



SightLine
APPLICATIONS

EAN-Digital Video Configuration

PN: EAN-Digital-Video-Configuration

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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 configure the SightLine hardware for digital video input. Tables for basic acquisitions settings are included for the 1500-OEM and 3000-OEM video processing boards.

There are two methods for configuring the SightLine hardware for digital video input. Predefined settings are configurations defined for specific cameras, e.g., FLIR Tau 640 8-bit. These camera parameters are stored in the firmware and cannot be modified. The Generic Digital interface allows the customer to setup and modify video timing parameters to match the settings specified by the camera manufacturer.

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-Ethernet-and-Serial-Communication](#): Describes how to setup serial communications for cameras or other payload devices from SLA hardware.

[Interface Command and Control \(IDD\)](#): 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.

[EAN-Camera Compatibility](#): Lists all third-party cameras that are currently supported by SightLine software. It also covers 1500 FPGA driver support and lens control through the SightLine Command and Control (IDD) protocol.

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.)

For a complete list of all the camera support EANs, go to the [Documentation](#) download page » Camera Configuration and Digital Video Input Support.

1.2 SightLine Software Requirements

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



2 Panel Plus Configuration Settings

This section covers how to configure the SightLine hardware to support the digital camera input. The following steps will reference the Panel Plus software. The 3000-OEM and 1500-OEM digital camera configuration procedures are similar.

The 1500-OEM and 3000-OEM can accept many types of digital video input. For optimal processing performance SightLine recommends the height and width of the image be a multiple of 16.

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 in Panel Plus go to *Configure » Acquisition Settings*.
3. For *Camera Index*, select *Digital* (1500-OEM) or *Cam 2* (3000-OEM). Select *Generic Digital* or choose a camera specific configuration for *Camera Type*. Use the *AutoFill* drop down to auto fill preloaded settings.
4. Additional parameter settings:
 - *Image Height and Width*: Set for all sensors.
 - *Vertical Front Porch*: Number of blanking lines before active video.
 - *Horizontal Front Porch*: Number of blanking pixels in every row before active video.
 - *Bit Depth*: Only applicable to grayscale (IR) sensors, 8, 14, and 16-bit modes supported.
 - *Byte Swap*: 3000 only, YUV and Bayer cameras only (not grayscale).
 - Other camera parameters are combined into a 16-bit flags value. See [Table 1](#).

*Parameters are broken out into checkboxes and pull downs. After selecting the appropriate settings and clicking *Apply*, the corresponding *Flag Bits* will be calculated and displayed.*

Acquisition Settings

Camera Index: Cam 2

Camera Type: Generic Digital

Frame Step: 0

Apply

Hit Apply, then Save Parameters and cycle power. Check for errors in menu View >> User Warnings

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

AutoFill

Height 720 Width 1280

Vertical Front Porch: 0 Horizontal Front Porch: 0

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

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

Camera Init Code: None Options:

Big: Height 0 Width 0 Vertical Blanking 0 Horizontal Blanking 0

Resulting Flag Bits 0x1

Bit Depth: 8

Figure 1: Digital Camera Parameter Settings



5. Save and activate the settings:

- a. Main menu » *Parameters* » *Save to Board*.
- b. Main menu » *Reset* » *Board*.
- c. Wait for the system to boot, and then reconnect to the board. Make sure the board connects.

2.1 Set Acquisition Parameters Digital Video Flags

See SightLine Command and Control [IDD](#) for more information. Set Acquisition Parameters (0x37) command.

