guide M
PA-28-140 (Cherokee Cruiser), PA-28-150, PA-28-160, A28-180, PA-28R-180, PA-28R-200, PA-28-151, PA-28-161, PA-28-181, PA-28-201T, PA-28-R201, PA-8R-201T, PA-28-236, PA32-300, PA-32-R300, PA-32 RT-300, PA32-301, PA-32-301T	765-055, 68804-03 (-04 & -05)	R1224	Guide A
PA-34-200	584 340, VR710 **	R1224	Guide F
PA-31, PA-31-300, PA-31-325, PA-31-350, PA-23, PA-23, PA-23-160, PA-23-235, PA-23-250, PA-E23-250,PA-34-200, PA34-200T, PA-34-220T, PA-44-180, PA44-180T	550 390, 550 393, 84199-006, 84199-007	R1224	Guide H
PA-28-140 (Cherokee Cruiser), PA-28-150, PA-28-160, PA28-180, PA-28- 235	756-055	R1224	Basic
PA-32-300, PA-32RT-300, PA-32-301, PA-38-301T, PA-34-200	765-055, 68804-03 (-04 & -05)	R1224	Guide A
PA-23, PA-23-160, PA-23-235, PA23-250, PA-E23-250, PA-30	InterAv 625-61623	R1224	Guide M
Revo, Incorporated			
Colonial C1, Colonial C2, Lake LA-4	InterAv 625-61623	R1224	Guide M
SOCATA Group Aerospatiale			
GA-7	Lamar Paralleling Regulators (Twin Engine) B-00288	R1224B	Guide H
**** Requires purchase of adapter plate P/N: 12-1021**			

Table 6-1 - Effectivity (cont.)

Note: All twin engines must replace both regulators	OEM Regulator P/N	Plane Power Regulator P/N	Supplement Information
True Flight Holdings, LLC			
AA-5, AA-5A, AA-5B	C6FF-10316BA, D4FF-10316-BA	R1224	Guide D
AA-1B	Prestolite FVR-4004, LW- 11357, Wico X17990, X16300B	R1224	Guide A
AA-1C	Wico X17990	R1224	Guide A
AG-5B	-	R1224	Guide J
Vulcanair, S.p.A			
P68C, P68C-TC, P68 “Observer” P68TC “Observer”, P68 “Observer 2”	Vulcanair NOR7.375-3	R1224B	Guide H
Weatherly			
620A, 620B	J12M24SP	R1224J	Guide N

