



SightLine

APPLICATIONS

EAN-HDMI Input

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Alerts

The following notifications are used throughout the document to help identify important safety and setup information to the user:

 **CAUTION:** Alerts to a potential hazard that may result in personal injury, or an unsafe practice that causes damage to the equipment if not avoided.

 **IMPORTANT:** Identifies crucial information that is important to setup and configuration procedures.

 *Used to emphasize points or reminds the user of something. Supplementary information that aids in the use or understanding of the equipment or subject that is not critical to system use.*



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1 Overview

This document describes how to install and configure the 3000-OEM and 1500-OEM with the corresponding HDMI input interface board. Hardware and setup for these two product lines are identical.

1.1 Associated Documents

[EAN-Startup Guide 1500-OEM](#): Describes steps for connecting, configuring, and testing the 1500-OEM video processing board on the 1500-AB accessory board.

[EAN-Startup Guide 3000-OEM](#): Describes steps for connecting, configuring, and testing the 3000-OEM video processing board on the 3000-IO interface board.

[EAN-Network Configuration](#): Describes how to assign a static IP address to the board, set telemetry destinations and ports, and provide configuration information for both the 3000-OEM and the 1500-OEM video processing boards.

[ICD-1500-OEM](#): Describes power requirements, thermal management, interface specifications, and connector pin-outs for the 1500-OEM and 1500-AB accessory board.

[ICD-3000-OEM](#): Describes power requirements, thermal management, interface specifications, and connector pin-outs for the 3000-OEM.

[ICD-3000 Adapter Boards](#): Describes power requirements, thermal management, interface specifications, and connector pin-outs for the 3000-OEM associated camera interface boards.

[Interface Command and Control \(IDD\)](http://sightlineapplications.com/support/command-control-protocol/): <http://sightlineapplications.com/support/command-control-protocol/> Describes the native communications protocol used by the SightLine Applications product line. The IDD is also available as a local download on the [Software Download](#) page.

Panel Plus User Guide: Provides descriptions of all the settings in the Panel Plus application. (Located in the Panel Plus application in the *Help* menu.)

1.2 SightLine Software Requirements

The 3000-OEM (REV C) requires firmware 2.24.xx and higher.

The HDMI camera interface board is supported in software version 2.22.19 and higher.

ⓘ IMPORTANT: The Panel Plus software version should match the firmware version running on the board.

1.3 1500-OEM FPGA Version

FPGA version 5 or 12 is required for the camera to operate correctly with the 1500-OEM. This information is located on the *Connect* tab.

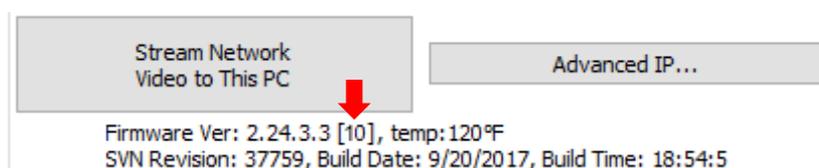


Figure 1: FPGA Version Number Location



2 Connection and Configuration Notes

ⓘ IMPORTANT: The HDMI camera must be powered separately from the SightLine Boards. Camera power is not supplied through the 3000-HDMI input board.

The HDMI input board allows acquisition of HDMI video. Acquisition parameters are setup in the Panel Plus application. These settings include desired resolution (720P/1080P) and frame step. These settings are persisted on the 1500-OEM and 3000-OEM through subsequent restarts.

At power up, the board reads the acquisition parameters and generates EDID data corresponding to the user specified resolution. If the user selects 720P, the EDID data only contains 720P. If the user selects 1080P, the EDID data only contains 1080P. The board programs the HDMI receiver chip with the corresponding EDID data. There is no flash memory on the HDMI receive chip. The EDID data is only programmed and available after the board has fully booted. Booting can take 20 to 30 seconds from power up.

