Product Manual

DA-630DC
PN 106500-0630-XXXXX

Aircraft Cabin Digital Audio DC Amplifier

w/ Custom EQ

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Revisions

Rev #	Date	Description
1	10/19/11	New Document
2	5/29/12	ECN E1111005 J1 pins 1-8 speakers E1-E4, Removed all AWG references in pinout tables, Removed all Reference to AC 43. 13 (4.6 4.7.1 4.9 Fig. 11 COG) Removed Notes in 4.4.1
3	09/25/12	E1209003 Added SW deviation for TSO-C139 in 3.1
4	02/13/14	E1402003 Added J2 Pinouts, added callout for pins 36-41 and remote mute function to J1 and added Section 4.8 remote mute function text
5	03/25/15	E1501005 Updated address, Added Section 3.5 and Updated 8.2 for loudspeaker with switches Updated 4.9 Chassis and Signal Ground, Updated environmental table
6	06/27/16	Updated to DO-160G and TSO-139a and Env. String

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Service Bulletin List

Service Bulletin Number	Subject	Manual Revision Number	Manual Revision Date

Table of Contents

List of Illustrations

1.0 GENERAL INFORMATION

1.1 Definitions

CMS	Cabin Management System
GPIO	General Purpose Input / Output
LRU	Line Replaceable Unit
PSU	Personal Service Unit (overhead in aircraft)
mA	milliamps (1 x 10-3)
OEM	Original Equipment Manufacturer
RMS	Root Mean Squared
VDC	Volts Direct Current
DSP	Digital Signal Processor
TSO	Technical Standard Order
EQ	Equalizer
PA	Passenger Address
LED	Light Emitting Diode
SPI	Serial Peripheral Interface
PTT	Push To Talk
AWG	American Wire Gauge
COG	Center Of Gravity
CIU	Cabin Interface Unit
IA	Innovative Advantage Inc.

1.2 Product Overview

The Alto DA-630DC is an 8 channel, 320 Watt RMS audio amplifier custom designed to interface with the IA Cabin Management System. Utilizing proprietary acoustic measurement and design software, Alto engineers acoustically map the aircraft interior, configuring the advanced Digital Signal Processors EQ filters such that when combined with Alto cabin loudspeakers, the acoustic presentation is optimized allowing the music to be heard as the artist intended. Additional audio processing features include dynamic loudness to optimize the bass and treble balance at all volume levels, SineWatch™ processing to eliminate distortion at high listening levels, spatial enhancement to create a wide and deep sound stage in all seats, Phase-aligned bass optimization to insure a balanced, deep bass response in all seats.

The DA-630DC incorporates an Ethernet audio network card that allows for direct interface to the digital audio network, delivering the highest quality noise-free digital quality. The Ethernet interface also enables additional advanced audio processing features. These include, signal compression to equalize the loud and soft passages during flight, and a more advanced and precise surround sound processing. The unit also incorporates conventional analog inputs supporting up to two independent audio zones.

A proprietary connector is available on the DA-630DC providing a configuration port for selecting or updating settings. The amplifier contains advanced diagnostics and can report on general fault conditions as well as loudspeaker open or short circuit. Using an Alto provided installation verification tool, the installer can easily verify that the entire Alto audio system is properly installed and functioning to spec. This includes loudspeaker connections, polarity, and general acoustic verification.

Figure 1: DA-630DC Image

2.0 APPLICATION

The DA-630DC interfaces with typical cockpit audio systems and is integrated with the Cobranet Audio Distribution System.

The unit itself has no active controls. Functional control of the DA-630DC is accomplished via the Cobranet data bus interface from a controlling device located in the aircraft cabin. A series of LEDs monitors functionality. These LEDs monitor power, fault, and Network Status.

The Amplifier will have indicator LEDs as shown in Figure 2. The power LEDs will glow Green to indicate the unit is powered. The Red indicates a fault condition. (Refer to section 8 for detailed fault code information.) The Network Status LED indicates that a network connection has been detected with the Cobranet Interface.

