

PS ENGINEERING[®] INCORPORATED

9800 Martel Road
Lenoir City, TN 37772
www.ps-engineering.com

HSA13



Impedance Adapter Installation and Operation Manual FAA-TSO C139a

Document P/N 200-213-0000
Revision 3, January 2020

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

PS Engineering, Inc. 2020©
Copyright Notice

Any reproduction or retransmittal of this publication, or any portion thereof, without the expressed written permission of PS Engineering, Inc. is strictly prohibited. For further information, contact the Publications Manager at PS Engineering, Inc., 9800 Martel Road, Lenoir City, TN 37772. Phone (865) 988-9800.

Table of Contents

SECTION I - GENERAL INFORMATION 1-1

1.1 INTRODUCTION 1-1

1.2 SCOPE..... 1-1

1.3 EQUIPMENT DESCRIPTION..... 1-1

1.4 APPROVAL BASIS – FAA-TSO 1-1

1.5 SPECIFICATIONS 1-2

1.6 EQUIPMENT SUPPLIED..... 1-2

1.7 EQUIPMENT REQUIRED BUT NOT SUPPLIED 1-3

1.8 LICENSE REQUIREMENTS 1-3

SECTION II - INSTALLATION..... 2-1

2.1 GENERAL INFORMATION..... 2-1

2.1.1 SCOPE..... 2-1

2.1.2 CERTIFICATION REQUIREMENTS 2-1

2.2 UNPACKING AND PRELIMINARY INSPECTION 2-1

2.3 EQUIPMENT INSTALLATION PROCEDURES..... 2-2

2.3.1 COOLING REQUIREMENTS 2-2

2.3.2 MOUNTING REQUIREMENTS 2-2

2.3.3 CONNECTOR ASSEMBLY 2-2

2.4 CABLE HARNESS WIRING 2-2

2.4.1 NOISE..... 2-2

2.4.2 POWER 2-3

2.4.3 HSA13 (P2131) PIN ASSIGNMENTS..... 2-3

2.5 ADJUSTMENTS 2-3

2.6 POST INSTALLATION CHECKOUT..... 2-4

2.6.1 OPERATIONAL CHECKOUT..... 2-4

2.7 FINAL INSPECTION 2-4

SECTION III OPERATION..... 3-1

3.1 SCOPE..... 3-1

3.2 OPERATION..... 3-1

SECTION IV- WARRANTY AND SERVICE..... 4-1

4.1 WARRANTY 4-1

4.2 FACTORY SERVICE..... 4-1

APPENDIX A – INSTALLATION DRAWINGA

APPENDIX B CONNECTOR LAYOUT AND WIRING.....B

6.1 CONNECTOR WIRINGB

6.2 APPENDIX C INSTRUCTIONS FOR CONTINUING AIRWORTHINESS,.....C

APPENDIX D – RTCA DO160G ENVIRONMENTAL QUALIFICATION FORMD

Record of revisions:

Revision	Date	Reason
New	November 2018	First Release
1	June 2019	Release after TSOA
2	July 2019	Revise installation kit part numbers
3	January 2020	Clarified temperature range

Section I - GENERAL INFORMATION

1.1 INTRODUCTION

The HSA13 is an accessory device designed to provide impedance matching between a general aviation (150Ω) audio panel or radio, and a low-impedance (5 Ω) microphone and or 8Ω headphone.

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 HSA13.

1.2 SCOPE

This manual provides detailed installation and operation instructions for the PS Engineering HSA13-series of Audio Amplifier Systems. This includes the following unit:

Model	Description	Part Number
HSA13	Microphone Impedance Adapter Replaces dB Systems DB-213	050-213-0001
HSA13	Headset Impedance Adapter Replaces Jupiter Avionics JP39	050-213-0100

1.3 EQUIPMENT DESCRIPTION

The unit is a remote-mounted device designed to match low impedance headset/helmet with high impedance systems. The HSA13 050-213-0001 is a drop-in, pin-compatible replacement for the dB Systems DB-213. The HSA13 050-213-0100 is a drop-in, pin-compatible replacement for the Jupiter Avionics JP39.