The HDMI HPD signal is a Hot Plug Detect (HPD). This tells the HDMI source (the camera) that it has been plugged into an HDMI sink (monitor) and that the source can read EDID data from the sink. Both 1500 and 3000 HDMI boards have pull-ups to pull this line high. When the 1500/3000 programs the EDID data into the HDMI receiver, the HDMI boards automatically pull the HPD line low when starting to program EDID, and then release it to high once the EDID data is valid. This lets the HDMI source (camera) know that the EDID has been programmed and that it should reconnect to the sink.

The board receives video with the resolution set up in the Acquisition Settings dialog window of Panel Plus. The HDMI board does not require that the EDID data be read, only that correct resolution HDMI video is sent to the receiver chip.

The HDMI camera may do one of the following:

- If the camera is set in automatic mode and supports the resolution in the EDID data, it can send video at the requested resolution.
- If the camera is in manual mode, it will remain in 720p or 1080p mode. If this mode does not match the settings in the Acquisition Settings dialog window in Panel Plus, then no video will display (or possibly misaligned video)
- If the camera does not support the requested resolution in the EDID data, it can output a different resolution.

Cameras can support various frame rates at different resolutions. Currently, the EDID data output by the HDMI board supports the following modes:

- 720p30 or 720p60 - camera determines frame rate
- 1080p30 or 1080p60 - camera determines frame rate

Configuring the resolution on a GoPro camera with the GoPro menus does not configure the HDMI format. If the board is power cycled and the HDMI camera is not, there may be issues with video acquisition. See the [Video Acquisition After Power Cycling](#) section.

HDMI cameras generally output the highest frame rate configurable. When running in 1080p/60 mode (or at 60fps), SightLine recommends lowering the frame rate to 30fps using the *Frame Step* parameter in the *Acquisition Settings* dialog window. It is possible that the camera will output 1080p/30 or 720p30. In this case the *Frame Step* setting should remain at 0.



3 Hardware Connections

3.1 Hardware Bench Setup 1500-OEM

This section describes the connections for the 1500-AB and the 1500-HDMI interface boards to the supporting components and equipment.

IMPORTANT: Use the appropriate screws and spacers for attaching the boards together.

1. Attach 1500-OEM video processor board to the top of the 1500-HDMI interface board. connector J3 provides power, network, and serial connections. The pinout of connector J3 is contained in [ICD-1500-OEM](#).
2. Connect the 1500-OEM+HDMI board assembly to the 1500-AB board using the SLA-CAB-1514 Molex cable.
3. Connect the HDMI interface cable between the GoPro camera and the 1500-HDMI board.
4. Connect the Ethernet, serial, and power cables to the 1500-AB board. Power to the camera in [Figure 2](#) is provided by a standard USB cable to a 5-volt USB wall adapter. Do not power the camera from a PC USB port.
5. Plug the 1500-AB power adapter (SLA-PWR-B05V) into an AC power source. A green light indicates the 1500-AB is powered on.
6. Slide the power switch to the left to power-on the 1500-OEM+HDMI board assembly.

A blue light on the 1500-AB board and a green light on the 1500-OEM indicate that all the boards are powered on

