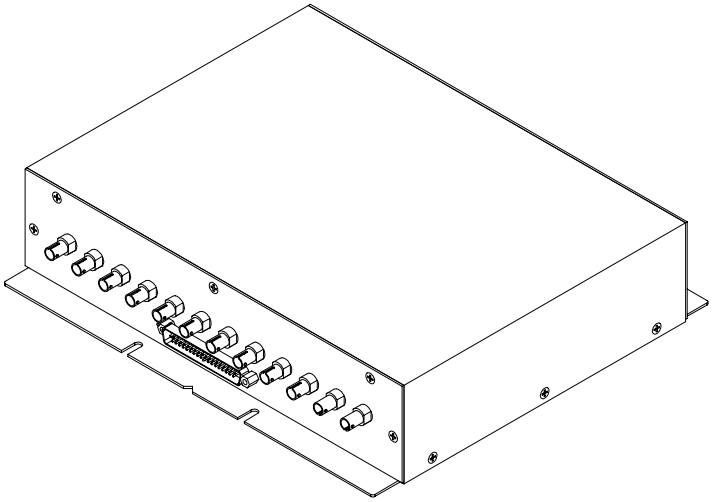
Installation and Operation Manual

ASP-101-02-x

Surround Sound Processor

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ASP-101-02-x

Surround Sound Processor

1.0 General Information

1.1 Introduction

This manual contains information for the proper application, installation, and operation of the Audio International, Inc. (AI), Surround Sound Processor, Model # ASP-101-02-x. The “-x” suffix in the model number designates the type of connector utilized. Also included are relative physical and electrical characteristics of the unit.

1.2 Purpose of the Equipment

The Surround Sound Processor has been specifically designed to meet the special requirements of aircraft use. The unit is comprised of four functional modules; audio control, cabin audio surround processor, digital to analog audio conversion, and FiberLink™ interface.

The ASP-101-02-x accepts audio inputs from the entertainment source equipment. Using commands issued from switch panels, LCD touch screens or electroluminescent touch screen panels, the unit distributes the audio to cabin speakers.

1.3 Operational Features

- Allows multiple source audio inputs to be selected and routed independently to multiple audio devices.
- FiberLink™ cabin audio output.
- Integrated cabin audio surround sound processor.
- 4 digital audio source inputs to integrated surround sound processor.
- 1 analog audio input to integrated surround sound processor.
- 1 digital audio to analog audio converter.
- Control, configuration, and interface with other components via Audio International's proprietary RS-485 serial data bus.
- 3 binary unit ID pin inputs identify each module on the data bus in a multi-unit configuration (up to 8 units total on the same AI proprietary RS-485 data bus).
- Separate PA audio and PA key inputs provide for entertainment audio override capability when activated for both the integrated cabin audio surround sound processor and the integrated 16 x 16 internal audio multiplexer.
- Power-up defaults are software configurable for each audio output.
- Lightweight, rugged aircraft design.