1.4 APPROVAL BASIS – FAA-TSO

The HSA13 Headset Adapter 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.

1.5 SPECIFICATIONS

<i>Specifications</i>	
ENVIRONMENTAL CONDITIONS:	
<i>Temperature Range:</i>	
Operating:	-20° C to +55°C
Short Term Operating:	-40°C to +70°C
Survival:	-55° C to +85°C Cold soak to -40°C
Altitude:	Up to 50,000 feet in an unpressurized area of the aircraft.
DIMENSIONS:	
	Height: 1.35 in. Length: 3.00 in Width: 3.05 in. (w/ mounting flanges)
WEIGHT (With Connector):	0.25 lbs. (0.23 kg)
POWER REQUIREMENTS	
Voltage:	Provided by Microphone Bias
<i>Audio Specifications</i>	
Microphone Input impedance:	4-8 Ω
Audio Output: Impedance	150Ω
Headphone Input (-0100 only)	150 Ω
Headphone Output (-0100 only)	8Ω
Audio Freq. Response, 3 dB:	300 Hz - 6000 Hz

1.6 EQUIPMENT SUPPLIED

One ea. of the following units:

Model	Part Number
HSA13	050-213-0001
HSA13	050-213-0100

HSA13 Installation Material: 250-213-0100

Description	Quantity	Part Number
DB9 Back shell – Metal	1	625-009-9209
DB9 Female – Crimp	1	425-009-7709
Female Pins – Crimp	9	425-020-5090
DB Connector Thumbscrews	2	475-045-3341

1.7 EQUIPMENT REQUIRED BUT NOT SUPPLIED

Low Impedance microphone and or headset

Audio control panel or radio requiring High Impedance microphone input.

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 HSA13 Headset Adapter.

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 HSA13 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 HSA13 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 HSA13 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 HSA13 close to high current devices or systems with high-voltage pulse type outputs, such as DME or transponders.

To install the HSA13, select a location convenient to the headphone jack providing the input, and the audio panel. 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 DB9 connector. This is a crimp-type connector. 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- and three-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

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

The HSA13 is powered by the audio system or radio microphone bias.

2.4.3 HSA13 (P2131) Pin Assignments

Pin	Function	
	-0001	-0100
1	Mic In Audio Hi	Mic Audio Hi In
2	Mic In Audio Lo	Mic Out Audio Hi
3	No Connect	Aircraft Ground
4	Mic Out Audio Lo	Phone In Hi
5	Mic Out Audio Hi	Phone Out Hi
6	Aircraft Ground	Mic In Audio Lo
7	No Connect	Mic Out Audio Lo
8	No Connect	Phone In Lo
9	No Connect	Phone Out Lo

2.5 Adjustments

The HSA13 is factory adjusted to accommodate the typical requirements for most aircraft configurations. The microphone gain can be adjusted using Mic Gain adjustment pot.



Figure 2-1 Microphone Gain Adjustment

2.6 Post Installation Checkout

2.6.1 Operational Checkout

Apply power to the aircraft and avionics. Speak into the microphone associated with the HSA13 and verify proper intercom and radio voice communication.

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.

Section III OPERATION

GENERAL INFORMATION

3.1 Scope

This section provides detailed operating instructions for the PS Engineering HSA13, Part Number 050-213-0000, Headset Adapter. Please read it carefully before using the equipment so that you can take full advantage of its capabilities.

3.2 Operation

The HSA13 has no independent controls. See audio panel installation and operations manuals for information.