7. Power on the HDMI camera.

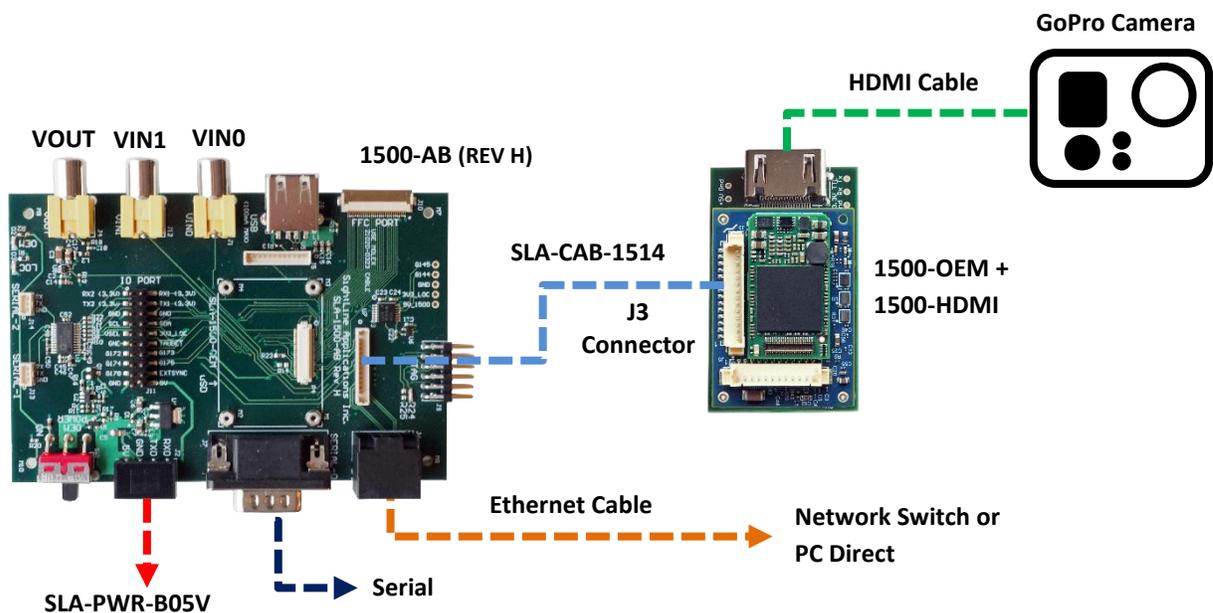


Figure 2: 1500-OEM HDMI Camera Bench Setup



3.2 Hardware Bench Setup 3000-OEM

This section describes the connections for the 3000-IO and the 3000-HDMI interface boards to the supporting components and equipment.

ⓘ IMPORTANT: Use the appropriate screws and spacers for attaching the boards together.

1. Attached the 3000-OEM board to the 3000-IO board.
2. Attach the 3000-HDMI board to one of the available video input connectors on the 3000-IO board. The 3000-IO board has two connectors for the HDMI board (VIN1 and VIN0). See the [3000-OEM](#) exploded assembly drawing for more physical connection layout information.

📄 On the 3000-IO board, VIN0 has camera channels 0 and 1 assigned. VIN1 has camera channels 2 and 3 assigned. If the configuration includes multiple camera interface boards, these can be installed on either VIN0 or VIN1. The 3000-IO board supports installing the HDMI camera interface board onto either of these connectors.

3. Connect the HDMI interface cable to the GoPro camera and the 3000-HDMI board.
4. Connect the Ethernet, serial, and power cables to the 3000-IO board. Power to the camera in [Figure 3](#) is provided by a standard USB connector.
5. Plug in the power adapter (SLA-PWR-C12V) to an AC power source. A green light on the IO board indicates that all boards are powered on.
6. Power on the HDMI camera.

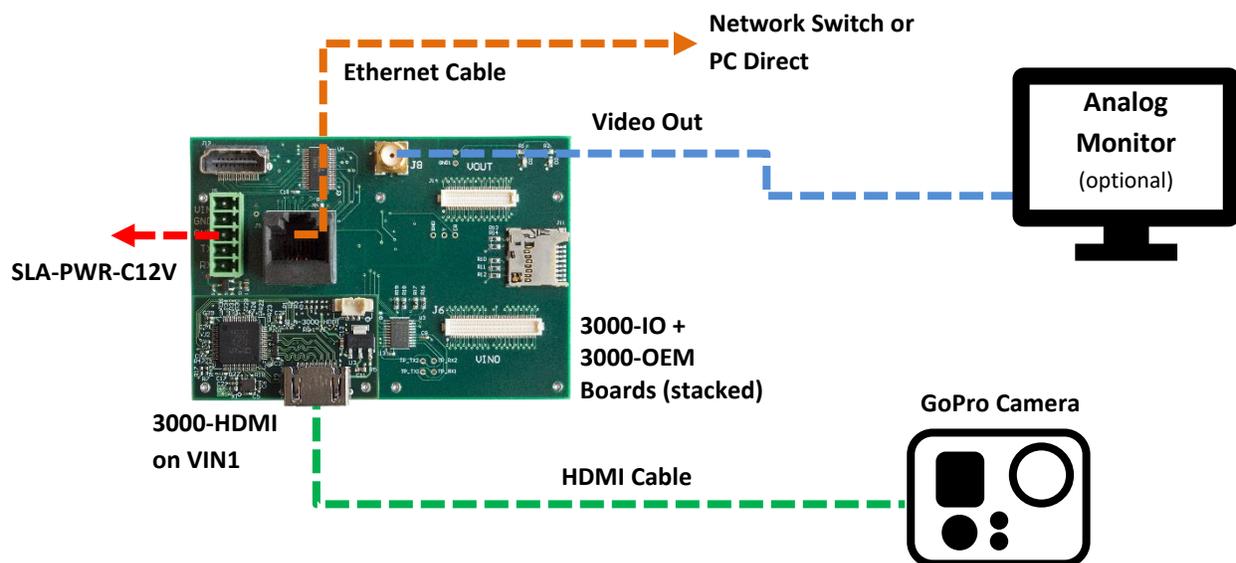
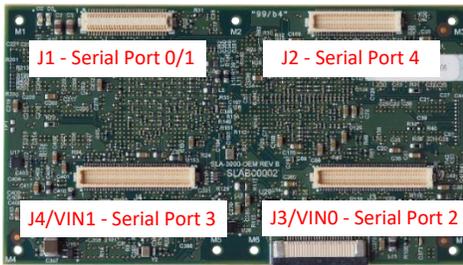