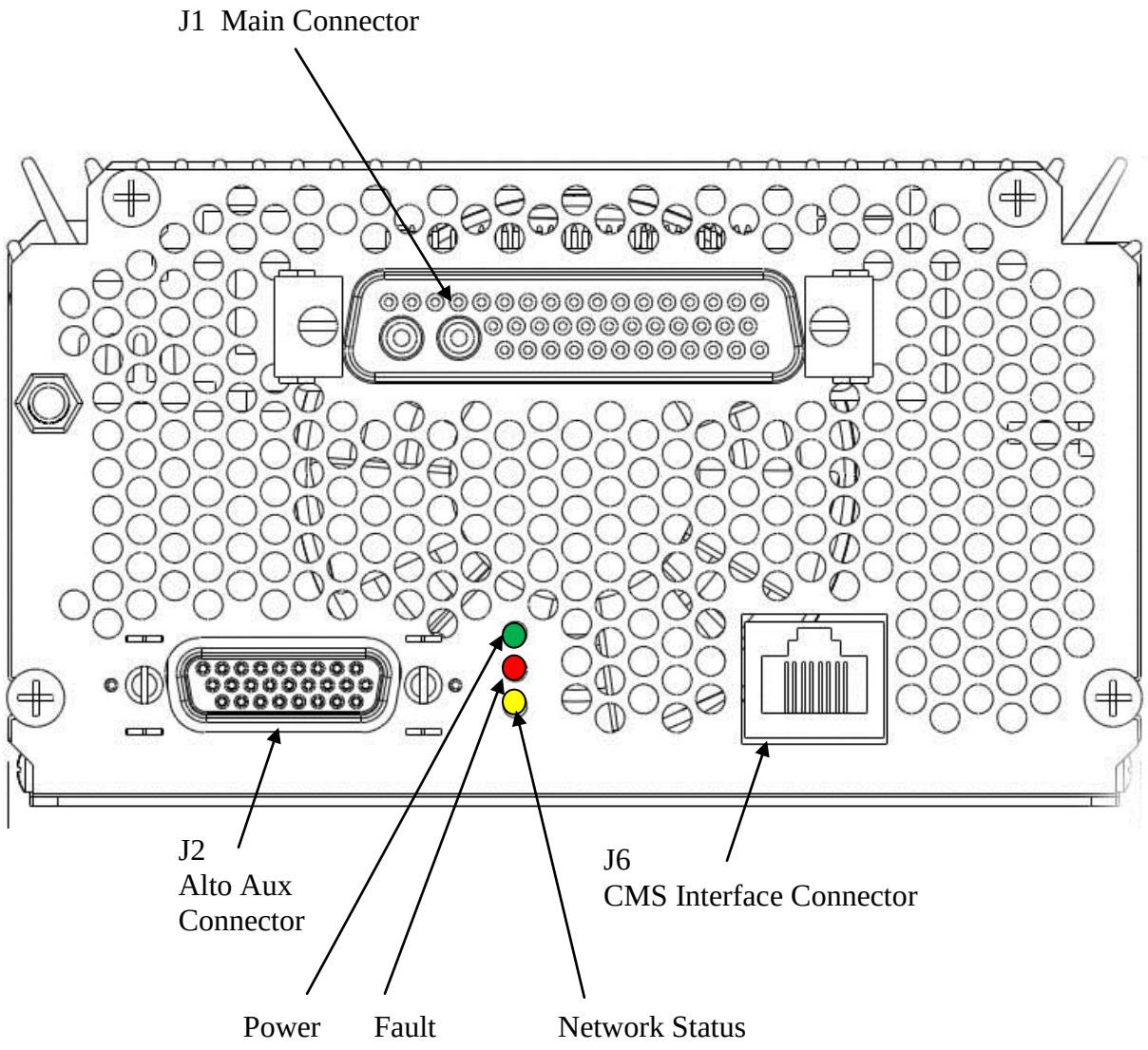


Figure 2: End Plate - Connector End

2.1 Full Block Diagram

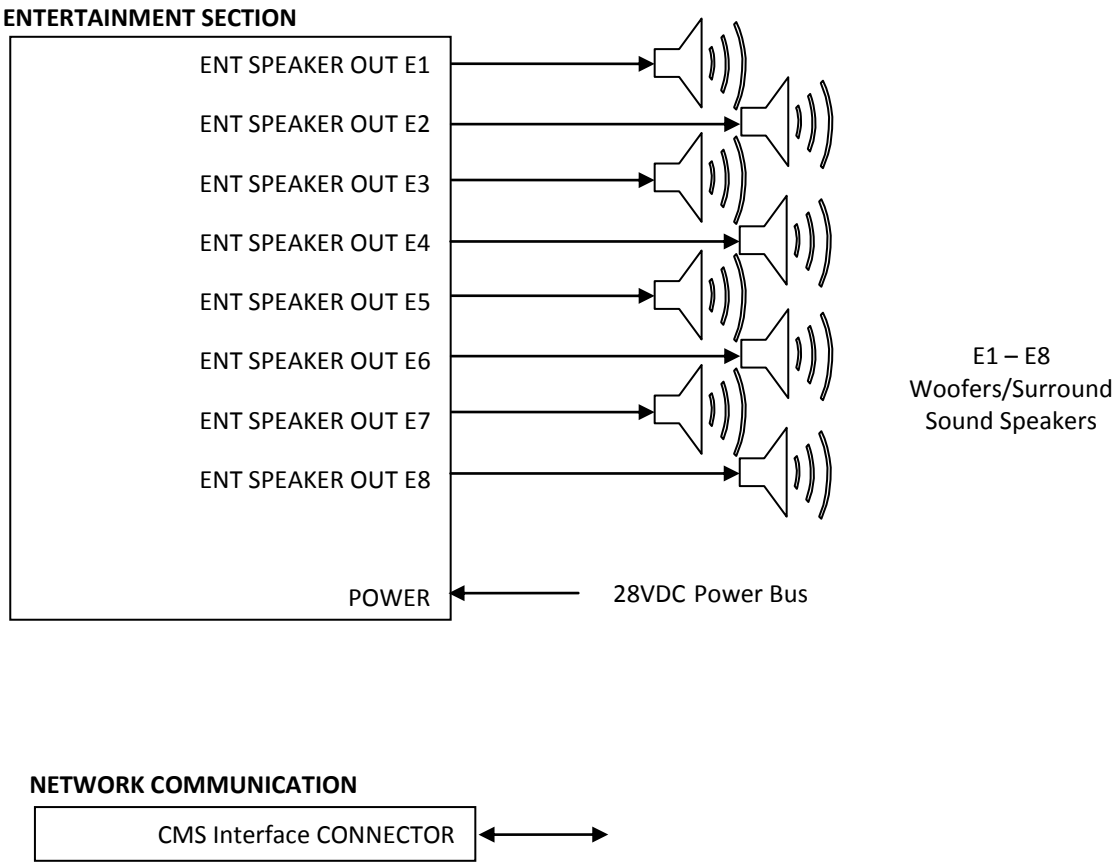


Figure 3: Full Block Diagram

3.0 INSTALLATION

3.1 General

The information in this section assists the installer of the unit. Conformity to the electrical wiring and mechanical mounting guidelines will help to ensure proper operation of the unit.

Review all information in this section before proceeding with the installation of the unit.

For assistance during installation please contact Alto using the following contact information:

Alto Aviation
86 Leominster Rd
PO Box 399
Sterling, MA 01564

Phone: 978.466.5992
800.814.0123
Fax: 978.466.5996
E-mail: tech@altoaviation.com

www.altoaviation.com

When connecting this unit to another manufacturer's product, consult the manufacturer's specifications and installation instructions pertaining to their equipment.

The product will be qualified to TSO-C139a and RTCA/DO-214.

The conditions and tests for TSO approval of this article are minimum performance standards. Those installing this article, on or in a specific type or class of aircraft, must determine that the aircraft installation conditions are within the TSO standards. The article may be installed only following 14 CFR part 43 or the applicable airworthiness requirements.

The software in this unit is certified to TSO-C139a at the following Design Assurance Level:

Entertainment software: Level E

This unit is suitable for installation where the failure condition of the Entertainment System is considered to be 'No Effect'.

3.2 Unpacking and Inspection

Carefully open the packaging and remove the product. Visually inspect the unit for evidence of physical damage during shipment. Retain the packing materials and all documentation received with the unit. Verify that all components on the packing list have been received.

If the unit has been damaged during shipment, contact Alto. A claim must be filed immediately after unpacking. Alto will assign a RMA Number (Returned Material Authorization) and give instructions for shipment. Please use the original carton and packing materials for return shipping.

3.3 Mounting Considerations

The following should be carefully considered before installation.