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

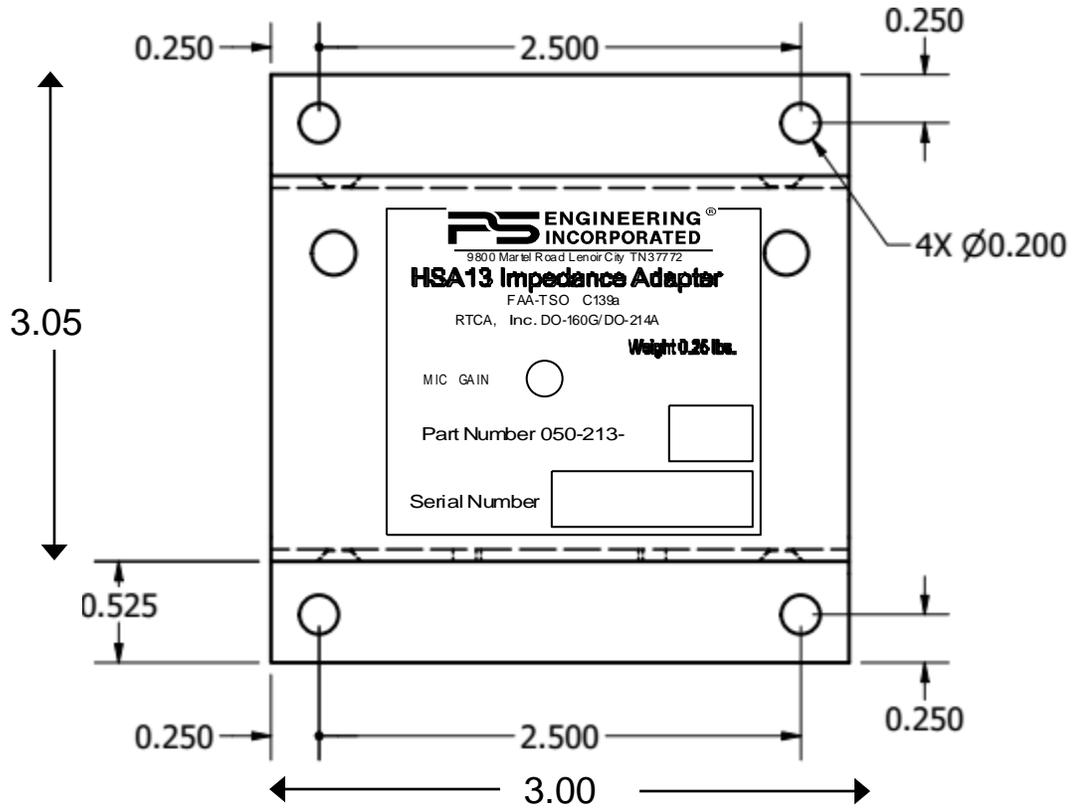
The unit is covered by a one-year limited warranty. See warranty information. Call PS Engineering, Inc. at (865) 988-9800 before you return the unit. This will allow the service technician to provide any other suggestions for identifying the problem and recommend possible solutions.