Table 6-1 - Effectivity

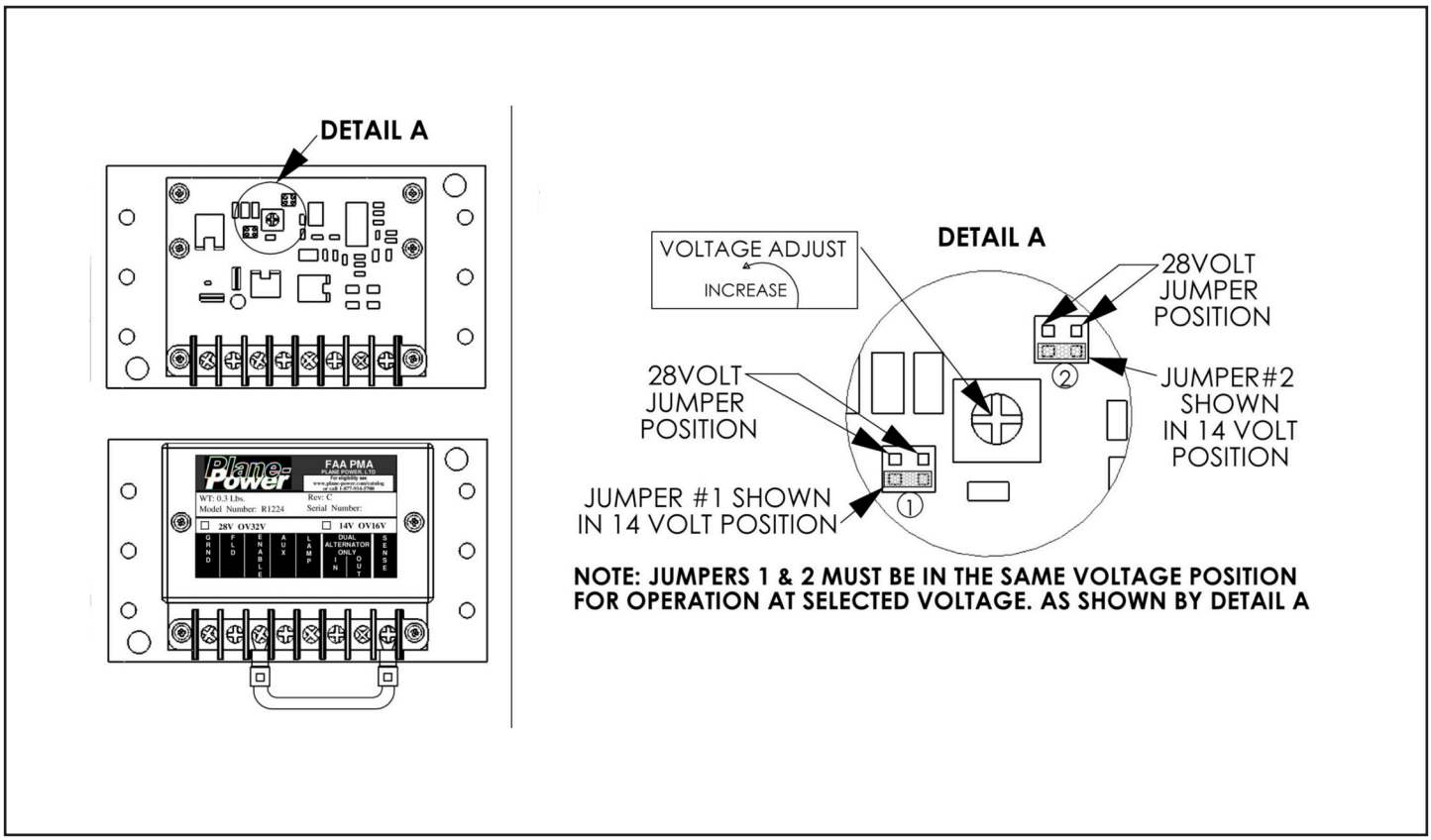

Figure 6-1 - Regulator Voltage Adjustment

WARNING: TO PREVENT DAMAGE TO AIRCRAFT OR UNIT, READ AND UNDERSTAND ALL INSTRUCTIONS PRIOR TO APPLYING POWER TO UNIT.

Current applications and specific regulator conversion/installation guides are available online at www.planepower.aero or www.hartzell.aero

NOTE: Use appropriately sized M7928/5 splices, M7981/1, ring lugs, and MIL-W-22759/16 wire.

6.2 Single Engine

A. Installation

(1) Remove existing regulator and solid-state over-voltage module (if installed).

(2) Install the regulator (R1224/R1224B/R1224J) in same location as regulator being replaced. If mounting holes do not align, add mounting holes as required using acceptable methods, techniques and practices such as those found in AC 43-13-1B and AC 43-13-2B.

(3) Connect GRND terminal to aircraft ground. It is critical that the regulator ground is connected to airframe ground. Without this ground, the regulator and its internal overvoltage protection cannot function.

(4) Connect the FLD terminal to the FIELD (brush) terminal of the alternator.

(5) Connect the ENABLE terminal to the regulator/field power source (the wire from the cockpit ALTERNATOR FIELD switch which is fed from a 7.5 max amp breaker). Note: In order for the over voltage protection circuit to operate the enable terminal must be connected to an operational circuit breaker. (In the event of an over-voltage condition the over-voltage protection circuit will cause the circuit breaker to trip removing all power from the regulating circuit.) Do not install the regulator in any aircraft that has an automatic resetting circuit breaker in the enable line.

