Installation and Operation Manual

FD600CAM-3

Glareshield Camera

TECHNICAL SUPPORT
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FD600CAM-3

Glareshield Camera

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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.

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General Information

The FD600CAM-3 is a Glareshield Camera. This small color camera, when mounted in the cockpit, will provide passengers with an opportunity to observe taxi, take-off, and landing, adding a whole new dimension to the In-Flight Entertainment experience!

Front View

Specifications

Video Output	HD-SDI
Video Output Mode	HD-SDI: 1080p@30fps; 720p@60fps
Camera Sensor	1/3″ Color CCD
Camera Lens	F=3.6, 6mm Lens
Camera Frame Rate	30fps@1080p or 60fps@720p
Effective Pixels	1944(H) x 1092 (V)
Approximate Field of View	75° with supplied 3.6mm Lens 45° with supplied 6mm Lens
Scanning System	2:1 Interlace
Signal to Noise Ratio	More than 50 dB
Minimum Illumination	0.1 Lux
Dimensions, Camera	1.35″ (W) x 1.35″ (H) x 2.92″ (D)
Dimensions, Mount	2.0″ (W) x 1.75″ (H) x 1.75″ (D)
Weight	Approx. 6 oz.
Power	28 Volt nominal, 18V Min / 30V Max
Operating Temperature	14° F to 122° F (-10° C to +50° C)

Installation Instructions

All cabin entertainment equipment, such as the FD600CAM-3, should be installed on a non-essential bus and have a dedicated circuit breaker.

Mounting from the cockpit headliner is suggested. Excessive sunlight will make the video image hard to see. Mounting inside the cockpit and out of direct sunlight will provide a “visor” to the camera lens.

Remember to set the camera pointing down at an approximately 60° angle, as this will optimize the picture for take-off and landings. When looking at the image while on the ground have the horizon 2/3 of the way up the video screen in the cabin.

Power

The FD600CAM-3 is a 28 Volt camera that requires 160mA power and can operate at 18 – 30 Volts DC.

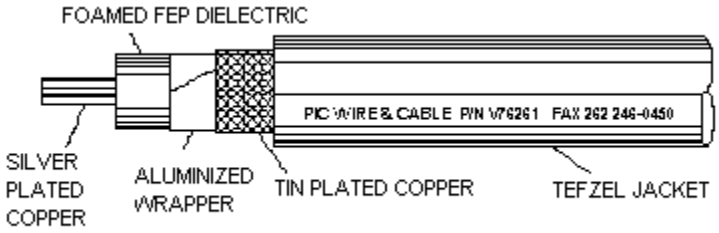
Wiring Suggestions

Avoid routing video wiring parallel to:

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

Video Wiring

Recommended cable is PIC 75 Ohm Coax, P/N V76261. This is a lightweight, flexible, and low signal loss cable which meets FAA flammability requirements of FAR 23.1359(d), FAR 25.853(a) and FAR 25.869(a)(4).



Similar coaxial cable can be used from other vendors, as well. Some aircraft are prone to AC noise. Video isolation transformers are effective in solving many kinds of noise problems. Allen Avionics part number: HD-VIT-75 (http://allenavionics.com (516) 248-8080).

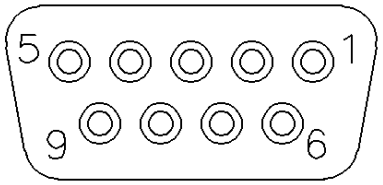
Power and Ground Wiring

22 AWG wire is recommended for Power and Ground applications.

Power/Video

Standard Density DB-9 Receptacle (supplied)

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



MATING FACE

Pin Number	FD600CAM-3 Description
1	28 VDC Input
2	28 VDC Return
3	RS-485 B
4	RS-485 A
5	N/C
6	N/C
7	N/C
8	N/C
9	N/C

RS485 Control

The FD600CAM-3 can be setup and configured through the OSD menu. This menu can be accessed and controlled via RS485 commands.

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. The commands are all ASCII human readable.

