

Installation and Operation Manual

FDS DIVCS-12-16 Video Crosspoint Switch HD-SDI 12x16 and 34x34



FDS DIVCS-12-16

FDS DIVCS-34-34





FDSDIVCS-12x16

FDSDIVCS-34x34

Video Crosspoint Switch, HD-SDI 12x16, HD-SDI 34x34

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General Information

The FDSDIVCS-12-16 is a 12 input, 16 output video crosspoint switch and is the central video component for an in-flight entertainment system for 8 to 20 seats. The FDSDIVCS-34x34 is a 34 input and 34 output video crosspoint switch available for an aircraft larger than 20 seats. This hardware device simplifies video wiring, permits non-blocking switching and distribution of High-Definition digital video. It is used with the following components:

- all models of HD-SDI Monitors,
- Composite to HD-SDI
- VGA to HD-SDI
- HDMI to HD-SDI Video Converters
- FD-AIPCVH-SDI
- Other Select CMS interfaces.



Functionality

The FDS DIVCS-12-16 can receive inputs from up to twelve different external digital video sources while the FDS DIVCS-34-34 can receive up to 34 different external digital video sources. It contains a non-blocking matrix switch to permit independent switching of up to 16 or 34 outputs for each input. There are no restrictions on the number of outputs that any one input can be connected. This device is controlled via RS-485 and CAN communication protocol which is utilized to control the user's video selection.

Specifications

Dimensions	FDS DIVCS-12-16 FDS DIVCS-34-34	11.42" W x 7.86" L x 1.70" T 15.07" W x 7.56" L x 2.58" T
Weight	FDS DIVCS-12-16 FDS DIVCS-34-34	2lbs 10oz 4lbs 9 oz
Power	FDS DIVCS-12-16 FDS DIVCS-34-34	28V DC @: 600mA 28V DC @ 1.0A
Materials		Aluminum
DO-160 Testing		160G, Category B, Section 7, Section 21
Remote Control		CAN and RS-485 Commands
Operating Temperature		-20°C to 60°C
Inrush Current:	FDS DIVCS-12-16	8.6 Amps @ 1.0µS 4.0 Amps @ 6.0µS 600mA Continuous
	FDS DIVCS-34-34	9.6 Amps @ 1.0µS 5.0 Amps @ 2.6 µS 1.0A Continuous

Configuration Details

The FDSDIVCS-12-16 and the FDSDIVCS-34-34 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:

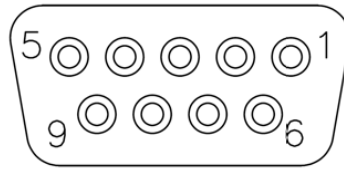
SMPTE-292M	: 720p(50/59.94/60)	1280x720
SMPTE-292M	: 1080i (60/59.94/50)	1920x1080
SMPTE-274M	: 1080i (60/59.94/50)	1920x1080
SMPTE-274M	: 1080p(30/29.97/25/24/23.98)	1920x1080
SMPTE-296M	: 720p(50/59.94/60)	1280x720
SMPTE-259M	: 480i(59.94),576i	
SMPTE-125M	: 480i(59.94)	
ITU-R.BT.656	: 576i(50)	720x576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

Power Connector

Part Numbers for DB-9 connectors, manufactured by Tyco or Amp.

Connector P/N M24308/2-281
 Crimp Contacts P/N M39029/63-368

DB9 Pinout & Female Mating Face Profile



Pin Number	Descriptions
1	+28 Volt Supply**
2	Power Return**
3	RS-485A
4	CAN Low
5	Signal Ground
6	+28 Volt Supply**
7	Power Return**
8	RS-485B
9	CAN High

Some connector pins are only compatible with the smaller gauge wires(22-26). If multiple power pins are available then all pins should be used. Multiple strands of wire may be run to the circuit breaker panel, or multiple small gauge wires may be joined to a larger gauge wire for a single strand run to the circuit breaker panel. Also, use short heavy gauge wire and a clean tight connection for ground. The quality of the ground connections set the quality of ESD protection.

**Connect all +28VDC power pins on each device to a 28 volt source. Connect all indicated ground pins on the device to a Power Grounding block using short heavy gauge wire. The multiple power and ground pins are provided for installer convenience. They are provided to furnish sufficient current carrying capability for the device and just as important, they are part of the power protection and EMI suppression circuit.

