

INSTALLATION MANUAL

FOR

The

VOLT & VAC ALERT

SYSTEM  
P/N 2044-1

SPECIFICATION IP-3

REV. 1

05-10-03

Approved

A handwritten signature in dark ink, appearing to be 'D.P.', is written over a horizontal line.

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**TABLE OF REVISIONS**

<b>Rev No.</b>	<b>Date</b>	<b>Description of Revision and pages changed</b>	<b>Approval</b>
0		Initial release	
1	05-10-03	Revised Pg. 4 for use with Approved Model List. Added information for pressure system installations. Added Pg 9	

## I. INTRODUCTION

This manual provides information for installing the P/N 2044-1 Volt & Vac Alert Warning System on a general aviation aircraft. All installation work is to be performed in accordance with this manual and applicable sections of AC 43.13 - 1B.

## II. BASIC OPERATIONS

The Volt & Vac Alert System is an electronic device which provides the pilot of the aircraft with an instant warning for both low electrical voltage, and low instrument vacuum or pressure. If the aircraft electrical voltage or the instrument vacuum or pressure fall below a set value, the pilot will hear an instantly recognizable voice warning directly in his head set, and will see a red light on the instrument panel as an indication of the problem. Separate voice messages are used to distinguish the type of failure. The system consists of two subassemblies, an electronic module, which is mounted inside the aircraft, and a red indicator light, which mounts on the instrument panel, close to the gyro instruments, and a switch to allow turning off the system. The system functions as follows: Any time the aircraft voltage falls below a set value, the pilot will hear the voice message "CHECK VOLTAGE, CHECK VOLTAGE" once in his headset. The panel-mounted red light will then illuminate, providing a visual indication of the problem. The light will continue to stay on until the voltage is again above the set value.

**NOTE:** A DELAY HAS BEEN ADDED TO THE VOLTAGE WARNING REQUIRING THAT THE AIRCRAFT VOLTAGE BE BELOW 12V OR 24V CONTINUOUSLY FOR 1 MINUTE BEFORE THE WARNING WILL SOUND.

If the instrument vacuum or pressure falls below a set value, the pilot will hear the voice message "CHECK GYROS, CHECK GYROS" once in his headset. The panel-mounted red light will illuminate until the instrument vacuum or pressure is again above the set point.

**NOTE:** THE VOLT & VAC ALERT IS AN ADVISORY SYSTEM ONLY. IT SHOULD NOT BE UTILIZED AS THE PRIMARY MEANS OF DETERMINING LOW VOLTAGE, LOW VACUUM, OR LOW PRESSURE. THE PILOT SHOULD CONTINUE TO UTILIZE THE NORMAL OPERATING PROCEDURES, CHECKLISTS, LIGHTS, INDICATORS, ETC. AS DEFINED IN THE AIRCRAFT FLIGHT MANUAL AS THE PRIMARY INDICATION OF PROPER OPERATION.

### **III APPLICABILITY**

Refer to the Approved Model List (AML), Specification 2044AML Rev 0, or later FAA approved revision for a listing of the aircraft models approved for installation of the P/N 2044-1 Volt & Vac Alert System:



## IV. INSTALLATION INFORMATION

### A. Mechanical Installation

1. Locate a place in the aircraft to mount the P/N 2044-2 electronic module. The unit can be mounted to the aircraft structure, side panels etc. Pick a location where the pressure signal tube or tubes can be conveniently connected to the instrument system.
2. Drill 2 mounting holes as shown on Fig A, and mount the unit using the hardware provided.
3. Determine a location on the instrument panel for the warning light. The light should be located close to the gyro instruments, within the pilot's normal scan of these instruments. Verify that there is sufficient space to place the label for the light. An on/off switch should be mounted in the panel in a convenient location by the gyro instruments.
4. Drill a 5/16 dia. hole through the panel, install the label, and the light.
5. Mount an on/off switch in a convenient location that is accessible to the pilot in flight. Label the switch "Volt & Vac on/off.". The switch should be an aircraft quality SPDT toggle or rocker switch rated 1 amp at 28v minimum, such as AN3021-2 or equal.