(6) If the regulator being replaced has a connection to the AUX terminal on the alternator, connect this wire to the AUX terminal. If not, install a jumper wire between AUX and ENABLE. Note: No connection to AUX terminal is necessary if an alternator out lamp is not installed.

NOTE: For superceded versions of the regulator (Rev B & previous) indicated by silver label, step 7 does not apply and no sense terminal exists. Wiring of a ‘Sense’ terminal on these regulators will result in damage to the regulator.

(7) If an ALTERNATOR out lamp is installed in the aircraft and is to be actuated by the regulator, connect the negative wire of the lamp to the LAMP terminal of the regulator.

(8) Remove the regulator cover and ensure that the internal jumper #1 and jumper #2 are set to the proper voltage for the aircraft system. Refer to Figure 6-1.

(9) With the engine running and the alternator switch turned on, using a small screwdriver, set the regulator’s voltage adjustment so that the bus voltage, as measured at the ENABLE terminal is the desired value. Refer to aircraft maintenance manual or battery manufacturer’s data for proper voltage setting.

(10) Reinstall the regulator cover.

6.3 Multi-Engine

A. Installation

(1) For both regulators, perform steps 1 thru 10 of the Single Engine procedure, section 6.2.

(2) Choose one regulator as the Master. It can be either. Connect the OUT terminal of the Master Regulator to the IN terminal of the other regulator.

6.4 Regulator Installation Guide-A

A. General

These regulators were connected via 3 color-coded wires. Cut the wires near the regulator and crimp appropriate ring lugs onto the wires.

(1) Remove the old regulator.

(2) Ensure that the R1224 jumpers are set properly for the aircraft voltage (Fig. 6-1). Verify aircraft electical system voltage.

(3) Install R1224 Regulator.

(4) Connect the Black wire to R1224 #1 (GND).

(5) Connect the Yellow (Field) wire to R1224 #2 (Field).

(6) Connect the Red (Power) wire to R1224 #3 (Enable).

(7) If applicable for LAMP function, connect a locally manufactured jumper between R1224 #3 (Enable) & #4 (Aux).

(8) For R1224 Rev C and later (Fig. 6-1): Remove jumper between #8 (Sense) and #3 (Enable). Connect the A (Sense) wire to R1224 #8 (Sense).

If the aircraft was equipped with an overvoltage relay, it may be removed, as the R1224 has internal overvoltage protection. Splice together the power input and output wires that went to the overvoltage regulator.

Adjust voltage as necessary with engine running and alternator enabled.

6.5 Regulator Installation Guide-B

A. General

These regulators were connected via 3 color-coded wires. Cut the wires near the regulator and crimp appropriate ring lugs onto the wires.

(1) Remove the old regulator.

(2) Ensure that the R1224 jumpers are set properly for the aircraft voltage (Fig. 6-1). Verify aircraft electical system voltage.

(3) Install R1224 Regulator.

(4) Connect the Black wire to R1224 #1 (GND).

(5) Connect the Blue (Field) wire to R1224 #2 (Field).

(6) Connect the Red (Power) wire to R1224 #3 (Enable).

(7) If applicable for LAMP function, connect a locally manufactured jumper between R1224 #3 (Enable) & #4 (Aux).

(8) For R1224 Rev C and later: Remove jumper between #8 (Sense) and #3 (Enable). Connect the A (Sense) wire to R1224 #8 (Sense).

If the aircraft was equipped with an overvoltage relay, it may be removed, as the R1224 has internal overvoltage protection. Splice together the power input and output wires that went to the overvoltage regulator.

(9) Adjust voltage as necessary with engine running and alternator enabled.

6.6 Regulator Installation Guide-C

A. General

Use R1224 and 12-1021 Adaptor Plate.

These regulators were connected via 5 color-coded wires. Cut the wires near the regulator and crimp the provided ring lugs onto the wires.

(1) Remove old regulator.