Figure 3: 3000-OEM HDMI Camera Bench Setup



3000-OEM	SLA-3000-IO	Serial Port	Camera Index Panel Plus
J1		0/1	NA
J2	VOUT	4	NA
J3	VIN0	2	CAM0/CAM1
J4	VIN1	3	CAM2

Figure 4: 3000-OEM Serial Port and Connector Reference

4 Configuration Settings

This section covers how to configure the 1500-OEM and 3000-OEM video processing boards to support a digital HDMI camera input. The following steps reference the Panel Plus software.

The 3000-OEM and 1500-OEM HDMI configuration procedures are similar.

1. Connect to the board using the Panel Plus application. See the [1500-OEM Startup Guide](#) or the [EAN-Startup Guide 3000-OEM](#) for connection instructions.
2. From the main menu » *Configure* » *Acquisition Settings*. Set the *Camera Index* and *Camera Type* according to [Table 1](#). The *Apply* button will turn red indicating input field changes have been detected.

3000-OEM Camera Index: If the HDMI adapter board is connected on VIN1 of the 3000-IO board use Cam 2. If the board is connected on VIN0, use Cam 0.

The AutoFill dropdown menu populates the relevant fields with the correct settings.

3. Click the *Apply* button

Table 1: Panel Plus Basic Camera Configuration Settings

Acquisition Settings	1500-OEM	3000-OEM	
	720p Resolution	720P Resolution	1080P Resolution
Camera Index:	Digital	Cam 0 / Cam 2	Cam 0 / Cam 2
Camera Type:	Generic Digital	Generic Digital	Generic Digital
Frame Step:	2	2	0
AutoFill:	HDMI 720P	HDMI 720P	HDMI 1080P
Height:	720	720	720
Width:	1280	1280	1280
Vertical Front Porch:	20	20	36
Horizontal Front Porch:	220	220	148
Bit Depth:	8	16	16
Resulting Flag Bits:	0x1	0x1	0x1
Input:	YUV color	YUV color	YUV color
Sync/Crop:	None	None	None
Camera Init Code:	None	None	None

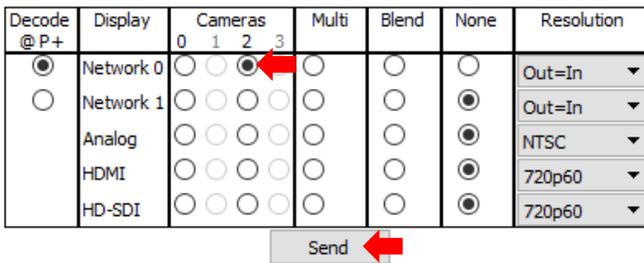


4. Click the *Multi Camera* tab.
 - a. 1500-OEM: Select the *Digital (2)* input as the primary camera to display the video in Panel Plus.