2.0 Application

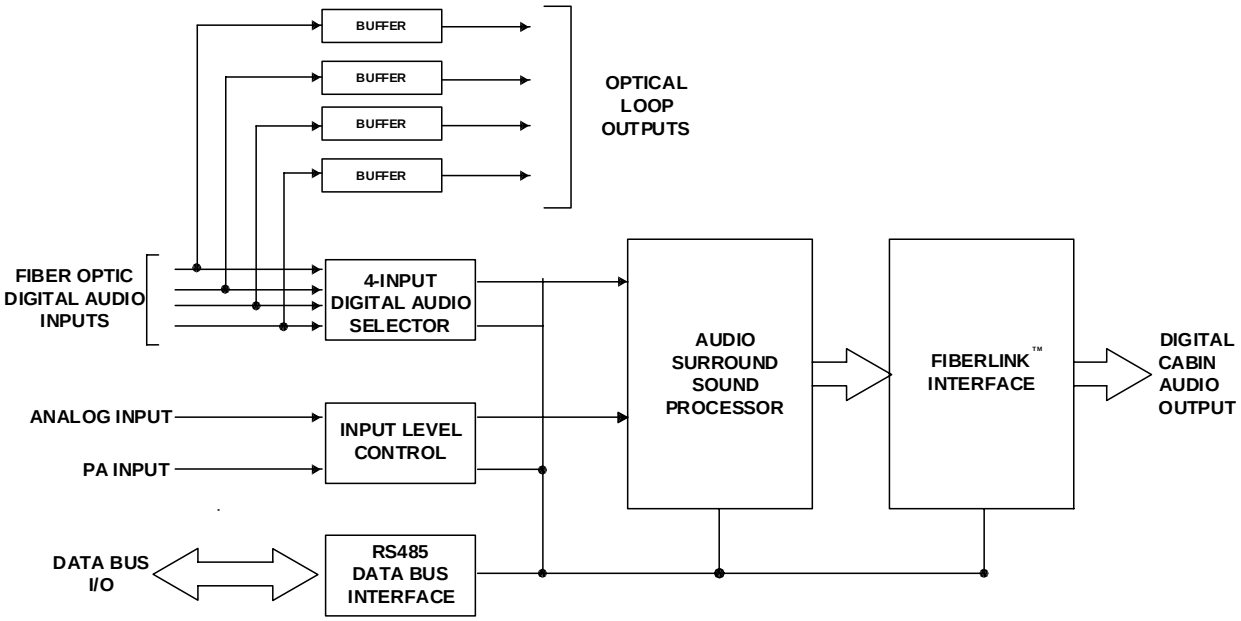
2.1 Introduction

The ASP-101-02-x is part of a complete cabin audio entertainment system. The application of the unit is specific to a particular aircraft based upon the desires of the customer or designer.

2.2 Typical Application

The unit provides a switching matrix for cabin entertainment systems utilizing multiple source audio inputs and outputs. Since it resides on AI's proprietary RS-485 data bus, any switch or control device can independently select from amongst the input sources. A dedicated FiberLink™ cabin audio output is provided via the integrated cabin audio surround sound processor.

2.3 Typical System Block Diagram



2.4 Multiple Unit Configurations

There is ONLY one (1) audio source input and output possible on each ASP-101-02-x. If more than one (1) audio input or output is needed, multiple-unit configurations are possible via AI's proprietary RS-485 serial data bus. This allows selection of any audio source from any location provided the proper audio source inputs are correctly routed to each ASP-101-02-x unit as needed. The number of possible units in a system is dependent on other modules used within the cabin audio system, up to eight (8) can be used on the same AI proprietary RS-485 data bus segment.

2.5 Data Bus Control

There are no controls on the ASP-101-02-x. Switching control of the unit is handled by commands sent via AI's proprietary RS-485 serial data bus. Some features are set upon installation using an external PC (typically a laptop) and an MSM2912-01-x, RS-232 / RS-485 Converter Module. A software program designed by Audio International specifically for this task sets the power-up state for each audio output, trim levels for each audio input source, and cabin audio Surround Sound Processor and FiberLink™ network specifications.

3.0 Installation

3.1 Prior to Installation

The ASP-101-02-x is a simple module to install. Prior to installation the following items should be considered:

3.1.1 During the design and layout of the aircraft cabin, careful consideration of the location of this and all other audio modules is necessary. Some of the items to consider include:

- Space
- Proximity to other devices (i.e. source equipment)
- Available power supply
- Length of cable runs
- Environmental conditions (temperature, humidity, etc.)
- Location of other aircraft systems (i.e. oxygen delivery)
- Access for service repair (if applicable)
- Convenience for user interface (if applicable)

3.1.2 The module shall be installed to conform to the standards designated by the customer, installing agency, or other specified requirements.

3.1.3 Select a mounting location for the ASP-101-02-x prior to installation. User access is NOT a consideration when placing unit into the suitable mounting location. Refer to Section 7.0 for dimensions and attachment points. The unit shall be bonded to the aircraft frame with a bonding resistance of less than 0.001-ohms.

3.2 Unpacking and Inspection

3.2.1 Carefully open the packaging and remove the ASP-101-02-x. Verify that all components have been included in the package per the packing list. Inspect the unit for shipping damage.

3.2.2 If damage has occurred during shipping, a claim should be filed with Audio International within 24 hours and a Return Request Authorization Number shall be obtained from AI. Refer to the front cover of this manual for address and telephone number of Audio International, Inc. Repackage the unit in its original packaging materials and return it to AI following instructions given by the AI representative. If no return is necessary, retain the packing list and the packing materials for storage.

3.3 Cautions & Warnings

3.3.1 All analog audio output lines from the Surround Sound Processor unit shall be shielded and properly grounded. Analog audio input lines shall be shielded and grounded at the source, unless indicated otherwise. Avoid placing cables near high power wires.

3.3.2 It is important to do a pin-to-pin power and ground check on all connectors. Ensure that power and ground are applied only where specified. Damage to the unit can result if power or ground is applied to the wrong points.

3.3.3 **DO NOT** connect or disconnect the unit while power is applied.

3.3.4 **DO NOT** connect or disconnect any inputs or outputs when power is applied to the unit.

3.3.5 **DO NOT** remove any factory-installed screws. Damage to the unit can result and void any warranties.