Table 1: Digital Video Flags Parameter

Bits	Description
Bits 0..2	Input Data Mode 0 = Greyscale 1 = YUV 2 = 8-Bit Grayscale with 16-bit input 3 = Bayer Color Other Values are reserved
Bit 3	0 = progressive (default) 1 = interlaced
Bit 4	Vertical Sync Polarity 0 = negative (default) 1 = inverted (for Sony 7500)
Bit 5	Horizontal Sync Polarity 0 = negative (default) 1 = inverted (for Sony 7500)
Bits 6..9	Camera Initialization routine. Called with parameters specified above in this message. 0 = no-op 1=InitSony(High resolution) 2=InitDRS(Bit Depth) 3=InitQuark/Tau(Bit Depth) 4=InitPhoton(Bit Depth) [1500 only] 5=InitCameraLinkLowSpeed(Bit Depth) [1500 only] 6=InitTau(Bit Depth) Direct Connect, SLA-FFC-TAU (REV A) [1500 only] 7=Reserved 8=InitAR0134CS - Airborne Innovation AGS720P 9=InitCameraLinkLowSpeed [1500 only] 10=InitBoson
Bits 10 - 11	0=NONE 1=Use Data Valid Signal [3000-OEM] 2=Embedded Sync 3=Use Hardware Crop
Bits 12 - 13	Reserved
Bit 14	Byte Swap (3000-OEM) YUV and Bayer cameras only (not grayscale)
Bit 15	Reserved special on 3000-OEM)



3 Digital Camera Settings Example

The following 1500-OEM example supports the Sony FCB-EH6300 camera in 720P mode:

- *Height* and *Width* are set to 720 x 1280. Bits are set to 8 (this setting is ignored).
- *Vertical Front Porch* and *Horizontal Front Porch* are determined from the FCB-EH6300 Timing Chart shown in **Figure 3**. The 1500-OEM triggers on the rising edge of V and H Sync.
- *Vertical Front Porch*: $25-5=20$ lines from rising edge.
- *Horizontal Front Porch*: $300-40=260$ pixels.