- b. 3000-OEM: Select *Network 0*.

Under *Cameras*, if the 3000-FPC board is connected on *VINO* on the 3000-IO board, select 0. If it is connected on *VIN1*, select 2. This enables video to display in *Panel Plus*.



5. Click the *Send* button to save the settings to the parameter file.
6. Close the *Acquisition Settings dialog* window.
7. Save and activate the settings:
 - a. Main menu » *Parameters* » *Save to Board*.
 - b. Main menu » *Reset* » *Board*.
 - c. After the system reboots reconnect to the board. Make sure the board connects.

4.1 Setup Logical Networks - 3000-OEM

The 3000-OEM can be setup for two logical networks. Each can have an independent destination addresses and ports. This can be setup from the *Streaming* section on the *Compression* tab.

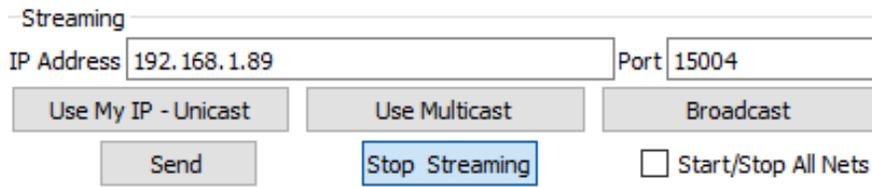


Figure 5: Setup Logical Networks



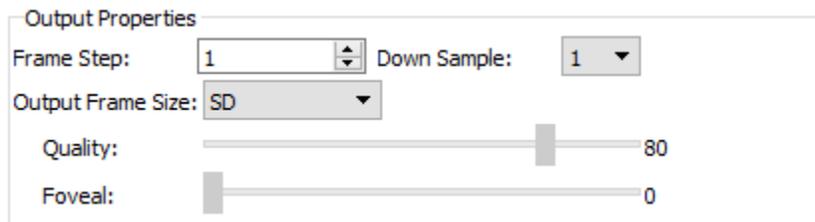
Assign a destination address and port for Network 0 or use the *Use My IP - Unicast* button to fill in the IP address. If using identical destination addresses, enter a unique port number for each.

Refer to the [EAN-Network Configuration](#) document for more information about setting up the two logical networks for the 3000-OEM. Panel Plus only displays video from logical Network 0.

4.2 Output Frame Size - 1500-OEM

1. Click the *Compression* tab and set the *Output Frame Size* in the *Output Properties* section. For HDMI select either 1280x720 or 960x20.

Selecting SD allows for the best processed output frame rate (see the next section for more details).



2. Save and activate the settings:
 - a. Main menu » *Parameters* » *Save to Board*.
 - b. Main menu » *Reset* » *Board* or cycle the power.
 - c. Wait for the system to boot, and then reconnect to the board. Make sure the board connects.

4.3 Impacts of Frame Size on Frame Rate

When selecting input and output frame size, processor rates and latency should be considered. The 1500-OEM can run very close to frame rate when processing HDMI input of 720p with the 720 x 960 frame size selected.

Processing time will increase for each video processing function enabled. If adding stabilization, tracking, MTI, etc., there will be an impact to overall processing and latency, which is reflected in output frame rates. This is a result of increasing the amount of processing being placed on the encoder (encoding larger frames).

The output video streaming statistics can be viewed from the *Compression* tab. The statistics are averages of the outbound stream.

Statistics					
Frames	24.40	[1/sec]	Video	1203.43	[Kb/sec]
Profile:	Baseline		KLV	33.78	[Kb/sec]
Encapsulation:	mpegts		Codec:	h264	

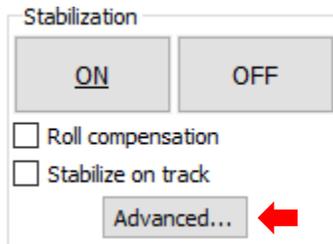
Figure 6: Output Video Streaming Statistics