(2) Ensure that the R1224 jumpers are set properly for the aircraft voltage (Fig. 6-1). Verify aircraft electical system voltage.

(3) Install R1224 using 12-1021 Adaptor Plate.

(4) Connect the Black wire to R1224 #1 (GND).

(5) Connect the Blue (Field) wire to R1224 #2 (FIELD).

(6) Connect the Red (Power) wire to R1224 #3 (ENABLE).

(7) Connect the Yellow (Lamp) wire to R1224 #5 (LAMP).

(8) If applicable for LAMP function, connect a locally manufactured jumper between R1224 #3 (Enable) & #4 (Aux).

(9) For R1224 Rev B and earlier: Insulate the end of the Orange (Sense) wire and stow it safely.

For R1224 Rev C and later: Remove jumper between #8 (SENSE) and #3 (ENABLE). Connect the Orange (Sense) wire to R1224 #8 (SENSE).

(10) Insulate the end of the White (OV Lamp) wire and stow it safely. (The R1224 indicates Over Voltage and Low Voltage on a common lamp connected to R1224 #5.)

(11) Adjust voltage as necessary with engine running and alternator enabled.

6.7 Regulator Installation Guide-D

A. General

The Ford regulators were connected via a flat plastic plug. Label the wires and cut the plug off. Marking the wires is important for reconnection. Crimp the appropriate ring lugs onto the wires.

(1) Remove old regulator.

(2) Ensure that the R1224 jumpers are set properly for the aircraft voltage (Fig. 6-1). Grumman AA-5, AA-5A and AA-5B are 14V. Single-engine Cessna aircraft were 14V or 28V – Verify aircraft electical system voltage.

(3) Install R1224. The large holes in the base match the mounting holes used to mount the Ford regulator. Some mounting locations may have protrusions under the regulator, as the Ford units had a hollow area underneath. If this is the case, mount the R1224 on standoffs or use the 12-1021 Adaptor Plate. The 12-1021 can be purchased from Plane-Power.

(4) Connect the G (Ground) wire to R1224 #1 (GRND).

(5) Connect the Blue (Field) wire to R1224 #2 (Field).

(6) Connect the S (Supply) wire to R1224 #3 (ENABLE).

(7) If applicable for LAMP function, connect a locally manufactured jumper between R1224 #3 (Enable) & #4 (Aux).

(8) For R1224 Rev B and earlier: Insulate the end of the A (Sense) wire and stow it safely.

For R1224 Rev C and later: Remove jumper between #8 (SENSE) and #3 (ENABLE). Connect the Orange (Sense) wire to R1224 #8 (SENSE)

(9) Adjust voltage as necessary with engine running and alternator enabled.

6.8 Regulator Installation Guide-E

A. General

There is a round connector on these Beechcraft regulators. A round plug on a cable is plugged into the connector on the regulator.

Use R1224B with the Plane-Power 12-1016 Installation Aid (Fig. 6-2. Purchase the 12-1016 connector from Plane-Power).

(1) Remove old regulator.

(2) Ensure that the R1224B jumpers are set properly for the aircraft voltage (Fig. 6-1). Verify aircraft electical system voltage.

(3) Jumper R1224B #3 (Enable) to #4 (Aux).

(4) For R1224B Rev. C and later: Ensure that there is a jumper between #8 (SENSE) and #3 (ENABLE).

(5) Unplug the cable from the regulator. Remove old regulator.

(6) Install R1224 in the location from which the Beechcraft regulator was removed.

(7) Connect the cable to the round connector on the 12-1016 Installation Aid (Fig. 6-2).

(8) Adjust voltage as necessary with engine running and alternator enabled.