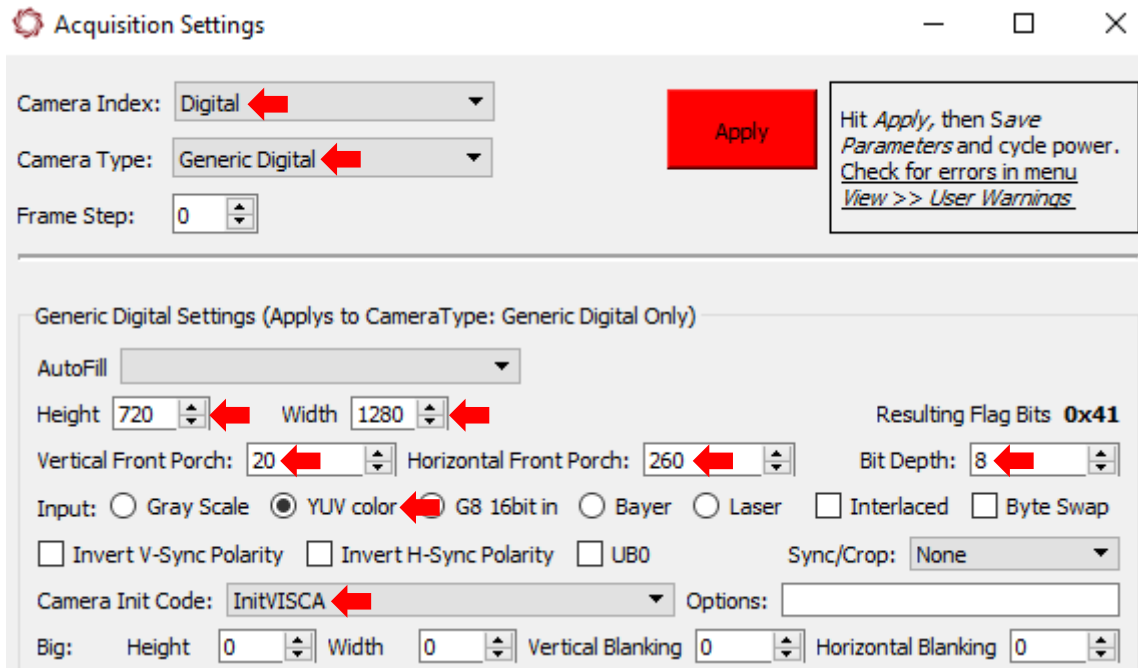


Figure 2: Sony FCB-EH6300 Camera Setup Example

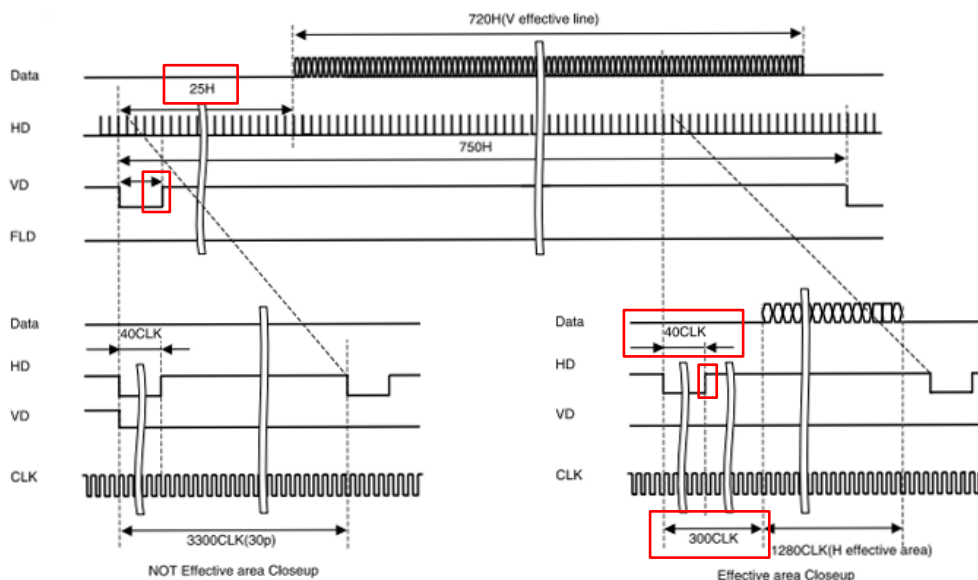


Figure 3: 720p/30 Output Timing Chart



Flags: 0x41

- InitSony (VISCA) = 0x40: This flag will result in a call to initialize the Sony over the serial port, with a parameter passed of Height (720 in this case). This will setup the Sony in 720P mode.
- YUV = 0x1: This is a color camera, and the data is set to YUV.
- The data must be 16-bit, with a doubled pixel clock (2 clocks per pixel). Luminance data in the lower byte, chrominance data alternating in the high byte (Figure 4).
- Maximum pixel clock rate is 148.5 MHz (doubled from 74.25 MHz)

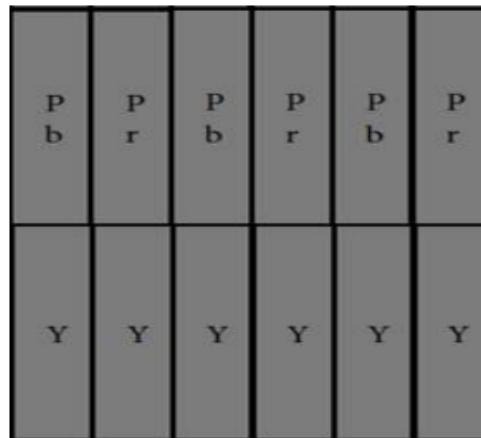


Figure 4: Luminance and Chrominance byte ordering

See additional 1500-OEM setting examples in the next section.

4 1500-OEM Digital Camera Settings

For digital camera specific configuration examples for third party cameras that are currently supported by SightLine see the following EANs shown below. Additional EANs can be found on the [Documentation](#) page of the SightLine Applications website.

- [EAN-1500 Hitachi](#)
- [EAN-DRS Tamarisk Camera](#)
- [EAN-FLIR Cameras](#)
- [EAN-Sony-Block-Cameras](#)

4.1 Using HD Camera in SD Mode (1500-OEM)

Using an HD camera in 720P or 1080P mode requires HD Input and HD Output licensing. It is possible to use an HD camera in SD mode (e.g., 640x480) by setting up the camera using the *Generic Digital* camera type, and then specifying the center 640x480 pixels. The acquired region can be offset to the center of the HD frame using the *Vertical* and *Horizontal Front Porch* settings to offset the imagery.



1. Use the generic digital interface to select a subframe of the HD camera pixel data to comply with SD frame sizing.

This is typical with color imagers (most IR imagers are not currently HD). It is better to extract the center area of the imager (less sensitive to rotation).