### B. Electrical Installation

1. Refer to Fig 1, 2, or 3 for information on the electrical installation. The Volt & Vac alert system is compatible with both 12v DC and 24v DC electrical systems. Refer to Note1 for information on the correct wire color for the aircraft voltage. Hook either the red wire (for 12-volt systems) or the green wire (for 24-volt systems) to the aircraft buss through a 1 amp fuse or circuit breaker and the on/off switch.
2. Attach the BLACK wire to a good aircraft ground.
3. Attach the BLUE and ORANGE wires to the same color wires on the light.
4. The Volt & Vac incorporates a standard 600 ohm audio output. The audio output must be hooked into the aircraft audio system in a way that the pilot cannot accidentally turn it off. If the aircraft has an audio panel that incorporates an un-switched audio input, the Volt & Vac audio output should be hooked to this point. This will provide a voice warning directly into the pilot's headset and through the cabin speaker. Hook the WHITE wire to this un-switched audio input
5. Cut any remaining wires and insulate the ends. Secure all wiring in place.

### C. Hookup to Aircraft Instrument System

Aircraft gyro systems can be configured in 3 different ways. The most common configuration uses a vacuum source referenced to the cabin air pressure to power the instruments. Some pressurized aircraft reference the vacuum source to the air pressure outside the aircraft pressure boundary. Other aircraft use a pressure system referenced to the cabin air pressure to power the instruments. The installer must determine which of these configurations exist in the aircraft, and then refer to the proper Fig (1, 2, or 3) and installation section.

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#### 1. Aircraft with vacuum systems referenced to cabin air pressure

- a) The P/N 2044-1 electronic module has 2 plastic tubes exiting the case. One tube marked with



a RED band close to the case is the HIGH pressure connection. The other unmarked tube is the LOW pressure connection.

- b) Attach the LOW pressure tube to the aircraft vacuum system. Install the P/N 2044-7 adapter into the aircraft vacuum system as shown on Fig 1. It can be installed into a section of tubing attached to an unused port on an instrument, or it can “T” into an existing vacuum line. The adapter can be used with 1/4 ID, 3/8 ID, or 1/2 ID tubing. Install the adapter into the line, and secure with a clamp. Cut the LOW pressure tube to length, and install it on the other end of the adapter. Secure with a clamp or safety wire. Secure the LOW pressure tube in place. Do not bend the tube in a radius smaller than 1 inch. Use care not to crush the tube when securing. Refer to AC43.13-1B section 9 for details on running and securing tubing.
- c) Cut off the HIGH pressure tube close to the electronic module.

## **2. Aircraft with vacuum systems referenced to air pressure outside the aircraft pressure boundary (pressurized aircraft).**

- a) The P/N 2044-1 electronic module has 2 plastic tubes exiting the case. One tube marked with a RED band close to the case is the HIGH pressure connection. The other unmarked tube is the LOW pressure connection.
- b) Attach the HIGH pressure tube to the air inlet side of the gyro instruments. Attach the LOW pressure tube to the vacuum side of the gyro instruments. Install a P/N 2044-7 adapter into the aircraft vacuum and air inlet systems as shown on Fig 2. The adapters can be attached into unused ports on the instruments, or they can “T” into existing vacuum lines. The adapters can be used with 1/4 ID, 3/8 ID, or 1/2 ID tubing. Install the adapters into the lines and secure with clamps. Cut the plastic tubes to length and install them on the other end of the adapters. Secure the tubing to the adapters with a clamp or safety wire. Secure the plastic tubes in place. Do not bend the tubes in a radius smaller than 1 inch. Use care not to crush the tubes when securing. Refer to AC 43.13-1B section 9 for details on running and securing tubing.

## **2. Aircraft using pressure systems to power the gyro instruments**

- a) The P/N 2044-1 electronic module has 2 plastic tubes exiting the case. One tube marked with a RED band close to the case is the HIGH pressure connection. The other unmarked tube is the LOW pressure connection.
- b) Attach the HIGH pressure tube to the pressurized side of the gyro instruments. Install a P/N 2044-7 adapter into the aircraft pressure system as shown on Fig 3. The adapter can be attached to an unused port on the instruments, or it can “T” into the existing pressure tubing. The adapter can be used with 1/4 ID, 3/8 ID, or 1/2 ID tubing. Secure with a clamp. Cut the HIGH pressure tube to length and install on the other end of the adapter. Secure with a clamp or safety wire. Do not bend the tube in a radius smaller than 1 inch. Use care not to crush the tube when securing. Refer to AC 43.13-1B section 9 for details on running and securing tubing.
- c) Cut off the LOW pressure tube close to the case.