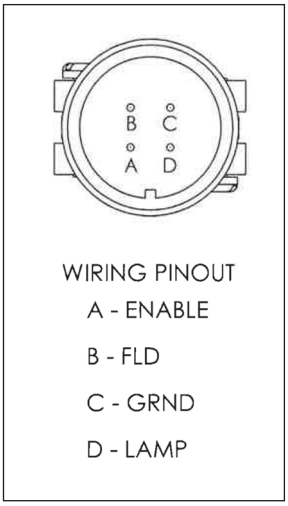

Figure 6-2 - Installation Aid

6.9 Regulator Installation Guide-F

A. General

Use two R1224 regulators set for 14V. Use the 12-1021 adaptor plate for mounting (which can be purchased from Plane-Power). **Both regulators must be replaced.**

(1) Ensure that the R1224 jumpers are set properly for the aircraft voltage (Fig. 6-1). Verify aircraft electical system voltage.

(2) Cut the wires close to the regulator case of the Electrodelta or Wico regulators and crimp one appropiate ring lug with the R1224 on each Red and Blue (or Yellow) wire. Remove remaining wires or insulate the ends.

(3) Remove the old regulators and the associated Over Voltage Relays (The R1224 has internal over voltage control so the original units are not needed).Connect the Blue (Field) wire to R1224 #2 (Field).

(4) Install R1224 regulators with 12-1021 adaptor plates in the location from which the original regulators were removed. Ground is obtained from the mounting so be sure that the regulators are mounted securely. It is advisable to connect a wire from #1 (Ground) of each R1224 to aircraft ground.

(5) Connect each Blue (or Yellow) wire to #2 (Field) of the corresponding R1224.

(6) Connect each Red wire to #3 (Enable) of the corresponding R1224.

(7) Ensure that there is a jumper between #3 (Enable) and #4 (Aux) of each R1224B. For R1224B Rev C and later: Ensure there is a jumper between #3 (Enable) and #8 (Sense) of each R1224B.

(8) Connect a wire from the right alternator's R1224 #6 (In) to the left alternator's R1224 #7 (Out). This designates the right R1224 as Slave and the left R1224 as Master for load-sharing operation.

Lamp Modification:

The PA-34-200 is equipped with a press-to-test over voltage Lamp for each alternator/regulator.

6.10 Regulator Installation Guide-G

A. General

These regulators were connected via screw terminals. Label the wires and remove from regulator terminals. Labeling the wires is important for reconnection. Cut the ring lugs off of the wires crimp the provided (smaller) ring lugs onto the wires.

(1) Remove old regulator.

(2) Ensure that the R1224 jumpers are set for 14V (Fig. 6-1).

(3) Install R1224 by drilling new mount holes in aircraft or into 12-1021 Adaptor Plate to match the original regulator mount holes in the aircraft.

(4) Connect the wire marked I to R1224 #3 (ENABLE).

(5) Connect the wire marked F to R1224 #2 (Field).

(6) Jumper R1224 #3 (Enable) to #4 (Aux).

(7) Ensure that there is a jumper between R1224 #8 (Sense) and #3 (Enable).

(8) It is advisable to connect a wire between the aircraft ground (one of the regulator mounting bolts is a good point) and R1224 #1 (GRND).

(9) Adjust voltage as necessary with engine running and alternator enabled.

6.11 Regulator Installation Guide-H

A. General

Use 2 R1224B as the mounting holes match the Lamar regulators. Both regulators must be replaced.

(1) Ensure that the R1224B internal jumpers are set properly for the aircraft voltage (Fig 6-1).

(2) Mark the wires on the Lamar regulators and disconnect them. Wire Identification is important for reconnection.

(3) Remove the old regulators. If the aircraft as equipped with Lamar Over voltage Relays you can remove them if you desire. (The R1224B has internal over voltage control so the Lamar units are not needed).

(4) Install R1224B regulators in the location from which the Lamar regulators were removed.

(5) If the ring lugs on the wires are too large, cut them off and crimp on the provided lugs.

(6) Connect each G wire to #1 (Ground) of the corresponding R1224B.

(7) Connect each F wire to #2 (Field) of the corresponding R1224B.

(8) Connect each S or B wire to #3 (Enable) of the corresponding R1224B.

(9) Ensure that there is a jumper between #3 (Enable) and #4 (Aux) of each R1224B. For R1224B Rev C and later: Ensure there is a jumper between #3 (Enable) and #8 (Sense) of each R1224B.