2. Set the vertical and horizontal front porch to reflect imager blanking (offset to the active region of video). For many cameras these offsets can be found in [Table 2](#) (1500-OEM) and [Table 3](#) (3000-OEM) in [section 5](#).
3. Add additional offsets to the vertical and horizontal front porch to get to the central portion of the imager.
4. Make sure to set (wide <= 720) and (high <= 576) to comply with SD level licensing.

4.2 Using HD Camera in Embedded Sync Mode (1500-OEM)

IMPORTANT: The 1500-OEM embedded sync configuration requires FPGA v7.

It is possible to use an HD camera that outputs digital video in SMPTE 274M, 296M modes. This format uses sync codes embedded in the data which can be processed to generate vertical and horizontal sync signals, which are not present). The 1500-OEM will automatically detect this encoding.

The 1500-OEM camera setup for embedded sync will use 0 for the vertical and horizontal front porch values. The active video area is fully determined by the embedded sync codes so there is no blanking area. The embedded sync format supported in the 1500-OEM is documented in the [Sony FCB-EH6300 Technical Manual](#).

5 Basic Camera Configuration Settings

Save parameters and reset the board when changing parameters. Cycle system power when changing resolution. If video is not present, cycle system power.

5.1 1500-OEM

Table 2: 1500-OEM Basic Camera Configuration Settings

1500-OEM Settings														
EO Digital Cameras														
	Camera Type	Frame Step	Height	Width	VFP	HFP	Bits	Input	Invert VSync	Invert HSync	Use DVal	Use ESync	Init Code	Flags
Airborne Innovations AGS720P	Generic Digital	0	720	1280	2	1	8	Bayer					InitAR01 34CS	0x203
	Generic Digital	0	720	1280	2	0	8	Gray					InitAR01 34CS	0x200
	<i>Configuration notes: Requires 2.24.14 and above. Requires FPGA version 10.</i>													
Hitachi* DI-SC120R DI-SC110R	Hitachi 720P	0	Auto Config Setting for 720P - preferred setup - 3000-Hitachi Adapter board default											
	<i>Configuration notes: Requires FPGA version 5 or 12.</i>													
	*Hitachi SC-120R is being phased out by Hitachi. See Appendix .													
Intertest XBC-KZ10	Generic Digital	2	720	1280	20	331	8	YUV					InitVisca	0x41
	Generic Digital	0	1080	1920	36	247	8	YUV					InitVisca	0x41
	<i>Configuration notes: Requires 2.24.14 and above. Requires FPGA version 5 or 12.</i>													



(EO Digital Cameras continued)

	Camera Type	Frame Step	Height	Width	VFP	HFP	Bits	Input	Invert VSync	Invert HSync	Use DVal	Use ESync	Init Code	Flags
KT&C ATC-HZ7810LC	Generic Digital	2	720	1280	20	331	8	YUV					InitVisca	0x41
	Generic Digital	0	1080	1920	36	247	8	YUV					InitVisca	0x41
Configuration notes: Requires 2.24.14 and above. Requires FPGA version 5 or 12.														
Sony EH Series 6300, 3150	FCB-EH 720P	0	Auto config setting for 720P - 1500 network output only supports 720P											
	FCB-EH 1080P	0	Auto config setting for 1080P - 1500 network output only supports 720P. This will result in lower frame rate on 1500.											
Configuration notes: Requires FPGA version 5 or 12. See EAN-Sony-Block-1500-OEM .														
Sony EV Series 7500, 7100 7520A	FCB-EV 720P	0	Auto config setting for 720P											
	FCB-EV 1080P	0	Auto config setting for 1080P - 1500 network output only supports 720P. This will result in lower frame rate on 1500-OEM											
Configuration notes: Requires FPGA version 5 or 12. See EAN-Sony-Block-1500-OEM .														
Tamron MP1010M-VC MP1110M-VC	Generic Digital	4	720	1280	0	0	8	YUV				✓	InitVisca	0x841
	Configuration notes: Requires FPGA version 7.													
HDMI Cameras														
	Camera Type	Frame Step	Height	Width	VFP	HFP	Bits	Input	Invert VSync	Invert HSync	Use DVal	Use ESync	Init Code	Flags
All	Generic Digital	0	720	1280	20	220	8	YUV					None	0x1
	Generic Digital	0	1080	1920	38	148	8	YUV					None	0x1
Configuration notes: Frame Step value of 2 may be required for cameras that output P60 frame rate. Requires FPGA version 5 or 12.														
Camera Link Cameras														
	Camera Type	Frame Step	Height	Width	VFP	HFP	Bits	Input	Invert VSync	Invert HSync	Use DVal	Use ESync	Init Code	Flags
Imperx B1921C	Generic Digital	0	1080	1920	0	1	8	Bayer					Camera Link	0x243
	Configuration notes: Requires 2.24 firmware and above. Requires FPGA version 10. Camera must be setup as 12-bit single tap camera. See EAN-Imperx-Cameras for details.													

