

# PS ENGINEERING<sup>®</sup> INCORPORATED

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## PSA210

### Dual Speaker Amplifier

### Installation and Operation Manual

### FAA-TSO C139A

Document P/N 200-210-0000

Revision 3, Oct 2024

*In certified aircraft, warranty is not valid unless this product is installed by an Authorized PS Engineering dealer.*

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Record of revisions:

<b>Revision</b>	<b>Date</b>	<b>Reason</b>
New	OCT 2018	New Release
1	May 2019	After FAA TSOA
2	July 2019	Revised Installation Kit
3	Oct 2024	Added section 26, DO-160 “Flammability”

## **Section I - GENERAL INFORMATION**

### **1.1 INTRODUCTION**

The PSA210 is an accessory device that contains two identical 10 watt speaker amplifiers, suitable for deriving cockpit or public address speakers from a low-level audio source.

Before installing and/or using this product, please read this manual completely. This will ensure that you will take full advantage of all the features in the PSA210.

### **1.2 SCOPE**

This manual provides detailed installation and operation instructions for the PS Engineering PSA210 Audio Amplifier. This includes the following unit:

Model	Description	Part Number
PSA210	Dual channel Speaker Amplifier	050-230-0000

### **1.3 EQUIPMENT DESCRIPTION**

The unit is a remote-mounted device with output to drive 4Ω speakers with up to 10 watts from a low-level audio input.

### **1.4 APPROVAL BASIS – FAA-TSO**

The PSA210 Speaker Amplifier is FAA authorized under TSO C139A (Audio Amplifiers).

ED-14C/DO-160G (*Environmental Conditions and Test Procedures for Airborne Equipment*), and ED- 18/DO-214A (*Audio Systems Characteristics and Minimum Operational Performance Standards for Aircraft Audio Systems*).

Operation is subject to the following conditions:

This device may not cause harmful interference.

This device must accept any interference received, including interference that may cause undesired operation.

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## 1.5 SPECIFICATIONS

<i>Specifications</i>	
ENVIRONMENTAL CONDITIONS:	
<i>Temperature Range:</i>	
Operating:	-20° C to +55°C
Short Term Operating:	-20°C to +70°C
Survival:	-55° C to +85°C Cold soak to -40°C
Altitude:	Up to 55,000 feet in an unpressurized area of the aircraft.
DIMENSIONS:	Height: 0.94 in. Length: 5.5 in Width: 4.8 in. (w/ mounting flanges)
WEIGHT (With Connector):	0.5 lbs. (0.23 kg)
POWER REQUIREMENTS	
Voltage:	11 to 33 VDC
Maximum Current:	Typical 400 mA 1.0 A Full Volume, 28V (Externally protected by a 3 Amp circuit breaker.)
<i>Audio Specifications</i>	
Input impedance:	510 Ω
Input Isolation:	-60 dB (min.)
Unswitched Audio:	2 inputs
Speaker Output:	10 W into 4Ω (28VDC) 5 W into 4Ω (14VDC)
Distortion:	<3% THD @ 10 W into 4Ω
Audio Freq. Response, 3 dB:	300 Hz - 6000 Hz

## 1.6 EQUIPMENT SUPPLIED

One ea. of the following units:

Model	Part Number
PSA210	050-230-0000

PSA210 Installation Material:

Description	Quantity	Part Number
DB15 Back shell – Metal	1	425-015-9215
DB15 Female – Crimp	1	425-015-2052
Female Pins – Crimp	15	425-020-5090
DB Connector Thumbscrews	2	475-045-3314

## 1.7 EQUIPMENT REQUIRED BUT NOT SUPPLIED

Circuit Breaker: 1 ea. 1 amp.

Input system (i.e. low-level output from audio panel)

Interconnect Wiring

## 1.8 LICENSE REQUIREMENTS

None

## **Section II - Installation**

### **2.1 GENERAL INFORMATION**

#### **2.1.1 SCOPE**

This section provides detailed installation and interconnect instructions for the PS Engineering PSA210 Speaker Amplifier.

The PSA210 contains two identical 10 W amplifiers. These can be used for cockpit, cabin or public address applications, or a combination.

Please read this manual carefully before beginning any installation to prevent damage and post-installation problems. Installation of this equipment requires special tools and knowledge.