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

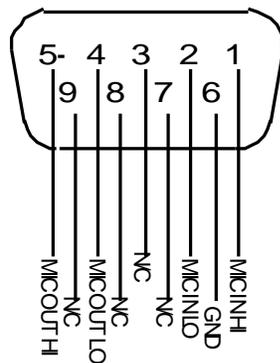
Appendix A – Installation Drawing



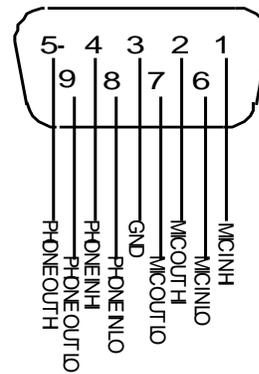
Not to scale

Appendix B Connector layout and wiring

050-213-0001 ONLY



050-213-0100 ONLY



Connector Map, viewed from front of connectors

6.1 Connector wiring

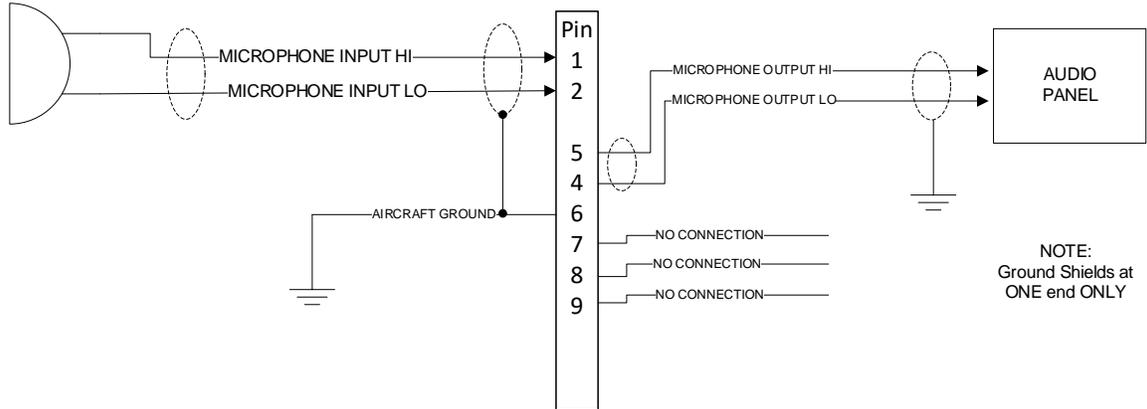


Figure 6-1 Installation Wiring Diagram (050-213-0001 only)

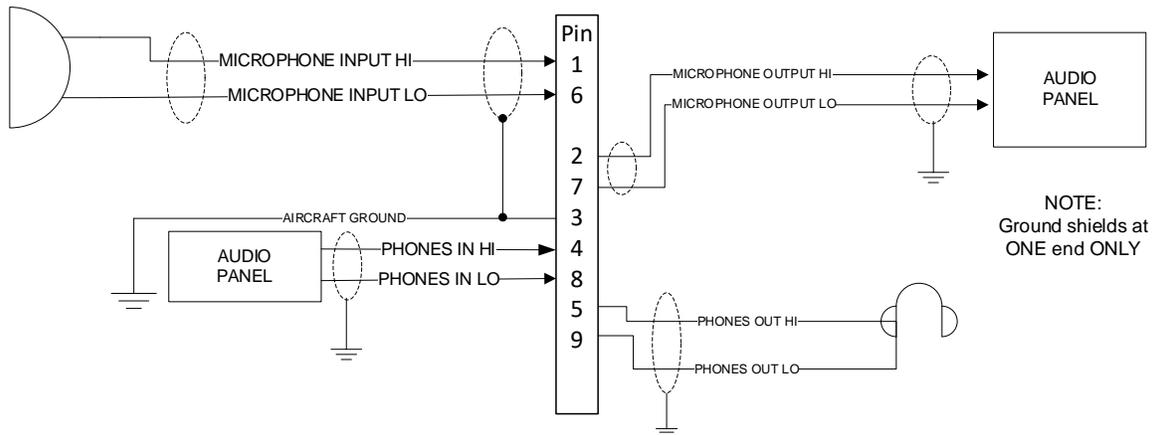


Figure 6-2 HSA13 Connector Wiring (050-213-0100 only)

6.2 Appendix C Instructions for Continuing Airworthiness,

Sample ICA Checklist for PS Engineering System:

Section	Item	Information
1	Introduction	Installation Headset Adapter.
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. Installation: Reverse the Removal Instructions
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 DO160G Environmental Qualification Form

Model Number HSA13 Microphone Headset Adapter

Part Number: 050-213- (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	-20°C Low Operating
	4.5.2	-55° C Survival,
	4.5.4	-40°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		
Altitude		Not Applicable, no cooling required
Decompression		50,000' unpressurized (D2)
Overpressure		Not Applicable
		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