Prefix: One Character. All RS-485 remote commands must start with the "!" character.
Device ID: Three Characters. "CAM" identifies all commands directed to the FD600CAM-3.

Commands:
!CAM,En – Button East
!CAM,Wn – Button West
!CAM,Sn – Button South
!CAM,Nn – Button North
!CAM,Pn – Button Press
(n = single ASCII char 0 to 9.)

- 0 = Button Pulse Time 0.25 Seconds
- 1 = Button Pulse Time 0.50 Seconds
- 2 = Button Pulse Time 0.75 Seconds
- 3 = Button Pulse Time 1.00 Seconds
- 4 = Button Pulse Time 1.25 Seconds
- 5 = Button Pulse Time 1.50 Seconds
- 6 = Button Pulse Time 1.75 Seconds
- 7 = Button Pulse Time 2.00 Seconds
- 8 = Button Pulse Time 2.25 Seconds
- 9 = Button Pulse Time 2.50 Seconds

Note: Buttons – North, South, East and West auto repeat

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

OSD Menu Structure

Main	Sub Menu	Sub Menu	
EXPOSURE	BRIGHTNESS	0 - 20	
	SHUTTER MODE	AUTO.MANUAL	
	SHUTTER SPEED	1/30(25), 1/60(50), 1/120(100), 1/250, 1/700, 1/1K, 1/1.6K, 1/2.5K, 1/5K, 1/7K, 1/10K, 1/30K.*() is for power-frequency 50Hz.	
	DSS	OFF, X2, X3, X4.	
	AGC MAX	0-23dB	
	INITIAL	BACK,DEFAULT	
	RETURN	BACK,EXIT	
WHITE BALANCE	WB MODE	AUTO, PUSH LOCK, MANUAL, AUTO EXT	
	CHROMA	0-20	
	KELVIN	0-20	
	RED GAIN	0-20	
	BLUE GAIN	0-20	
	PUSH AUTO	ON,OFF	
	INITIAL	BACK,DEFAULT	
	RETURN	BACK,EXIT	
WDR/BLC	MODE	ON,OFF	
	WDR LEVEL	0-4	
	BLC OSD	ON,OFF	
	BLC X-POS	0 - 20	
	BLC Y-POS	0 - 20	
	BLC X-SIZE	0 - 20	
	BLC Y-SIZE	0 - 20	
	INITIAL	BACK,DEFAULT	
	RETURN	BACK,EXIT	
DAY & NIGHT	MODE	COLOR, B/W, AUTO	
	DWELL TIME	3s	
	AGC THRS	0-10	
	MARGIN	0-10	
	INITIAL	BACK,DEFAULT	
	RETURN	BACK,EXIT	
IMAGE	SHARPNESS	0-10	
	MIRROR	ON,OFF	
	FLIP	OFF, H FLIP, V FLIP, HV FLIP	
	DZOOM	0-20X	
	HLMASK	ON,OFF	HLMASK LEVEL: 0-20
			HLMASK COLOR: Black, White, Yellow, Cyan, Green, Magenta, Red, Blue
	D-WDR	0-4	
	DNR	LOW, MIDDLE,NIGH	
	INITIAL	BACK/DEFAULT	

OSD Menu Structure (Cont.)

Main	Sub Menu	Sub Menu		
SPECIAL	CAM TITLE	0 - 20		
	LANGUAGE	ENGLISH, RUSSIAN, SPANISH, GERMAN, FRENCH, PORTUGUESE		
	PRIVACY	ON, OFF	ZONE NO	0-23
			MASK MODE	ON,OFF
			X-POSITION	0-60
			Y-POSITION	0-40
			X-SIZE	0-40
			Y-SIZE	0-40
			INITIAL	BACK,DEFAULT
			RETURN	BACK,EXIT
	MOTION	RESOLUTION	1-10	
		SENSITIVITY	1-10	
		WINDOW USE	ON, OFF	
		WINDOW TONE	1-10	
		X-POSITION	0-60	
		Y-POSITION	0-40	
		X-SIZE	0-40	
		Y-SIZE	0-40	
		INITIAL	BACK,DEFAULT	
		RETURN	BACK,EXIT	
	DISPLAY	CAM TITLE	ON, OFF	
		MOTION	ON, OFF	
		DZOOM	ON, OFF	
		INITIAL	BACK,DEFAULT	
		RETURN	BACK,EXIT	
	SYSTEM	SHADING DET	ON, OFF	
		DEFECT DET	ON, OFF	
		DOUT FORMAT	1080P / 720P	
		DOUT FPS	30, 60	
		CVBS	PAL, NTSC	
		APPLY		