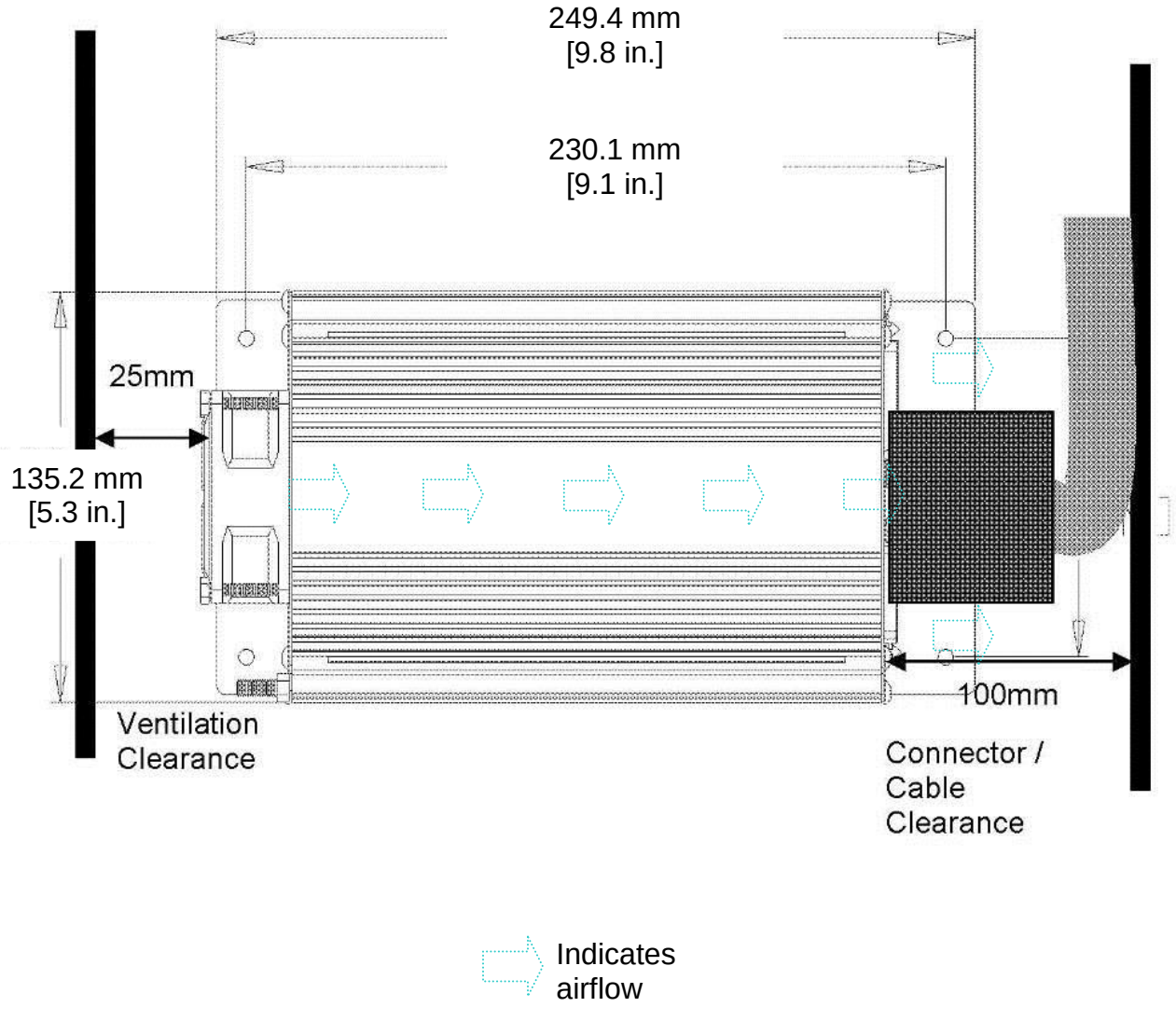
Allow for a minimum of 1” air space around the unit and 2” air space at each end for proper operation and heat dissipation.

The unit should be located such that the lengths of wiring required for the audio inputs, speaker outputs, and power supply are minimized.

Allow sufficient room to connect and disconnect the wiring harness.

The amplifier is designed to be mounted in any suitable orientation.

Figure 4: Minimum Connector/Cable clearance



3.4 Configuration

The DA-630DC must be configured and loaded for the specific aircraft installation. There are 2 levels of configurability for the unit.

The first level is called the Tuning Database. The Tuning Database customizes the amplifier to match the loudspeaker layout, floor layout, and acoustic properties of the aircraft. These adjustments are determined by Alto Research and are automatically loaded through the Cobranet Audio Distribution System.

The second level is the Configuration Table. These are parameters that can be set by a technician to specify customer preferences and default operating conditions. These come with default values from the factory. Appendix 1 outlines these parameters.

3.5 Using Switches/Relay Contacts with Speakers

If the loudspeaker is attached to a switch or relay contact, wire a 50 OHM, 5 Watt resistor directly across the amplifier output channel being switched. (See Figure below) Wire it such that the resistor is always connected across the amplifier output regardless of the switch position. This will insure that the amplifier always sees a load during startup regardless of the switch state.

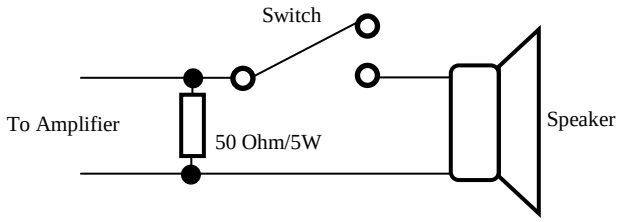


Figure 5: Switched Speaker Wiring

4.0 ENTERTAINMENT SECTION

4.1 Entertainment Block Diagram

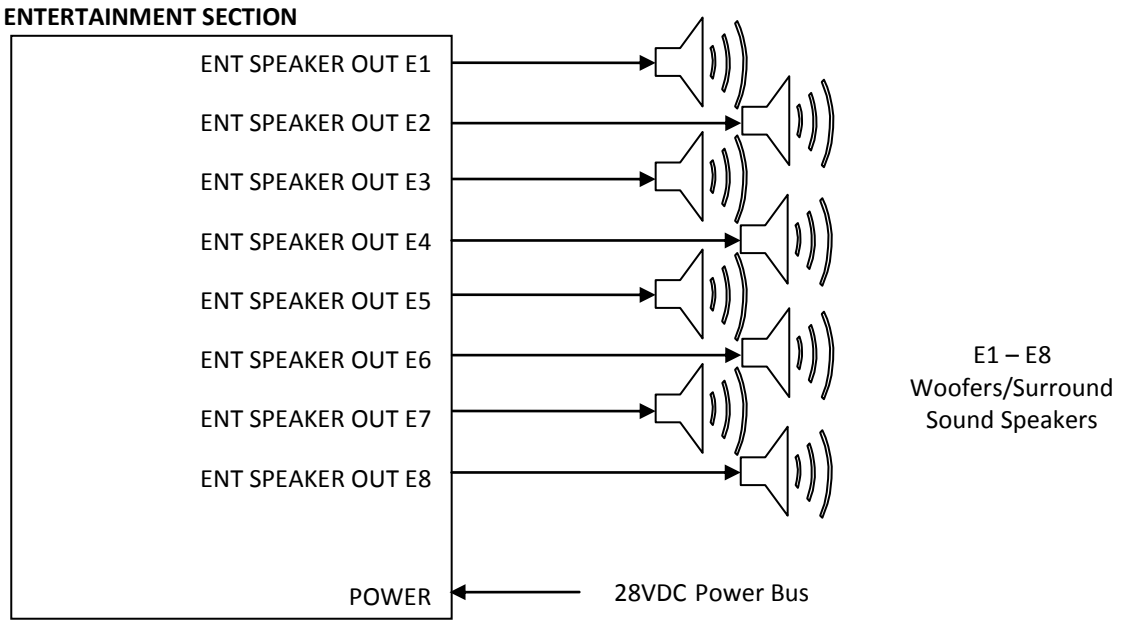


Figure 6: Entertainment Block Diagram

4.2 Entertainment Amp Power Requirements

The unit operates from a nominal power source of +28VDC. Its operating range is from +22 to +32VDC.

