AVDS Installation Manual

Document Information

Summary: Installation instructions and recommendations for AVDS, including mechanical and electrical specifications.

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Revision: F
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Revision History

REV	Date	ECO	Initials	Description
A	8/27/15	--	GJC	Initial submittal for release
B	8/31/15	--	GJC	SDI output card revision
C	9/10/15	--	DAG	Ethernet Card pinout change
D	9/15/15	--	GCJ	Corrected SDI output to 4 output only in all tables Added switch/router note to Ethernet Section 5.3.17
E	9/29/15	00480	GJC	Changed Ethernet card to show Port 4 as 1Gbps instead of Port 1 Grammatical error corrected in Table 4 Note 6
F	5/13/16	00583	GJC	Removed all reference to new SDI output card (110-0068-XX) due to product availability status Added current draw vs input voltage chart to Table 2 Added additional information to P1 pinout table Added PIC contact information everywhere PIC cable called out Updated 4 Port Ethernet Card (110-0066-01) information Removed incorrect note regarding RS-485 Enable connection and added multi-drop limitation note Added chassis connections to pinouts Added video converter card 3G-SDI limitation Updated Channel Tracker grounding nomenclature

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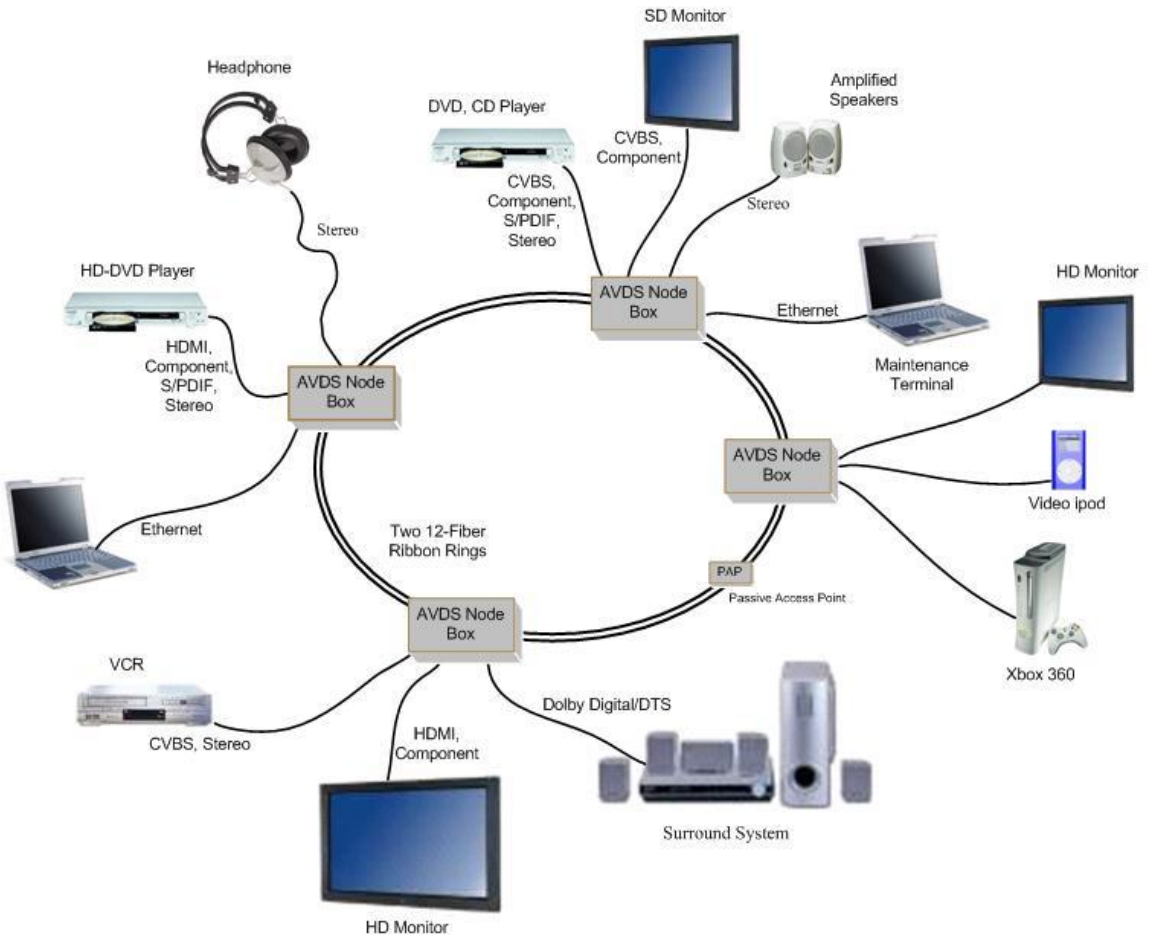
1 AVDS Overview

The Audio Video Distribution System (AVDS) provides a network infrastructure for standard and high definition audio/video content in an uncompressed format allowing for interconnection of source and rendering equipment in a redundant ring topology. It also integrates a conventional gigabit Ethernet backbone for more general-purpose data networking.

The AVDS is intended to provide a foundation for data transaction on the aircraft: a backbone upon which high-speed video, audio, control and information can be transferred. The system is specifically designed to satisfy the unique demands of the business jet cabin environment.



The AVDS is made up of one or multiple Nodes. A single Node consists of a base unit and slots for up to 8 I/O cards. The base unit provides the fiber backbone and network connectivity for routing audio, video, and computer data. The I/O cards provide connectivity to a variety of source equipment and rendering devices.

2 Node Types

A single node consists of a base unit and slots for up to 8 I/O cards. The base unit provides the fiber backbone and network connectivity for routing audio, video, and computer data. The I/O cards provide connectivity to a variety of source equipment and rendering devices.

AVDS Nodes are packaged in several different configurations. In general, a Networked 8-slot node is given a specific part number in the form of 100-0025-XX. A standalone 8-slot node (fiber modules removed) is given a specific part number in the form of 100-0026-XX.

Figure 1: 8-slot, networked Node unit

2.1 Mechanical Specifications

8-Slot Node	
Unit Height	2.5 in. (6.35 cm)
Unit Width (w/o mounting feet)	9.0 in. (22.86 cm)
Unit Width (w/ mounting feet)	9.9 in. (25.15 cm)
Unit Depth	5.2 in. (13.2 cm)
Unit Weight	See Table 1

2.2 8-Slot Node Outline

The AVDS 8-Slot Node box is nominally 2.5” x 5.2” x 9.0” with four mounting tabs that support #8 mounting hardware as shown in the diagram that follows.

2.2.1 Two Ethernet Ports*

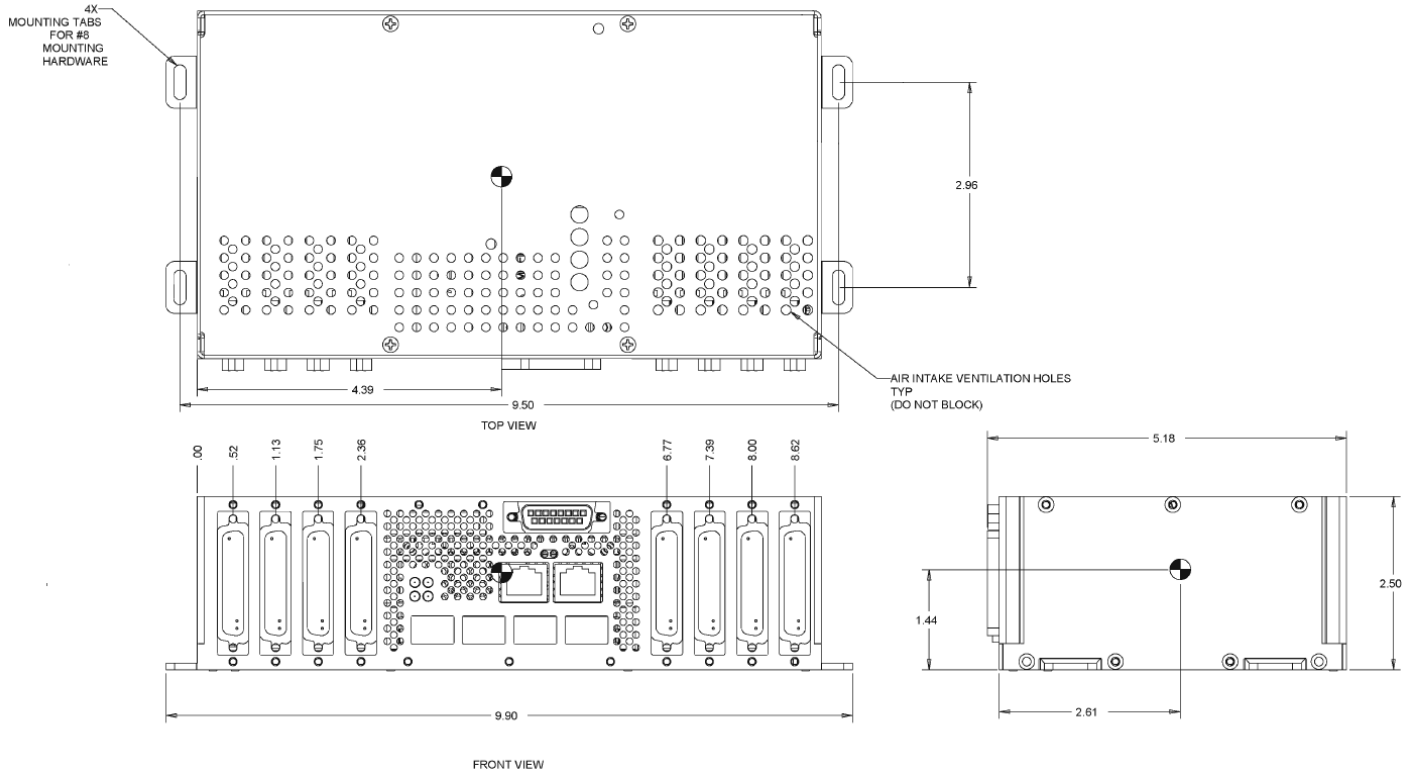


Figure 2 AVDS Node Box Dimensions 8-Slot with 2 Ethernet Ports

2.2.2 Three Ethernet Ports

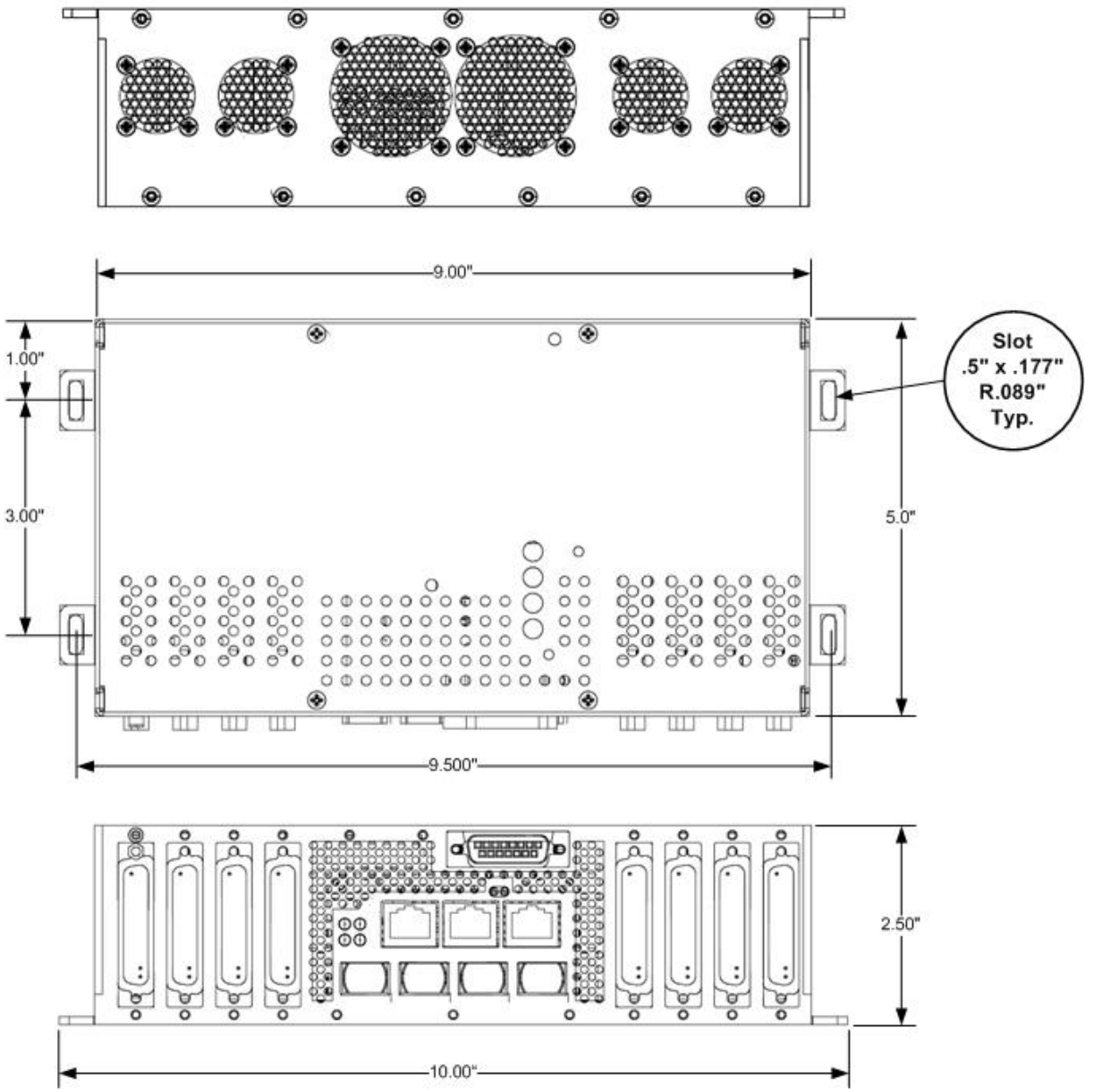


Figure 3 AVDS Node Box Dimensions 8-Slot with 3 Ethernet Ports

2.3 Mounting Clearances

Air flow intake comes from vents on the cover and connector panels and exhausts out the panel opposite the connectors where the fans are mounted as seen in Figure 1. When installing, care must be taken to allow clearance for connectors and cables and adequate air flow around the vents. A confined space must be adequately vented to provide a minimum air flow of 33 CFM into and out of the confined space. Recommended minimum clearances are shown in the figure below.