5.2 3000-OEM

Table 3: 3000-OEM Basic Camera Configuration Settings

3000-OEM Settings														
EO Digital Cameras														
	Camera Type	Frame Step	Height	Width	VFP	HFP	Bits	Input	Invert VSync	Invert HSync	Use DVal	Use ESync	Init Code	Flags
Hitachi* DI-SC120R DI-SC110R	Hitachi 720P	0	Auto config setting for 720P - preferred setup - 3000-Hitachi adapter board default											
	Generic Digital	0	720	1280	30	320	16	YUV	✓	✓			None	0x31
*Hitachi SC-120R is being phased out by Hitachi. See Appendix .														
Intertest XBC-KZ10	Generic Digital	2	720	1280	20	331	16	YUV					InitVisca	0x41
	Generic Digital	0	1080	1920	36	247	16	YUV					InitVisca	0x41
Configuration notes: Requires 2.24.14 and above.														
KT&C ATC-HZ7810LC	Generic Digital	2	720	1280	20	331	16	YUV					InitVisca	0x41
	Generic Digital	0	1080	1920	36	247	16	YUV					InitVisca	0x41
Configuration notes: Requires 2.24.14 and above.														
Sony EH Series 6300, 3150	FCB-EH 720P	0	Auto config setting for 720P - preferred setup - 3000-Sony adapter board default											
	FCB-EH 1080P	0	Auto config setting for 1080P - preferred setup											
	Generic Digital	0	720	1280	25	300	16	YUV	✓	✓			InitVisca	0x71
	Generic Digital	0	1080	1920	41	236	16	YUV	✓	✓			InitVisca	0x71

(EO Digital Cameras continued)