The maximum current required for the unit is 15 amps.

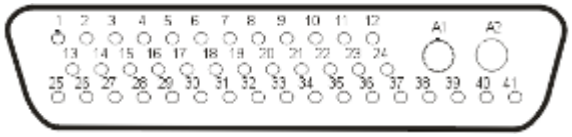
The recommended breaker for this unit is 20Amp.

4.3 Entertainment Amp Inputs

Audio signal input is delivered via the Cobranet bus. Refer to IA specifications for wiring and connection details.

4.4 Entertainment Amp Connector Pinouts

4.4.1 Main J1 Connector



MAIN J1 connector for power, speakers, inputs
43 Pin Combo-D D-sub Male connector
Positronic # CBD43W2M55B100V5X
Mate= CBC43W2S10JVLX

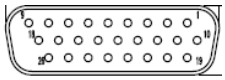
Main J1 Connector Pinout Description

PIN	DESCRIPTION	Details
1	Speaker E1 Out +	Twisted Pair (1&2)
2	Speaker E1 Out -	Twisted Pair (1&2)
3	Speaker E2 Out +	Twisted Pair (3&4)
4	Speaker E2 Out -	Twisted Pair (3&4)
5	Speaker E3 Out +	Twisted Pair (5&6)
6	Speaker E3 Out -	Twisted Pair (5&6)
7	Speaker E4 Out +	Twisted Pair (7&8)
8	Speaker E4 Out -	Twisted Pair (7&8)
9	Speaker E5 Out +	Twisted Pair (9&10)
10	Speaker E5 Out -	Twisted Pair (9&10)
11	Speaker E6 Out +	Twisted Pair (11&12)
12	Speaker E6 Out -	Twisted Pair (11&12)
13	N/C	N/C
14	N/C	N/C
15	N/C	N/C
16	N/C	N/C
17	N/C	N/C
18	N/C	N/C
19	N/C	N/C
20	N/C	N/C
21	N/C	N/C
22	N/C	N/C
23	N/C	N/C
24	N/C	N/C
25	N/C	N/C
26	N/C	N/C
27	N/C	N/C
28	N/C	N/C
29	Speaker E7 Out +	Twisted Pair (29&30)
30	Speaker E7 Out -	Twisted Pair (29&30)
31	Speaker E8 Out +	Twisted Pair (31&32)
32	Speaker E8 Out -	Twisted Pair (31&32)
33	N/C	N/C
34	N/C	N/C
35	N/C	N/C
36	Chassis GND	
37	Audio Signal GND	
38	Remote Bias -	
39	Remote Bias +28V	
40	Amp Remote Mute -	
41	Amp Remote Mute +	
A1	DC +28V	
A2	DC GND RETURN	

Figure 7: Main Connector J1 Pinout

4.4.2 AUX J2 Connector

Reserved for Factory use only. All pins N/C



Alto J2 AUX connector for programming, diagnostics, Serial Data control
26 pin Female D-Sub Positronic ODD26F4B100V5X
Mate= DD26M10JVLX

PIN	DESCRIPTION	Details
1	N/C	N/C
2	N/C	N/C
3	N/C	N/C
4	Analog Test Audio Input-	Twisted Pair (4 & 5)
5	Analog Test Audio Input+	Twisted Pair (4 & 5)
6	RS-422 RX-	Twisted Pair (6 & 7)
7	RS-422 RX+	Twisted Pair (6 & 7)
8	RS-422 TX-	Twisted Pair (8 & 9)
9	RS-422 TX+	Twisted Pair (8 & 9)
10	N/C	N/C
11	N/C	N/C
12	N/C	N/C
13	+12 Out (to power accessories) 500mA	Twisted Pair (13 & 17)
14	N/C	N/C
15	N/C	N/C
16	N/C	N/C
17	Ground	Twisted Pair (13 & 17)
18	N/C	N/C
19	N/C	N/C
20	N/C	N/C
21	N/C	N/C
22	N/C	N/C
23	N/C	N/C
24	N/C	N/C
25	N/C	N/C
26	N/C	N/C

Figure 8: Alto Connector J2 AUX Pinout

4.5 Entertainment Amp Outputs

The entertainment unit provides 8 speaker outputs, each producing 40Watts RMS for a total of 320 Watts RMS.

The unit can be used for up to 2 independent Zones, each with Left and Right mid/high frequency enclosures and 1 mono subwoofer, and optional surround and center loudspeakers. The partitioning and channel assignment for speaker outputs are determined as part of the Tuning Database. This is custom designed for the particular aircraft layout and is provided as part of the delivered system.

4.6 Entertainment Amp Wiring Requirements

The installing agency is responsible for the supply or fabrication of the wiring harnesses. Perform a pin-to-pin check to confirm that all wires terminate at their proper location. Pay close attention to the power and ground connections.

Do not connect any unnecessary wiring. Any wires installed for future use must be capped or terminated near the unit.

Speaker wires should be twisted pair or twisted pair with shield. If twisted shielded pair is used, the shield should be grounded at the unit end only.

Speaker wires that are too small will attenuate the signal to the speakers. The maximum harness resistance between the unit and each speaker should be < .25 ohm. Harness resistance can be measured by:

- Disconnect the unit and speaker.
- Short the harness pins together at the speaker end.
- Measure resistance across the speaker output pins at the unit end of the harness.

The length of the input wires should be kept at a minimum to reduce the chance of noise being introduced into the system.

Avoid parallel runs or installation of audio signal cables in close proximity of transmitter coax cables, high current DC power wiring, AC power wiring, or other high current wiring.

Avoid installation in close proximity to any device with a strong alternating magnetic field such as an inverter or electrical motor.

Wire size, type, and installation should comply with all industry regulations pertaining to the actual installation.

4.7 Entertainment Amp Power Supply

The power wiring to the unit must be protected by a circuit breaker or fuse located close to the source of the power.

The wire used should be of sufficient size such that the power supply voltage does not drop more than 2 volts between the power source and the unit at a calculated 10A load.

The DC Return power wire should be attached to a local ground close to the unit.

Avoid installation in close proximity to any device with a strong alternating magnetic field such as an inverter or electrical motor.

The AC ripple on the power supply wires at the unit should be less than 2 Volts peak-to-peak to avoid noise being introduced into the system.