## **V. SYSTEM CHECKOUT AND OPERATION**

1. Turn on the master switch and the on/off switch. Since the system voltage and the



instrument vacuum or pressure are both below the set points, both warning messages will be heard in the pilot's headset. The voice messages will play only once. The RED warning light on the panel will then illuminate continuously. This acts as a test of the system. Verify that the voice volume is adequate. If either warning message fails to sound, this constitutes a failure of the test and it will be necessary to determine the cause of the problem.

Note: There will be a 1 minute delay after the master switch is activated before the voice sounds

2. Verify that the RED warning light illuminates after the voice messages, and that the brightness is adequate. If the light does not illuminate, or it is not bright enough to be seen under normal conditions, that constitutes failure of the test. It will be necessary to replace the unit.
3. Start the engine. Verify that the aircraft generator or alternator is charging (system voltage should be greater than 12v or 24v). Verify that the instrument vacuum or pressure is greater than 1 inch HG or 0.5 psi. The RED warning light should turn off. If the light continues to illuminate when the voltage and vacuum or pressure are above the set values, that constitutes a failure of the test. Verify that the signal lines are not being pinched closed. If this does not correct the problem, it will be necessary to replace the unit.
4. Decrease the engine rpm to idle. The instrument vacuum or pressure will decrease. As the vacuum or pressure falls, the voice message "CHECK GYROS, CHECK GYROS" should be heard in the pilot's headset. The RED warning light should illuminate. Increase the engine rpm again until the vacuum or pressure is above 1 in HG or 0.5 psi. The warning light should turn off. If the system fails to follow this sequence, that constitutes failure of the test, and it will be necessary to replace the unit.
5. Decrease engine rpms to idle. It may be necessary to turn on a number of electrical devices to increase the electrical load to cause the voltage to drop sufficiently. As the system voltage falls below the set point, the voice message "CHECK VOLTAGE, CHECK VOLTAGE" will be heard in the pilot's headset, and the RED warning light will illuminate. If the system fails to follow this sequence, that constitutes failure of the test and it will be necessary to replace the unit.
6. Individually turn on each electrical device in the aircraft. As each device is powered up, verify that its operation is not effected by the operation of the Volt & Vac alert, and that the Volt & Vac is not effected by the operation on the device turned on. Use the attached checklist as a guide. If any device fails to operate properly, turn off the Volt & Vac alert to determine if it is the cause of the malfunction. Any interaction between the Volt & Vac alert and any other electrical equipment in the aircraft constitutes failure of the test. The interference must be resolved.

## **VI. DOCUMENTATION**

1. The installer is responsible for making all logbook entries, revising weight and balance, and other documentation as required. Place the aircraft flight manual supplement (AFMS) in the aircraft and provide the Instructions for Continued Airworthiness to the owner for inclusion with his maintenance records. The total weight of the Volt & Vac system components is 0.4 Lb., (0.34 lb. for the electronic module and .06 lb. for the light assembly.)

The following is a checklist to be used when checking for interference between the Volt & Vac Alert system and other electrical equipment installed in the aircraft. This is a suggested listing only. Testing should include all electrical equipment actually installed in the aircraft.