	Camera Type	Frame Step	Height	Width	VFP	HFP	Bits	Input	Invert VSync	Invert HSync	Use DVal	Use ESync	Init Code	Flags
Sony EV Series 7500, 7100 7520A	FCB-EV 720P	0	Auto config setting for 720P - recommended setup											
	FCB-EV 1080P	0	Auto config setting for 1080P - recommended setup											
	Generic Digital	0	720	1280	25	260	16	YUV					InitVisca	0x41
	Generic Digital	0	1080	1920	41	192	16	YUV					InitVisca	0x41
Tamron MP1010M-VC MP1110M-VC	Generic Digital	2	720	1280	0	0	16	YUV				✓	InitVisca	0x841
	Generic Digital	0	1080	1920	0	0	16	YUV				✓	InitVisca	0x841
HDMI Cameras														
	Camera Type	Frame Step	Height	Width	VFP	HFP	Bits	Input	Invert VSync	Invert HSync	Use DVal	Use ESync	Init Code	Flags
All	Generic Digital	0	720	1280	20	220	16	YUV					None	0x1
	Generic Digital	0	1080	1920	36	148	16	YUV					None	0x1
<i>Configuration notes: Frame Step value of 2 may be required for cameras that output P60 frame rate.</i>														
HD-SDI Cameras														
	Camera Type	Frame Step	Height	Width	VFP	HFP	Bits	Input	Invert VSync	Invert HSync	Use DVal	Use ESync	Init Code	Flags
All	HD-SDI 720P	0	Auto config setting for 720P - preferred setup - 3000-HD-SDI adapter board default.											
	Generic Digital	0	720	1280	0	0	16	YUV			✓		None	0x401
	Generic Digital	0	720	1280	25	262	16	YUV					None	0x1
	HD-SDI 1080P	0	Auto config setting for 1080P - preferred setup											
	Generic Digital	0	1080	1920	0	0	16	YUV			✓		None	0x401
	Generic Digital	0	1080	1920	41	194	16	YUV					None	0x1
	HD-SDI 1080i	0	1080	1920	0	0	16	YUV	✓ Interlaced			✓	None	0x809
	Generic Digital													
<i>Configuration notes: If image colors are incorrect (green/purple), the camera is not in the resolution mode for the 3000. A Frame Step value of 2 may be required for cameras that output P60 frame rate. HD-SDI typically uses Data Valid line. It is possible to use Generic Digital to manually adjust vertical and horizontal front porch (blanking).</i>														
Camera Link Cameras														
	Camera Type	Frame Step	Height	Width	VFP	HFP	Bits	Input	Invert VSync	Invert HSync	Use DVal	Use ESync	Init Code	Flags
Imperx B1921C	Generic Digital	0	1080	1920	0	0	8	Bayer					None	0x3
	<i>Configuration notes: Requires 2.24.xx and above. See EAN-Imperx-Cameras for details.</i>													
JAI GO-2400M (monochrome)	Generic Digital	0	1080	1920	0	0	8	G8 -16-bit					None	0x4002
	<i>Configuration notes: Byte Swap <u>must</u> be checked. The camera outputs a larger image (1936 x 1216) and it is cropped to 1920 x 1080. The image can be shifted by adjusting VFP and HFP. Camera serial config ((9600, LF/CR after commands): TAGM=1 (1X2_1Y) CLCF=2(37.12MHz) SA=1 (persist)</i>													
JAI GO-5000C Bayer	Generic Digital	0	1080	1920	0	0	8	Bayer			✓		None	0x403
	<i>Configuration notes: The camera outputs a larger image (2560 x 2048) and it is cropped to 1920 x 1080. The image can be shifted by adjusting VFP and HFP. This camera must be run as 2 tap 8 bit Bayer Camera serial config (9600, LF/CR after commands): TI=2(soft trigger) TAGM=1 (1X2_1Y) CLCF=2 (0=84.9MHz) AR=33333 (30fps) SA=1 (persist)</i>													
JAI GO-5101C Bayer	Generic Digital	0	1080	1920	0	0	8	Bayer			✓		None	0x4403
	<i>Configuration notes: Byte Swap <u>must</u> be checked. The camera outputs a larger image (2464 x 2056) and it is cropped to 1920 x 1080. The image can be shifted by adjusting VFP and HFP. This camera must be run as 2 tap 8 bit Bayer Camera serial config (9600, LF/CR after commands): TI=2(soft trigger) TAGM=1 (1X2_1Y) CLCF=2 (0=84.9MHz) AR=33333 (30fps) SA=1 (persist)</i>													



6 Camera Link

6.1 Camera Link Power

The Sightline Applications Camera Link adapter boards do not provide camera power over the Camera Link cable (POCL). External camera power must be supplied.

6.2 Camera Link Cables

Camera link cables can be incompatible in systems with limited space. Alternative cables are available from [Components Express](#). Cables are available in 0.2, 0.3, 0.5, 0.6 M lengths (0.2 is the shortest cable). Camera Link cables are shown in [Figure 5](#).

- ICL-9-1-9-0.2M (type 9 connector on both ends)
- HDR male straight exit recessed screws connector to 0.2 meter ribbon 3M 90201/26 cable to HDR male straight exit recessed screws connector



Figure 5: Component Express Camera Link Cables

6.3 Camera Link Video Formats

Cameras generally come in grayscale or Bayer formats.

6.3.1 Camera Link Taps

Single tap indicates a single pixel value is read out for each pixel clock.

Dual tap indicates that two adjacent pixel values are read out at each pixel clock. For example, 2x8-bit pixel values are packed into a 16-bit word and acquired at the same pixel clock.

A Camera Link Base configuration (single cable) allows up to 24-bits of data. A 3-tap configuration at 8-bits will fit on a single cable (3x8=24). A 3-tap configuration at 10-bits requires dual cables (3x10=30) and a Camera Link Medium configuration.