Wire size, type, and installation should comply with all industry regulations pertaining to the actual installation.

4.7.1 Electrical Load Analysis

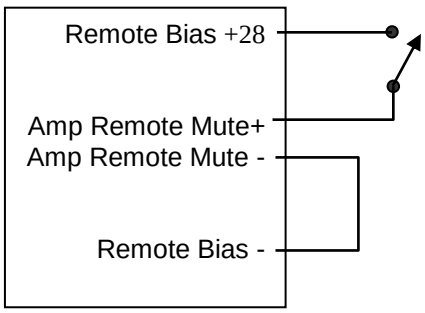
Prior to installation, perform an electrical load analysis on the aircraft. Use the following values to support the analysis:

- **28 VDC Nominal Load** 4 A
- **28 VDC Maximum Load** 15 A

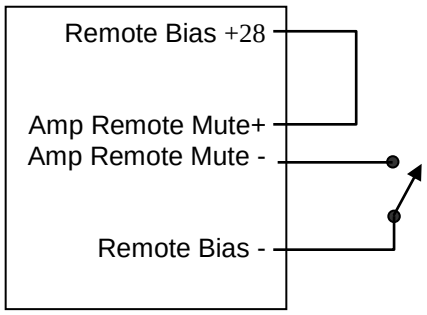
Ensure that the power input to the Entertainment unit is circuit-protected.

4.8 Remote Mute Function

J1 Pins 38-40 support an external logic amplifier mute function. When enabled in the Entertainment Amp Configuration Table, the Amp Remote Mute pins 40 and 41 control whether the entertainment section of the amplifier will output audio normally or disable the output of the power amplifiers. Use pins 38,39 to provide bias depending on desired logic drive. The PA amplifier section remains operational at all times and will not be muted.



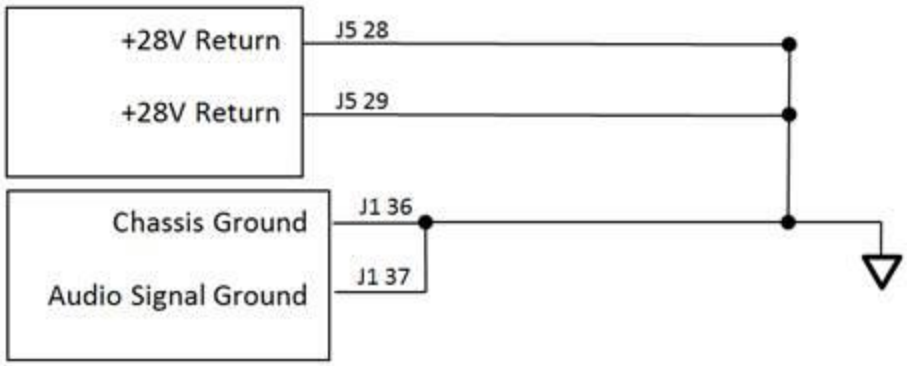
Switch to +V option



Switch to GND option

4.9 Chassis Ground

The unit's chassis provides a ground lug that must be strapped to airframe ground. The ground strap to chassis impedance should be less than .003 ohms (3 milliohms). In addition, J1 pin 36 is internally connected to the Chassis Ground. J1 pin 37 is internally connected to the Audio Signal reference Ground. If the audio source equipment feeding audio to the amplifier is ground referenced to the aircraft chassis, then it is recommended to connect J1 pin 36 to J1 pin 37. This will insure that audio signal ground loop noise is minimized. In the case where the audio source equipment is not referenced to the same Chassis Ground as the amplifier, or if due to mounting location the chassis Ground potential varies significantly between the Source equipment and the amplifier, it is recommended to run a wire from Amp J1 pin 37 and connect this at the Ground reference at the source equipment.



4.10 Entertainment Amp Configuration Table

Table A1 in Appendix 1 lists parameters that are available to be configured by the installer. These parameters are controlled via Alto supplied configuration management tool. The parameters are loaded with default values after the initial loading of the amplifier database.

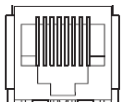
Extreme care should be taken when making changes and should only be done by a knowledgeable installer.

5.0 IA DIGITAL EXTERNAL INTERFACE

The Amplifier is IEEE 802.3 compliant 100BaseT Ethernet device. This interface will provide connection to the Cabin Management System and other cabin equipment. The Amplifier uses the Ethernet interface for command, control, and content, and uses an IA Daughter Card CCA to provide the connection to the Cabin Management System.

The Amplifier provides status and diagnostic information to the Cabin Management System. It is capable of updating its database via the Daughter Card CCA over the Cabin Management System.

The pinout of the IA Daughter Card connector complies with Figure 9 below:



Ethernet connector
RJ-45 Socket

1	Ethernet TX+	5	
2	Ethernet TX-	6	Ethernet RX-
3	Ethernet RX+	7	
4		8	

Figure 9: Pinout of IA Daughter Card Connector

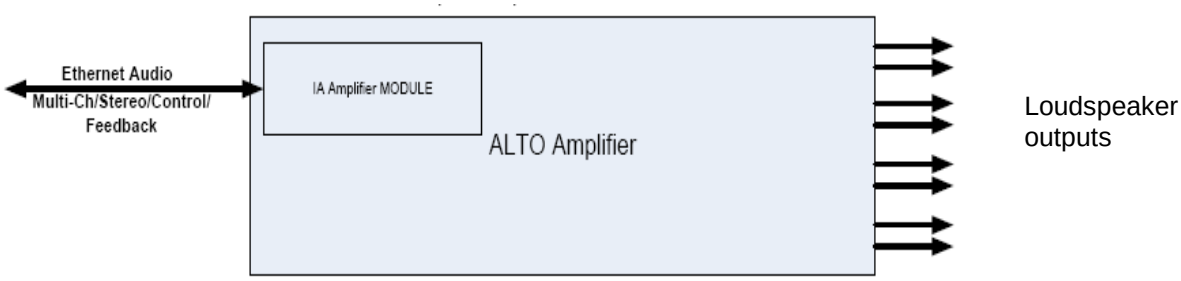


Figure 10: Daughter card mounted inside amplifier

5.1.1 Connecting Signal Descriptions

- Audio data sent from IA module to Amplifier via 3 X TDM-4 digital serial audio channels
  - Supports up to 2 independent zones (groups)
  - Provides either 2 channel stereo, or 6 channel decoded surround for each zone
- Control communication between amplifier and IA module via UART. Key information passed includes:
  - Volume, Tone or other cabin audio controls
  - General operating conditions or modes
  - Cabin type information and channel mapping information
  - Amplifier sends status, diagnostic reports
- Hard reset control from amplifier
- Power supplied to IA module from amplifier

6.0 CHECKOUT

The operation of the DA-630DC is dependent on the source units that provide the audio inputs to the unit and the speakers attached to the output. Ensure that all units in the audio system are operating properly before beginning the checkout of this unit.