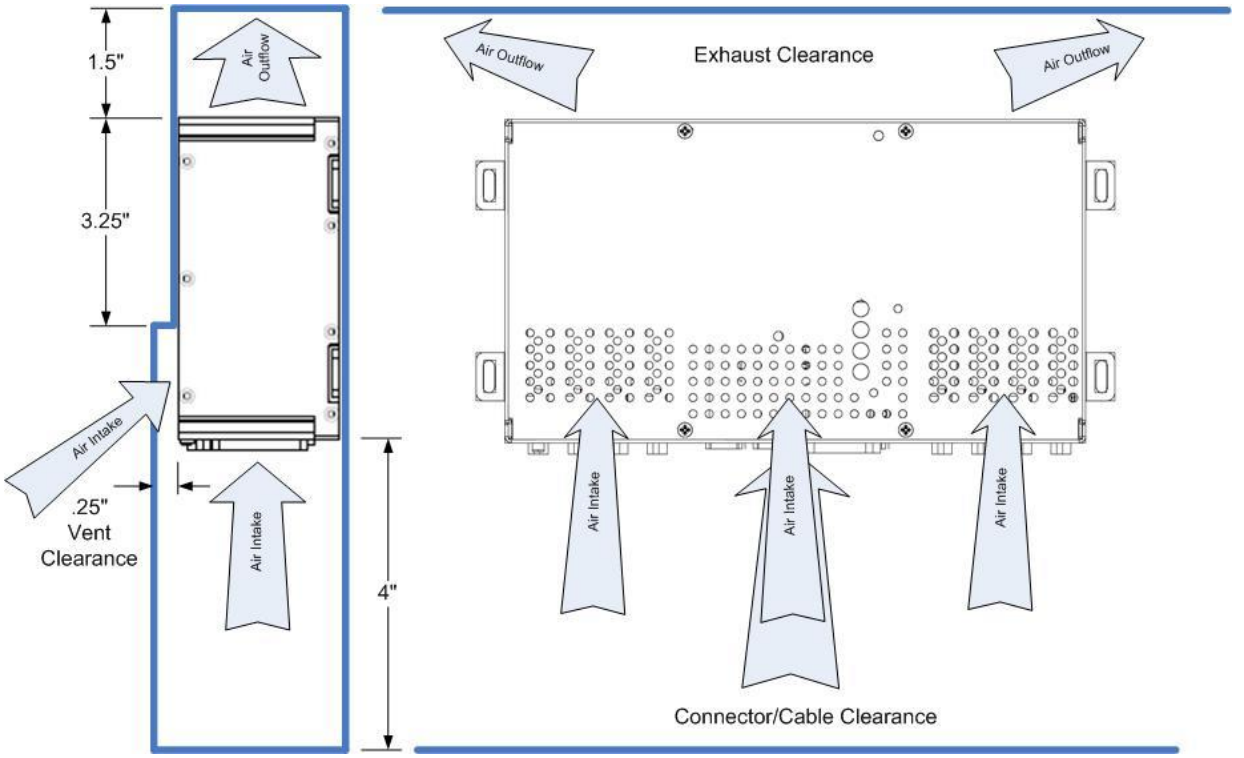


Figure 4 Recommended Clearances

2.4 Indicators

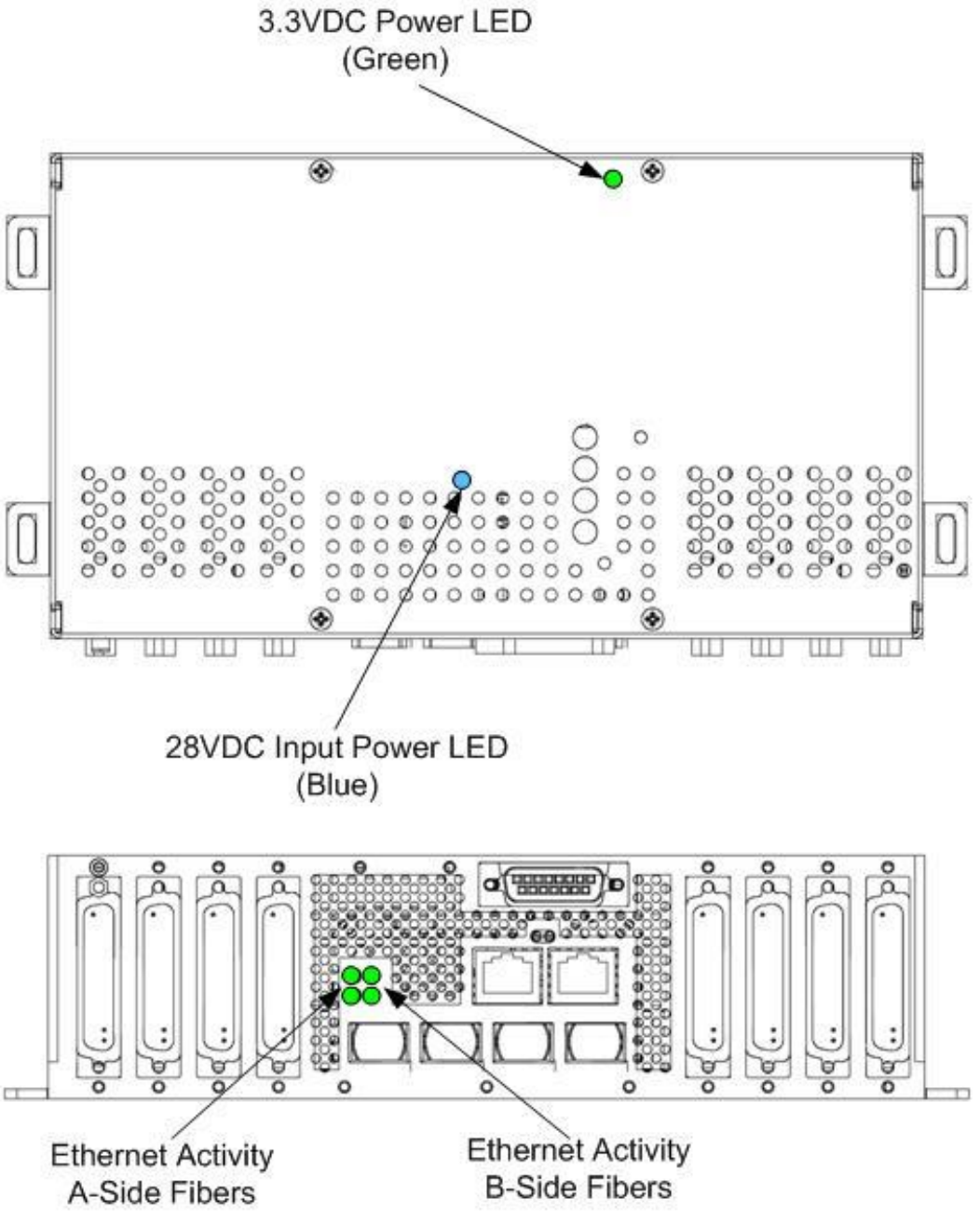


Figure 5 Indicators

2.5 Labels


Innovative Advantage, Inc.
AVDS Node Box
Seat Group 1
100-0003-01 Ser # 12345N1234
Mod:
PMA xxxx – See website
Node Address
x 1000
Reset
x 100
x 10
x 1
www.in-advantage.com
Made in USA
S1
S2
S3
S4
RA
TA
RB
TB
S5
S6
S7
S8

2.6 Node Address Switches

The node address switches can be accessed through holes in the top cover of the enclosure. These are 10-position rotary switches.

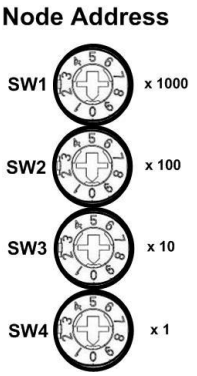


Figure 6 Node Address Switches

There are four switches (SW1-SW4). SW1 is the most significant digit, SW4 is the least significant digit. Node address ranges are from 1 to 9999. The node's base IP address can be determined from the node's address as follows:

10.0.ab.cd

where 'a' represents SW1 setting, 'b' is SW2, 'c' is SW3, and 'd' is SW4. Thus, nodes can have base IP addresses in the range of **10.0.0.1 to 10.0.99.99**. The AVDS Node subnet mask is 255.0.0.0.

2.7 AVDS Component Weights

Part Number	Description	Weight (pounds)
110-0001-xx	8-Slot Base Unit plus Enclosure (2 Ethernet Ports)	2.75
110-0053-xx	8-Slot Base Unit plus Enclosure (3 Ethernet Ports) [will supersede old 8-Slot Base Unit]	2.75
110-0003-xx	CVBS x4 Input Card	0.11
110-0004-xx	CVBS x 4 Output Card	0.11
110-0005-xx	Stereo x 4 Input Card	0.14
110-0006-xx	Stereo x 4 Output Card	0.16
110-0008-xx	3G/HD/SD-SDI x 4 Input Card	0.09
110-0009-xx	Digital Audio x 4 Output Card	0.21
110-0012-xx	HDMI + DA Input Card	0.14
110-0014-xx	3G/HD/SD-SDI x 4 Output Card	0.10
110-0015-xx	Component/CVBS/Graphics Input Card	0.20
110-0019-xx	Video Converter Card	0.19
110-0020-xx	CVBS x3 + 3G/HD/SD-SDI Output Card	0.11
110-0036-xx	3G/HD/SD-SDI x 4 Input with Embedded Audio	0.18
110-0039-xx	Channel Tracker	0.21
110-0043-xx	Encoder Card	0.19
110-0045-xx	HDMI + CVBS	0.15
110-0056-xx	Decoder Card	0.16
110-0065-xx	Digital Audio x 4 Input	0.21
110-0066-xx	Ethernet x 4 Card	0.11

Table 1 AVDS Component Weights

*Products with asterisk are new or in development. Call for availability.

All weights assume connector protective end-caps are removed.

2.8 Electrical Specifications

Power Input Voltage (nominal)	28 Vdc
Power Input Voltage (minimum)	22 Vdc
Power Input Voltage (maximum)	30 Vdc
Power Input Current	See Table 2
Maximum Input Power Loss Holdup*	500 microseconds
RS232/RS485 Selection	Open - RS232
	Grounded - RS485
RS232 Low Voltage	-25 V – 0.6 V
RS232 High Voltage	2 V – 25 V
RS232 Input Resistance	5k ohms
RS232 Output Voltage	+-5V
RS485 Input Differential Threshold	-200 mV
RS485 Input Resistance	48k Ohms
RS485 Output Voltage	+-1.5V (27 ohm bus load)

*Power losses in excess of this value will cause the unit to reset and return to its default state upon restoration of power. The expectation is that the control system maintains prior state and will command the AVDS appropriately to restore conditions prior to the power loss.

2.8.1 AVDS Component Power Requirements

Table 2 AVDS Component Power Requirements		
Part Number	**Description**	**Current (Amps) @ 28VDC**
110-0001-xx	8-Slot Base Unit plus Enclosure	1.35
110-0053-xx	8-Slot Base Unit plus Enclosure (3 Ethernet Ports) [will supersede old 8-Slot Base Unit]	1.35
110-0003-xx	CVBS x4 Input Card	0.13
110-0005-xx	Stereo x 4 Input Card	0.20 (1)
110-0006-xx	Stereo x 4 Output Card	0.20 (1)
110-0008-xx	3G/HD/SD-SDI x 4 Input Card	0.11
110-0009-xx	Digital Audio x 4 Output Card	0.22
110-0012-xx	HDMI + DA Input Card	0.15
110-0014-xx	3G/HD/SD-SDI x 4 Output Card	0.16
110-0015-xx	Component/CVBS/Graphics Input Card	0.28
110-0019-xx	Video Converter Card	0.29
110-0020-xx	CVBS x3 + 3G/HD/SD-SDI Output Card	0.16
110-0036-xx	3G/HD/SD-SDI x 4 Input with Embedded Audio	0.43 (1)
110-0039-xx	Channel Tracker	0.22
110-0043-xx	Encoder Card	0.35 (1)
110-0045-xx	HDMI + CVBS	0.27 (1)
110-0056-xx	Decoder Card	0.32 (1)
110-0065-xx	Digital Audio x 4 Input	0.22
110-0066-xx	Ethernet x 4 Card	0.05

Notes:

1) The AVDS uses internal rail voltages of 5, 3.3, 2.5, 1.2, and -5 VDC. These particular cards use high amounts of current for a particular rail voltage. To ensure proper power budget overhead, consult with Innovative Advantage if using a combination of four (4) or more of these cards noted.

2) *Products with asterisk are new or in development. Call for availability.

3) Values shown are at 28VDC. Use the following table to determine the current draw scalar based on actual input voltage.