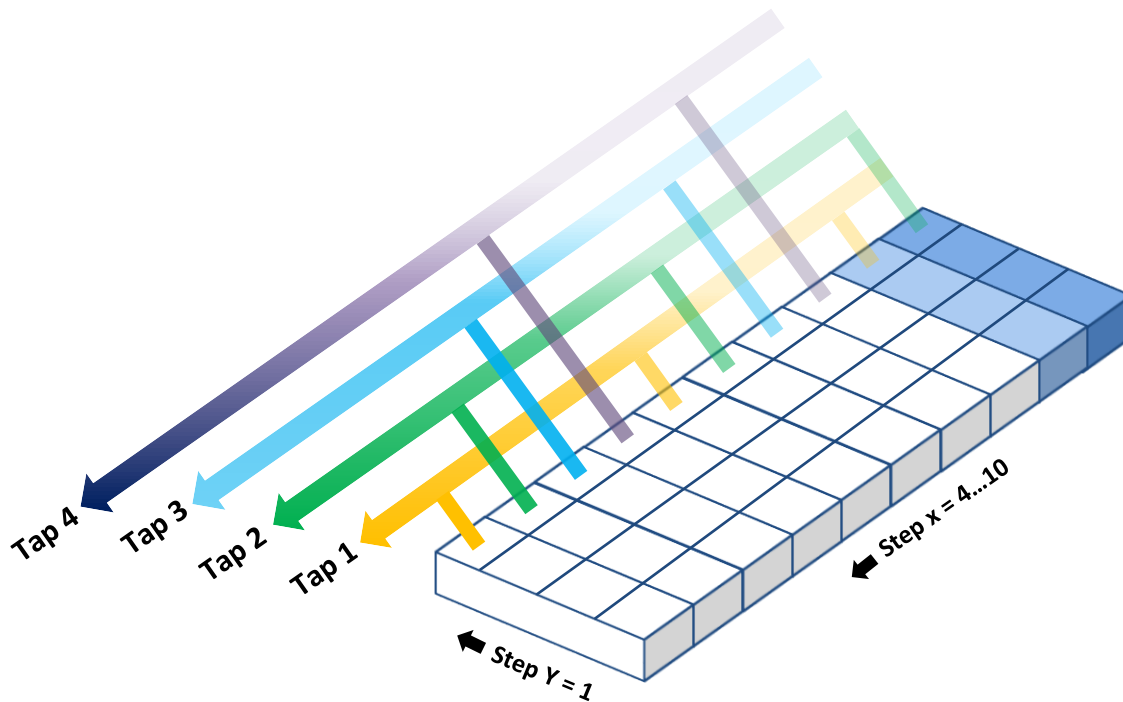


Figure 6: Camera Link 4 Tap Example

6.4 Supported Video Formats

1500-OEM

- Bayer in 12-bit single tap mode (1X1_1Y) requires FPGA 10 (see Imperx camera settings in [Basic Camera Configuration Settings](#)).
- Grayscale in 8 to 16-bit single tap mode (1X1_1Y)

3000-OEM

- Grayscale in 8 to 16-bit single tap mode (1X1_1Y)
- Grayscale 8-bit in dual tap format (1X2_1Y) requires G8 16-bit input set in *Acquisition Parameters* dialog window in Panel Plus. Dual tap mode acquires 2 pixels in a 16-bit word.
- Bayer 8-bit in 2 tap format (1X2_1Y) requires a Bayer format set in *Acquisition Parameters*. Dual tap mode acquires 2 pixels in a 16-bit word. This assumes the Bayer camera color order is BGGR (see [Bayer Camera Color Order](#) for more information).



7 Bayer Camera Color Order

Different cameras will output Bayer color data in different orders.

The four Bayer color-order patterns are shown below. Bayer color order patterns start in the upper left-hand corner of the imager. The color pattern is read from upper-left, upper-right, lower-left, lower-right.



Figure 7: Patterns Indicating Order of Color

Bayer support assumes the camera color order is BGGR. It is possible to use the *Acquisition Settings* dialog window in Panel Plus to change the acquired Bayer color ordering. This assumes the camera outputs more rows and columns of active data than will be acquired (most common).