The unit is hard wired into the aircraft power system and is controlled via commands from the Cobranet data bus.

Insure that all connections are made and the Green POWER LED is illuminated.

7.0 INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

7.1 Periodic Maintenance

No periodic scheduled maintenance or calibration is required for continued airworthiness of the DA-630DC. If the unit fails to perform to specifications, it must be removed and serviced by a qualified service facility.

8.0 GENERAL TROUBLE SHOOTING PROCEDURES

- Verify power to the unit by rechecking +28VDC power is applied to the proper pins on the unit. Use a voltmeter to verify correct level.
- Remove power from the unit for at least ten (10) seconds and re-apply power.
- Recheck all connections to the unit for security. Check all harness runs for possible pinching. Recheck all pin-outs for application accuracy.

8.1 System Fault Codes

Refer to Figure2 for end plate LED indicators. The Main amplifier has a red LED used to report fault conditions. Fault codes are reported by a sequence of 0.5 second blinks followed by a 1.5 second pause. Any logged faults will be blinked in sequence and then the sequence will repeat. If a fault is cleared then the blink code will be removed from the sequence.

# of blinks	Description	Resolution
1	Host Fault, Cobranet Audio Distribution System is not responding or has indicated a fault condition	Check connections to Cobranet system (J3). Insure Cobranet Audio Distribution System is powered and functioning. Cycle unit power.
2	Database Fault, Unit has detected a corrupted or incorrectly loaded Tuning Database	Re-load the Tuning Database through the Cobranet system
3	Amplifier Channel Fault, Unit has detected a problem with loudspeaker loads. Either they do not match the intended load specified in the configuration table, or indicate a channel fault (short, open, short to GND or Short to VCC)	Check amplifier Status report through Cobranet tool for channel specific report. Check each speaker channel for open / shorts. In sure Configuration table (Appendix 1) matches intended loudspeaker connections.
4	Amplifier General Fault. Unit has detected a general internal subsystem fault	Insure all connectors properly seated. Cycle unit power. Insure power supply voltage is sufficient.
5	DSP / CODEC Fault. Unit has detected a problem with the internal DSP subsystem	Insure temperature and voltage conditions are within spec. Cycle unit power.
6	Fan Fault. Unit has detected a problem with the cooling fan (Entertainment only)	Check fan on unit to insure it is not obstructed and rotating freely. Cycle power on unit (at least 5 seconds off time)
7	Temperature or Voltage Fault. Unit has entered an under-voltage or Over-temperature condition	Check power supply voltage to insure it is within spec. Inspect unit for hot condition, allow to cool.

Figure 11 System Fault Codes

8.2 Basic Troubleshooting

Problem	Possible Cause	Possible Solution
No Sound (Entertainment section)	Alto Unit is not powered or reporting faults	Check that unit is properly powered and free from reported faults
Some speakers not operating	Fault condition in speaker wiring or configuration	Check fault report, insure all speakers are detected and configuration table matches aircraft Audio layout Verify all loudspeaker switches and relay contacts are ON when amplifier powers on.
	Incorrect Tuning Database loaded	Insure correct Tuning Database and configurations are loaded to all amplifier
Poor Audio Quality, lack of bass, strange spatial	Polarity of one or more Loudspeakers reversed	Insure wiring is correct. Installer can use a polarity verification tool (contact supplier for info)
	User settings (Bass, Treble, Loudness, spatial) improperly set	Insure user has not set controls to extremes
Audio distortion, level problems	Configuration settings not set appropriately for installation	Reset settings to defaults, insure each is properly set and tested (Appendix 1)

Figure 12: Basic Troubleshooting

9.0 TECHNICAL SPECIFICATIONS

9.1 Main Entertainment Amplifier

Power Requirements

Supply Voltage:	nominal	DC, 28V
	maximum	32V
	minimum	22V
Supply Current:	maximum	15A
	nominal	3A (varies with volume setting and music content)
	idle	800mA
Circuit Breaker (recommended)		20 Amp

Input Specifications

Input Characteristic:	All audio derived from Cobranet Audio Distribution System digital interface

Output Specifications

Output Power	total:	320 Watts RMS
	per channel:	40 Watts RMS
Output Load	recommended:	4-8 ohm
Output Protection:	Differential short, short to ground, overload, and thermal	
Distortion:	@50% rated power	< 0.1% THD
	@ rated power	< 0.5% THD
	maximum	< 3% THD (distortion limiter active)
Output Noise:	no input signal	< 400 uV A-Weighted
Frequency Response:		Custom contoured for application

9.2 Other Specifications

Equalizer Specifications

Factory designed, configured, and matched to the aircraft cabin for use with Alto speakers.

Audio Adjustments

Accessible through Cobranet Interface or through PC configuration interface (25 pin Dsub)

MAIN Connector

43W2 Combo D Male	Positronic #	CBD43W2M55B100V5X
Mating connector	Positronic #	CBC43W2S10JVLX

AUX Connector

26 pin Female D-Sub	Positronic #	ODD26F4B100V5X
Mating connector	Positronic #	DD26M10JVLX