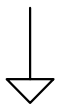
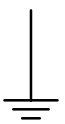
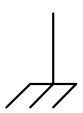
Actual Current Draw = [Current Draw from Table 2 above] * [Relative Current Draw below]

Input Voltage	Relative Current Draw
22VDC	1.27
24VDC	1.11
26VDC	1.08
28VDC	1.00
30VDC	0.94

2.8.2 AVDS Grounding

In order to provide the highest quality distribution, the AVDS uses a specific grounding scheme. Extra precaution must be given to the ground connections of the AVDS LRU. There are three (3) types of grounds within the AVDS LRU as detailed in Table 3 below. It is critical to pay special attention to the symbols used throughout this document and ensure that proper grounding is maintained throughout the entire system.

Table 3: AVDS Grounding Definition

Symbol	Description	Reference Name(s)
	This symbol references the isolated ground of the AVDS. As shown in Figure 7 below, this ground is on the isolated side of the Isolated DC/DC Converter. This signal ground is used to ensure a clean ground and is used by nearly all internal circuity of the AVDS. This signal ground is also used to provide an isolated signal ground for audio and video signals.	Signal Ground Audio Return
	This symbol references the filtered and protected 28VDC Return of the AVDS. As shown in Figure 7 below, this ground has input protection (ESD, surge, etc) and filtering applied before it is distributed throughout the AVDS. Although it is distributed to all of the card slots, it is rarely used at the card level.	28VDC Return
	This symbol references the chassis connection of the AVDS. This chassis connection is bonded between the input power connector, the AVDS housing, and all card slot connectors. As shown in Figure 7 below, Chassis is connected to the 28VDC Return connection before the protection and filtering components.	Chassis

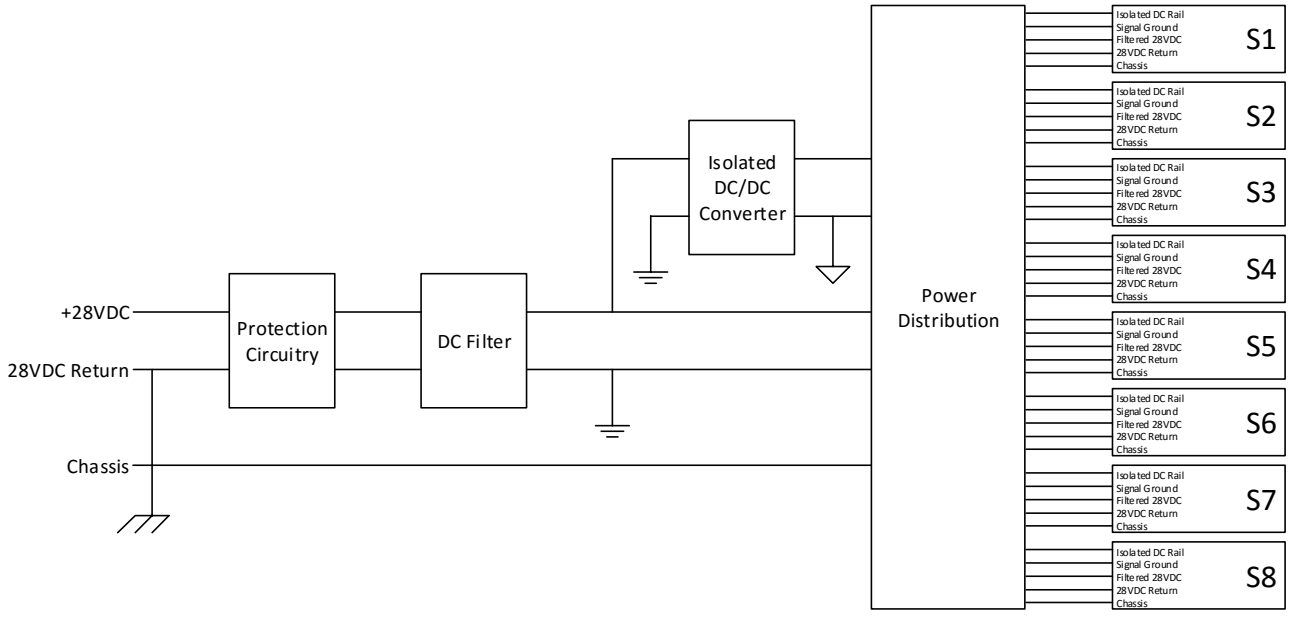


Figure 7: AVDS Power Distribution Block Diagram

3 Environmental

AVDS meets or exceeds the following environmental standards as specified by DO-160G.

DO 160G Section	Conditions	Cabin	Notes
4.0	*Temperature & Altitude*	*A1*	1 2 5 6
5.0	Temperature Variation	Category C	6
6.0	Humidity	Category A	6
7.0	Operation Shocks & Crash Safety	Category B	6
8.0	Vibration	Category S (Curve B)	6
16.0	Power Input	Category A	3 6
17.0	Voltage Spike Conducted	Category B	6
21.0	Emission Of Radio Frequency (Radiated & Conducted)	Category M	4 6
Flam	FAR 25.853(a), Appendix F 25.1(b)(4), Amdt 25-72		6

Table 4 Environmental Specification

Notes:

1) At low ambient temperatures the unit will control its fans in order to keep its internal temperature above 5°C. This allows the unit to operate effectively in ambient temperatures well below -15°C.

2) The unit may experience degraded audio/video routing functionality while ambient is above 55°C or below -15°C, but will automatically recover when the ambient falls back within those limits. To preserve component lifetime, the unit holds major components in reset if its internal sensor readings exceed 85°C. The unit will come out of reset when internal readings are less than 83°C.

3) The unit will reset and return to its default state upon any loss of power or under-voltage condition exceeding “Maximum Input Power Loss Holdup” in the Electrical Specifications.

4) Assumes attached cables are manufactured per recommendations in this document.

5) Assumes mounting clearances per section 2.2.2.

6) Innovative Advantage conducted DO-160 testing for a node configured for what was deemed worst case configuration. This testing was done under an FAA STC project and Innovative Advantage has 8110-3 DER approval for this test effort. Not all cards or configurations of the AVDS Node have been tested. Innovative Advantage uses this FAA approved data in support of a similarity report for custom node configurations and to draw similarity between test cards and non-tested cards. This similarity report and supporting documentation can be provided upon request by contacting Innovative Advantage.

3.1 AVDS Subassembly Qualification Status

Part Number	Revision	Description	Qualification Method:
100-0025-00	A	AVDS Node, Custom Config, 8-slot, Networked	Test
100-0026-00	A	AVDS Node, Custom Config, 8-slot, Standalone	Similarity
100-0053-00	A	AVDS Node, Custom Config, 8-slot, Networked, (3 Ethernet Ports) [will supersede old 8-Slot Base Unit]*	*Similarity
100-00XX-00	A	AVDS Node, Custom Config, 8-slot, Standalone, (3 Ethernet Ports) [will supersede old 8-Slot Base Unit]*	*Similarity
110-0003-02	A	Assy, In Card, Video, CVBSx4	Test
110-0005-02	A	Assy, In Card, Audio, Analog, x4	Test
110-0006-02	A	Assy, Out Card, Audio, Analog, x4	Test
110-0008-02	A	SDI x 4 Input	Similarity
110-0009-02	A	Digital Audio x 4 Output	*Similarity
110-0012-02	A	Assy, In Card, HDMI, DA	Test
110-0014-02	A	SDI x 4 Output	Similarity
110-0015-03	A	Assy, In Card, PC/YPbPr/CVBS	Test
110-0019-02	A	Video Converter	Similarity
110-0020-02	A	Assy, Out Card, CVBSx3 + SDI	Test
110-0036-02	A	Assy, In Card, 3G-SDIx4, Audio, Descr	Test
110-0039-02	A	Assy, AVDS Card, Channel Tracker, Basic control	Test
110-0043-02	A	Encoder Card	*Test Pending
110-0045-02	A	HDMI™/DVI + CVBS Input	Similarity
110-0056-02	A	Decoder Card	*Test Pending
110-0065-xx	A	Digital Audio x 4 Input*	*Similarity
110-0066-xx	A	Ethernet x 4 Card*	*Test Pending

*Products with asterisk are new or in development. Call for availability.

4 Base Unit

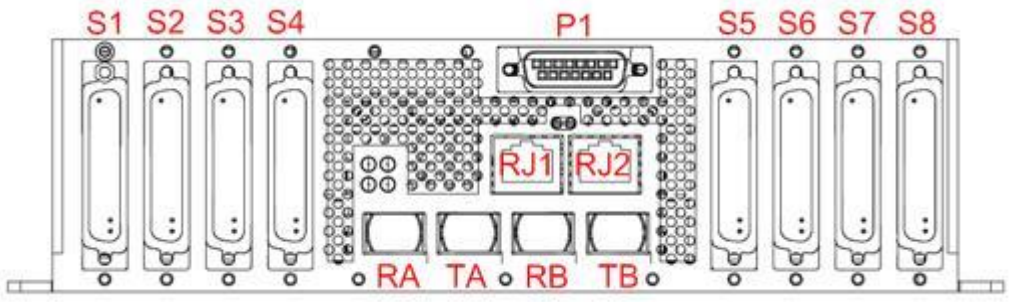


Figure 8 Connector Reference Designators (2 Ethernet Ports)

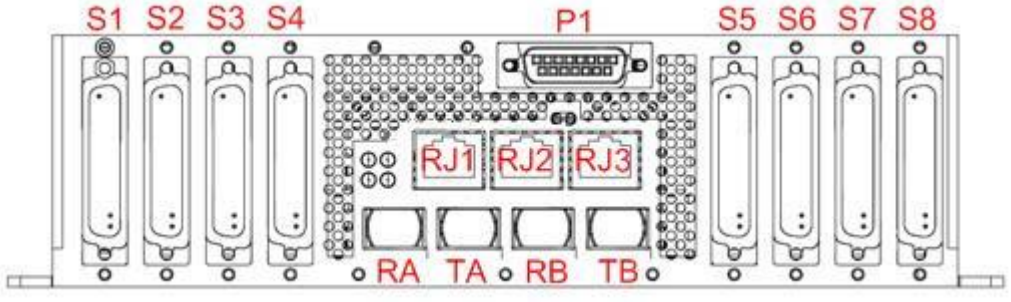


Figure 9 Connector Reference Designators (3 Ethernet Ports)

4.1 Power/Serial Communication Port (P1)

Connector P1 is used for input power and serial communications. The unit requires 28VDC and can draw up to 3 amps when fully loaded.

The serial port can be used for communication with a cabin control system. The port can be configured for RS232 or RS485 (pin 12 is strapped to Signal Ground for RS485, leave unconnected for RS232). Reference Appendix B for serial wiring examples. Software updates typically occur over the Ethernet port, but the serial port can also be used to update software and even restore the boot-loader itself in the event that program storage has been entirely corrupted.

Connector Type: D-Subminiature 15 Male (Pins) with jack-posts

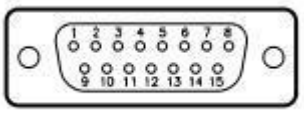


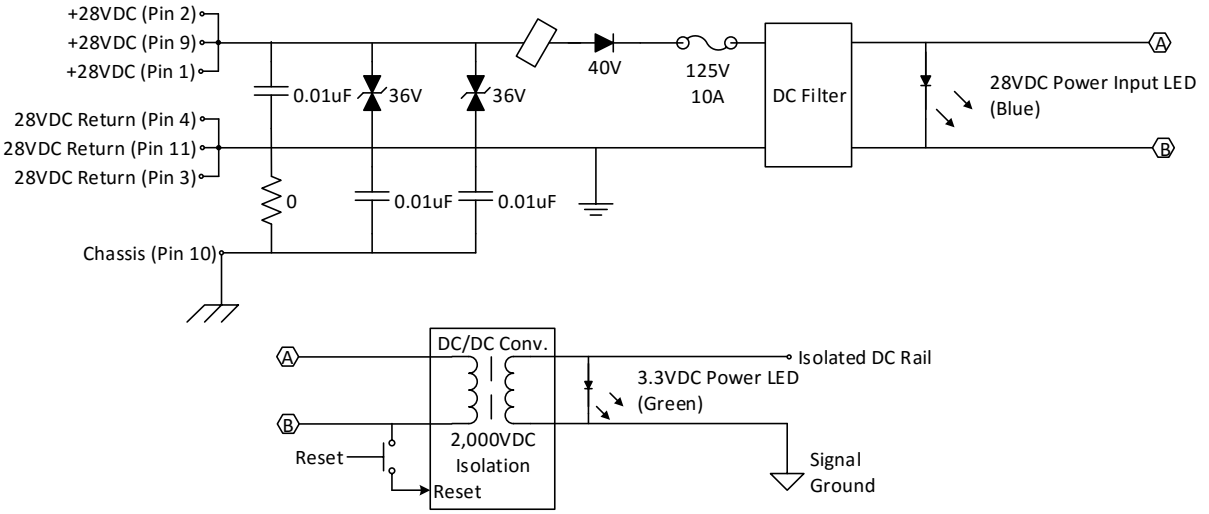
Figure 10 Power/Serial Port D-Sub 15 Pin Male

Mating connectors are to be secured with jack-screws.