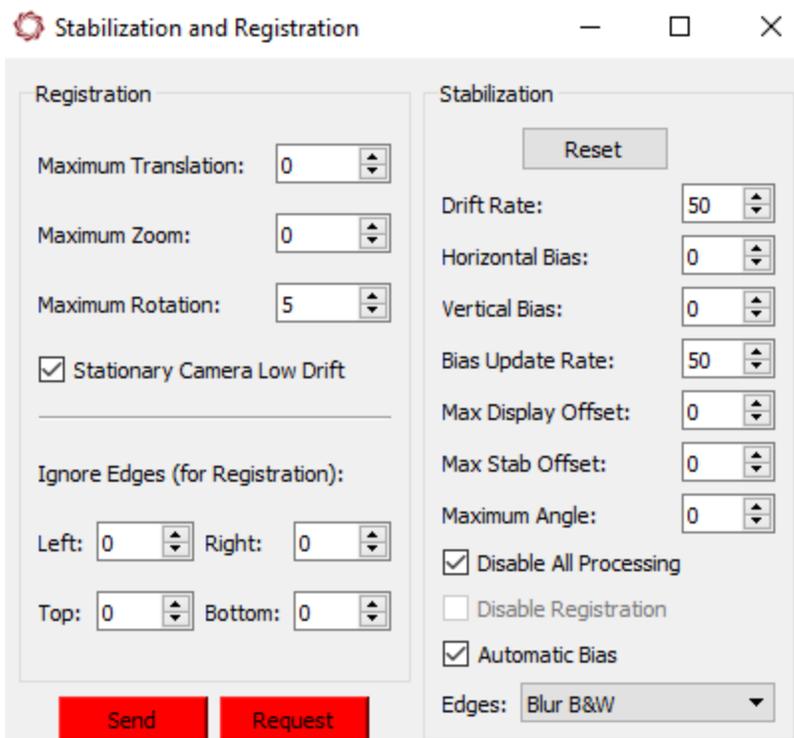
5 Improve Processing and Increase Frame Rate Output

There are different ways to allocate more processing to the encoding and increase the output frame rate. If the system is being used as an encoder only, one option is to disable the *Stabilization* processes.

1. In Panel Plus click on the *Video* tab. Click the *Advanced* button.



2. In the *Stabilization and Registration* dialog window, check the *Disabling All Processing*. Click *Send*. This will disable stabilization and telemetry tracking.



3. Click the *Compression* tab to review the output statistics.

 While 1080p input to the 1500-OEM board is supported, SightLine recommends 720p as the maximum input frame rate for the 1500-OEM when utilizing multiple video processing library functions simultaneously.



6 Camera and HDMI Board Compatibility

The following cameras have been tested and verified to work with the HDMI board. Refer to this section during camera setup. If a camera is not listed here, contact [support](#) for more information.

6.1.1 GoPro Hero3+ Black (CHDHX-302)

This camera can only be run in 720P and 480P modes. The 1080P mode defaults to P60 frame rate and cannot be acquired. The following values will generate 720P30 and 480P30 video.

H	V	D	VFP	HFP	Flags	Frame Step	Camera Setting
480	720	8	30	60	1	1	WVGA 240 FPS
720	1280	8	20	222	1	2	720 60 FPS

6.1.2 GoPro Hero3 White (CHDHE-302)

This camera can be run in 1080P, 720P and 480P modes. The 1080P mode defaults to 1080I60 and the HDMI board deinterlaces the video. The following values will generate 1080P30, 720P30 and 480P30 video.

H	V	D	VFP	HFP	Flags	Frame Step	Camera Setting
480	720	8	30	60	1	2	WVGA 60 FPS
720	1280	8	20	222	1	2	720 60 FPS
1080	1920	8	38	148	1	0	1080 30 FPS

6.1.3 Canon HD CMOS PRO Camcorder (XA-25)

This camera can be run in 720P and 480P modes. The following values will generate 720P30 and 480P30 video.

H	V	D	VFP	HFP	Flags	Frame Step	Camera Setting
480	720	8	30	60	1	1	Auto HDMI
720	1280	8	20	222	1	1	Auto HDMI

6.1.4 Sony Handycam Camcorder (HDR-CX220)

This camera can be run in 720P and 480P modes. The following values will generate 720P30 and 480P30 video.

