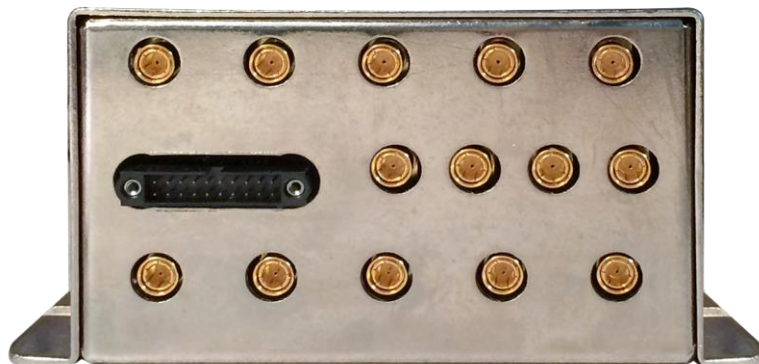


## Installation and Operation Manual

### **FDSDIVCS-4-5**

### **FDSDIVCS-4-10**

### **SDI Video Crosspoint Switch**





FDSDIVCS-4-5

FDSDIVCS-4-10

SDI Video Crosspoint Switch

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For additional support, please visit our Frequently Asked Questions section located on our web site Support Center at <http://support.FlightDisplay.com>.





## Table of Contents

<b>General Information</b> .....	<b>4</b>
Back View .....	4
Specifications .....	5
<b>Configuration Details</b> .....	<b>5</b>
Technical Drawing FDSDIVCS-4-5.....	6
Technical Drawing FDSDIVCS-4-10.....	7
Pinout .....	8
Video Inputs & Video Outputs.....	9
Push Button Switches.....	10
RS485 Control .....	11
Command Set.....	12
Installation Instructions .....	13
Mechanical Installation .....	13-14
Ship Kit Items .....	15
Technical Support.....	16
Instructions for Continued Airworthiness .....	16
Warranty .....	17
Log of Revisions.....	18



## General Information

The FDS DIVCS-4-5 is a 4 input, 5 output video crosspoint switch and the FDS DIVCS-4-10 is a 4 input, 10 output crosspoint switch. These crosspoint switch components are the central video component for in-flight entertainment. This hardware device simplifies video wiring by using 75 ohm coax to transmit HD video to onboard displays. Non-blocking switching permits a connection of any HD-SDI input to any HD-SDI output. Switching is controlled through CAN, RS485 or momentary ground switches. It is used with the following components:

- All models of HD-SDI Monitors,
- Composite to HD-SDI Converter
- VGA to HD-SDI Converter
- HDMI to HD-SDI Converter
- HD-SDI Cameras

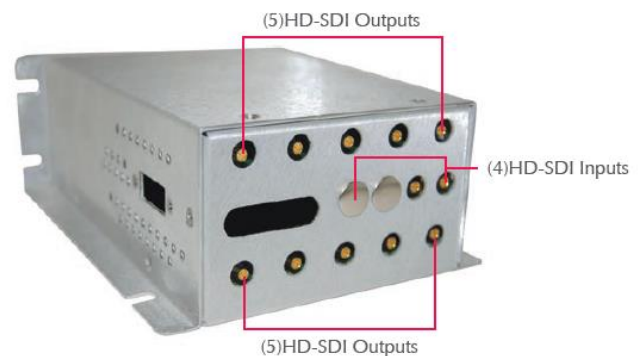
Depending on the amount of outputs required would depend on which crosspoint switch is used.

## Back View

- FDS DIVCS-4-5 - The bottom row from left to right are outputs 1-5, the top row from left to right are inputs 1-4.