P1 Connector Pinout:

Pin	Function	Notes
1	+28VDC	3A maximum current per pin
2	+28VDC	3A maximum current per pin
3	28VDC Return	3A maximum current per pin
4	28VDC Return	3A maximum current per pin
5	(Reserved)	
6	RS-232 RX	
7	RS-232 TX/RS-485 B	
8	Signal Ground	Electrically isolated (floating) from 28VDC Return and Chassis
9	+28VDC	3A maximum current per pin
10	Chassis	
11	28VDC Return	3A maximum current per pin
12	RS-485 Enable	
13	(Reserved)	
14	(Reserved)	
15	RS-485 A	

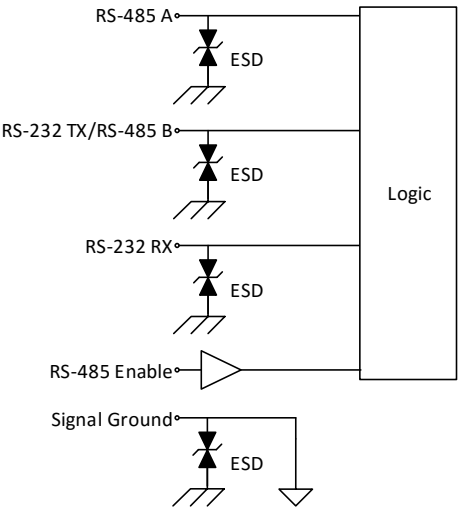
Power Input Details:



Notes:

- Connector pins are 20AWG rated for 3A maximum per pin.

Serial Connection Details:



4.2 Ethernet Ports (RJ1, RJ2, RJ3)

The Ethernet ports can be used for connection to a cabin control system or any other equipment that needs access to the Ethernet backbone. The ports are capable of 10Mbps, 100Mbps, or 1 Gbps, full duplex. The RJ ports on the AVDS support Auto Cross to support MDI or MDIX wiring, straight thru or cross over.

Connector Type: 10/100/1000 Base-T RJ45

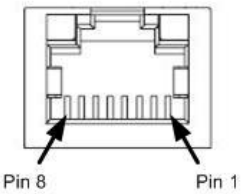


Figure 11 Ethernet Port RJ45 Receptacle

RJ1, RJ2, RJ3 Connector Pinout:

Pin	10/100 Base-T Function	1000 Base-T Function
1	Transmit+	BI-DA+
2	Transmit-	BI-DA-
3	Receive+	BI-DB+
4	Unused	BI-DC+
5	Unused	BI-DC-
6	Receive-	BI-DB-
7	Unused	BI-DD+
8	Unused	BI-DD-

Note: Gigabit connections should use CAT5e or CAT6 cables.

The AVDS RJ ports are driven by a powerful managed Ethernet switch. This switch supports many advanced features such as VLANs, RSTP, and IGMP snooping. For this reason, one or multiple AVDS Nodes can be used as the Ethernet backbone for the aircraft.

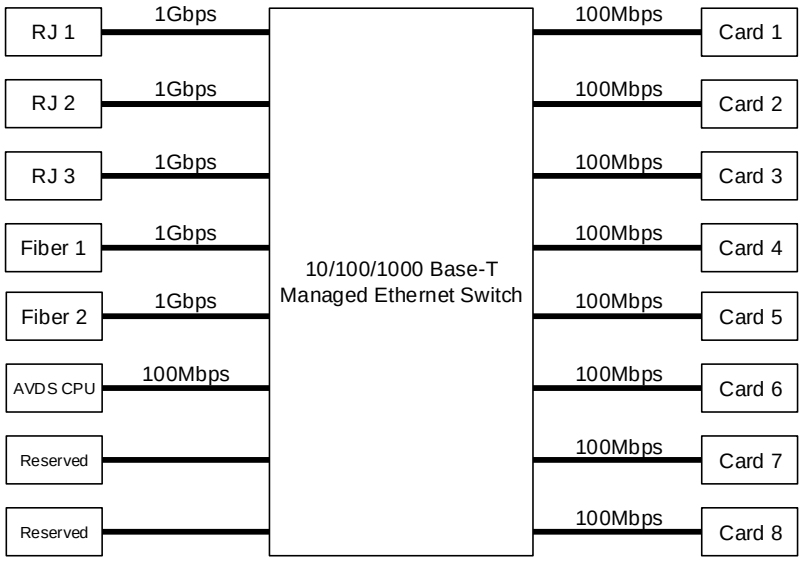


Figure 12: AVDS Ethernet Switch Block Diagram

4.3 Fiber Backbone Ports (RA, TA, RB, TB)

These ports provide the interconnection between nodes across two bands of 12-fiber ribbon. RA (*Fiber Receiver A*) and TA (*Fiber Transmitter A*) connect to an upstream node. RB and TB connect to a downstream node. Note that standalone units do not have these ports.

Connector Type: MTP – 12 Fiber Ribbon connector

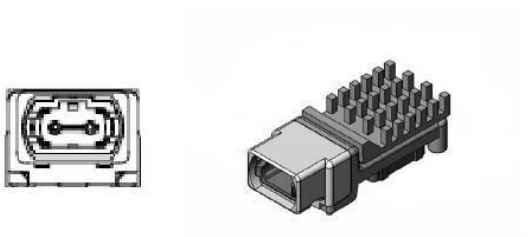


Figure 13 Fiber MTP Receptacle

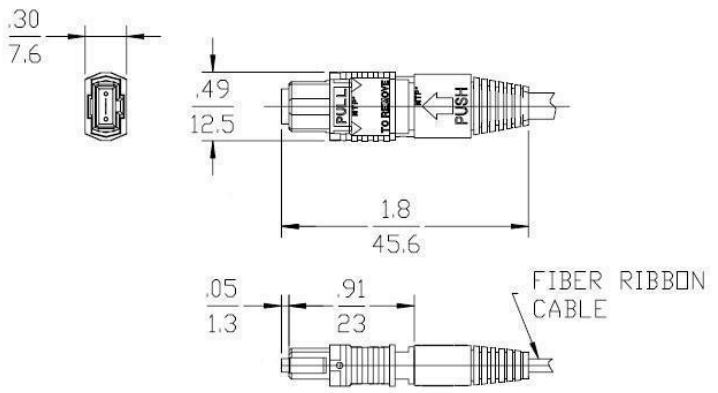


Figure 14 Fiber Ribbon Cable w/MTP Connectors

The fiber cable is jacketed ribbon, FAR Part 25 Appendix F compliant. It is constructed of twelve multimode 50/125um fibers.

All node box fiber receptacles have gauge pins (Male) for accurate alignment. Fiber cables between boxes must **NOT** have gauge pins (Female). Fiber connectors should be specified to have less than .5 dB loss.

Part number examples of a 6-ft jacketed 12-fiber ribbon cable without gauge pins:

Timbercon P/N MT-599012-115-115-00006F-016 or
Carlisle P/N CIT-F0012AM4-072

The total optical budget ***between any two adjacent nodes*** is 8 dB.

During initial phase installation of fiber, when measuring the optical loss of a complete fiber loop that has passive adapters in place of nodes, be sure to factor in a connector loss of up to 1 dB per passive adapter.

Up to four (4) fiber disconnects can be used between any two adjacent nodes. The fiber cable between a passive adapter and a Node or additional passive adapters must have one connector without gauge pins and one connector with gauge pins. Example part numbers for adapter cable and passive adapter:

Timbercon P/N MT-599012-115-125-00006F-016 or equivalent
L-COM P/N FOA-012 or equivalent

4.3.1 Interconnection

The following diagram illustrates the fiber backbone interconnections. A-ports always connect to B-ports. RX from one box connects to TX of the other. A calculated maximum on 38 Nodes are able to be connected in a ring; however, contact Innovative Advantage for further analysis for any system with 10 or more Nodes in a single system.

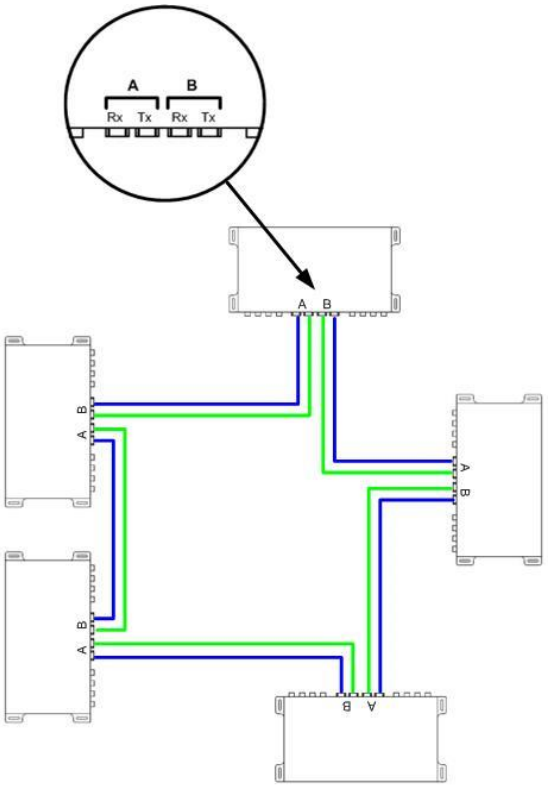


Figure 15 Fiber Backbone Connection Diagram

5 I/O Cards

A typical AVDS is comprised of node boxes that contain a variety of pluggable input and output cards. Input cards are used to connect source equipment (cameras, HDMI ports, media servers, Blu-ray players, etc.) to the network. Output cards are used to connect rendering equipment (monitors, speakers, headsets, amplifiers, surround processors, etc.) to the network.

A key aspect of the system is its ability to support multiple video and audio formats simultaneously from a single source. This allows standard and high-end rendering devices to coexist on the same network and have access to signals that take advantage of their respective capabilities. Each one is automatically routed the appropriate signals in a manner that is transparent to the external control system.

5.1 Input Cards

Input cards take standard consumer electronics audio/video input from source equipment and make it available on the network.

Video inputs are serialized to SDI and routed via the digital cross-point switch to an available physical channel.

Uncompressed audio inputs are sample rate converted to 48kHz, packetized and transmitted over the Ethernet.

Surround encoded audio inputs are routed via the digital cross-point switch to an available physical channel.

PC Graphics inputs are converted to an HD standard, serialized to SDI and routed via the digital cross-point switch to an available physical channel.

5.2 Output Cards

Output cards take audio/video from any source on the network and present it in a standard consumer electronics audio/video format.

Video output comes from the network as SDI on one of the physical channels. The data is routed to a de-serializer via the cross-point switch. From there the data can be routed to the appropriate output circuitry.

Uncompressed PCM audio data can be retrieved from the Ethernet channel then directed to the audio output circuitry.

Surround encoded audio data can be retrieved from a physical channel via the cross-point switch and directed to an external surround processor.

Serialized graphics data can be retrieved from a physical channel via the cross-point and sent directly to an HD capable monitor.

5.3 Card Types

The following paragraphs describe each card type. As noted in Section 0 above, the cards utilizes various internal rail voltages. Consult with Innovative Advantage if a combination of four (4) or more of the cards with flag note (1) are used.

5.3.1 110-0003-xx CVBS x 4 Input

This card supports four independent composite (CVBS) video inputs in either NTSC or PAL formats. Note that this CVBS input card is not suitable for most VCRs. VCRs without built-in time-base correction circuitry must be connected to the 110-0015-02 PC-Video Input card.

Connector Type: ITT Cannon DBMD5C5PJK87 with jack screw posts or equivalent. This connector contains 5 coaxial plugs (75ohm) in standard D-Sub 25 form factor.

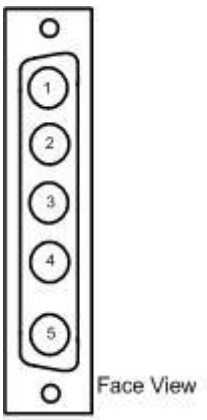


Figure 16 CVBS 4-Port Input Connector

Mating cable connector housing should be ITT Cannon DBA5W5SA197F0 with coaxial contacts ITT Cannon D130344-1 or equivalent.

Connector Pinout:

Pin	Function
1	CVBS Port 1
2	CVBS Port 2
3	CVBS Port 3
4	CVBS Port 4
5	Unused

The individual cables should be RG-179 (0.1” O.D. 75 ohm coax). These cables shall be FAR Part 25 compliant for flammability and out-gassing.

CVBS Voltage Input	**1Vp-p**
Input Impedance	**75 ohms**
Formats Supported	**NTSC, PAL**

5.3.2 110-0005-xx Stereo x 4 Input

This card supports four independent single-ended stereo analog audio inputs (8 channels total). If used for multi-channel purposes, channels must be connected as indicated in the table below.

Connector Type: D-Sub 25 Male (Pins) with jack screw posts

Stereo Audio x 4 Input Connector Pinout:

Pin	Function	Multi-Channel Function	Pin	Function	Multi-Channel Function
1	Audio In 1 Left	Front Left	13	Unused	
2	Chassis		14	Signal Ret	
3	Signal Ret		15	Audio In 1 Right	Front Right
4	Audio In 2 Left	Subwoofer (LFE)	16	Chassis	
5	Chassis		17	Signal Ret	
6	Signal Ret		18	Audio In 2 Right	Center
7	Audio In 3 Left	Surround Left	19	Chassis	
8	Chassis		20	Signal Ret	
9	Signal Ret		21	Audio In 3 Right	Surround Right
10	Audio In 4 Left	Rear Left (7.1)	22	Chassis	
11	Chassis		23	Signal Ret	
12	Signal Ret		24	Audio In 4 Right	Rear Right (7.1)
			25	Chassis	

The cables should be twisted pair or shielded coax. This cable shall be surrounded by a high quality braided shield connected to chassis, and the cable assembly shall be FAR Part 25 compliant for flammability and out-gassing.