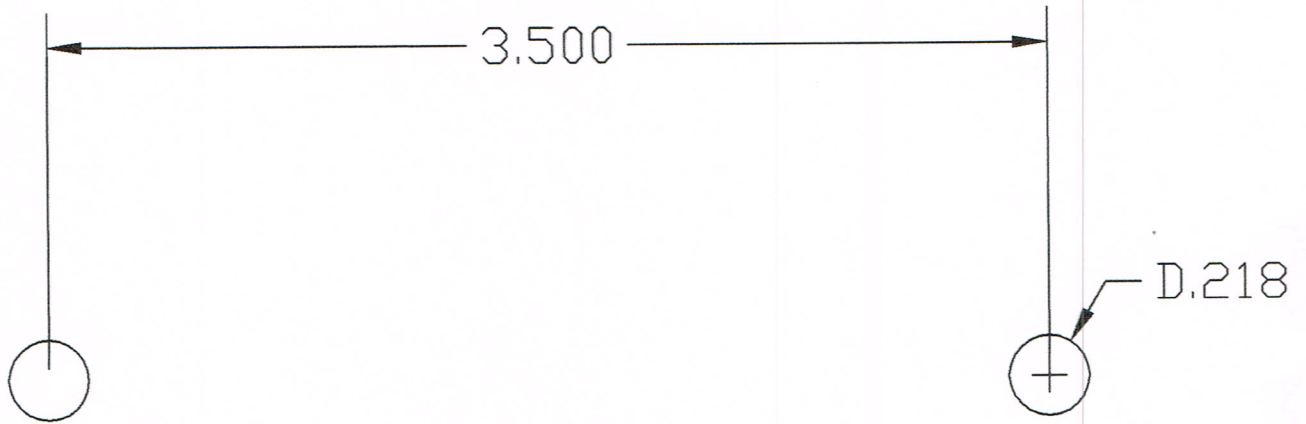
ITEM	GROUND TEST
1. Master Switch	
2. Avionics Master Switch	
3. Electronic Aircraft Instrumentation	
4. Audio System	
5. Boost Pump	
6. Flaps	
7. Landing Gear Actuators	
8. Trim Motors	
9. Accessory Motors	
10. Communication Radios	
11. GPS	
12. VOR receivers	
13. ADF receiver	
14. DME	
15. Transponder	
16. Marker beacon receiver	
17. TCAS system	
18. Strobe lights	
19. Rotating Beacon	
20. Electric clocks/timers	
21. Pitot heat.	
22. Navigation lights	
23. Landing lights	



The following parts make up the P/N 2044-1 Volt and Vac Alert System. Check all parts before starting the installation.

Item	Qty	Description	Part Number
1	1	Electronic Module	2044-2-1
2	1 or 2	Vacuum Adapter	2044-4-1
3	1	Light Assembly	2044-9-1
4	1	Light Label	2044-8-1
5	2	Mounting Screws 8x32x1/2 RH P SS	
6	2	Hex Nuts 8x32 self locking SS	
7	2	Flat Washers #8 SS	
8	2	Insulated Ring Connectors #6, 18-22	
9	1	Heat Shrink Tubing 1/8 dia x 6 inch long	
10	15	Nylon Cable Ties 4 inch	
11	1	Aircraft Flight Manual Supplement	AFMS-2044 R1 *
12	1	Instructions for Continued Airworthiness	ICA-2044 Rev 1 *

\*or later FAA approved revision of these documents.



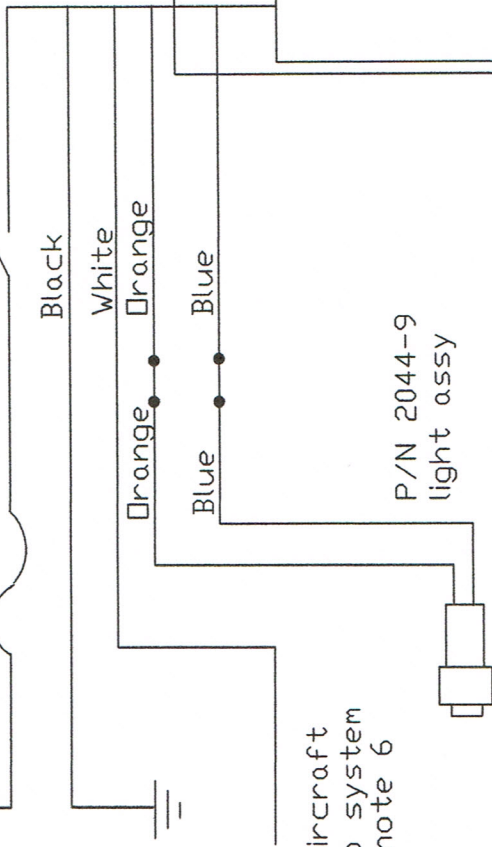
Mounting Holes

FIG A

REVISIONS		
ZONE	REV	DESCRIPTION
	1	Updated for AML
		DATE
		05-10-03
		APPROVED

12v or 24v power buss  
 1 amp fuse or circuit breaker  
 See notes 1 & 5

on-off switch  
 see note 7



To aircraft audio system  
 See note 6

Notes:  
 1. For 12 v systems, hook the RED wire to power. For 24v systems, hook the GREEN wire to power.