H	V	D	VFP	HFP	Flags	Frame Step	Camera Setting
480	720	8	30	60	1	1	Auto
720	1280	8	20	222	1	1	Auto



7 Troubleshooting

7.1 Video Not Displaying

There are several issues that can result in video not being displayed. If the camera is not connected properly or the resolution does not match the 3000-OEM configuration, in some instances, it will display as a full green image as shown.

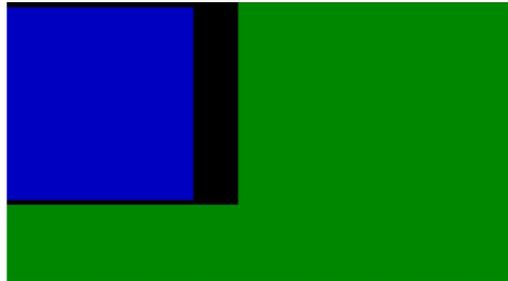


Figure 7: No Source Camera Input or Resolution Mismatch

Possible solution: From the Panel Plus main menu » *Configure* » *Acquisition Settings*. Check that the *Height* and *Width* values match the output resolution of the camera.

Generic Digital Settings (Applies to CameraType: Generic Digital Only)

AutoFill: HDMI 720P

Height: 720 ← Width: 1280 ←

Vertical Front Porch: 20 Horizontal Front Porch: 222 Resulting Flag Bits: 0x1

Bit Depth: 8

Input: Gray Scale YUV color G8 16bit in Bayer Interlaced Byte Swap

Invert V-Sync Polarity Invert H-Sync Polarity UB0 Sync/Crop: None

Figure 8: Verify Output Resolution

7.2 Poor Video Quality

Horizontal lines of color or vertical areas of black on the sides is an indicator of poor video quality.



Figure 9: Horizontal Lines of Color



Possible solution: From the Panel Plus main menu » *Configure* » *Acquisition Settings*. In the Acquisition Settings dialog adjust the *Vertical* and *Horizontal Front Porch* values to ignore an appropriate number of lines.

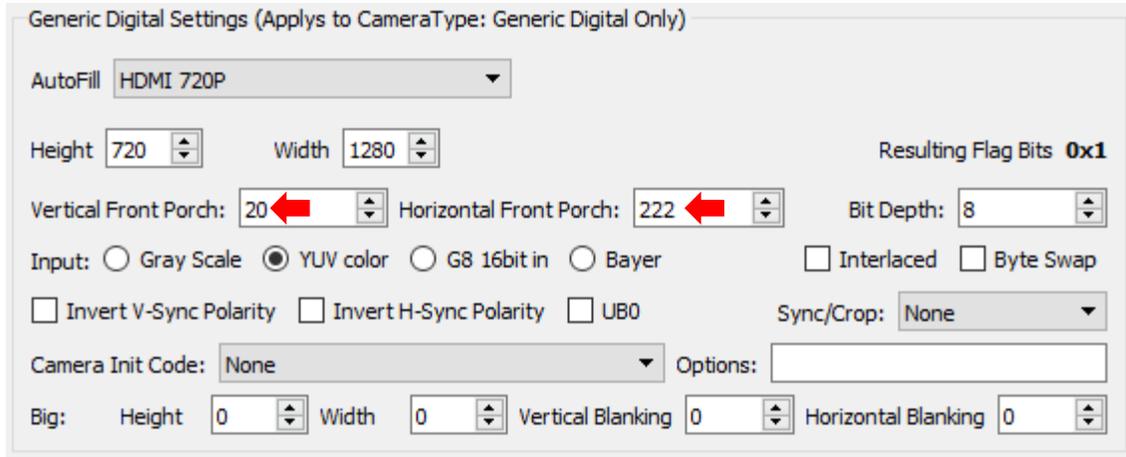


Figure 10: Adjust Vertical and Horizontal Front Porch

7.3 Video Displays in Gray Scale

From the Panel Plus main menu » *Configure* » *Acquisition Settings*. Verify the camera is set to YUV, not *Gray Scale*.