**NOTE:** An appropriately rated Certified Aircraft Repair Station must install this equipment in accordance with applicable regulations. PS Engineering, Incorporated warranty is not valid unless the equipment is installed by an authorized PS Engineering, Incorporated dealer. Failure to follow any of the installation instructions, or installation by a non-certified individual or agency will void the warranty, and may result in an unairworthy installation.

#### **2.1.2 Certification Requirements**

The PSA210 requires specialized knowledge and tools for an effective installation. An appropriately rated Certified Aircraft Repair Station **must** install this equipment in accordance with applicable regulations. PS Engineering, Incorporated warranty is not valid unless the equipment is installed by an authorized PS Engineering, Incorporated dealer. Failure to follow any of the installation instructions, or installation by a non-certified individual or agency will void the warranty, and may result in an **unairworthy** installation.

This article meets the minimum performance and quality control standards required by a technical standard order (TSO). Installation of this article requires separate approval. Refer to AC 20-41A for information regarding Substitute TSO Aircraft Equipment.

### **2.2 Unpacking and Preliminary Inspection**

Use care when unpacking the equipment. Inspect the units and parts supplied for visible signs of shipping damage. Examine the unit for loose or broken buttons, bent knobs, etc. Verify the correct quantity of components supplied with the list in Section 1.6. If any claim is to be made, save the shipping material and contact the freight carrier. Do NOT return units damaged in shipping to PS Engineering. If the unit or accessories show any sign of external shipping damage, contact PS Engineering to arrange for a replacement. Under no circumstances attempt to install a damaged unit in an aircraft. Equipment returned to PS Engineering for any other reason should be shipped in the original PS Engineering packaging, or other UPS approved packaging.

## **2.3 Equipment Installation Procedures**

### **2.3.1 Cooling Requirements**

Forced air-cooling of the PSA210 is not required. However the unit should be kept away from heat producing sources (i.e. defrost or heater ducts, dropping resistors, heat producing avionics) without adequate cooling air provided.

### **2.3.2 Mounting Requirements**

The PSA210 must be rigidly mounted to the aircraft structure. Installation must comply with FAA Advisory Circular AC 43.13-2A. The unit may be mounted in any area where adequate clearance for the unit and associated wiring bundle exist. The unit may be mounted in any position or orientation.

Avoid installing the PSA210 close to high current devices or systems with high-voltage pulse type outputs, such as DME or transponders.

To install the PSA210, select a convenient location. The unit may be installed in any position, on a surface that will allow for installation in accordance with AC43-13-2A.

### **2.3.3 Connector Assembly**

The unit connector is a male DB15 connector. This is a crimp-type connector. These are crimp-type connectors. The AMP Contact Crimping Tool, AMP 601966-1 (or MS22520 equiv.), with Positioning Tool 601966-5 must be used to ensure good quality harness.

Ensure that proper strain relief and chafing precautions are made during wiring and installation.

## **2.4 Cable Harness Wiring**

Referring to the Appendix, assemble a wiring harness as required for the installation. All wires must be MIL-SPEC in accordance with current regulations. Two-conductor shielded wire must be used where indicated, and be MIL-C-27500 or equivalent specification. Proper stripping, shielding and soldering technique must be used at all times. It is imperative that correct wire be used.

Refer to FAA Advisory Circular 43.13-2A for more information. Failure to use correct techniques may result in improper operation, electrical noise or unit failure. Damage caused by improper installation will void the PS Engineering warranty.

### **2.4.1 Noise**

Due to the variety and the high power of radio equipment often found in today's general aviation aircraft, there is a potential for both radiated and conducted noise interference.

Ground loop noise occurs when there are two or more ground paths for the same signal (i.e., airframe and ground return wire). Large cyclic loads such as strobes, inverters, etc., can inject noise signals onto the airframe that are detected by the audio system. Follow

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the wiring diagram very carefully to help ensure a minimum of ground loop potential. Use only Mil Spec shielded wires (MIL-C-275000, or better).