2. Install adapter into vacuum tubing, secure with clamp.
3. Cut and secure all unused wires.
4. Mount Electronic Module using #8 screws and self locking nuts.

5. Locate fuse or circuit breaker in instrument panel. Label as V & V.  
 6. If attached to un-switched audio panel input, warning will be heard in all headsets and cabin speaker. If hooked to pilots headset jack, pilot must wear headset to hear warning.

7. SPDT switch rated 1 amp min. accessible to the pilot in flight. Label V & V on/off

P/N 2044-2  
 Electronic Module  
 See note 4

TOLERANCES

X.XXX = ±.005  
 X.XX = ±.010

**AIRCRAFT COMPONENTS INC.**

2044 Installation Drawing  
 vacuum systems / internal ref.

APPROVED	SIZE	FSCM NO.	DWG NO.	REV
	A		FIG 1	1
DATE	SCALE	DRAWN BY	SHEET	
10-01-01	None	J.D.G.	6 of 8	

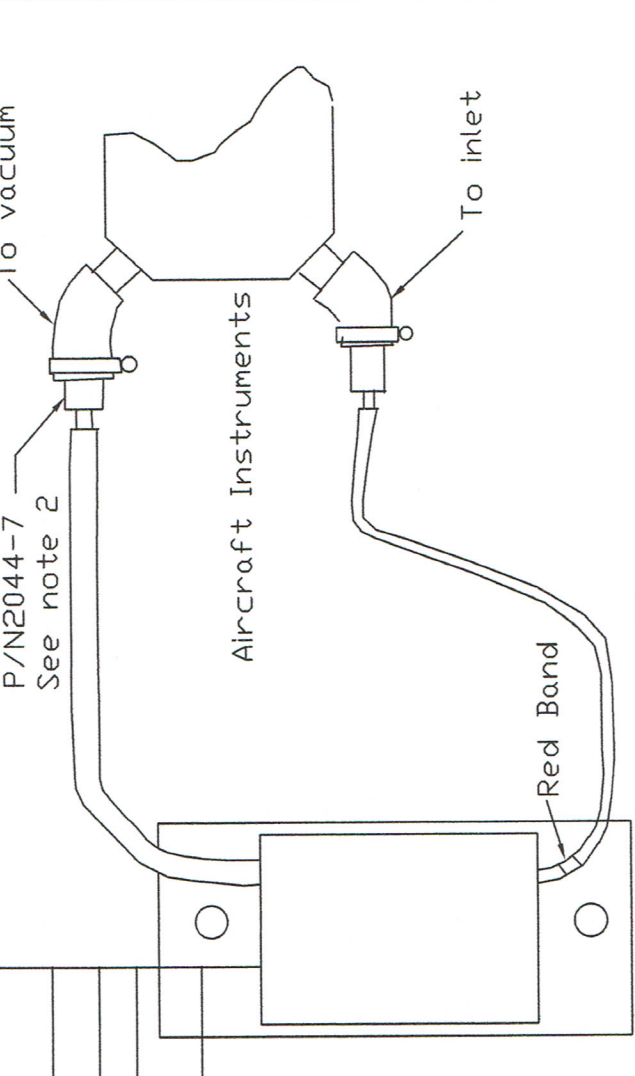


REVISIONS			
ZONE	REV	DESCRIPTION	DATE

12v or 24v power buss

1 amp fuse or circuit breaker  
See notes 1 & 5

on/off switch  
see note 7



P/N 2044-2  
Electronic Module  
See note 4

To aircraft audio system  
See note 6

P/N 2044-9  
light assy

- Notes:
1. For 12 v systems, hook the RED wire to power. For 24v systems, hook the GREEN wire to power.
  2. Install adapter into tubing, secure with clamp,
  3. Cut and secure all unused wires.
  4. Mount Electronic Module using #8 screws and self locking nuts.
  5. Locate fuse or circuit breaker in instrument panel. Label as V & V.
  6. If attached to un-switched audio panel input, warning will be heard in all headsets and cabin speaker. If hooked to pilots headset jack, pilot must wear headset to hear warning.
  7. SPDT switch rated 1 amp min., accessible to the pilot in flight. Label V & V on/off