It is the installer's responsibility to understand the product's requirements and to install the product in compliance with industry and safety standards.

Video Inputs and Video Outputs

HD-SDI Video :

SMB Mini. Male 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 the video signal 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 142194-75	SMB Mini Right Angle version for RG179 and RG187 Cable.
TE Connectivity 5415487-1	SMB Mini Straight version for RG179 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 150 feet of length between the crosspoint switch and either a signal source, or a monitor or other endpoint.

Power and Ground Wiring

The 34x34 switch is a 28VDC device that requires 9.6 Amps of power to start. The rated current of the equipment and associated voltage drop should be taken into consideration when selecting wire gauge. To operate properly this device requires an input voltage of 25-32VDC allowing a 3 volt drop on the wire, this is equal to the sum of the voltage drop on the 28V power wire and the voltage drop on the ground or power return wire.

The following examples are based on an install with a 28VDC power system and a total of 50 feet of wire between the circuit breaker, switch and ground block.

Example 1: 20awg wire has 9.88 Ohms per 1000 feet, this equates to .494 Ohms for 50 feet. 9.6 Amps of current on .494 Ohms will drop 4.7 Volts. This exceeds the allowable voltage drop to operate this device.

Example 2: 10awg wire has 1.26 Ohms per 1000 feet, this equates to .063 Ohms for 50 feet. 9.6 Amps of current on .063 Ohms will drop 0.6 Volts. This is within the allowable range to operate this device.

Resistance of Wire Type M22759/16-** (** = Gauge)	
Gauge (AWG)	OHMS/1000'
20	9.88
16	4.81
12	2.02
10	1.26
8	.701

Some connector pins are only compatible with the smaller gauge wires. If multiple power pins are available then all pins should be used. Multiple strands of wire may be run to the circuit breaker panel, or the multiple small gauge wires may be joined to a larger gauge wire for a single strand run to the circuit breaker panel. Also, use short heavy gauge wire and a clean tight connection for ground.

It is the installer's responsibility to understand the product's requirements to install the product in compliance with industry standards and safety.



Installation Instructions

All cabin entertainment equipment, such as the FDSDIVCS-12-16 or the FDSDIVDS-34-34, 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.

Avoid routing video wiring parallel to:

- AC wiring
- Strobe wiring
- DC motor supply cables
- Inverter cabling
- Or any other potential noise source.

Some aircraft are prone to AC noise. If Macro blocking, freezing, pixilation, or bluescreen is observed on Video signals that use standard Coax Cabling, then we recommend adding 75 Ohm video isolation transformer rated for 1.5 GHz HD-SDI signaling such as: HD-VIT-75 Manufactured by Allen Avionics, Inc. Mineola, NY USA Telephone +1-516-248-8080.

Please contact Flight Display Systems technical support for troubleshooting, programming, installation, etc.