- FDS DIVCS-4-10
- The top row of outputs is: 6-10( left to right)
- The center row of inputs is: 1-4(left to right)
- The bottom row of outputs is:1-5(left to right)



## Specifications

<b>Dimensions - FDSDIVCS-4-5</b>	4.29" x 1.60" x 6.06"
<b>Dimensions - FDSDIVCS-4-10</b>	4.78" x 2.31" x 5.82"
<b>Weight - FDSDIVCS-4-5</b>	13 oz.
<b>Weight - FDSDIVCS-4-10</b>	1.1 lbs.
<b>Power</b>	28V DC @ 1A steady state 800mA
<b>Material</b>	Aluminum
<b>Operating Temperature</b>	-20 C to 60 C
<b>Control</b>	CAN, RS485, Push Button Momentary Switch
<b>Video Input</b>	1.5G HD-SDI
<b>Video Output</b>	1.5G HD-SDI

## Configuration Details

The FDSDIVCS-4-5 and FDSDIVCS-4-10 can be configured:

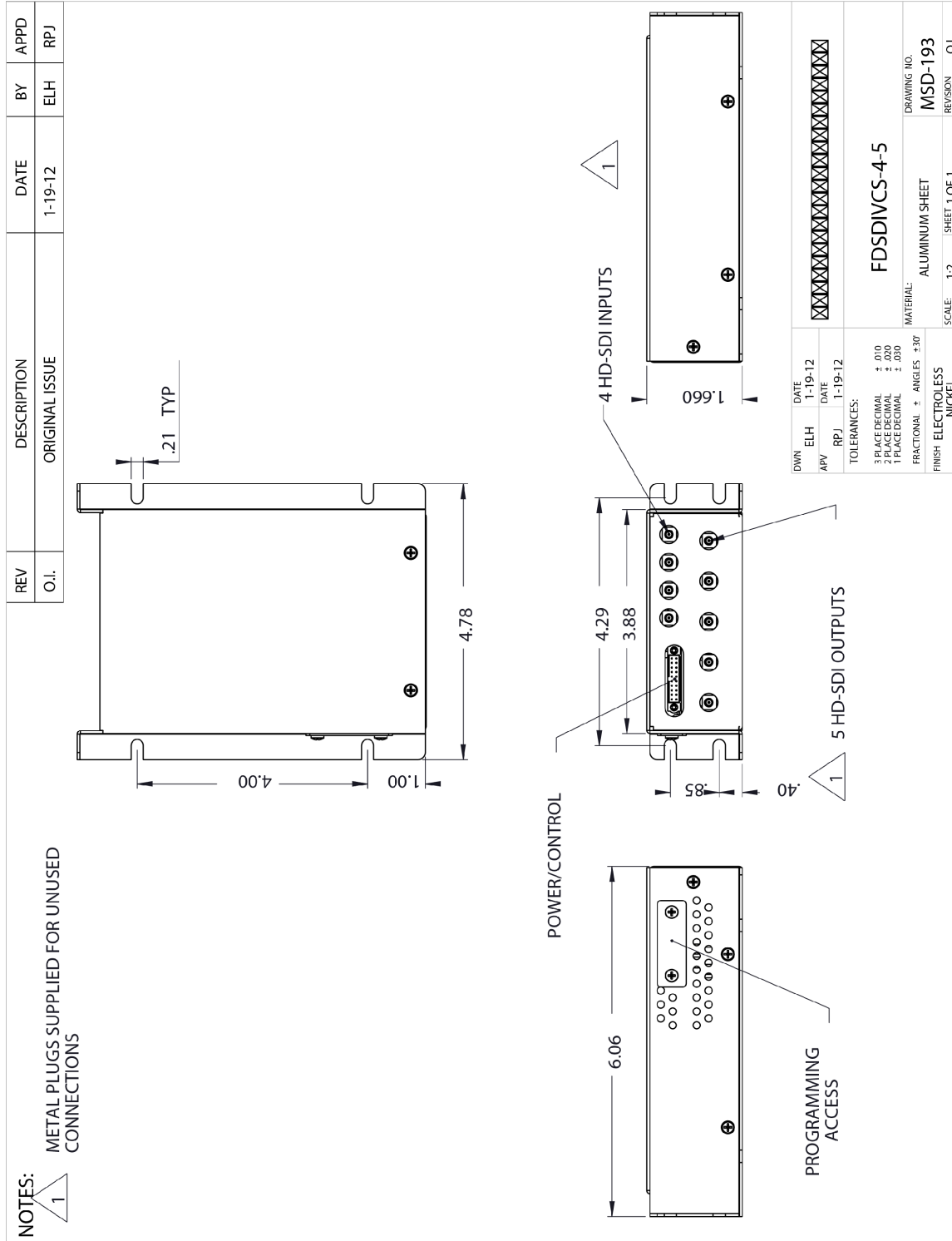
- to re-select the last channel request for each output channel (default state)
- or set all outputs to a predefined input upon system power up or momentary loss of power.