TOLERANCES

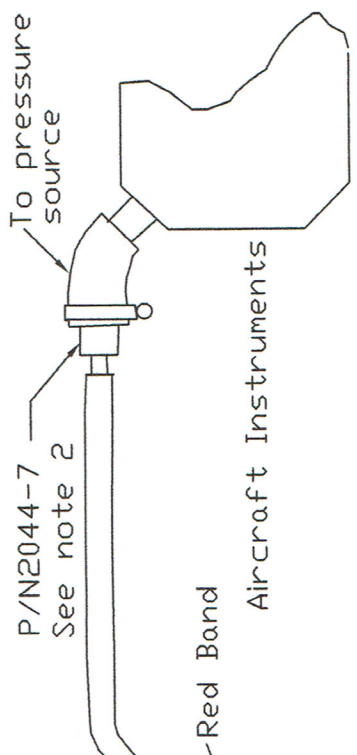
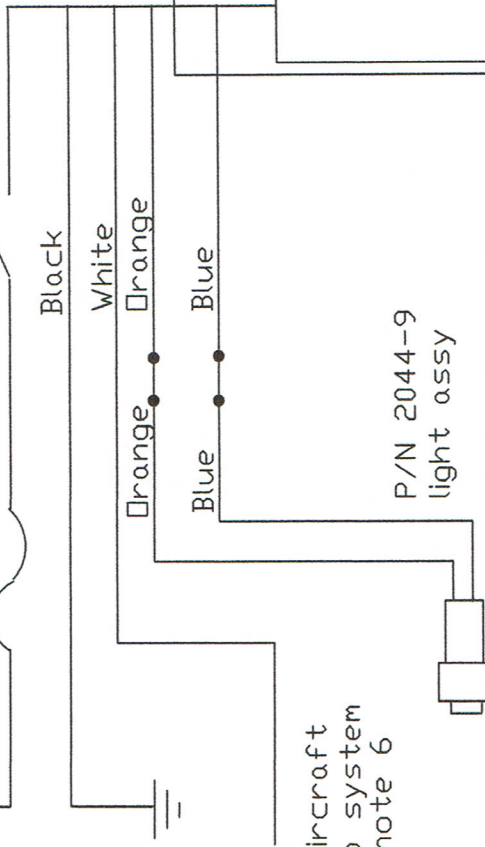
X.XXX = ±.005  
X.XX = ±.010

<b>AIRCRAFT COMPONENTS INC.</b>			
2044 Installation Drawing			
vacuum systems / external ref.			
SIZE	FSCM NO.	DWG NO.	REV
A		FIG 2	0
SCALE	None	DRAWN BY	J.D.G.
DATE	11-18-02	SHEET	7 of 8



12v or 24v power buss

1 amp fuse or circuit breaker on/off switch See notes 1 & 5 see note 7



REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVED

P/N2044-7 See note 2

Red Band Aircraft Instruments

P/N 2044-2 Electronic Module See note 4

To aircraft audio system See note 6

P/N 2044-9 light assy

Notes:

- For 12 v systems, hook the RED wire to power. For 24v systems, hook the GREEN wire to power.
- Install adapter into tubing, secure with clamp,
- Cut and secure all unused wires.
- Mount Electronic Module using #8 screws and self locking nuts.
- Locate fuse or circuit breaker in instrument panel. Label as V & V.
- If attached to un-switched audio panel input, warning will be heard in all headsets and cabin speaker. If hooked to pilots headset jack, pilot must wear headset to hear warning.
- SPDT switch rated 1 amp min., accessible to the pilot in flight. Label V & V on/off

TOLERANCES

X.XXX = ±.005  
X.XX = ±.010

AIRCRAFT COMPONENTS INC.

2044 Installation Drawing  
pressure systems/internal ref.

APPROVED	SIZE A	FSCM NO.	DWG NO. FIG 3	REV 0
DATE 11-18-02	SCALE None	DRAWN BY J.D.G.		SHEET 8 of 8