Function Description

SETUP

- EXPOSURE: Go sub menu for camera exposure control.
- WHITE ALANCE: Go sub menu for camera white balance control.
- WDR / BLC: Go sub menu for camera WDR or BLC action.
- DAY&NIGHT: Control day and night settings
- IMAGE: Go sub menu for adjust image functions.
- SPECIAL: Go sub menu for special feature control.
- FACTORY DEFAULT: Reset all settings back to factory default
- EXIT

EXPOSURE

- BRIGHTNESS: Adjust image brightness value.
- SHUTTER MODE: Select shutter speed control type.
- SHUTTER SPEED: Enable user to set up the Shutter Speed
- DSS: Adjust digital slow shutter control level.
- AGC: Adjust max gain level for brightness control.

WHITE BALANCE

- WB MODE: Select white balance control mode.
  - AUTO: Enable user to trace the White Balance automatically in the range of 2,300K~10,000K.
  - PUSH LOCK: Enable user to fix the White Balance according to the color temperature in environment.
  - MANUAL: Enable user to sets the White Balance according to the circumstance
  - AUTO EXT: Extended auto mode for special illumination.
- CHROMA: Enable user to set the Color Gain(0~20steps).
- KELVIN: In the MANUAL setting of WB MODE, enable user to set the color temperature range.
- RED GAIN: In the MANUAL setting of WB MODE, enable user to set the RED GAIN.
- BLUE GAIN: In the MANUAL setting of WB MODE, enable user to set the BLUE GAIN.

- PUSH AUTO: In the PUSH LOCK setting of WB MODE, enable user to fix the White Balance in camera setting.
- INITIAL: Enable user to reset the WHITE BALANCE menu setting.

WDR/BLC

- MODE: Select WDR for BLC mode.
- WDR LEVEL: Enable user to adjust level of WDR(Wide Dynamic Range).
- BLC OSD: Enable user to set up screen output of selected BLC zone.
- BLC X-POSITION: Enable user to set up screen output of selected BLC zone.
- BLC Y-POSITION: Enable user to set up Horizontal start position.
- BLC X-SIZE: Enable user to set up Vertical size.
- BLC Y-SIZE: Enable user to set up Horizontal size.
- INITIAL: Enable user to initialize the BLC setting.

DAY&NIGHT

- DAY&NIGHT MODE: Conversion of output image COLOR / BW depending on exterior environment.
  - COLOR: Enable user to fit the output image in color.
  - B/W: Enable user to fit the output image in B/W.
  - 3 AUTO: Enable user to convert to COLOR/BW automatically by photocell
- DWELL TIME: In D&N MODE AUTO, enable user to set to delay time for changing COLOR/BW
- INITIAL: Enable user to initialize the setting in DAY&NIGHT menu.

IMAGE

- SHARPNESS: Enable user to control the image sharpness.
- MIRROR: Enable user to mirror flip the image.
- FLIP: Sets the Vertical flip for the display output.
- DZOOM(Digital Zoom): Max. 20x Digital Zoom.
- HLMASK: Suppresses or masks strong light sources.
  - HLMASK LEVEL: Enable user to set HLMASK Level.
  - HLMASK COLOR: Set the HLMASK color
- D-WDR: In this mode, the brightness of a single image is compensated using the gamma curve.
- DNR: This function reduces noise.
- INITIAL: Enable user to initialize the setting on IMAGE menu.