Video formats supported: SDI and HD-SDI up to 1.5GHz.

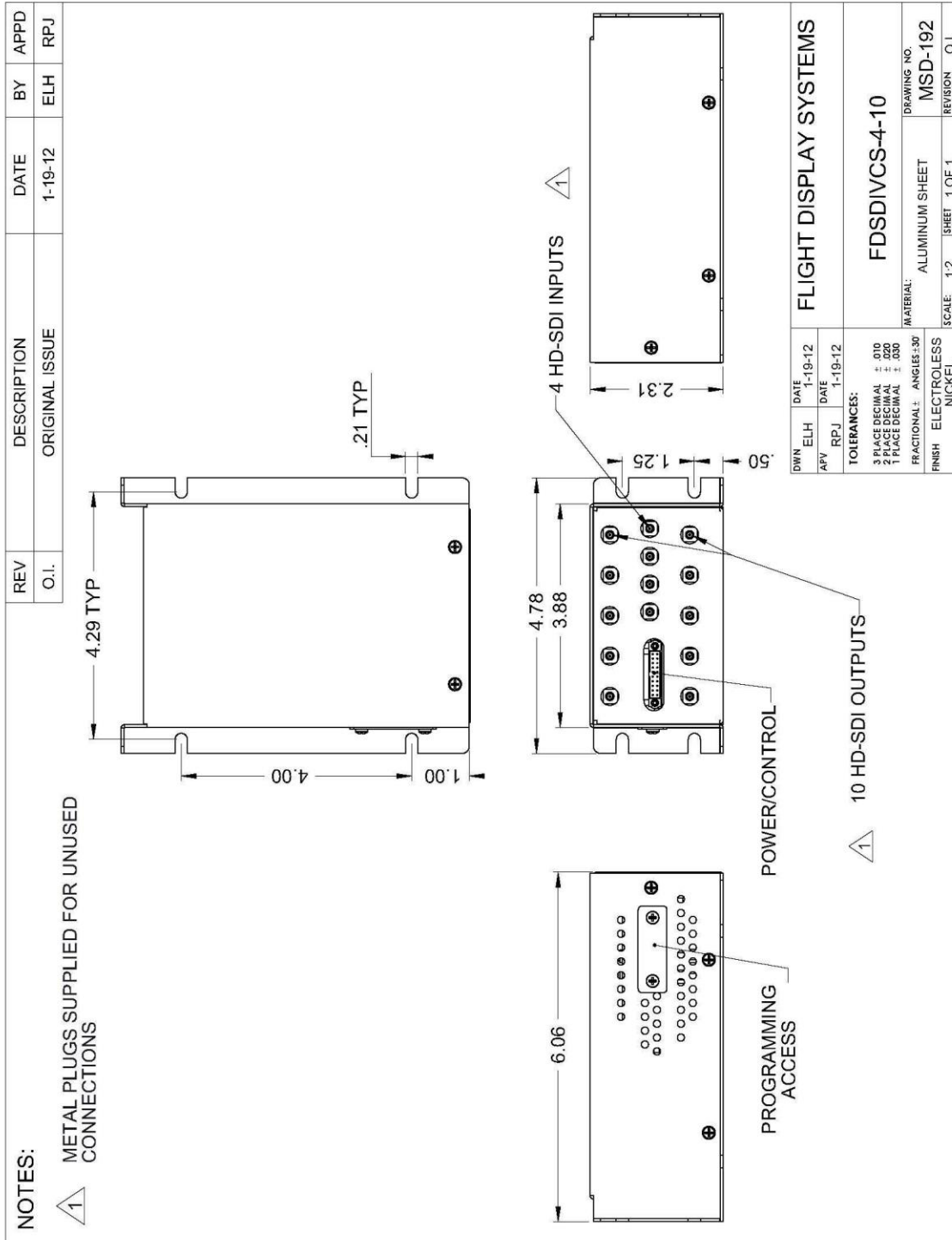
Supports but not limited to:

SMPTE-292M : 720p(50/59.94/60)	1280x720
SMPTE-292M : 1080i (60/59.94/50)	1920x1080
SMPTE-274M : 1080i (60/59.94/50)	1920x1080
SMPTE-274M : 1080p(30/29.97/25/24/23.98)	1920x1080
SMPTE-296M : 720p(50/59.94/60)	1280x720
SMPTE-259M : 480i(59.94),576i	
SMPTE-125M : 480i(59.94)	
ITU-R.BT.656 : 576i(50)	720x576
2K Format : 1080(23.98psf/24psf/23.98/24)	2048x1080

### Technical Drawing - FDS DIVCS-4-5



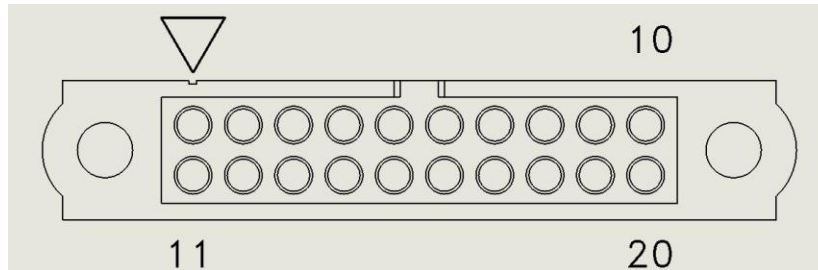
### Technical Drawing – FDS DIVCS-4-10



## Pinout for FDS DIVCS-4-5 and FDS DIVCS-4-10 - Mating connector

Harwin P/N: M80-9412042

Harwin P/N: M80-0110001



### MATING FACE

Pin Number	Description
1	Push button Switch for Output Channel 1*
2	Push button Switch for Output Channel 2*
3	Push button Switch for Output Channel 3*
4	Push button Switch for Output Channel 4*
5	Push button Switch for Output Channel 5*
6	Push button Switch for Output Channel 6*
7	Push button Switch for Output Channel 7*
8	Push button Switch for Output Channel 8*
9	Push button Switch for Output Channel 9*
10	Push button Switch for Output Channel 10*
11	Jumper for Enable Input Channel 3
12	Jumper for Enable Input Channel 4
13	Reserved
14	Reserved
15	CAN Low
16	CAN High
17	RS-485A
18	RS-485B
19	+28VDC Input
20	28V Power Return**

\* momentary switching

\*\* Use this pin only for power return



## Video Inputs and Video Outputs

### HD-SDI Video :

SMB Mini. Female connectors are on the chassis.

Disconnects: Use SMB Mini 75 Ohm Jack to Jack adapters rated 1.5GHz or better. Amphenol Connex 142249-75 or equivalent.

Do not use D connectors, circular or multi-pin connectors as disconnects for SDI video signals, as it may cause macro blocking, intermittent freezing or blue screen images.

Limit the number of disconnects on any one length of cables to the a minimum. As a general rule of thumb, a disconnect and it's two associated coax mating connectors (with near perfect installation) are equivalent to about 20 feet of cable loss.

Coax cable. Industry standard M17/94-RG179

Compatible Mating connectors:

Amphenol 142189-75	SMB Mini Right Angle version for RG179 and RG187 Cable.
--------------------	---------------------------------------------------------

### Notes:

Industry standard M17/94-RG179 Coaxial Cable with many brands of SMB Mini connectors specified for use with RG-179 will support up to 100 feet of length between the crosspoint switch and either a signal source, or a monitor or other endpoint.