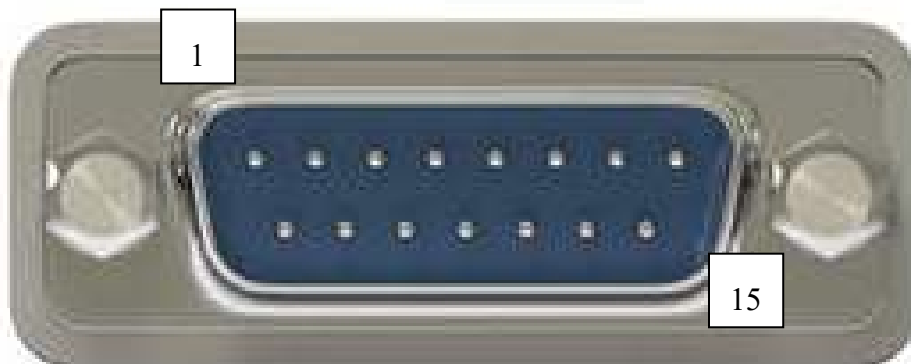
Radiated signals can be a factor when low-level audio signals are "bundled" with current carrying power wires. Keep these cables physically separated.

**2.4.2 Power (Pin 25)**

The PSA210-Series are compatible with both 14 and 28 Volt DC systems. A one (1) Amp circuit breaker is required. Power and ground wires must be a minimum #20 AWG pair. Connect airframe power ground to Pin 15 only.

**2.4.3 PSA210 (P2101) Pin Assignments**

Pin	Function	Remarks
1	No Connection	No Connection
2	PA (SPR 2) Audio In Low	Audio Low
3	PA Audio Out Low	Audio Low
4	<i>No Connection</i>	<i>No Connection</i>
5	Speaker (1) Audio In Low	Audio Low
6	Speaker Audio Out Low	Audio Low
7	No Connection	<i>No Connection</i>
8	+28 V Power input	Wire for harness will be 20 awg
9	No Connection	<i>No Connection</i>
10	PA (SPR 2) Audio In Hi	Low level audio in
11	PA (SPR 2) Audio Out	10 Watt audio output at 28VDC
12	No Connection	No Connection
13	Speaker (1) Audio In Hi	Low level audio in
14	Speaker (1) Audio Out	10 Watt audio out at 28VDC
15	Aircraft Power Ground	Wire for harness will be 20 awg



## **2.5 Adjustments**

The PSA210 is factory adjusted to accommodate the typical requirements for most aircraft configurations. The output volumes can be adjusted using Audio Adjustment pots. See Appendix B for locations

## **2.6 Post Installation Checkout**

After wiring is complete, verify power is ONLY on pin 8 of the J2101 connector, and air-frame ground on pin 15. Failure to do so will cause serious internal damage and void PS Engineering's warranty.

### **2.6.1 Operational Checkout**

Apply power to the aircraft and avionics. Verify that the speaker presents the selected audio correctly, from either the radio or a crewmember microphone in the case of the Public Address function.

## **2.7 Final Inspection**

Verify that the wiring is bundled away from all controls and no part of the installation interferes with aircraft control operation. Move all controls through their full range while examining the installation to see that no mechanical interference exists. Verify that the cables are secured to the aircraft structure in accordance with good practices, with adequate strain relief. Ensure that there are no kinks or sharp bends in the cables and coaxial cables. Verify that the cables are not exposed to any sharp edges or rough surfaces, and that all contact points are protected from abrasion.

Complete log documentation, weight and balance computation and other documentation as required. Sample instructions for continuing airworthiness can be found in §6.1.

Return completed warranty registration application to PS Engineering.



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## **Section III OPERATION**

### GENERAL INFORMATION

The PSA210 contains two speaker level amplifiers. These pass the audio signals presented by the audio panel.

The PSA210 has no independent controls. See audio panel installation and operations manuals for information.

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## **Section IV- Warranty and Service**

### **4.1 Warranty**

In order for the factory warranty to be valid, the installations in a certified aircraft must be accomplished by an FAA-certified avionics shop and authorized PS Engineering dealer. If the unit is being installed by a non-certified individual in an experimental aircraft, a factory-made harness must be used for the warranty to be valid.

PS Engineering, Inc. warrants this product to be free from defect in material and workmanship for a period of one (1) year from the date of sale. During the **twelve (12) months** of the warranty period, PS Engineering, Inc., at its option, will send a replacement unit at our expense if the unit should be determined to be defective after consultation with a factory technician.

All transportation charges for returning the defective units are the responsibility of the purchaser. All domestic transportation charges for returning the exchange or repaired unit to the purchaser will be borne by PS Engineering, Inc. The risk of loss or damage to the product is borne by the party making the shipment, unless the purchaser requests a specific method of shipment. In this case, the purchaser assumes the risk of loss.