7.1 Single Tap Cameras (1X1_1Y)

For single tap cameras the pattern can be adjusted to BGGR by using the Vertical and Horizontal front porch settings in the *Acquisition Parameters* dialog window. Vertical front porch removes a row of data from the acquired imagery, while horizontal front porch removes a column of data from the acquired imagery. For example, a camera that outputs GBRG (below) can be changed to BGGR by setting the horizontal front porch value to 1. This will eliminate the first column of data resulting in a BGGR image.

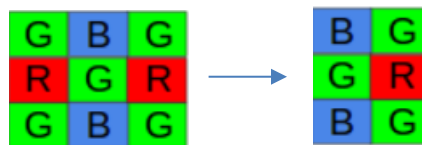


Figure 8: GBRG to BGGR

7.2 Dual Tap Cameras (1X2_1Y)

For dual tap cameras the pattern can be adjusted to BGGR by using the *Byte Swap* and *Horizontal front porch* settings in the *Acquisition Parameters* dialog window. In dual tap cameras, 2x adjacent pixels are acquired in a single 16-bit word. Enabling the *Byte Swap* checkbox swaps the pixels. Horizontal front porch will remove a column of data from the acquired imagery. As the pixel values are acquired two at a time, the Vertical front porch will remove 2x pixels per increment on the parameter. For example, a camera that outputs GBRG can be changed to BGGR by selecting the *Byte Swap* checkbox.

8 Questions and Additional Support

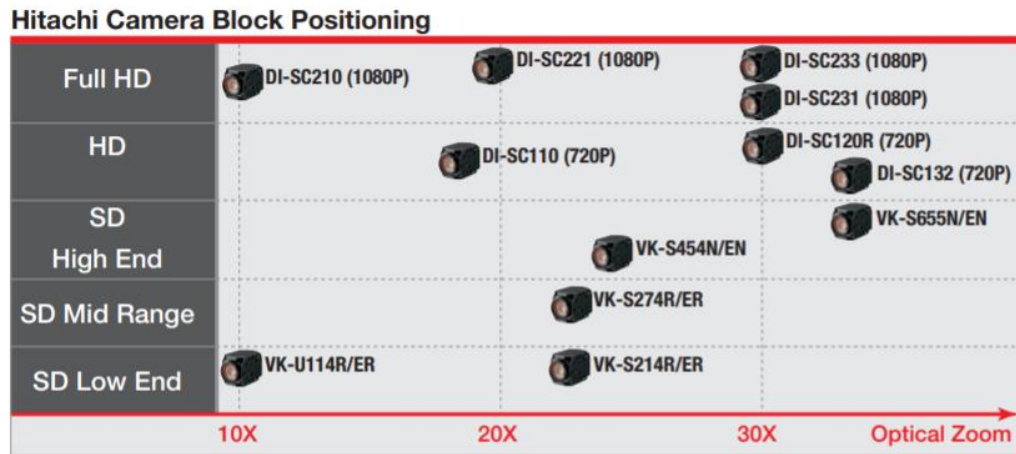
If you are still having issues and require additional support, please contact [Technical Support](#). Additional support, documentation and Engineering Application Notes (EANs) can be found on the Support pages of the SightLine Applications [website](#).



Appendix - Hitachi SC-120R Camera

The Hitachi SC-120R camera is being phased out by Hitachi. The only compatible camera is the SC-110R, which has less zoom. The SC-120R and SC-110R are CCD cameras. All other Hitachi block cameras are CMOS cameras that have rolling shutter effects.

ⓘ IMPORTANT: The Hitachi camera models shown in [Figure A1](#) have different connectors and cables than the SC-120/110R and are not compatible with the SightLine Hitachi adapter boards.



Cables

Type	Models
Molex 9 pin FFC cable	VK-S454N/EN, VK-S655N/EN
Molex 30 pin micro-coax cable	VK-S454N/EN, DI-SC220, VK-S655N/EN
Molex 40 pin micro-coax cable	DI-SC110, DI-SC120R
KEL 30 pin micro-coax cable	DI-SC132, DI-SC210, DI-SC221, DI-SC231, DI-SC233

Hitachi offers a variety of cable lengths for analog and HD camera blocks with Molex flat flex and/or micro-coax connectors. For assistance with KEL cables, please contact your local KEL representative.

Figure A1: Hitachi Camera Models Chart