### **Push Button Switches:**

The Crosspoint Switch may be controlled using Normally Open Momentary push button switches. Use one switch for each output channel that needs to be controlled. One pin of the switch connects to a source of 28V (+16 to +30 Volts), the other pin is wired to the 20 pin connector on the cross point switch. A short press of the switch commands its corresponding output channel to be connected to the next enabled input channel. Input channels 1 and 2 are always enabled. Input channels 3 and 4 can be individually enabled by connecting pins 11 and 12 (for channels 3 and 4 respectively) to a source of 28V (+16 to +30 Volts). For instance: : If pins 11 and 12 are left disconnected, then inputs 1 and 2 are enabled, and inputs 3 & 4 are disabled. A short press of any of the channel command switches will cycle their corresponding output through inputs 1, 2, 1, 2, 1, 2..... If pin 11 is connected to a source of 28V and pin 12 is left disconnected, then inputs 1,2,& 3 are enabled, and input 4 is disabled. A short press of a channel command switch will cycle its corresponding output through input 1, 2, 3, 1, 2, 3, 1, 2.....

### **Notes:**

Industry standard M17/94-RG179 Coaxial Cable with many brands of SMB Mini connectors that are specified for use with RG-179 @ 1.5GHz or more will support up to 100 feet of length between the cross point switch and either a signal source, or a monitor or other endpoint. Premium Cable such as Thermax 875-892 cable and their specified connectors can increase useable cable length.

## RS485 Control

Full control of the SDI Video Cross-point switch can be achieved through a standard RS485 port on the rear panel. Serial commands can be used to set channels, as well as configure the device.

**RS485 Port Configuration:** The RS-485 port at default is standard 9600 baud, no parity, 8 data bits, 1 stop bit, and no flow control. It is standard two wires half duplex.

**Prefix:** One Character. All RS-485 remote commands must start with the “!” character.

**Device ID:** Four Characters. “VC” identifies all commands directed to the VCS. Leading zeros are required for all commands.

**Address:** Address specified in the EEPROM. Two characters in the range 01 to 09, default ADDR is 01.

**Termination:** One Character; ASCII CR. Each command must end with Carriage Return<CR>.

**Turnaround Time:** Allow 500mS between messages, since time is needed to change direction of the port, the device will wait a minimum of 10ms in between receiving and transmitting a message.



## Command Set

Function	Command Format	Parameters (Values in HEX)	Example	Reply
Set Input and Output Channel	!VC<ADDR>CH,XX,YY<CR>	XX = Output Channel (FF means all channels) YY = Input Channel	!VC01CH,05,01<CR> -Sets input channel 01 to output channel 05 on Device 01.	!VC<ADDR>OK<CR>
Roll Call	!VC<ADDR>RC<CR>		!VC01RC<CR> -Request Roll call on Device 01.	!VC<ADDR>RC,<MODE L NO>,v<VERSION>,<#ofI NPUTS>,<#ofOUTPUTS ><CR>
Temperature	!VC<ADDR>TEMP<CR>		!VC01TEMP<CR> -Request Temp on Device 01.	!VCTEMP,<###>C<CR> ### = Temperature as a three digit integer with leading zeros in Celsius.
Configure power up defaults	!VC<ADDR>CFGDFLT, XX,YY<CR>	XX = Output Channel (FF means all channels) YY = Input Channel (FF = Last known state on output)	!VC01 CFGDFLT,02,04<CR> - Set input channel 04 to output channel 02 as power up default.	VC<ADDR>OK<CR>
Set inputs and outputs to power up defaults	!VC<ADDR>CLR<CR>		!VC01CLR<CR> -Clear current input and output power up defaults	VC<ADDR>OK<CR>
Configure Zones	!VC<ADDR>CFGZONE, XX,ZZ<CR>	XX = Output Channel (FF means all channels) ZZ = Zones(00-20)	!VC01CFGZONE,05,02<CR> -Assign output 5 to zone 2.	VC<ADDR>OK<CR>
Set Zone on Input	!VC<ADDR>ZONE,ZZ,YY<CR>	ZZ = Zones(00-20) YY = Input Channel	!VC01ZONE,02,03<CR> > -Set zone 2 on input 3	VC<ADDR>OK<CR>
Set device address	!VC<ADDR>ADD,XX<CR>	XX = 01 to 09	!VC01ADD,05<CR> -Set Device 01 to address 05.	VC<ADDR>OK<CR>
Set baud rate	!VC<ADDR> BAUD,X<CR>	X=0 300 BAUD X=1 600 BAUD X=2 1200 BAUD X=3 2400 BAUD X=4 4800 BAUD X=5 9600 BAUD X=6 19200 BAUD X=7 38400 BAUD X=8 57600 BAUD	!VC01BAUD,8<CR> -Set baud rate 57600 on Device 01.	VC<ADDR>OK<CR>