SPECIAL

- CAM TITLE: Enable user to choose any word in screen. (Maximum 10 letter is available)
  - A letter Choice from the screen using Menu key.
  - Enable user to move to next menu using LEFT, RIGHT KEY in LOCATION.
  - By using UP, DOWN, LEFT, RIGHT KEY, enable user to choose any letters in LOCATION and then get back to previous step.
  - Enable user to finish words choice and position by using LEFT, RIGHT KEY in RETURN.

- LANGUAGE: Enable user to set up an OSD language.

- PRIVACY: Enables privacy function.
  - ZONE NO: Enable user to set up a position from 0 to 29 area.
  - MASK MODE: Enable user to set up screen output of chosen position.
  - X-POSITION: Mask Horizontal start position.
  - Y-POSITION: Mask Vertical start position.
  - X-SIZE: Mask Horizontal width.
  - Y-SIZE: Mask Vertical height.
  - COLOR: Set the mask color.
  - TRANSPARENCY: Set the transparency of the mask.
  - INITIAL: Enable user to initialize setting of PRIVACY MENU.

- MOTION: Motion detection function.
  - RESOLUTION: Enable user to set up resolution
  - SENSITIVITY: Enable user to set up sensitivity.
  - WINDOW USE: Enable user to select to motion area.
  - WINDOW TONE: Enable user to area window tone.
  - X-POSITION: Window Horizontal start position.
  - Y-POSITION: Window Vertical start position.
  - X-SIZE: Window Horizontal width.
  - Y-SIZE: Window Vertical height.
  - INITIAL: Enable user to initialize setting of MOTION DETECT.

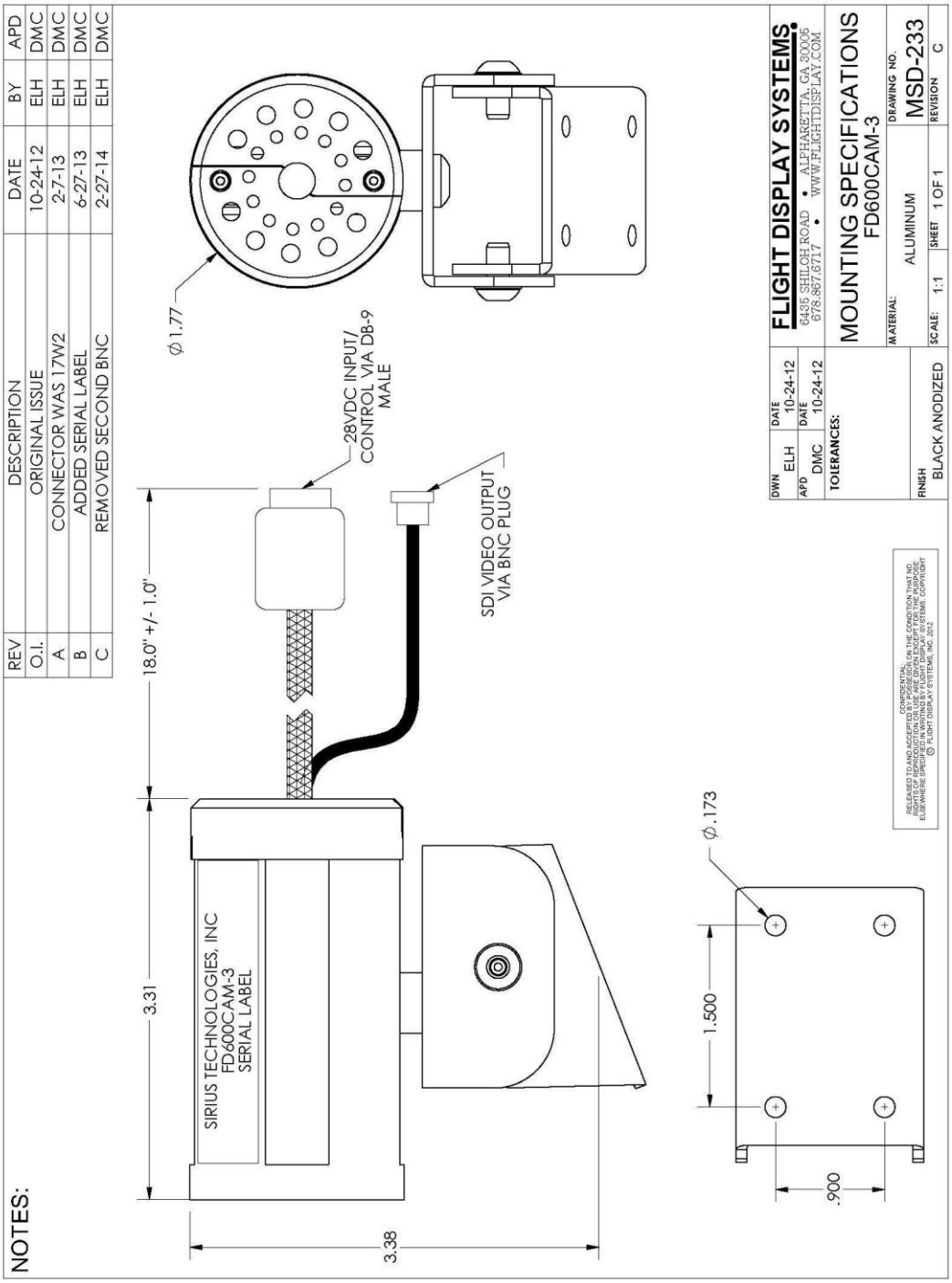
- DISPLAY: Enable user to set up a screen marking CAM TITLE, MOTION, DZOOM.
  - CAM TITLE: Enable user to set up output in fixed CAM TITLE.
  - MOTION: Enable user to set up output of MOTION on the screen as MOTION ON setting.
  - DZOOM: Enable user to set up output DZOOM ratio.