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

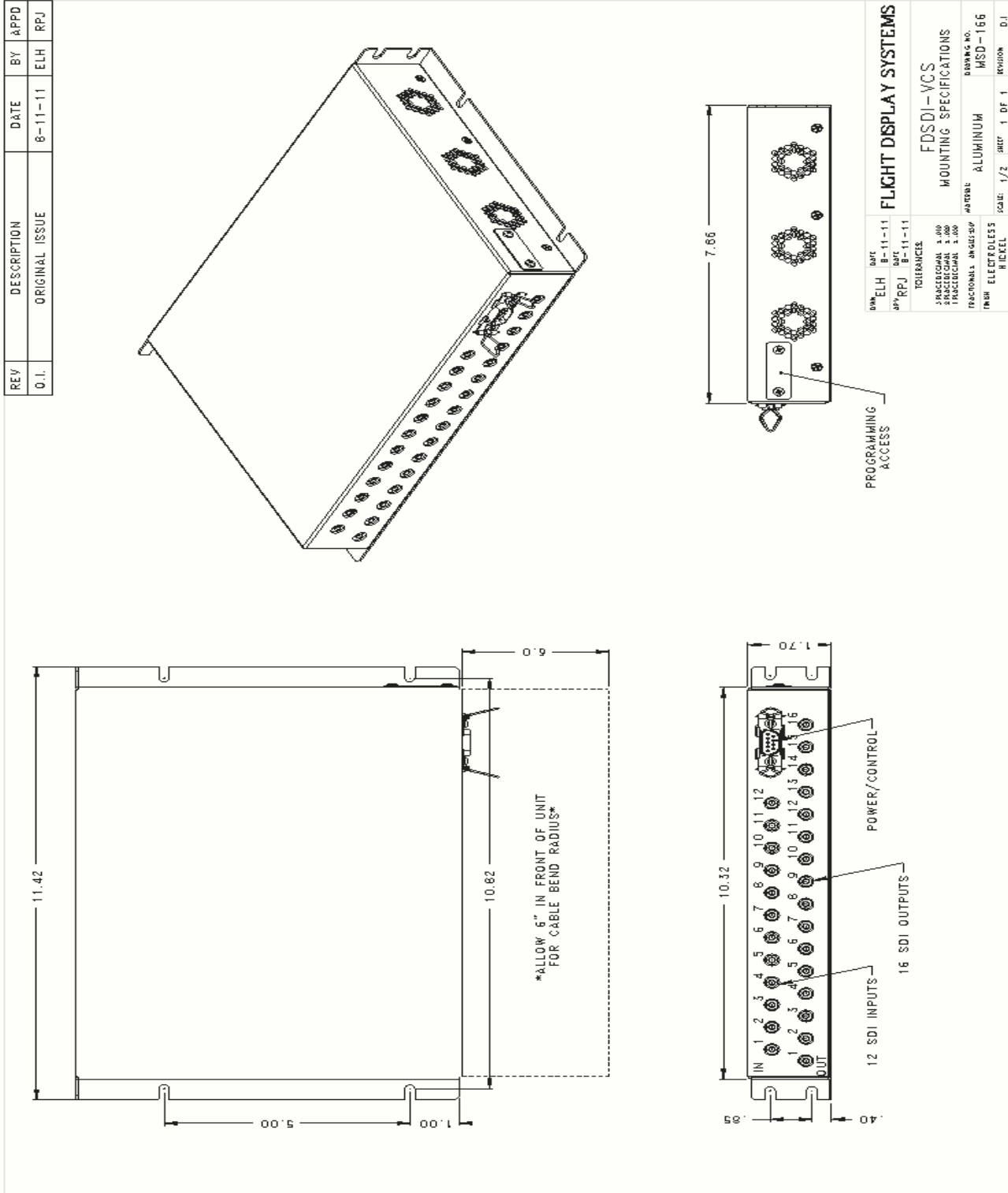
Function	Command Format	Parameters (Values in HEX)	Example	Reply
Set Input and Output Channel	!VC<ADDR>CH,XX,YY<CR>	XX = Output Channel (FF means all channels) YY = Input Channel	!VC01CH,05,01<CR> -Sets input channel 01 to output channel 05 on Device 01.	!VC<ADDR>OK<CR>
Roll Call	!VC<ADDR>RC<CR>		!VC01RC<CR> -Request Roll call on Device 01.	!VC<ADDR>RC,<MODE L NO>,<v<VERSION>,<#of I 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