(10) Connect the paralleling wire of the right alternator regulator to #6 (IN), there by designating this regulator as the SLAVE for load-sharing operation.

(11) Connect the paralleling wire of the left alternator regulator to #7 (OUT), thereby designating this regulator as the MASTER for load-sharing operation.

Voltage Adjustment:

Remove the regulator covers. With the engines running, enable only the left (MASTER) alternator and regulator. Make sure that the right regulator & alternator are disabled. Adjust the MASTER R1224B for the desired voltage.

Disable the left (MASTER) alternator and regulator and enable the right (SLAVE) R1224B. Make sure that the left regulator & alternator are isabled. Adjust the SLAVE R1224B for the desired voltage.

Replace the regulator covers.

6.12 Regulator Installation Guide-I

A. Prepare the replacement regulator

(1) Use the R1224 regulator and a 12-1021 mounting plate (which can be purchased from Plane-Power). Ensure regulator jumpers are set to match aircraft battery voltage (12V or 24V).

(2) Ensure that the factory installed jumper between SENSE and ENABLE is in place.

B. Prepare the installation

(1) Cut the wires at the regulator body and new ring lugs provided with the R1224 regulator.

(2) Unplug the wire connector from the aircraft plug.

(3) Connect the ring lugs to the R1224 regulator as shown below:

- Red to ENABLE
- Blue to Field
- White to AUX
- Yellow to LAMP

(4) Mount the R1224 regulator on the 12-1021 plate using appropriate AN or MS hardware.

C. Replace the regulator

(1) Remove the original regulator from the aircraft.

(2) Install the R1224 regulator on the 10-1021 plate in the same location using existing hardware.

(3) Plug the harness from the R1224 the aircraft plug.

(4) Remove the alternator lamp lead from the ALTERNATOR switch on the aircraft and connect it to the aircraft positive BUS via a 1A in-line fuse & holder.

The installation is complete after testing.

6.13 Regulator Installation Guide-J

A. General

The AG-5B regulators were connected via a 4-pin plastic plug and a ground wire with a large ring-lug. Cut the wires near the regulator and crimp the provided ring lugs into the wires. Remove old regulator.

(1) Ensure that the R1224 jumpers are set for 28V. See Plane-Power R1224 Installation Drawing 12-1001.

(2) Install R1224 using the 12-1021adaptor plate. Put the large ring lug on the black wire under one of the mounting bolts.

(3) Connect the Black (Ground) wire to R1224 #1 (GND).

(4) Connect the Blue (Field) wire to R1224 #2 (Field).

(5) Connect the Red (Enable) wire to R1224 #3 (Enable).

(6) Connect the Yellow (Lamp) wire to R1224 #5 (Lamp).

(7) Jumper R1224 #3 (Enable) to R1224 #4 (Aux).

(8) For R1224 Rev C and later: Ensure that there is a jumper between R1224 #3 (Enable) and #6 (Sense).

B. Lamp Modification

(1) Remove wire EL36A20 from the output side of the Alternator Control circuit breaker and connect it to the input side of the circuit breaker through a 1A fuse.

(2) Adjust voltage as necessary with engine running and alternator enabled.

The installation is complete after testing.

6.14 Regulator Installation Guide-K

A. Prepare the replacement regulators

(1) Use two R1224B regulators. Ensure regulator jumpers are set to match aircraft battery voltage (12V or 24V).

(2) Ensure that the factory jumper between SENSE and ENABLE is in place on both R1224B regulators.

(3) Add a jumper between SENSE and AUX on both R1224B regulators.

B. Prepare the installation

(1) Tag the wires to both LAMAR regulators: BUS, FIELD, GND, PAR.

(2) Cut the terminals off the end of these wires and install new ring lugs provided with the R1224B regulators.

C. Replace the regulators

(1) Remove the Lamar regulators from the aircraft.

(2) Install the R1224B regulators in the same location using existing hardware.Plug the harness from the R1224 the aircraft plug.