Signal Voltage (max)	**±3.6V TBD**
Input Impedance	**10k ohms**
Frequency Response	**20 Hz – 20 kHz (-3dB) TBD**

5.3.3 110-0006-xx Stereo x 4 Output

This card supports four independent stereo analog audio outputs (8 channels total). Each of these is capable of driving loads from 16 ohm headphones to high impedance line loads. If used for multi-channel purposes, channels must be connected as indicated in the table below.

Connector Type: D-Sub 25 Female (Sockets) with jack screw posts

Stereo Audio x 4 Output Connector Pinout:

Pin	Function	Multi-Channel Function
1	Audio Out 1 Left	Front Left
2	Chassis	
3	Signal Ret	
4	Audio Out 2 Left	Subwoofer (LFE)
5	Chassis	
6	Signal Ret	
7	Audio Out 3 Left	Surround Left
8	Chassis	
9	Signal Ret	
10	Audio Out 4 Left	Rear Left (7.1)
11	Chassis	
12	Signal Ret	
13	Unused	
14	Signal Ret	
15	Audio Out 1 Right	Front Right
16	Chassis	
17	Signal Ret	
18	Audio Out 2 Right	Center
19	Chassis	
20	Signal Ret	
21	Audio Out 3 Right	Surround Right
22	Chassis	
23	Signal Ret	
24	Audio Out 4 Right	Rear Right (7.1)
25	Chassis	

The cables should be twisted pair or shielded coax. These cables shall be FAR Part 25 compliant for flammability and out-gassing.

Signal Voltage (max)	**±3.6V TBD**
Output Impedance	**23 ohms**
Frequency Response	**20 Hz – 20 kHz (-3dB) TBD**

5.3.4 110-0008-xx SDI x 4 Input

Four independent digital video SDI inputs capable of 3G, HD and SD (SMPTE 424M, SMPTE 292M and SMPTE 259M-C).

Connector Type: ITT Cannon DBMD5C5PJK87 with jack-posts or equivalent.
This connector contains 5 coaxial plugs (75ohm) in standard D-Sub 25 form factor.

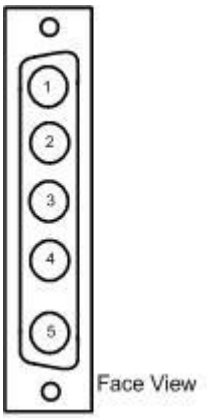


Figure 17 SDI 4-Port Output Connector

Mating cable connector housing should be ITT Cannon DBA5W5SA197F0 with coaxial contacts ITT Cannon D130344-1 or equivalent.

Connector Pinout:

Pin	Function
1	SDI Port 1
2	SDI Port 2
3	SDI Port 3
4	SDI Port 4
5	Unused

The individual cables should be a high-quality, low-loss RG-179 (0.1” O.D. 75 ohm coax). These cables shall be FAR Part 25 compliant for flammability and out-gassing.

SDI Voltage Input	**800mVp-p (typical)**
Input Impedance	**75 ohms**
Formats Supported	**SMPTE 259M-C (480i,576i)** **SMPTE 292M (720p, 1080i)** **SMPTE 424M (1080p/60)**
Encryption	**Proprietary Mechanism**

Maximum of 20dB loss at ½ the clock frequency. Clock frequency for various signal types:

Signal Type	Clock Freq.	½ the Clock Freq.
SD-SDI (480i, NTSC/PAL, etc.)	270 MHz	135 MHz
HD-SDI (720p, 1080i, etc.)	1.5 GHz	750 MHz
3G-SDI (1080p, etc.)	3.0 GHz	1.5 GHz

For longer cable runs, specialty cables such as PIC Cables PN V73263 or equivalent can be used instead of RG179. Note: Use PIC contact 110236 with the V73263 cable.

5.3.5 110-0009-xx Digital Audio x 4 Output

This card supports four independent balanced digital audio (S/PDIF) outputs, each capable of 2-channel PCM or encoded multi-channel audio (e.g. Dolby Digital or DTS).

Connector Type: D-Sub 25 Female (Sockets) with jack screw posts

Digital Audio x 4 Output Connector Pinout:

Pin	Function
1	Chassis
2	Reserved
3	SPDIF4Gnd
4	SPDIF4A
5	Reserved
6	SPDIF3Gnd
7	SPDIF3A
8	Reserved
9	SPDIF2Gnd
10	SPDIF2A
11	Reserved
12	SPDIF1Gnd
13	SPDIF1A
14	Reserved
15	Reserved
16	SPDIF4B
17	Reserved
18	Reserved
19	SPDIF3B
20	Reserved
21	Reserved
22	SPDIF2B
23	Reserved
24	Reserved
25	SPDIF1B

The cables should be twisted pair 100 ohm. These cables shall be FAR Part 25 compliant for flammability and out-gassing.

Signal Voltage (max)	**2-7V p-p**
Output Impedance	**100 ohms**

5.3.6 110-0012-xx HDMI™/DVI + DA Input

This card is used to connect HDMI™ and DVI sources and also provides an independent Digital Audio (DA) S/PDIF input signal.

<u>Important notice</u>: this card receives and decodes video signals protected by High-bandwidth Digital Content Protection (HDCP). These video signals are intended only for display on monitors affixed to the aircraft. Failure to comply with the following physical security provisions for installation would be a material breach of the AVDSClient EULA and may subject End-User or Installer to legal action under Section 1201 of Title 17 of the United States Code (the DMCA) and similar laws in other jurisdictions. The following restrictions on the AVDS installation are to be strictly enforced if this card is configured for use:

> **Any such installation shall not provide end-user access points to unprotected AVDS video outputs (unless otherwise specified, all AVDS outputs should be assumed to be unprotected).**
>
> **Video display connectors associated with unprotected AVDS outputs must be of a form factor and/or pin-out not standard to the Consumer Electronics industry and must be reasonably inaccessible to the end-user (e.g. behind panels, buried within seat-backs or arm rests, etc.).**
>
> **No devices may be installed anywhere downstream of unprotected AVDS video outputs that allow end-user access to the unprotected content or that allow permanent storage, recording, or duplication of the unprotected content.**

This card does not support dual-channel DVI. Some of the unused dual-channel DVI inputs are used for bringing digital audio into the card and supplying an external auxiliary panel with power (used to convert optical digital audio to coaxial digital audio at the panel). Refer to Appendix A: Auxiliary Audio Input Panel Reference Schematic.

Connector Type: DVI receptacle with jack screw posts.

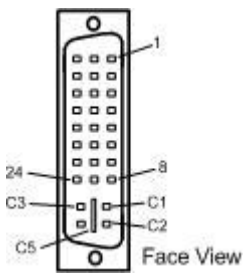


Figure 18 HDMI/DVI Input Connector

Connector Pinout:

Pin	Function	Pin	
1	TMDS Data2-	14	+5V Power
2	TMDS Data2+	15	DDC GND
3	TMDS Data2 Shield	16	Hot Plug Detect
4	DA Return	17	TMDS Data0-
5	DA Input	18	TMDS Data0+
6	DDC Clock	19	TMDS Data0 Shield
7	DDC Data	20	3.3V Ext (panel power)
8	Unused	21	Ext GND
9	TMDS Data1-	22	TMDS Clock Shield
10	TMDS Data1+	23	TMDS Clock+
11	TMDS Data1 Shield	24	TMDS Clock-
12	Unused	C1-C4	Unused
13	Unused	C5	GND

The individual cables and signals should conform to the HDMI 1.3 specification. These cables shall be FAR Part 25 compliant for flammability and out-gassing.

HDMI™/DVI-D Video Formats Supported	**480i30, 576i25, 720p50/60, 1080i25/30**
Digital Audio Formats Supported	**2-Ch LPCM (44.1 kHz – 192 kHz), Dolby Digital, DTS pass-through**
Input Voltage	**0.5V_{p-p}**

5.3.7 110-0014-xx SDI x 4 Output

This card supports four independent digital video SDI outputs capable of 3G, HD and SD (SMPTE 424M, SMPTE 292M and SMPTE 259M-C).

Connector Type: ITT Cannon DBMD5C5PJK87 with jack-posts or equivalent.
This connector contains 5 coaxial plugs (75ohm) in standard D-Sub 25 form factor.

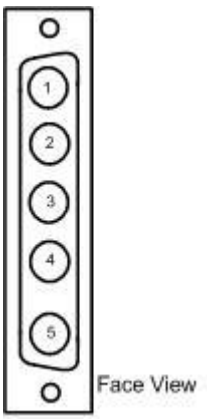


Figure 19. SDI 4-Port Output Connector

Mating cable connector housing should be ITT Cannon DBA5W5SA197F0 with coaxial contacts ITT Cannon D130344-1 or equivalent.

Connector Pinout:

Pin	Function
1	SDI Port 1
2	SDI Port 2
3	SDI Port 3
4	SDI Port 4
5	Unused

The individual cables should be a high-quality, low-loss RG-179 (0.1” O.D. 75 ohm coax). These cables shall be shall be FAR Part 25 compliant for flammability and out-gassing.

HD-SDI Voltage Output	**800mVp-p (loaded)**
Output Impedance	**75 ohms**
Formats Supported	**SMPTE 259M-C (480i,576i)** **SMPTE 292M (720p, 1080i)** **SMPTE 424M (1080p/60)**
Encryption	**Proprietary Mechanism**

Maximum of 20dB loss at ½ the clock frequency. Clock frequency for various signal types:

Signal Type	Clock Freq.	½ the Clock Freq.
SD-SDI (480i, NTSC/PAL, etc.)	270 MHz	135 MHz
HD-SDI (720p, 1080i, etc.)	1.5 GHz	750 MHz
3G-SDI (1080p, etc.)	3.0 GHz	1.5 GHz

For longer cable runs, specialty cables such as PIC Cables PN V73263 or equivalent can be used instead of RG179. Note: Use PIC contact 110236 with the V73263 cable.

5.3.8 110-0015-xx Component/CVBS/Graphics Input

This is a multi-format card that supports PC-Graphics (VGA to SXGA), Component (YPbPr SD/HD) and CVBS input. Inputs are mutually exclusive. The card will auto-sense which type of signal is active. This card is equipped with a Video Processor making it capable of accepting (and up-converting) 480p as well as handling and correcting for time-base errors common with many VCRs.

Connector Type: D-Subminiature 15 Female (sockets) with jack-posts

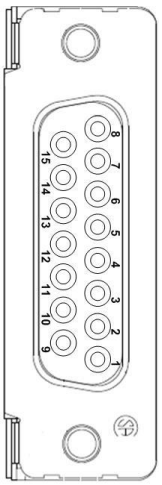


Figure 20 Graphics/Component/CVBS Input Connector

Connector Pinout:

Pin	Function
1	Chassis
2	DDC_SDA_5V
3	DDC_SCL_5V
4	VSYNC_IN_5V
5	HSYNC_IN_5V
6	Video B/Pb
7	Video G/Y/CVBS
8	Video R/Pr
9	5V_DDC_IN
10	Signal Ground
11	Signal Ground
12	Signal Ground
13	Signal Ground
14	Signal Ground
15	Signal Ground

The individual cables should be RG-179 (0.1” O.D. 75 ohm coax). These cables shall be FAR Part 25 compliant for flammability and out-gassing.

CVBS or Luminance (Y) Voltage Input	**1V_{p-p} (including sync)**
Color Difference (Cb, Cr) Voltage Input	**0.7V_{p-p}**
Input Impedance	**75 ohms**
Video Formats Supported	**NTSC, PAL, 480i, 480p, 576i, 576p, 720p, 1080i**
PC Graphics Formats Supported	**VGA, SVGA, XGA, SXGA (640x480, 800x600, 1024x768, 1280x1024).**

5.3.9 110-0019-xx Video Converter

This card provides internal video format and frame rate conversion. Its primary intended purpose is to convert HD video sources to SD for SD-Only legacy monitors, but it can be used in any application requiring frame or format conversion. For example, it can be used to up-convert an SD signal to an HD signal, NTSC to PAL, PAL to NTSC, 50Hz signals to 60Hz signals, and more.

Connector Type: Not applicable, this card has no external connectors.

In order to render HD content on an SD monitor a Video Converter card may be required (this is the case when the HD source does not simultaneously output SD over a composite signal). The system can be configured to statically link a Video Converter card to an HD-only source or alternatively link a Video Converter card to an SD monitor. The lesser of the number of HD-only sources and number of SD monitors will determine the total number of Video Converter cards required by the system.

For example, if a system has three HD-only sources and six SD personal monitors, your options would be as seen in the diagram below. In this case it is apparent that Option 1 is preferable as it only requires half of the Video Converters of Option 2.

A given Video Converter card can be linked to any HD source or monitor equipment within the system, regardless of which node that equipment is connected to.

Note also that any HD source equipment that can simultaneously output SD does not need a converter.

Note: This card does not support 3G-SDI signal inputs. It only supports SD-SDI and HD-SDI input formats. For example, it cannot convert 1080p60 video inputs.