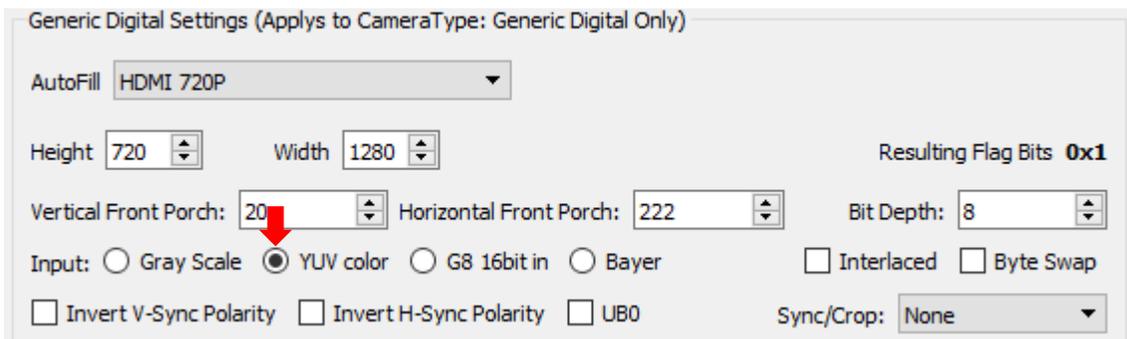
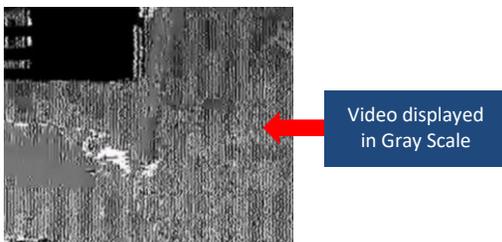


Figure 11: Acquisition Settings - YUV Color



7.4 Video Acquisition After Power Cycling

If the 1500/3000-OEM board is power cycled and the HDMI camera is not power cycled, there may be issues with video acquisition. This has been an issue with GoPro cameras.

Possible solution:

- Remove and reinstall the battery from the GoPro.
- Remove and reinsert the USB cable supplying power to the camera.
- Power cycle both the 1500 / 3000-OEM and the GoPro at the same time.

In HDMI, the video source (GoPro) communicates with the display device to see what HDMI modes the display supports. When the power is cycled on the 1500/3000-OEM the GoPro thinks a new display device has been attached and communicates with it. Sometimes while the 1500/3000-OEM is booting this confuses the GoPro. The only workaround is to cycle power on the GoPro.

Typically, if a display is turned off, the GoPro will externally power up the HDMI section of the display to read HDMI formats. This does not work with the 1500/3000-OEM because the HDMI formats are stored in an externally readable flash memory. The 1500/3000-OEM must boot and program the supported HDMI formats into memory that can be read by the GoPro or other HDMI camera.

7.5 1500-HDMI Hot Plug Detect Issue

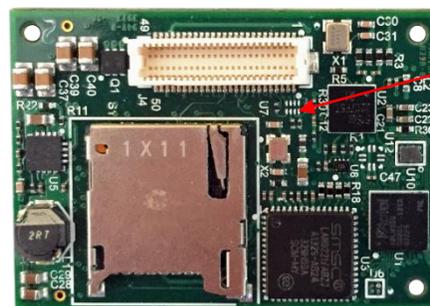
The Hot Plug Detect line does not rise to 5V (instead only going to about 2.6V). While this is within the HDMI spec (2.4V->5.3V), some cameras like the GoPro only detect the 1500-HDMI board when outputting the full 5V on the HPD line.

7.6 Driver Chip Not Installed - 1500-OEM (old board)

Many older 1500-OEM boards do not have the I2C driver chip installed (U7). This chip is necessary for communication between the 1500-OEM and the HDMI board. The board on the left has the chip installed, the board on the right does not. If the chip is not installed, contact [sales](#) for more information.



Driver chip installed



Driver chip not installed

Figure 12: Driver Chip Location



8 Questions and Additional Support

For questions and additional support, please contact [Technical Support](#). Additional support documentation and Engineering Application Notes (EANs) can be found on the Support pages of the SightLine Applications [website](#).