(3) Connect the wires removed from the LAMAR regulators to the corresponding replacement R1224B:

- GND to GRND
- BUS to ENABLE
- FIELD to FLD

(4) Choose one R1224B as “MASTER” and connect the PAR wire that was removed from one LAMAR regulator to the OUT terminal.

(5) Connect the other PAR terminal to IN on the remaining R1224B regulator.

The installation is complete after testing.

6.15 Regulator Installation Guide-L

A. Prepare the replacement regulator

(1) Use the R1224 regulators. Ensure regulator jumpers are set to match aircraft battery voltage (12V or 24V).

(2) Remove the factory jumper between SENSE and ENABLE.

(3) Remove the old regulators. If the aircraft as equipped with Lamar Over voltage Relays you can remove them if you desire. (The R1224B has internal over voltage control so the Lamar units are not needed).

(4) Add a jumper between ENABLE and AUX.

B. Prepare the installation:

(1) Cut the terminals off the end of these wires and install new ring lugs provided with the R1224 regulator.

C. Replace the regulator

(1) Remove the FORD-type regulator from the aircraft.

(2) Install the R1224 regulators in the same location using existing hardware.

(3) Connect the wires removed from the FORD type regulator to the corresponding replacement R1224:

- **A** to SENSE
- **S** to ENABLE
- **F** to FLD

The installation is complete after testing.

6.16 Regulator Installation Guide-M

A. General

INTERAV: These are installed on aircraft, which have been converted to an alternator from a generator by STC SA334SW.

Use R1224.

Labeling the wires is important for reconnection:

(1) Remove Interav regulator and over voltage relay. The R1224 has internal over voltage protection, so the Interav over voltage relay is no longer needed.

(2) Ensure that the R1224 jumpers are set for 14V (Fig. 6-1). Add a jumper between SENSE and AUX on both R1224B regulators.

(3) Install R1224 in the location from which the InterAv regulator was removed.

(4) Remove the wires on both terminals of the ALTERNATOR switch (on the aircraft panel). Connect one terminal of the switch to the 5A breaker where the wire to “Red-Pos” of the Interav OV Relay was connected. Connect the other terminal of the switch to R1224 #3 (Enable).

(5) Connect the GND (Ground) wire to R1224 #1 (GRND).

(6) Connect the Field terminal of the alternator to R1224 #2 (FLD).

(7) Jumper R1224 #3 (Enable) to #4 (AUX). For R1224 Rev C and later: Ensure that there is a jumper between R1224 #8 (SENSE) and #3 (ENABLE).

(8) Remove all disconnected and unused wires.

(9) If a warning lamp is incorporated, connect one terminal of the lamp to R1224 #5 (Lamp) and the other terminal of the lamp to the aircraft bus through a 1A fuse or breaker. Be sure the lamp is a 100-milliamp bulb or it will not work properly.

(10) Adjust voltage as necessary with engine running and alternator enabled.

The installation is complete after testing.

6.17 Regulator Installation Guide-N

A. General

Replacement of Jasco J12M20SP (12V) or J12M24SP (24V) regulators.

B. Prepare the replacement regulator

(1) Use R1224J, ensure regulator jumpers are set to match aircraft battery voltage (Fig. 6-1).

(2) Add jumper between ENABLE and AUX terminals (Regulator side only).

C. Replace the regulator

(1) Remove the old regulator and if present separate voltage protector.

(2) Remove the load resistor connected between the regulator and the aircraft bus or alternator output used with 24V Jasco regulators.

(3) Install R1224J in same location using existing hardware.

(4) Connect ENABLE to the regulator/field power source (the wire from the cockpit ALTERNATOR FIELD switch which is fed from a 7.5 amp breaker).

(5) Connect regulator FLD to alternator FIELD terminal.

(6) Connect regulator GRND to alternator GRND terminal.

(7) Remove all disconnected and unused wires.

(8) Adjust voltage as necessary with engine running and alternator enabled.

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