- INITIAL: Enable user to initialize of DISPLAY menu.

- SYSTEM: Go sub menu for system control & information.
  - DEFECT DET: White pixel detection and compensation function.
  - DOUT FORMAT: Enable user to set up digital output format (720p, 1080p).
  - DOUT FPS: Enable user to set up digital output frame rate.
  - 4.FREQ: Enable user to set up power-frequency(50Hz, 60Hz).
  - CVBS: Enable user to set up CVBS type NTSC or PAL.
  - APPLY: Enable user to setting of SYSTEM.

FACTORY DEFAULT : Enable user to reset all of the status as the factory default.

Technical Drawing



Troubleshooting

VGA Shadowing

Most of shadowing problems are due to shielding on the wire. Locate the point where all of the shields are connected. Cut away the shields, one at a time, while viewing the display on the screen to observe which shield is causing the noise. Cutting away one shield at a time will allow you to focus and isolate the video noise issue.

- Twisted pair wiring is prone to video noise. ECS VGA Wire

  (Detailed under “Video Wiring Suggestions”) is recommended.

Snow or Sweeping Lines

Lines that slowly sweep up and down are a result of AC noise. This AC noise can be generated by a power cart on the aircraft. Take the power cart off of the aircraft. Be careful of inverter wiring, which can also cause noise. Stand off the wires, if necessary.

If snow or sweeping lines persist, it is possible that the ground is at an incorrect point in the aircraft. Try moving the ground to another location.

No power to Monitor, or No video Input

- Verify correct wiring. Check the base receptacle connectors for possibly damaged pins.
- Check that the video source is:
  1. Powered on,
  2. In Play mode, and
  3. Displaying video.

Color Distortion

- Adjust brightness and contrast settings using the buttons on the monitor.

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
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Fax: 678-867-6742
Email: 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

Instructions for Continued Airworthiness

The FD600CAM-3 is 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.

Revision Logs

Rev	Date	Page	Description
A	03/05/2014	All	Initial Release
B	04/14/2014	8	Added RS485 Commands