Physical Specifications

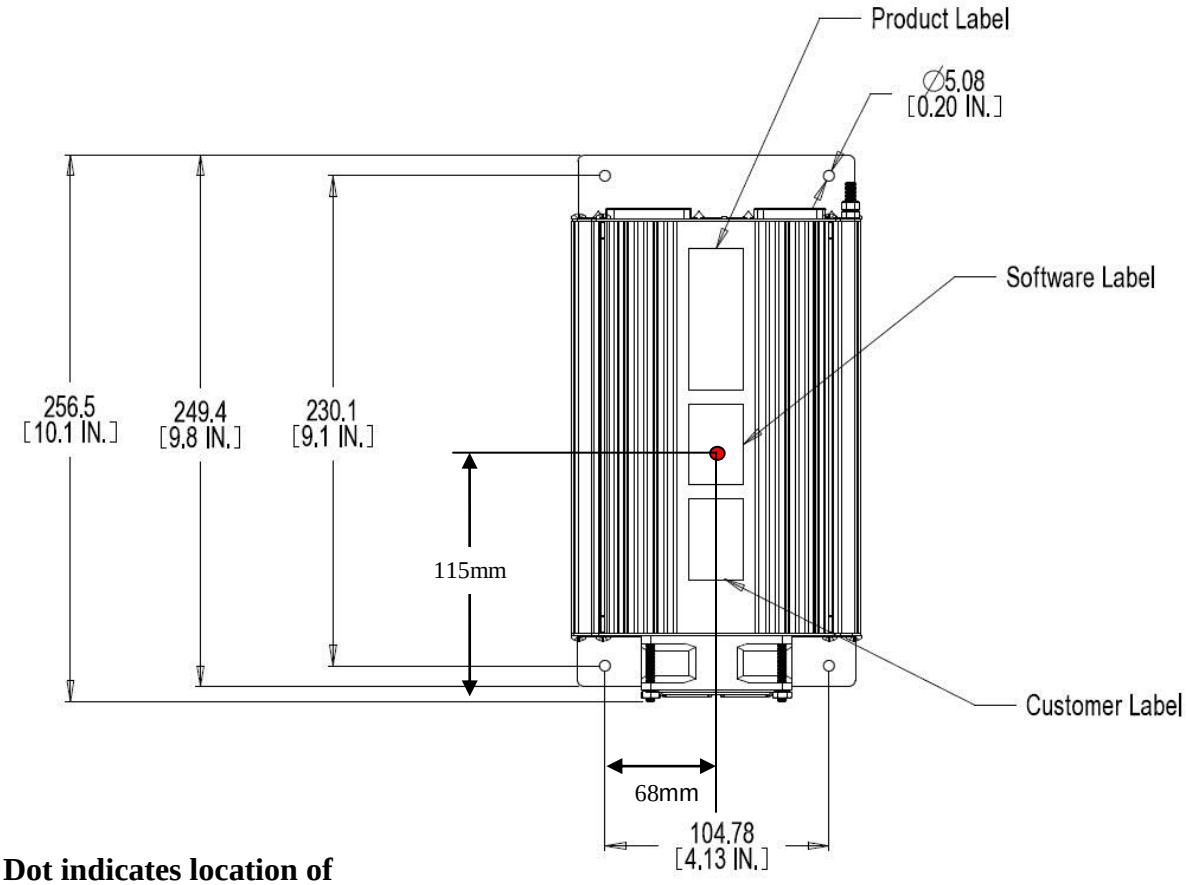
Weight	< 3.4 lbs / 1.54 kg
Dimensions	5.4”W x 3.0”H x 10.1”D (138mmW x 76mmH x 257mmD)
Cooling	Forced air cooling using a side mounted fan

TSO-C139a Certified

DO-160G Env. Cat.

[A2X]CAB[(SC)(HR)]EXXXXXZ[Z(XX)]AZ[AC][TT]M[XXE3XX][XXXX]XAX

9.3 Outline Drawing, Weight & Balance



Dot indicates location of Center of Gravity.

Tolerance +-10mm

Unit weight: < 3.4 lbs / 1.54 kg

A Weight and Balance calculation aircraft is required as part of installation approval process.

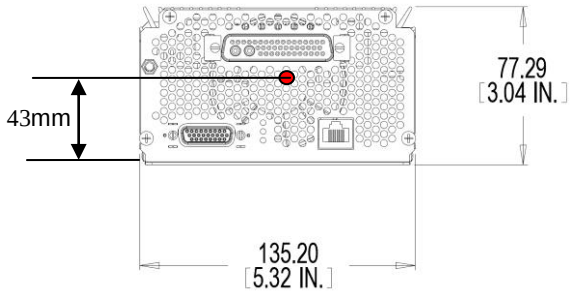


Figure 13: DA-630DC Outline Drawing, Weight & Balance

Note: Dimensions are for reference only. See DA (Delivered Assembly) drawing for exact dimensions.

10.0 OPERATION

The operation of the DA-630DC is dependent on the source units that provide the audio inputs to the unit and the speakers attached to the output.

Once the unit is installed and any configuration table adjustments are made, the unit requires no further direct user interaction.

10.1 Controls

There are no user controls on the unit. All operation is controlled through the Cobranet Audio Distribution System interface.

10.2 Operation

10.2.1 Power On/Off

The unit is hard wired into the aircraft power system and has no independent On/Off switch on the unit. The unit is operating whenever the power is applied to the unit.

10.2.2 Audio Volume Control

The unit has no internal volume control. The volume must be adjusted at the source unit that supplies the audio input to the unit.

11.0 APPENDIX 1

11.1 Entertainment Section Configuration Settings

The entertainment amplifier contains a Configuration Table. These are parameters that can be set by a technician to specify customer preferences and default operating conditions. These come with default values from the factory. Only the Value entries can be changed. These parameters are representative configuration items.

Index	Parameter	Value	Low-Lim	Up-Lim	Default	DataType	Description	Settings
0	Zone1_Volume	15	0	31	15	VOLUME	Set the main volume initialization of the zone	0-31 steps, taken from volume taper table in memory
1	Zone1_Bass	0	-7	7	0	VOLUME	Set the bass initialization of the zone	-7 to +7
2	Zone1_Treble	0	-7	7	0	VOLUME	Set the treble initialization of the zone	-7 to +7
3	Zone1_Loudness	2	0	15	2	VOLUME	Enables the Loudness function of the zone	low bits 00 = bass 0, 01=bass+6, 02=bass+9, 03=bass+12 hi bits 00 = treb 0, 01=treb+4, 02=treb+6, 03=treb+8
4	Zone1_Compressor	1	0	1	1	ON/OFF	Enables the signal Compression function of the zone	0 = OFF, 1=ON
5	Zone1_Spatial	0	0	3	0	VOLUME	Enables the Spatial Enhancement function of the zone	0 = OFF, 1=min, 2=med, 3=max
6	Zone1_Mute	0	0	1	1	ON/OFF	Set Mute initialization on unit startup of zone	0 = UNMUTED, 1=MUTED
7	Zone2_Volume	15	0	31	15	VOLUME	Set the main volume initialization of the zone	0-31 steps, taken from volume taper table in memory
8	Zone2_Bass	0	-7	7	0	VOLUME	Set the bass initialization of the zone	-7 to +7
9	Zone2_Treble	0	-7	7	0	VOLUME	Set the treble initialization of the zone	-7 to +7
10	Zone2_Loudness	2	0	15	2	VOLUME	Enables the Loudness function of the zone	low bits 00 = bass 0, 01=bass+6, 02=bass+9, 03=bass+12 hi bits 00 = treb 0, 01=treb+4, 02=treb+6, 03=treb+8
11	Zone2_Compressor	1	0	1	1	ON/OFF	Enables the signal Compression function of the zone	0 = OFF, 1=ON
12	Zone2_Spatial	0	0	3	0	VOLUME	Enables the Spatial Enhancement function of the zone	0 = OFF, 1=min, 2=med, 3=max
13	Zone2_Mute	0	0	1	1	ON/OFF	Set Mute initialization on unit startup of zone	0 = UNMUTED, 1=MUTED
14	Analog_Input1_AttenA	0	0	1	0	ON/OFF	Sets input attenuation -10dB switch on Zone 1 input A	0 = no attenuation, 1 = -10dB
15	Analog_Input1_AttenB	0	0	1	0	ON/OFF	Sets input attenuation -10dB switch on Zone 1 input B	0 = no attenuation, 1 = -10dB
16	Analog_Input2_AttenA	0	0	1	0	ON/OFF	Sets input attenuation -10dB switch on Zone 2 input A	0 = no attenuation, 1 = -10dB
17	Analog_Input2_AttenB	0	0	1	0	ON/OFF	Sets input attenuation -10dB switch on Zone 2 input B	0 = no attenuation, 1 = -10dB
18	Analog_Input1_A-B	0	0	1	0	ON/OFF	Selects Analog input Zone1 between A and B input	0 = A input, 1 = B input
19	Analog_Input2_A-B	0	0	1	0	ON/OFF	Selects Analog input Zone2 between A and B input	0 = A input, 1 = B input
20	Analog_Zone1_Gain	0	-20	20	0	VOLUME	Adjusts the overall base gain of Zone1 for analog inputs	0 = default, plus or minus in 1dB steps
21	Analog_Zone2_Gain	0	-20	20	0	VOLUME	Adjusts the overall base gain of Zone2 for analog inputs	0 = default, plus or minus in 1dB steps