3.3.6 ESD (Electro Static Discharge) guidelines shall be followed.

3.4 Wiring Requirements

The installing agency shall supply and fabricate all external cables and connectors. The length and routing of external cables should be carefully studied and planned before attempting installation of the equipment. Allow adequate space for installation of cable and connectors.

3.4.1 Digital Audio / FiberLink™ Lines

All digital audio / FiberLink™ wiring shall be 100/140 µm (core/cladding) multi-mode fiber optic cabling. All fiber optic connectors/couplers shall use ceramic ferrules to minimize adverse reflection effects. BRAND-REX P/N: OC-1011 or equivalent fiber optic cabling shall be used for all digital audio / FiberLink™ wiring.

3.4.2 Analog Audio Lines

All analog audio wiring shall be 22 AWG, MINIMUM, twisted shielded cable unless otherwise specified. All audio input and output lines require twisted shielded cable with the cable shields grounded at the source. Shield continuity shall be maintained through all production breaks.

3.4.3 Power Wires

All power and ground wires shall be 20 AWG, MINIMUM. Power ground wires shall be grounded within twelve inches of the unit. Protect power wires with circuit breakers or fuses located close to the electrical power source bus.

3.4.4 AI's Proprietary RS-485 Serial Data Bus

The ASP-101-02-x is designed to interface with other Audio International equipment via AI's proprietary RS-485 serial data bus. The data bus shall be implemented using a twisted shielded pair cable in accordance with **MIL-DTL-27500** or equivalent. The wire size for the conductors in this cable shall be 22 AWG, MINIMUM. The shield shall be connected to a shield pin or to ground at one end of the connection between devices. Shield terminations shall be made as close to the connector pin as possible.

Maximum derivation distance from data bus splice connections to actual connector of each data bus device is 24 inches in length. All modules on AI's proprietary RS-485 serial data bus shall be connected in a daisy-chain configuration.

3.4.5 MIL-SPEC Requirements

All wires shall be in accordance with **MIL-W-22759** or equivalent. Twisted shielded cable shall be in accordance with **MIL-DTL-27500** or equivalent.

3.4.7 Clearance and Separation Requirements

When running cables, avoid sharp bends and placing cables near aircraft control cables. Maintain a MINIMUM clearance of three (3) inches from any control cable. If wiring is run parallel to combustible fluid or oxygen lines, maintain a separation of six (6) inches between the lines.

3.5 Physical Characteristics

3.5.1 The ASP-101-02-x should be located away from heat sources, magnetic fields, direct sunlight, and areas with excessive dust and/or moisture. The unit shall NOT be mounted to the skin of the aircraft.

3.5.2 Refer to Section 7.0 for unit dimensions and mounting hole sizes.

3.5.3 The unit shall be rigidly mounted to its location using the appropriate fastening hardware supplied by the installing agency.

3.5.4 When mounting the unit to the aircraft's frame, allow sufficient space for mating connectors.

3.5.5 ASP-101-02-x Configuration Options

Audio

Each audio input may have the following configuration options specified:

- Input Level adjustment from 0% to 100% of full maximum in increments of 2%

Each audio output (amplifier and headphone) may have the following configuration options specified independently:

- Power-up volume level from 0% to 80% in increments of 10%
- Power-up bass level from 0% to 100% in increments of 25%.
- Power-up treble level from 0% to 100% in increments of 25%.

3.6 Mating Connector Information

3.6.1 ASP-101-02-x Mating Connectors

Model #	Pin #	Description
ASP-101-02-1	P1	RD37F10JVL0 Female Plug (Positronic)
	P2-P13	Mates with ST Series Optical Cable 501380-2 AMP or Equivalent
ASP-101-02-2	P1	DCMA-37S Female Plug M85049/48-1-4 Backshell D20419-18 Male Screwlock
	P2-P13	Mates with ST Series Optical Cable 501380-2 AMP or Equivalent
ALL CONNECTORS TO HAVE LOCK TAB SETS ON UNIT.		

3.7 Pinout Assignments and Descriptions

P1 Pinout Chart	
Pin #	Description
1	+28 VDC Input (Digital)
2	Ground Input
3	Data Bus A
4	Data Bus B
5	Data Bus Shield
6	Unit ID 1
7	Unit ID 2
8	Unit ID 4
9	ID Common
10	PA Key Input
11	PA Audio High Input
12	PA Audio Low Input
13	PA Audio Shield Input
14	Left Analog Audio Input High
15	Left Analog Audio Input Low
16	Left Analog Audio Input Shield
17	Right Analog Audio Input High
18	Right Analog Audio Input Low
19	Right Analog Audio Input Shield