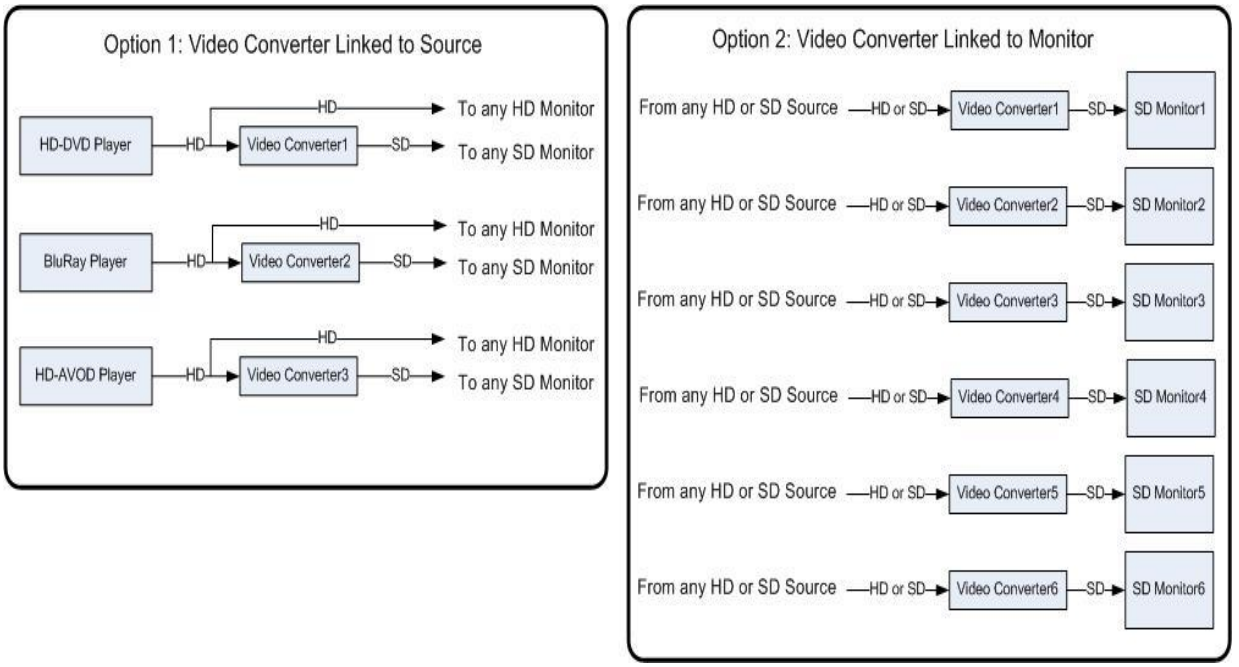


Figure 21 Example Video Converter Assignment Options

5.3.10 110-0020-xx CVBS x 3 + SDI Output

This card supports three independent composite (CVBS) video outputs in either NTSC or PAL formats and one SDI output.

Connector Type: ITT Cannon DBMD5C5PJK87 with jack screw posts or equivalent. This connector contains 5 coaxial plugs (75ohm) in standard D-Sub 25 form factor.

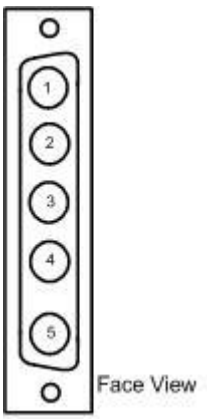


Figure 22 CVBS x 3 and SDI Output Connector

Mating cable connector housing should be ITT Cannon DBA5W5SA197F0 with coaxial contacts ITT Cannon D130344-1 or equivalent.

Connector Pinout:

Pin	Function
1	CVBS Port 1
2	CVBS Port 2
3	CVBS Port 3
4	SDI Port 1
5	Unused

The individual cables should be RG-179 (0.1” O.D. 75 ohm coax). These cables shall be FAR Part 25 compliant for flammability and out-gassing.

CVBS Voltage Output	**1Vp-p (loaded)**
Output Impedance	**75 ohms**
Formats Supported	**NTSC, PAL**

SDI Voltage Output	**800mVp-p (loaded)**
Output Impedance	**75 ohms**

Formats Supported	**SMPTE 259M-C (480i, 576i)** **SMPTE 292M (720p, 1080i)** **SMPTE 424M (1080p/60)**
Encryption	**Proprietary Mechanism**

Maximum of 20dB loss at ½ the clock frequency. Clock frequency for various signal types:

Signal Type	Clock Freq.	½ the Clock Freq.
SD-SDI (480i, NTSC/PAL, etc.)	270 MHz	135 MHz
HD-SDI (720p, 1080i, etc.)	1.5 GHz	750 MHz
3G-SDI (1080p, etc.)	3.0 GHz	1.5 GHz

For longer cable runs, specialty cables such as PIC Cables PN V73263 or equivalent can be used instead of RG179. Note: Use PIC contact 110236 with the V73263 cable.

5.3.11 110-0036-xx SDI Input x 4 with Audio

This card supports up to four SDI inputs at either 3G-SDI, HD-SDI or SD-SDI formats (SMPTE 424M Level A, SMPTE 292M and SMPTE 259M-C, respectively). In 3G and HD modes its supports the extraction of audio embedded per SMPTE 299M. Any port can be configured to support multi-channel, stereo, or video-only, subject to the three following valid combinations for the card:

- Two Video/Multi-channel (5.1) Audio Inputs + Two Video-only Inputs, or
- One Video/Multi-channel (5.1) Audio Input + Two Video/Stereo Audio Inputs + One Video-only Input, or
- Four Video/Stereo Audio Inputs.

Connector Type: ITT Cannon DBMD5C5PJK87 with jack-posts or equivalent.

This connector contains 5 coaxial plugs (75ohm) in standard D-Sub 25 form factor.

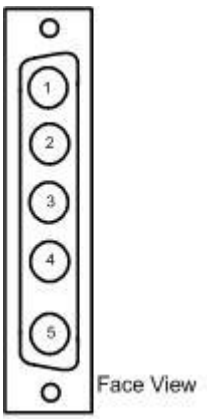


Figure 23 SDI 4-Port Output Connector

Mating cable connector housing should be ITT Cannon DBA5W5SA197F0 with coaxial contacts ITT Cannon D130344-1 or equivalent.

Connector Pinout:

Pin	Function
1	SDI Port 1
2	SDI Port 2
3	SDI Port 3
4	SDI Port 4
5	Unused

The individual cables should be a high-quality, low-loss RG-179 (0.1” O.D. 75 ohm coax). These cables shall be FAR Part 25 compliant for flammability and out-gassing.

SDI Voltage Input	**800mVp-p (typical)**
Input Impedance	**75 ohms**
Formats Supported	**SD-SDI SMPTE 259M-C (480i,576i)** **HD-SDI SMPTE 292M (720p, 1080i)** **3G-SDI SMPTE 424M (Level A only, 1080p)**
Encryption	**Proprietary Mechanism**
Audio Extraction	**SMPTE 299M (3G/HD only)**

Maximum of 20dB loss at ½ the clock frequency. Clock frequency for various signal types:

Signal Type	Clock Freq.	½ the Clock Freq.
SD-SDI (480i, NTSC/PAL, etc.)	270 MHz	135 MHz
HD-SDI (720p, 1080i, etc.)	1.5 GHz	750 MHz
3G-SDI (1080p, etc.)	3.0 GHz	1.5 GHz

For longer cable runs, specialty cables such as PIC Cables PN V73263 or equivalent can be used instead of RG179. Note: Use PIC contact 110236 with the V73263 cable.

5.3.12 110-0039-xx Channel Tracker Card

This card supports twelve simulated analog outputs, twelve analog signal detector inputs, four open-collector general-purpose logic outputs, four general-purpose ground-detecting inputs, and a single RS232/485 communication port.

The analog signal input outputs can be used to simulate analog signals through a crosspoint switch and detect dynamic channel-switching. The input to output channel mapping may then be used by the AVDS system for various system controls.

The logic I/O channels may be used for general-purpose signal detects and control. Note: the logic I/O are referenced to AVDS signal ground – not aircraft 28VDC Return. Special grounding considerations must be taken when interfacing with other aircraft equipment.

Connector Type: D-Sub 44 High-Density Female (Sockets) with jack screw posts

Channel Tracker Output Connector Pinout:

Pin	Function
1	Analog Output 1
2	Analog Output 2
3	Analog Output 3
4	Analog Output 4
5	Analog Output 5
6	Analog Output 6
7	Analog Output 7
8	Analog Output 8
9	Analog Output 9
10	Analog Output 10
11	Analog Output 11
12	Analog Output 12
13	RS-485 A
14	RS-232 Rx
15	Chassis
16	Analog Input 1
17	Analog Input 2
18	Analog Input 3
19	Analog Input 4
20	Analog Input 5
21	Analog Input 6
22	Analog Input 7
23	Analog Input 8
24	Analog Input 9
25	Analog Input 10
26	Analog Input 11
27	Analog Input 12
28	General Purpose Input 4 (1)
29	Signal Ground
30	Signal Ground
31	Signal Ground
32	General Purpose Input 1 (1)
33	Signal Ground
34	General Purpose Output 1 (1)
35	Signal Ground
36	General Purpose Input 2 (1)
37	Signal Ground
38	General Purpose Output 2 (1)
39	Signal Ground
40	General Purpose Input 3 (1)
41	Signal Ground
42	General Purpose Output 3 (1)
43	General Purpose Output 4 (1)
44	RS-232 Tx / RS485 B

Note 1: The logic I/O are referenced to AVDS signal ground – not aircraft 28VDC Return. Special grounding considerations must be taken when interfacing with other aircraft equipment.

The grounds should be distributed evenly along with the signals evenly to the various equipment. These cables shall be FAR Part 25 compliant for flammability and out-gassing.

Analog Signal Voltage (to high-impedance input)	**~ 1 V_{ACp-p}**
Analog Output Impedance	**75 Ω**
Analog Output Load (max)	**75 Ω**
Analog Input (max)	**2 V_{ACp-p}**
Analog Input Impedance	**5k Ω**
General Purpose Logic Output Current	**50 mA (Open-Collector)**
General Purpose Logic Input	**Switched by Open-Collector**
COM Port Max Baud	**1 MBit/Sec**
COM Port RS-232 Swing	**± 5V**
COM Port RS-485 Swing	**± 1.5V (differential to 27Ω load)**

5.3.13 110-0043-xx Encoder Card

This card provides the ability to compress and stream over the AVDS Ethernet network audio/video signals present on the AVDS uncompressed network. By way of an external wireless router connected to the AVDS Ethernet network (not provided by AVDS) this allows for wireless streaming to personal carry-on devices (qualified iOS or Android smart phones or tablets). Each AVDS Encoder card is capable of handling two independent audio/video signals.

Live audio/video feeds are tapped off the AVDS uncompressed network and compressed into H.264 for live streaming. The Encoder card can handle two uncompressed input signals up to 1080p/60Hz and can compress and stream those signals independently over Ethernet at H.264 formats up to 1080p/30Hz.

End-users gain access to these streams by downloading an application to their qualified iOS or Android device. The application will allow them to connect to an available server in AVDS (two connections available per Decoder card) on a first-come first-served basis. Once connected, the end-user will be able to select from any audio or video source that is present on the AVDS uncompressed network.

Input Video Formats Supported	**SD-SDI SMPTE 259M-C (480i,576i)** **HD-SDI SMPTE 292M (720p, 1080i)** **3G-SDI SMPTE 424M (Level A only, 1080p)**
Input Audio Formats Supported	**2-Ch LPCM (48 kHz)**
Output Formats Supported	**H.264 video encode at 480p30/60, 720p30/60, or 1080p30.** **48kHz AAC audio with ADTS headers.** **A/V PES encapsulated in MPEG-2 TS.**
Number of independent input channels	**2**
Streaming Communications Protocol	**DLNA compliant server**
PED Platforms supported	**iOS, Android**
DRM protection	**Yes**

5.3.14 110-0045-xx HDMI™/DVI + CVBS Input

This card is used to connect HDMI™ and DVI sources and also provides an independent CVBS input signal.

<u>Important notice</u>: this card receives and decodes video signals protected by High-bandwidth Digital Content Protection (HDCP). These video signals are intended only for display on monitors affixed to the aircraft. Failure to comply with the following physical security provisions for installation would be a material breach of the AVDSClient EULA and may subject End-User or Installer to legal action under Section 1201 of Title 17 of the United States Code (the DMCA) and similar laws in other jurisdictions. The following restrictions on the AVDS installation are to be strictly enforced if this card is configured for use:

> **Any such installation shall not provide end-user access points to unprotected AVDS video outputs (unless otherwise specified, all AVDS outputs should be assumed to be unprotected).**
>
> **Video display connectors associated with unprotected AVDS outputs must be of a form factor and/or pin-out not standard to the Consumer Electronics industry and must be reasonably inaccessible to the end-user (e.g. behind panels, buried within seat-backs or arm rests, etc.).**
>
> **No devices may be installed anywhere downstream of unprotected AVDS video outputs that allow end-user access to the unprotected content or that allow permanent storage, recording, or duplication of the unprotected content.**

This card does not support dual-channel DVI. Some of the unused dual-channel DVI inputs are used for CVBS input.

Connector Type: DVI receptacle with jack screw posts.

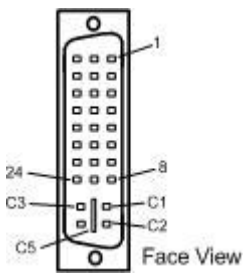


Figure 24 HDMI/DVI Input Connector

Connector Pinout:

Pin	Function	Pin	
1	TMDS Data2-	14	+5V Power
2	TMDS Data2+	15	DDC GND
3	TMDS Data2 Shield	16	Hot Plug Detect
4	CVBS Return	17	TMDS Data0-
5	CVBS Input	18	TMDS Data0+
6	DDC Clock	19	TMDS Data0 Shield
7	DDC Data	20	Unused
8	Unused	21	Unused
9	TMDS Data1-	22	TMDS Clock Shield
10	TMDS Data1+	23	TMDS Clock+
11	TMDS Data1 Shield	24	TMDS Clock-
12	CEC	C1-C4	Unused
13	Unused	C5	GND

The individual cables and signals should conform to the HDMI 1.3 specification. These cables shall be FAR Part 25 compliant for flammability and out-gassing.