This warranty is not transferable. Any implied warranties expire at the expiration date of this warranty. PS Engineering SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES. This warranty does not cover a defect that has resulted from improper handling, storage or preservation, or unreasonable use or maintenance as determined by us. This warranty is void if there is any attempt to disassemble this product without factory authorization. This warranty gives you specific legal rights, and you may also have other rights, which may vary from state to state. Some states do not allow the exclusion of limitation of incidental or consequential damages, so the above limitation or exclusions may not apply to you.

All items repaired or replaced under this warranty are warranted for the remainder of the original warranty period. PS Engineering, Inc. reserves the rights to make modifications or improvements to the product without obligation to perform like modifications or improvements to previously manufactured products.

### **4.2 Factory Service**

The unit is covered by a one-year limited warranty. See warranty information. Call PS Engineering, Inc. at (865) 988-9800 before you return the unit. This will allow the service technician to provide any other suggestions for identifying the problem and recommend possible solutions.

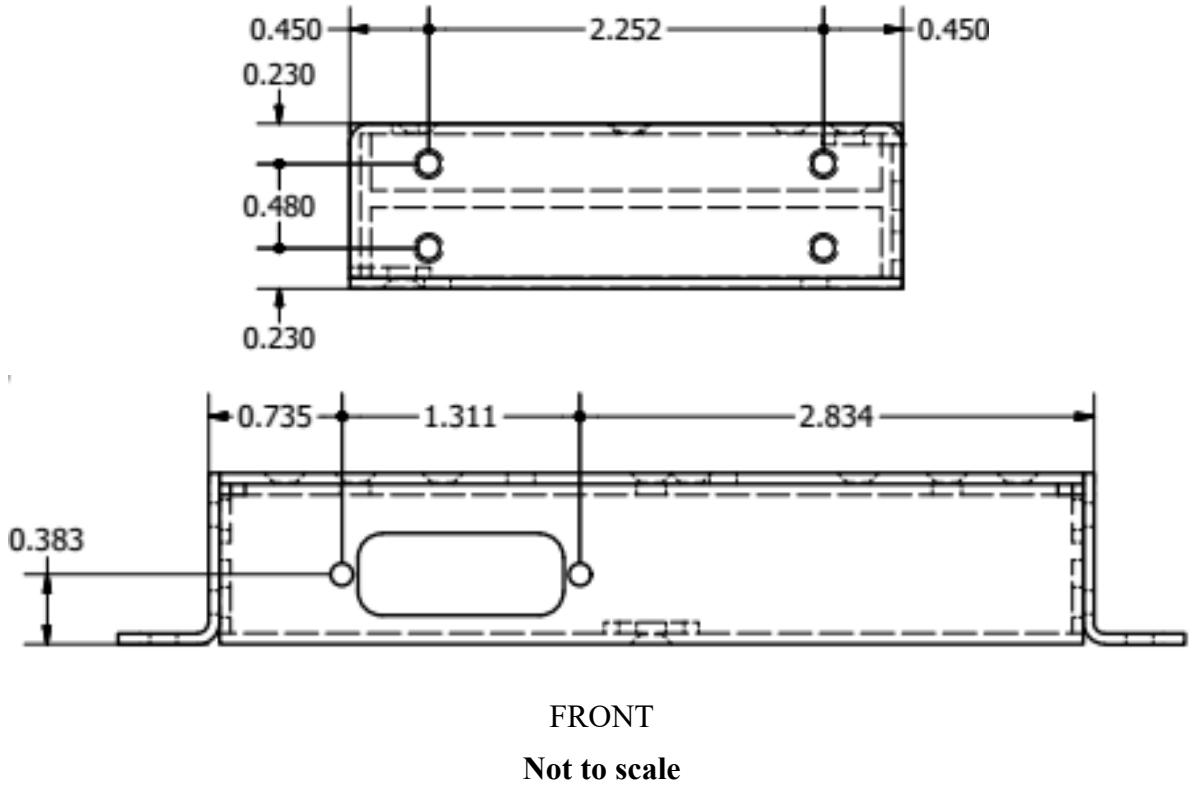
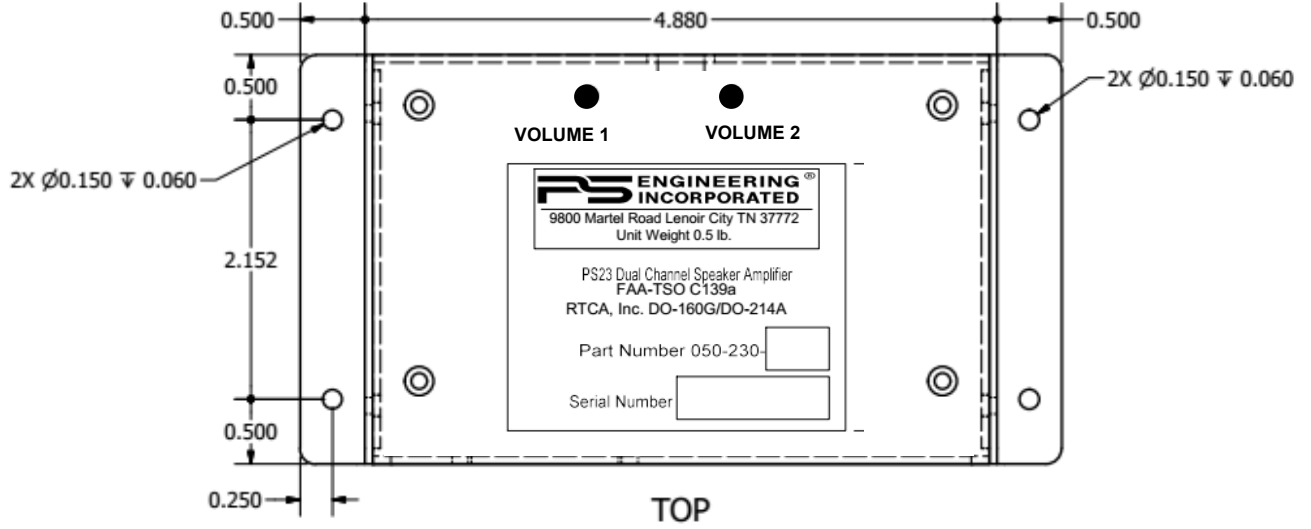
After discussing the problem with the technician and you obtain a Return Authorization Number, ship product to:

*[Note: PS Engineering will not be responsible for items shipped in US Mail.]*

PS Engineering, Inc.  
Attn: Service Department  
9800 Martel Rd  
Lenoir City, TN 37772  
(865) 988-9800 FAX (865) 988-6619

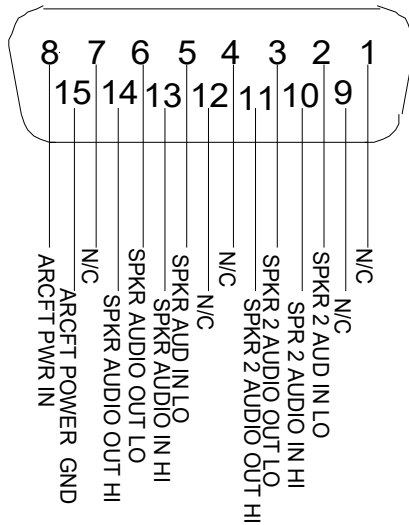
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Appendix A – Installation Drawing

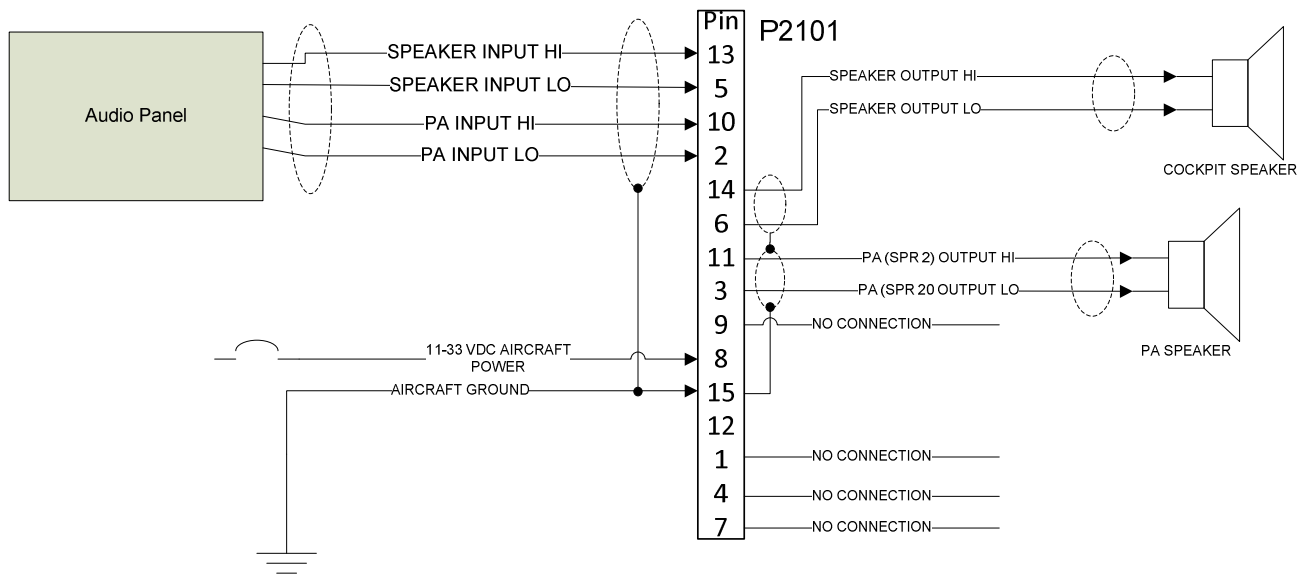


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**Appendix B – Connector Interconnect**



Connector Map, viewed from front of connector



**Figure 6-1 P2101 Connector Wiring**

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## Appendix C – Instructions for Continuing Airworthiness,

Sample ICA Checklist for PS Engineering System:

Section	Item	Information
1	Introduction	Installation speaker amplifier.
2	Description	Installation as described in manufacturer’s installation manual and referenced on FAA Form 337, including interface with other avionics audio as required.
3	Controls	See installation and operator’s guide referenced on FAA Form 337.
4	Servicing	None Required
5	Maintenance Instructions	On Condition, no special instructions
6	Troubleshooting	Follow checkout instructions in the installation manual referenced on the FAA Form 337. For a specific unit fault, contact the manufacturer at (865) 988-9800 for special instructions.
7	Removal and replacement information	<i>Remote Mounted</i> — Remove 4 retaining screws. <b>Installation: Reverse the Removal Instructions</b>
8	Diagrams	Not applicable
9	Special Inspection Requirements	Not Applicable
10	Protective Treatments	Not Applicable
11	Structural Data	Not Applicable
12	Special Tools	None
13	Not Applicable	Not Applicable
14	Recommended Overhaul Periods	None
15	Airworthiness Limitations	Not Applicable
16	Revision	To be determined by installer