Pin #	Description
20	Left Analog Audio Output High
21	Left Analog Audio Output Low
22	Left Analog Audio Output Shield
23	Right Analog Audio Output High
24	Right Analog Audio Output Low
25	Right Analog Audio Output Shield
26	Front Left Output High
27	Front Left Output Low
28	Front Right Output High
29	Front Right Output Low
30	Rear Left Output High
31	Rear Left Output Low
32	Rear Right Output High
33	Rear Right Output Low
34	Woofer Output High
35	Woofer Output Low
36	Center Output High
37	Center Output Low

Connector Functions P2 – P13			
P2	Optical Input #1	P8	Optical Input #4
P3	Optical Output #1	P9	Optical Output #4
P4	Optical Input #2	P10	Optical Input (for Analog Out)
P5	Optical Output #2	P11	Optical Output
P6	Optical Input #3	P12	Fiberlink™ Input
P7	Optical Output #3	P13	Fiberlink™ Output

3.8 Post Installation Test

3.8.1 With the aircraft power “ON”, select an audio source unit and operate that unit to create audio signal to the ASP-101-02-x. Verify that an audio output is present at one of the audio output locations. Repeat this test for each audio source unit in the system. Repeat this test for each audio output location in the system.

3.8.2 Repeat the above tests using all control units in the aircraft (switch panels, IR Remotes, LCD touch-screen monitors, etc.)

3.8.3 Activate and speak into a microphone to verify that the PA audio overrides the entertainment audio.

3.8.4 All aircraft audio functions should be tested for proper operation. If all audio functions are operational, the ASP-101-02-x has been properly installed. Refer to Section 5.0, Troubleshooting, if problems are encountered.

4.0 Operation

4.1 Power Up

Power to the unit is initiated when the aircraft power is turned on and remains on at all times.

4.2 Source Switching

There are no direct controls on the unit. All functions are controlled through commands sent via AI's proprietary RS-485 serial data bus. Switching audio sources from any location is accomplished through any user device designed to give selection choice – switch panels, LCD touch screens, remote controls, etc.

5.0 Troubleshooting

5.1 General Troubleshooting Procedures

Many problems can be isolated with the following general techniques:

- To verify power to the unit, recheck +28 VDC power is applied to the proper pins on the unit. Use a voltmeter to verify correct level.
- To reset, remove power from the unit for at least one minute and reapply power to verify that the problem still exists.
- Recheck all connections to the unit for security. Check all harness runs for possible pinching. Recheck all pin outs for application accuracy.

5.2 Troubleshooting Chart

Problem	Possible Cause	Solution
Audio is not present in the speakers	Audio source not selected or activated	Ensure an active audio source input is present
	Unit is not properly connected to the audio source(s)	Ensure the unit has been properly connected to the audio source(s)
	Circuit breaker has been tripped	Reset circuit breaker
	There has been a power failure while the respective entertainment unit was operating	Refer to the entertainment unit operation manual to re-activate the corresponding unit
Problem selecting audio sources	Control panel or ASP unit improperly connected to AI's proprietary RS-485 serial data bus	Check each device for proper connections to data bus
	Device ID pins improperly connected	Verify proper device ID pin connections on units
	Selection not responding	Verify that data bus A and B connections are not swapped at any device on data bus segment

6.0 Specifications

Physical Specifications	
Housing	Black Brushed Aluminum
Dimensions (l x w x h)	9.4" x 10.5" x 2.4" 23.88 cm x 26.67 cm x 5.08 cm
Weight	2.5 lbs / 1.13 kg

Power Requirement Specifications	
P7 (Entertainment)	Amp Maximum @ +28 VDC Amp Nominal @ +28 VDC
P10 (Digital)	Amp Maximum @ +28 VDC Amp Nominal @ +28 VDC
Operating Voltage Range	+18 to + 32 VDC, +28 VDC Nominal

Digital Audio Specifications	
Number of Audio Inputs	4 – Entertainment 1 – D/A Conversion
Number of Audio Outputs	1 - FiberLink™

Analog Audio Input Specifications	
Number of Audio Inputs	1
Input Signal Level	+1 to + 5 VRMS, +2 VRMS optimum (differential)
Input Impedance	4.7 k-ohm / input
Frequency Response	20 Hz – 20 kHz +/- 1 dB
PA Audio Input	+1 to +5 VRMS, +2 VRMS optimum @ 1 k-ohm

Analog Audio Output Specifications (P6 & P9 only)	
Number of Audio Outputs	1
Output Power	530 mW / Channel RMS
Output Impedance	50-ohm MINIMUM (common ground output)

PA and Video Briefer Key Input Specifications	
Active Signal Type	Ground
Active Signal Level	< +1.2 VDC

7.0 Reference Drawings

The following diagrams show the unit dimensions and connector locations for the ASP-101-02-x. All dimensions are shown in inches.