HDMI™/DVI-D Video Formats Supported	**480i30, 576i25, 720p50/60, 1080i25/30 , 1080p60**
CVBS Input Impedance	**75 ohms**
CVBS Input Voltage	**$1V_{p-p}$**
Digital Audio Formats Supported	**2-Ch LPCM (44.1 kHz – 192 kHz), Dolby Digital, DTS pass-through**
Input Voltage	**$0.5V_{p-p}$**

5.3.15 110-0056-xx Decoder Card

The card provides decoding of compressed H.264 content from Media Servers or personal devices that are connected to the AVDS Ethernet network for insertion into the AVDS uncompressed network. Each AVDS Decoder card is capable of decoding one H.264 stream at an encoded resolution/frame rate up to 1080p/30. Once decoded, the video is made available for display on any fixed monitor connected to the AVDS uncompressed network, and the audio shall be available to any speaker group or headset location.

The Decoder can also act as an auxiliary input for carry-on devices, as it is capable of decoding non-DRM protected audio or video streams from personal devices that are DLNA compliant. A third-party application may be required to be downloaded to the PED to make it DLNA compliant.

Important Note: The AVDS Decoder Card is an Android platform capable of hosting third-party Media Server client application(s) and/or DLNA Digital Media Player (DMP) application(s) that are designed to run on Android devices. Navigation of the content library and selection of content for streaming along with playback control is the responsibility of the client application. AVDS cannot guarantee suitability of the AVOD client application for the aircraft environment, nor can explicit support for any particular AVOD compression format or DRM protection mechanism be assumed.

The Android platform present on the Decoder card provides hardware accelerated decode for the input formats listed in the table below.

Input Formats Supported	**H.264 Decode 480i30, 576i25, 480p50/60, 720p24/25/30/50/60, 1080p24/25/30.**
Output Formats Supported	**SD-SDI SMPTE 259M-C (480i,576i)** **HD-SDI SMPTE 292M (720p, 1080i)** **3G-SDI SMPTE 424M (Level A only, 1080p)**
Number of streams	**1**
Streaming Communications Protocol	**Application Specific**
Platform	**Android**
DRM protection	**Application Specific**

5.3.16 110-0065-xx Digital Audio x 4 Input

This card supports four independent balanced digital audio (S/PDIF) inputs, each capable of 2-channel PCM or encoded multi-channel audio (e.g. Dolby Digital or DTS).

Connector Type: D-Sub 25 Female (Sockets) with jack screw posts

Digital Audio x 4 Output Connector Pinout:

Pin	Function
1	Chassis
2	Reserved
3	SPDIF4Gnd
4	SPDIF4A
5	Reserved
6	SPDIF3Gnd
7	SPDIF3A
8	Reserved
9	SPDIF2Gnd
10	SPDIF2A
11	Reserved
12	SPDIF1Gnd
13	SPDIF1A
14	Reserved
15	Reserved
16	SPDIF4B
17	Reserved
18	Reserved
19	SPDIF3B
20	Reserved
21	Reserved
22	SPDIF2B
23	Reserved
24	Reserved
25	SPDIF1B

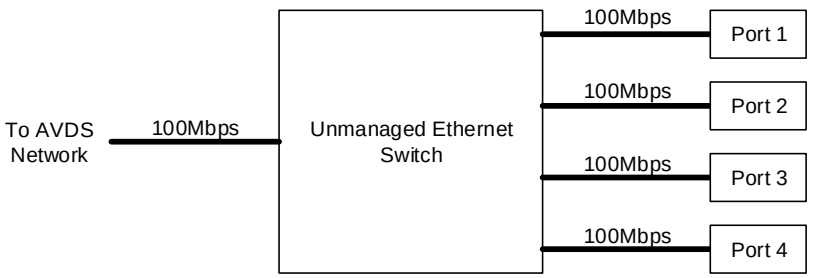
The cables should be twisted pair 100 ohm. These cables shall be FAR Part 25 compliant for flammability and out-gassing.

Signal Voltage (max)	**2-7V p-p**
Output Impedance	**100 ohms**

5.3.17 110-0066-01 4 Port Ethernet

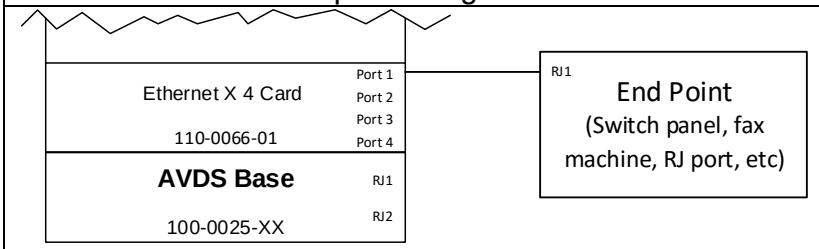
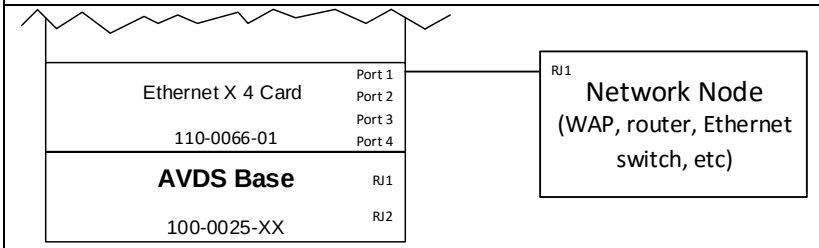
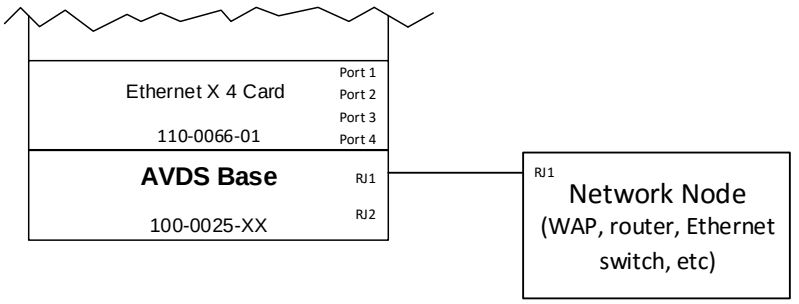
The Ethernet ports can be used for connection to a cabin control system or other equipment that needs access to the Ethernet backbone. The card has four 10/100 Base-T full duplex ports. The ports support Auto Cross to support MDI or MDIX wiring, straight thru or cross over.

All ports share a single 100Mbps connection back to the AVDS' central switch. This architecture is more than sufficient for most applications including command and control, stored media servers, and Internet connectivity ports.



Refer to Section 4.2 above for information on the AVDS' central switch specifications. Ethernet card 110-0066-01 uses an unmanaged switch. It does not support RSTP or IGMP between the four external ports like the AVDS' central switch does. This prevent Ethernet card 110-0061-01 from being used in the following such examples:

1. The connection between the Ethernet card and the AVDS' central switch does support IGMP snooping pass thru. This means that the card will not join a multicast stream unless any one of the four ports transmits an IGMP join request. At that time, all four ports will transmit the multicast traffic. This can cause problems for low powered processor such as switch panels. If such devices exist in the system, it is best to isolate them to dedicated Ethernet cards where they will not see such multicast traffic.
2. The connection between the Ethernet card and the AVDS' central switch does support RSTP pass thru. This means that an Ethernet loop from an Ethernet card's port and an AVDS' central switch port is supported. The central port will detect the loop and automatically adapt. However, an Ethernet loop created between ports on the same card is not supported.
3. As a general best practice, the ports on the Ethernet card should only be used to connect endpoints to the network. They should not be used to connect devices such as network switches, hubs, routers, access points, etc; please use RJ1, RJ2, or RJ3 for these purposes.

Example Configuration	Pass/Fail	Description
	PASS! 	Ethernet card connected to an end point such as a switch panel, fax machine, RJ port for laptops, etc.
	FAIL! 	A network node – such as a Wireless Access Point, router, Ethernet switch, etc – is connected to the Ethernet card.
	PASS! 	A network node – such as a Wireless Access Point, router, Ethernet switch, etc – is to the AVDS' 1Gbps RJ port instead of the Ethernet card's 100Mbps ports.

Connector Type: D-Sub 44 High-Density Female (Sockets) with jack screw posts

4 Port Ethernet Connector Pinout:

Pin	Function
1	Reserved
2	Reserved
3	Reserved
4	Reserved
5	Reserved
6	ENET P4 TXB+
7	ENET P4 TXA+
8	Reserved
9	Reserved
10	ENET P3 TX+
11	ENET P3 RX+
12	ENET P2 TX+
13	ENET P2 RX+
14	ENET P1 TX+
15	ENET P1 RX+
16	NC
17	Ground
18	Chassis
19	Reserved
20	Reserved
21	ENET P4 TXB-
22	ENET P4 TXA-
23	Reserved
24	Reserved
25	ENET P3 TX-
26	ENET P3 RX-
27	ENET P2 TX-
28	ENET P2 RX-
29	ENET P1 TX-
30	ENET P1 RX-
31	NC
32	Chassis
33	Chassis
34	Chassis
35	Chassis
36	Chassis
37	Chassis
38	Chassis
39	Chassis
40	Chassis
41	Chassis
42	Chassis
43	Chassis
44	Chassis

6 Configuration and Control

Figure 25 AVDS Logical Channels below depicts a way in which the system can be broken up into logical channels. The AVDS can support up to 100 logical channels in a system. Configuring an AVDS system involves defining the specific inputs that specify each input channel in the system and the specific outputs that define each output channel in the system. Controlling an AVDS system involves commanding a given output channel to receive from a given input channel.

A key design feature of the AVDS is the straight forward manner that HD video, SD video, encoded audio, and PCM audio signals can all be input from the same source. Hence, the system is able to provide the best match of available input signals to the capabilities of the rendering device. One HD monitor can be displaying the HD video signal from the HD DVD player, while an SD monitor is displaying the SD video signal from the same HD DVD Player. A surround sound receiver can process the HD DVD player's encoded audio while the same HD DVD player's down-mixed PCM audio can be routed to a stereo-only device like headphones.

An XML file provides a way to organize the various input and output signals to combine related signals into logical channels. Selecting an input channel to be routed to an output channel is the fundamental task of the AVDS. The use of logical channels abstracts the details from the control system.

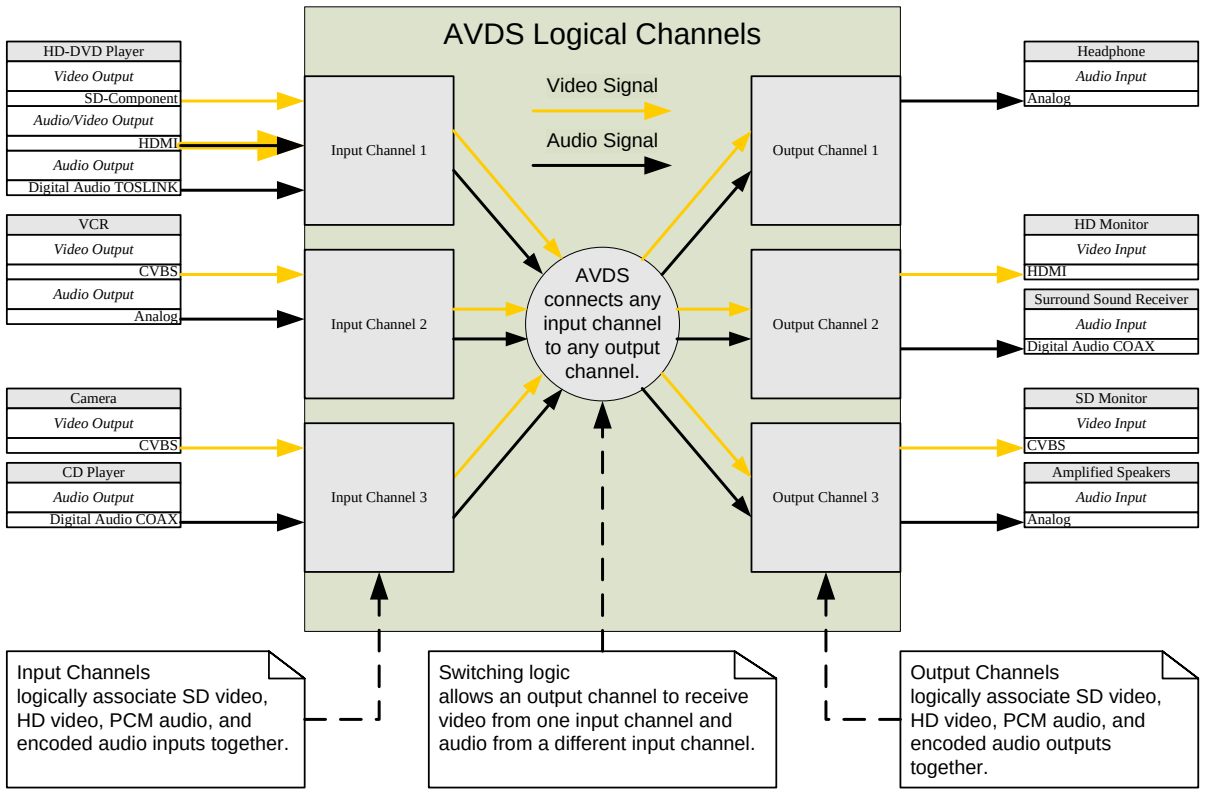


Figure 25 AVDS Logical Channels

Note that although audio and video signals are combined logically within a given input channel, the system affords the flexibility of routing the audio from one input channel and video from another input channel to the same output channel. This allows the user to watch the video from one channel while listening to the audio from another channel.