## Appendix D – RTCA DO-160G Environmental Qualification Form

Model Number PSA210 Audio Amplifier

Part Number: 050-210-(XXXX )

FAA TSO Number: C139a

Manufacturer: PS Engineering Incorporated 9800 Martel Road Lenoir City TN 37772

Conditions	Section	Conducted Tests
Temperature and Altitude	4.0	Equipment tested to CAT D1
Low Temperature	4.5.1	-45°C Low Operating
	4.5.2	-55° C Survival,
	4.5.4	-45°C Low Short Term Operating
High Temperature	4.6.1	+85°C Survival,
	4.6.2	+55°C High Operating
	4.6.3	+70°C High Short Time Operating
In-flight Loss of Cooling		Not Applicable, no cooling required
Altitude		55,000' unpressurized (D2)
Decompression		Not Applicable
Overpressure		Not Applicable
Temperature variation	5.2	Equipment tested to Category B
Humidity	6.0	Equipment tested to Category A
Shock	7.0	Equipment tested to Category B Standard operational shock and crash safety
Vibration	8.0	Equipment tested to Category SM, SB, U2FF1, Helicopter Random
Explosion	9.0	Category X, not tested
Waterproofness	10.0	Category X, not tested
Fluids Susceptibility	11.0	Category X, not tested
Sand and Dust	12.0	Category X, not tested
Fungus	13.0	Category X, not tested
Salt Spray	14.0	Category X, not tested
Magnetic Effect	15.0	Equipment tested to Category Z
Power input	16.0	Equipment tested to Category Z (28V)
Voltage Spike	17.0	Equipment tested to Category A (600V)
Audio Frequency Susceptibility	18.0	Equipment tested to Category Z
Induced Frequency Susceptibility	19.0	Equipment tested to Category ZC
Radio Frequency Susceptibility	20.0	Equipment tested to Category T
Radio Frequency Emission	21.0	Equipment tested to Category B
Lightning Induced Transient Susceptibility	22.0	Equipment tested to Category A3J33
Lightning Direct Effects	23.0	Category X, not tested
Icing	24.0	Category X, not tested
ESD	25.0	Category A
Flammability	26.0	Category C, not tested