## Command Acknowledgements

Command	Description
!VC<ADDR>OK<CR>	Successful transmission
!VC<ADDR>ERROR<CR>	Unknown Command
!VC<ADDR>FAULT<CR>	Communication Error
!VC<ADDR>INVALID<CR>	Incorrect parameter value



## Installation Instructions

All cabin entertainment equipment, such as the FDS DIVCS-4-5 or FDS DIVCS-4-10, should be installed on a non-essential bus and have a dedicated circuit breaker. It is necessary that a switch be installed on a non-essential bus and have a dedicated circuit breaker. It is necessary that a switch be installed in the cockpit so that the pilot can de-energize the entertainment system should it become necessary.

## Mechanical Installation

The unit may be mounted inside a cabinet. It is recommended to install with at least 1 inch of space around the top and left & right sides of the unit to allow circulation of air for cooling.

**NOTE: It imperative that each device MUST be plugged into the appropriate output connection on the ACS/VCS. If devices are not plugged into the correct channel, they will be controlled by unintended devices.**

- **Secure the cables to protect stress within the connectors.** RJ-179 cable has a small gauge inner conductor. It is possible to break the connection if not properly supported.
- **Stay within the cable manufacturers recommended bend radius.** Thin diameter Coax cable can be easily crushed or deformed by tight bends. The properties of the cable change upon deformation and do not recover.
- **Position the equipment with enough room for the cable.** Installers must position equipment where there is plenty of room for the bend radius of the cable as it exits the equipment. The small diameter center conductor of the cable is easily broken and requires a bit of care. Do not bend the cable within 3 inches of a connector.
- **Use only 75 ohm cable and connectors.** HD-SDI video requires use of 75 OHM cables and 75 OHM connectors that are rated for use on signals up to 1.5GHz. Use of a mix and match of 75 OHM and 50 OHM cables and connectors will cause poor image quality. Use of connectors that do not have RF performance specifications are likely to cause poor image quality. The only solution to the problem is to replace the cable and connectors with properly rated components.

- **Connect ground to the aircraft grounding block with correctly sized wire and connectors** . ALL pins labelled “Power Return” must be connected to the fuselage grounding block using a heavy gauge wire. Use the max gauge permitted for the connector pin. It is permitted to join several individual power return pins to a heavier gauge wire for a run to the ground block. No other signal should be joined to or shared with that wire.
- **Connect all power and ground (power return) connectors.** Multiple Power and Power Return pins are provided for EMI control and voltage transient protection. Internal power transient protection components rely on a solid path to the fuselage during a transient event. If there are only one or two light gauge wires between the device and the fuselage, then the transient protection will be limited.
- **Unit is shipped with steel dome video connector covers.** Install them on all unused video inputs and outputs to retain full EMI specifications.
- **Not all “Ground” wires are the same.** Connect all pins marked “Power Return” to a fuselage grounding block. It’s ok to join several smaller gauge wires (that must be of a certain size to be compatible with connector terminals) to a larger wire for the connection to the fuselage grounding block. Do not share that larger wire with other signals or with ground connections from other products.