The use of logical channels reduces a number of operations handled by the AVDS to a single, simple command executed from the external control system.

Refer to *002-0004-01 AVDS Interface Control Document* for detailed interface control description.

7 Software

Each node box contains a microcontroller that is responsible for controlling all of its on-board peripherals. The microcontroller runs software that resides in FLASH. This software can be updated via the IP connection.

All software is developed to RTCA DO-178 Level E.

Configuration properties are downloaded and stored in non-volatile memory. Configuration properties can be updated via serial port or IP connection. A PC based maintenance application (AVDS Client) is available to assist with configuration, diagnostics, and control.

7.1 AVDS Node Automatic Update Routine

The AVDS system has an automatic update routine to ensure that all Nodes on a system are using the same base software. Below is a description of how this automatic update routine works:

1. Power is applied to all Nodes. Once the booted, all Nodes will verify that the fiber loop is complete. This is their way of verifying that all LRUs have booted.
    a. If the loop is not complete then the automatic update routine will never initiate.
2. Once all Nodes boot and have verified that the loops is complete, a voting routing begins. All Nodes see the software version installed on all other Nodes on the system. They then use a majority rules algorithm to determine which software version to use for the entire system. If there is a tie for majority, then the tie breaker goes to the Master of the system. Below are hypothetical examples to demonstrate this voting:
    a. Example 1:
    Node 1: Version A
    Node 2 (Master): Version A
    Node 3: Version B
    Result: Version A will be used and Node 3 will be update to Version A.
    b. Example 2:
    Node 1: Version B
    Node 2 (Master): Version A
    Node 3: Version B
    Result: Version B will be used and Node 2 will be updated to Version B.
    c. Example 3:
    Node 1: Version A
    Node 2 (Master): Version B
    Node 3: Version C
    Result: Version B will be used because there is a tie, but the Master Node is using Version B. Nodes 1 and 3 will be updated to Version B.

3. Once it is determined which version of software to use, the Nodes will being downloading and installing the correct version of software. After installation is complete for the entire system, then the Nodes will reboot and the routine is complete.

7.2 AVDS Client Application

- PC based application (Windows XP, Vista, Windows 7, Windows 8, and Windows 10 compatible)
- Uploads/Downloads system files (configuration and application)
- Lists logical input and output channels by human readable name (parsed from XML file).
- For each output channel:
    - Allows selection of logical audio input channel
    - Allows selection of logical video input channel
    - Allows control of volume level and tone
- Status window displays current health and connectivity of each node.
- Provides debug message log.

Typically, the system is configured and controlled by a third-party control system that communicates to one of the node boxes via the serial RS232 port or via an IP socket over the Ethernet. Control commands may be issued to any node box on the network. The nodes will automatically communicate among themselves via the Ethernet channel to carry out the control commands. See *002-0004-01 AVDS Interface Control Document* for more detail.

8 Field Troubleshooting

Refer to *002-0007-01 AVDS Troubleshooting Guide* for more information. AVDS Client software designed to run under Windows XP/Vista/7/8/10 is provided to assist in field troubleshooting. This application communicates with the AVDS system over an IP connection. Refer to 002-0007-01 AVDS Troubleshooting Guide for more information.

9 Instruction for Continued Airworthiness

The AVDS must be installed in accordance with the specifications defined in this installation manual. Because of the self-healing nature of the AVDS, non-critical, non-safety of flight failures can go undetected during normal operation. As an example, a damaged fiber cable will cause the AVDS to automatically reroute audio/video traffic through another route. For this reason it is important to perform the schedule inspections as detailed below:

Required inspection type:	Scheduled inspections
Inspection interval:	Follow aircraft's standard zonal inspection interval
Required tools:	(1) AVDS Client Application 890-0002-01 (latest release) (2) Laptop computer with Ethernet port (3) 10/100 or 1000BaseT Ethernet cable
Inspection instructions:	(1) Inspect the exterior LRU for signs of physical damage such as cracks, corrosion, dents, fluid intrusion, or other physical damage. (2) Following the instructions as detailed in 002-0021-01 (Latest released), use the laptop and the AVDS Client Application to perform the following checks: a) Retrieve the system Error Log. Ensure there are not Critical Errors in the log. Note: The "Unacknowledged Error Status" LED at the bottom of the screen will be illuminated yellow if there is a Critical Error in the log. If illuminated green then there are no errors in the log. b) If the system has multiple AVDS Nodes connected in a fiber ring, perform a Fiber Integrity test.
Inspection findings:	In the event of a finding during inspection, contact Innovative Advantage at support@in-advantage.com

10 Appendix A: Auxiliary Audio Input Panel Reference Schematic

This schematic may be used as an example of a circuit which converts optical digital audio input to an electrical version which may be input into the auxiliary digital audio input on the HDMI input card.

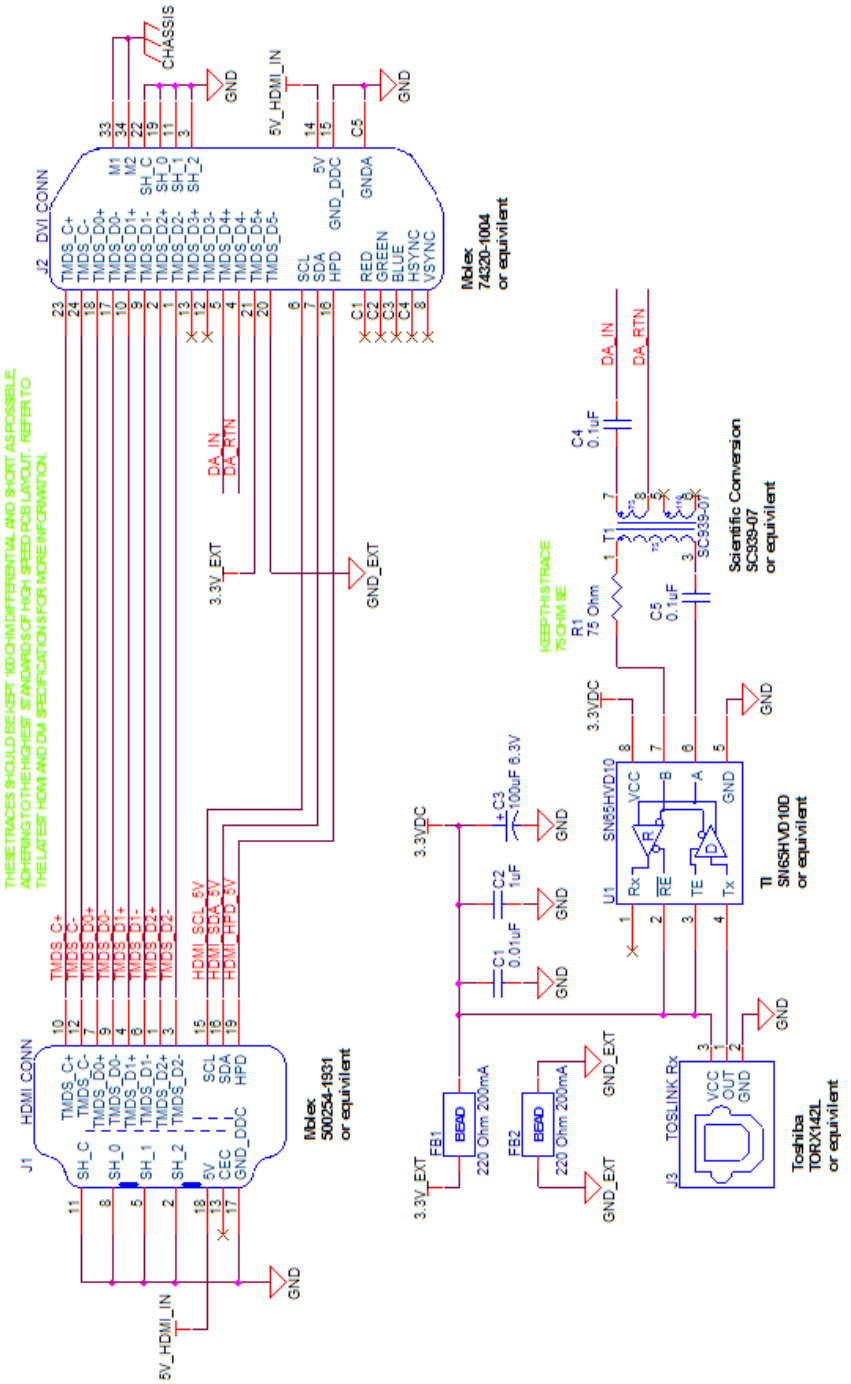


Figure 26. Auxiliary Audio Input Panel Reference Schematic

11 Appendix B: Serial Control Wiring Examples

RS-485 Operation

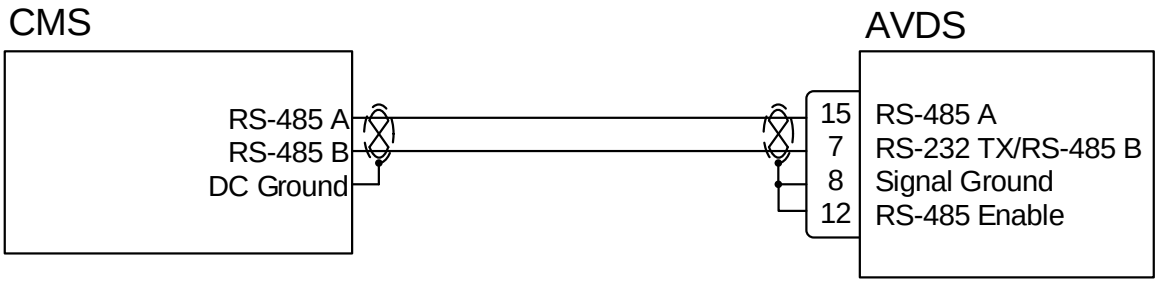


Figure 27: RS-485 Wiring Example

Note: The AVDS RS-485 interface is point-to-point – you cannot use a multi-drop architecture.

RS-232 Operation

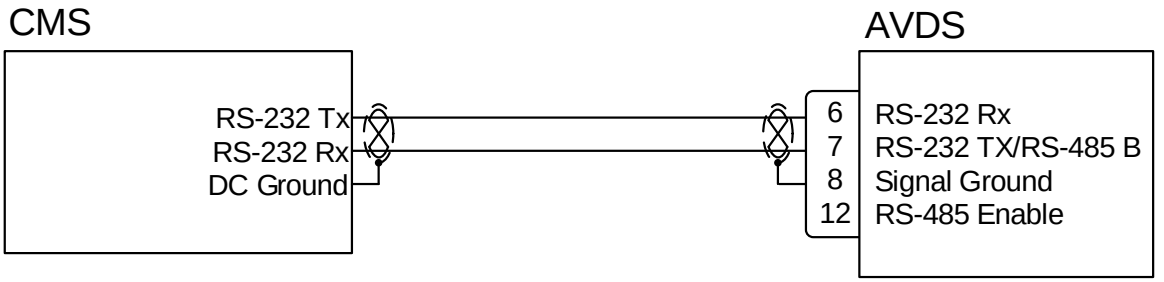


Figure 28: RS-232 Wiring Example

Appendix C: AVDSClient Software License Agreement

END-USER LICENSE AGREEMENT FOR AVDS Client. IMPORTANT PLEASE READ THE TERMS AND CONDITIONS OF THIS LICENSE AGREEMENT CAREFULLY BEFORE CONTINUING WITH THIS PROGRAM INSTALL: Innovative Advantage's End-User License Agreement ("EULA") is a legal agreement between you (either an individual or a single entity) as an "Authorized End-User" and Innovative Advantage for the Innovative Advantage software product(s) identified above which may include associated software components, media, printed materials, and "online" or electronic documentation ("SOFTWARE PRODUCT"). By installing, copying, or otherwise using the SOFTWARE PRODUCT, you agree to be bound by the terms of this EULA. This license agreement represents the entire agreement concerning the SOFTWARE PRODUCT between you as an Authorized End-User and Innovative Advantage (referred to as "LICENSOR"), and it supersedes any prior proposal, representation, or understanding between the parties. If you do not agree to the terms of this EULA, do not install or use the SOFTWARE PRODUCT.

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AVDS installations must comply with the installation instructions (the "Installation Instructions" for AVDS found in the AVDS Installation Manual. You as the End-User or Installer, as applicable, agree to comply with all such Installation Instructions. Such Installation Instructions include special requirements with respect to Compliance and Robustness Rules to assure the physical security of presentation devices and with respect to the operation and maintenance of installations; compliance with such rules is mandatory to provide that Content is reasonably secure from being intercepted or copied, and therefore must restrict End-User access to AVDS outputs when HDMI/DVI with HDCP input ports are provided to the End-User. You may not modify physical installation of any equipment or the SOFTWARE PRODUCT in any way so as to circumvent any such Content protection measures. Furthermore, End-User agrees not to temporarily or permanently install or have installed, or allow operation of any recording, permanent storage, or duplication device, or of any unauthorized access or test points, downstream of any AVDS outputs. Failure to comply with the Installation Instructions, including those that provide for physical security protection of Content would be a material breach of this EULA and may subject End-User and/or Installer to legal action under Section 1201 of Title 17 of the United States Code (the Digital Millennium Copyright Act, or DMCA) and similar laws in other jurisdictions.
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