22	Speaker1_Volume	0	-10	10	0	VOLUME	Output gain trim for channels 1	0 = default, plus or minus in 1dB steps
23	Speaker2_Volume	0	-10	10	0	VOLUME	Output gain trim for channels 2	0 = default, plus or minus in 1dB steps
24	Speaker3_Volume	0	-10	10	0	VOLUME	Output gain trim for channels 3	0 = default, plus or minus in 1dB steps
25	Speaker4_Volume	0	-10	10	0	VOLUME	Output gain trim for channels 4	0 = default, plus or minus in 1dB steps
26	Speaker5_Volume	0	-10	10	0	VOLUME	Output gain trim for channels 5	0 = default, plus or minus in 1dB steps
27	Speaker6_Volume	0	-10	10	0	VOLUME	Output gain trim for channels 6	0 = default, plus or minus in 1dB steps
28	Speaker7_Volume	0	-10	10	0	VOLUME	Output gain trim for channels 7	0 = default, plus or minus in 1dB steps
29	Speaker8_Volume	0	-10	10	0	VOLUME	Output gain trim for channels 8	0 = default, plus or minus in 1dB steps
30	Speaker1_Load	4	0	255	4	OHM	Expected Output load for channel 1	0=open, 4=4ohm, etc. 255 = Open
31	Speaker2_Load	4	0	255	4	OHM	Expected Output load for channel 2	0=open, 4=4ohm, etc. 255 = Open
32	Speaker3_Load	4	0	255	4	OHM	Expected Output load for channel 3	0=open, 4=4ohm, etc. 255 = Open
33	Speaker4_Load	4	0	255	4	OHM	Expected Output load for channel 4	0=open, 4=4ohm, etc. 255 = Open
34	Speaker5_Load	4	0	255	4	OHM	Expected Output load for channel 5	0=open, 4=4ohm, etc. 255 = Open
35	Speaker6_Load	4	0	255	4	OHM	Expected Output load for channel 6	0=open, 4=4ohm, etc. 255 = Open
36	Speaker7_Load	4	0	255	4	OHM	Expected Output load for channel 7	0=open, 4=4ohm, etc. 255 = Open
37	Speaker8_Load	4	0	255	4	OHM	Expected Output load for channel 8	0=open, 4=4ohm, etc. 255 = Open
38	PA_Amplifier_Present	1	0	1	1	ON/OFF	Specifies if a PA amplifier is present	0 = NO, 1 = YES
39	Standby_Pin_Enable	0	0	1	0	ON/OFF	Specifies if amp is controlled by pin 40,41 standby voltage	0 = NO, 1 = YES
40	SPI_Interrupt_Delay	10	0	255	10	DELAY	Specifies the minimum delay between assertions of SPI_ENET_REQUEST	Time in mSec
41	Heartbeat_Timeout	50	0	255	50	DELAY	Specifies the number of seconds without HB for a timeout. 0 = no HB / no timeout	Time in 100mSec
42	Host_Model_Ver_MSB	0	0	255	0	HOST_TYPE	Reserved for Host tracking flagging	Value
43	Host_Model_Ver_LSB	0	0	255	0	HOST_TYPE	Reserved for Host tracking flagging	Value
44	Host_Local_Ver_MSB	0	0	255	0	HOST_TYPE	Reserved for Host tracking flagging	Value
45	Host_Local_Ver_LSB	0	0	255	0	HOST_TYPE	Reserved for Host tracking flagging	Value

Table A1

11.2 Environmental Categories and Tests

Environmental Tests	*RTCA/DO-160G Section*	*Conducted Test Category*
Temperature and Altitude		
Low Temp	4.5.1 & 4.5.2	Qualified by Similarity to Category **A2**
High Temp	4.5.3 & 4.5.4	Qualified by Similarity to Category **A2**
In-Flight Loss of Cooling	4.5.5	Identified as Category **X** Not applicable, cooling not required
Altitude	4.6.1	Qualified by Similarity to Category **A2**
Decompression	4.6.2	Qualified by Similarity to Category **A2**
Overpressure	4.6.3	Identified as Category **X** , no test performed
Temperature Variation	5	Qualified by Similarity to Category **C**
Humidity	6	Qualified by Similarity to Category **A**
Operational Shocks & Crash Safety	7	Qualified by Similarity to Category **B**
Vibration	8	Qualified by Similarity to Category **S, H**, Curve(s) **C, R**
Explosion Proofness	9	Qualified by Similarity to Category **E**
Waterproofness	10	Identified as Category **X** , no test performed
Fluids Susceptibility	11	Identified as Category **X** , no test performed
Sand and Dust	12	Identified as Category **X** , no test performed
Fungus Resistance	13	Identified as Category **X** , no test performed
Salt Spray	14	Identified as Category **X** , no test performed
Magnetic Effects	15	Qualified by Similarity to Category **Z**
Power Input	16	Qualified by Similarity to Category **ZXX**
Voltage Spike	17	Qualified by Similarity to Category **A**
Audio Frequency Conducted Susceptibility	18	Qualified by Similarity to Category **Z**
Induced Signal Susceptibility	19	Qualified by Similarity to Category **AC**
Radio Frequency Susceptibility	20	Qualified by Similarity to Conducted **T** Radiated **T**
Emission of Radio Frequency Energy	21	Qualified by Similarity to Category **M**
Lightning Induced Transient Susceptibility	22	Qualified by Similarity to Category **XXE3XX** Pin Injection **XX ,** no test performed Cable Bundle **E3** Burst **XX** , no test performed
Lightning Direct Effects	23	Identified as Category **X** , no test performed
Icing	24	Identified as Category **X** , no test performed
Electrostatic Discharge	25	Qualified by Similarity to Category **A**
Fire, Flammability	26	Identified as Category **X** , no test performed

Table A2