## Ship Kit Items for

**Products:** FDSDIVCS-4-5  
FDSDIVCS-4-10



M80-9412042 - Con w/Hood, Harwin  
Both Products come with a 20-Pin



28A2024-0A0 - FERRITE, TUBE BOX, 0.5" WHITE



M80-0110001 - FEMALE LARGE BORE CRIMP CONTACT  
- Twenty per Kit



142189-75 - Con, Jack, SMB, Straight, Crimp  
FDSDIVCS-4-5 = 9 Connectors  
FDSDIVCS-4-10 = 14 Connectors



## Technical Support

Should you have any questions concerning this product or other Flight Display Systems products, please contact our Product Support representatives at (470) 239-7421.

### **Flight Display Systems**

6435 Shiloh Road

Alpharetta, GA 30005

Phone: 470-239-7400

Fax: 678-867-6742

Email: [sales@FlightDisplay.com](mailto:sales@FlightDisplay.com)

For further product information, technical data and sample wiring diagrams, please click on the **Dealers** section of our web site at [www.FlightDisplay.com](http://www.FlightDisplay.com)

## Instructions for Continued Airworthiness

The FDS DIVCS-4-5 and FDS DIVCS-4-10 are designed not to require regular general maintenance.







## Limited Warranty

All Flight Display Systems (FDS) products are warranted to be free from material or manufacturing defects for a period of 24 months from the date of shipment for General Aviation customers or 12 months from the date of shipment for Government/Special Mission customers. Any material or repair workmanship for in warranty repair service will be specifically warranted for 90 days or the remainder of the original warranty period, whichever is longer. If the original warranty period has expired, the 90 day repair warranty is limited to the material and workmanship specific to the repair activity completed.

The following conditions are exclusions to warranty coverage:

1. Labor costs associated with installation, removal or reinstallation of any product.
2. Damage to or malfunction caused by any unauthorized alteration made to the product.
3. Resolving signal quality issues caused by externally generated noise introduced by aircraft electrical systems or other components connected to any FDS product.
4. Any malfunction caused by improper installation or connection to aircraft wiring, industry standard cabin management/ inflight entertainment systems, or third party commercial equipment not specifically identified as compatible with FDS products.
5. Any malfunction caused by installation that does not conform to precautions associated with operating environments listed in the operating manual or consistent with industry best practices such as; high temperature, adequate ventilation, high humidity, high dust, or power surges.
6. Cosmetic damage or damage to internal components caused by installation or removal, failure to follow installation or operating instructions, or any neglect or misuse of the product.
7. Any product that is returned for service with a broken tamper evident seal, indicating tampering or improper handling of the product by an unauthorized person. Violation of product tamper evident seals or modification of factory installed serial and PMA labels voids any warranty, either expressed or implied.

The FDS technical support team is available to provide distance troubleshooting support during business hours (8:00am to 5:00pm EST) Monday through Friday at (470) 239-7421.

Many repair requests can be resolved through distance support and may not require return of merchandise to the factory. If a product must be returned to the factory for repair, an RMA number will be issued as directed by the technical support team and communicated by the repair coordinator.

Upon request by the customer, FDS may send a service technician onsite to repair any non-PMA products. The travel expenses incurred to include transportation, lodging and meals along with the technician's hourly rate shall be payable by the customer in accordance with FDS' applicable rates and procedures.

Flight Display Systems will, upon receipt of returned merchandise, remanufacture or replace the unit at our discretion and return the product by Ground Return Shipping. Express return shipment will be the responsibility of the sender.

This warranty is not transferable.

Any implied warranties expire at the express limited warranty expiration date. FDS shall not be held liable for any indirect, special, punitive, incidental or consequential damages.

Some states do not allow limitation on the length of an implied warranty. In such states, the exclusions or limitations of this limited warranty may not apply.





## Log of Revisions

Rev	Date	Page	Description
A	07/16/2012		Initial Release
B	04/04/2014	All	Address Changes, Technical Drawings, Ship Kit Changes, Pinouts, Warranty Information
C	09/26/2014	Pg 9	Changed out part number Johnson 131-8901-406 – No longer manufactured.
D	10/29/2014	Pgs. 9, 11 & 12	Changed SMB Connectors, and Replaced the RS485 Controls/Commands