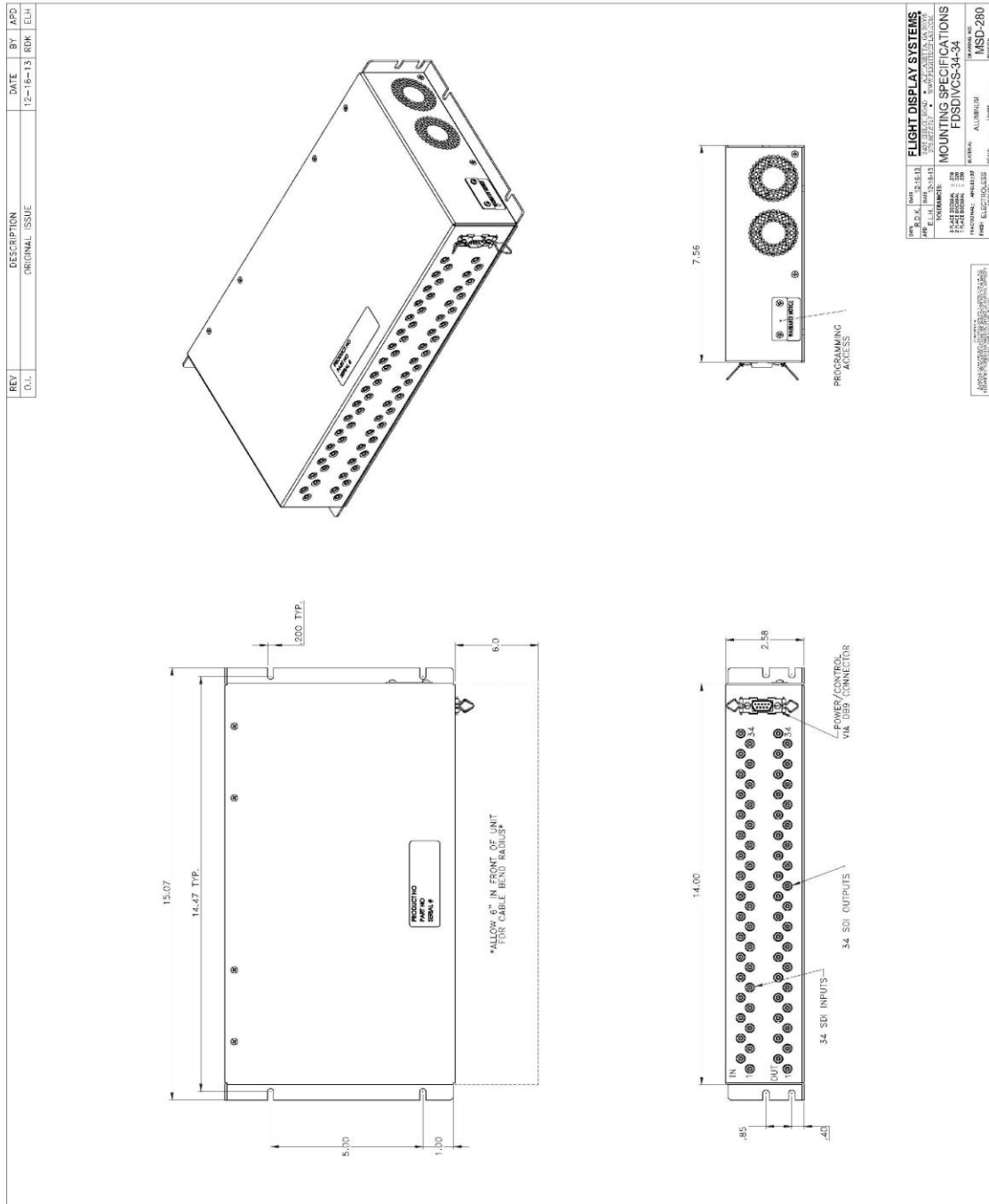
Command	Description
!VC<ADDR>OK<CR>	Successful transmission
!VC<ADDR>ERROR<CR>	Unknown Command
!VC<ADDR>FAULT<CR>	Communication Error
!VC<ADDR>INVALID<CR>	Incorrect parameter value



Technical Drawing



Technical Drawing



Ship Kit Items

Product

750-FDSDIVCS-12-16
 750-FDSDIVCS-34-34

Shipping Materials

750-FDSDIVCS-12-16

- (1) 750-DB09F-LATCH
- (28) 251-00063-00 Mini-SMB plugs
- (28) 350-00029-0313 5/16" metal hole plugs

750-FDSDIVCS-34-34

- (1) 750-DB09F-LATCH
- (68) 251-00063-00 Mini-SMB plugs
- (68) 350-00029-0313 5/16" metal hole plugs

Compatible Mating connectors:

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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 150 feet of length between the crosspoint switch and either a signal source, or a monitor or other endpoint.





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.

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For further product information, technical data and sample wiring diagrams, please click on the **Dealers** section of our web site at www.FlightDisplay.com

Instructions for Continued Airworthiness

The FDSDIVCS-12x16 and the FDSDIVCS-34x34 are designed not to require regular general maintenance.





Warranty Information

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		All	Initial Release
B	11/14/2014	All	Combined FDSDIVCS-12-16 and FDSDIVCS-34-34. Updated address and warranty Data. Added power and ground data as well as inrush current for both products.

