SightLine APPLICATIONS

ICD-3000-OEM

PN: ICD-3000-OEM

6/14/2018

Contact:

Web: sightlineapplications.com

Sales: sales@sightlineapplications.com

Support: support@sightlineapplications.com

Phone: +1 (541) 716-5137

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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.

Contents

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Revision History

Date	Description
6/12/2018	Updated adapter ID for FPC board.
5/22/2018	Added notes explaining D2/D3 LED functions to LED Summary section.
03/09/2018	Highlighted that input voltage can be passed to camera through adapter board. Added details on Port ID and Board ID.
02/14/2017	Analog out is incompatible with Digital output (Vout, HDMI).
12/20/2017	Syntax updates. Added notes on thermal and magnetics.
12/14/2017	Clarified notes on generic adapter ID 0xD.
11/09/2017	Updated document to new format and edited for clarity. Created new ICD document for 3000-OEM adapter boards. See ICD-3000-Adapters.
07/28/2017	Add notes on generic adapter ID, GPIO pin and reset/power-down lines.
05/18/2017	Add notes on minimum vertical blanking.
04/28/2017	Add in video timing diagram for 1080P as an example.
04/27/17	Correct HDVPSS timing information chapter (8.10.1).
04/26/17	Add detailed information on synchronization edges, maximum input pixel clock, reference to TI HDVPSS input timing documentation.
04/24/17	Add section detailing how to measure blanking.
04/22/17	Add section on synchronization signals and blanking.
03/15/10	Fix error in supported data formats, should by YCbCr.
02/16/17	Add section on supported camera data formats.
02/07/17	Add Port A and Port B data bit locations to VIP ports.
01/25/17	Adding information for rounding the corners, embedded Ethernet, update HDSDI-IN image and connector descriptions. Add: 3000-CL board.
01/10/17	Specify grayscale input data bit locations. Add notes on I2C Linux bus numbering.

01/06/17	Change generic adapter ID = 0xD. Note that adapter ID = 0 will result in no video acquisition.
10/24/16	Mod: Input Mezzanine Board Address table to include more information when a board is not connected. Identify IDs that are reserved.
09/26/16	Add: SLA-3000-HDMI board.
09/09/16	Add: Temperature sensor information.
08/01/16	Updated PRELIMINARY Junction-to-Case Thermal Resistance (Theta-JC) section with new image, notes, and part number.
05/10/16	Add notes on grayscale support.
02/04/16	Add notes regarding serial port voltage levels and Ethernet 10/100.
01/26/16	Add: section on safe device handling and thermal management. Added: 3000-USB section
11/13/15	Added other adapter boards.
10/06/15	Update bideo formats, LED summary, test points, camera naming convention, table captions
09/08/15	Updated tables for J3 and J4. Add SLA-3000-HDSDI-IN (REV B) photo.
06/30/15	Insert ToC, numerous table and illustration captions, and formatting changes. Added design checklist. Renamed SLA-3000-MAIN to 3000-IO.
02/02/15	Formatting, photo changes.
05/27/14	Formatting, address update.
05/22/14	Updated video input connector tables, voltage level, description, mezzanine ID.

1 Overview

Describes power requirements, thermal management, interface specifications, and connector pin-outs for the 3000-OEM video processing board.

1.1 Associated Documents

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-File Recording: Describes how to record video or snap shots to either the onboard MicroSD card or to an external FTP drive.

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.

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

EAN-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

Panel Plus software and firmware versions:

3000-OEM requires Panel Plus and Firmware 2.23.0 and higher.

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

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

2 Safe Device Handling

△ **CAUTION:** To prevent damage to hardware boards, use the following Electro Static Discharge (ESD) guidelines:

- Use a conductive wrist strap attached to a good earth ground.
- Before picking up an ESD sensitive electronic component, discharge built up static by touching a grounded bare metal surface or approved antistatic mat.

3 3000-OEM Overview

The 3000-OEM has four connectors on the bottom side that are designed for board-to-board connectivity. The connectors are: Main (Power, Ethernet, Serial, HDMI and analog output), Input Channels 0 and 1 (Digital Video In, power out, and serial), and the Optional Output Video (Digital Video Out).

Figure 1: 3000-OEM Overview

3.1 3000-OEM Specifications

Revision: C (green)

Dimensions: 3.465 in x 1.969 in (88 mm x 50 mm)

Weight: 38 grams

Drawing: 3000-OEM Drawing Rev C

3000-OEM Drawing Rev B

3000-OEM Assembly

STEP File: 3000-OEM Rev C STEP

3000-OEM Rev B STEP

All 300-OEM board mounting holes support M1.6 screws.

3.2 Hardware Revisions

Board Revision	Changes
Rev C	*(coming soon)*

3.3 Interface Protocol

The 3000-OEM shares the same interface protocol as other SLA video processing boards. The protocol is a packet-based command and control interface. There is an ARM core on the DM8148 that is only lightly utilized in the SLA implementation. This provides customers with a processor to implement other processing functions or protocol conversions (allows communications via a customer's proprietary protocol).

3.4 Functional Block Diagram

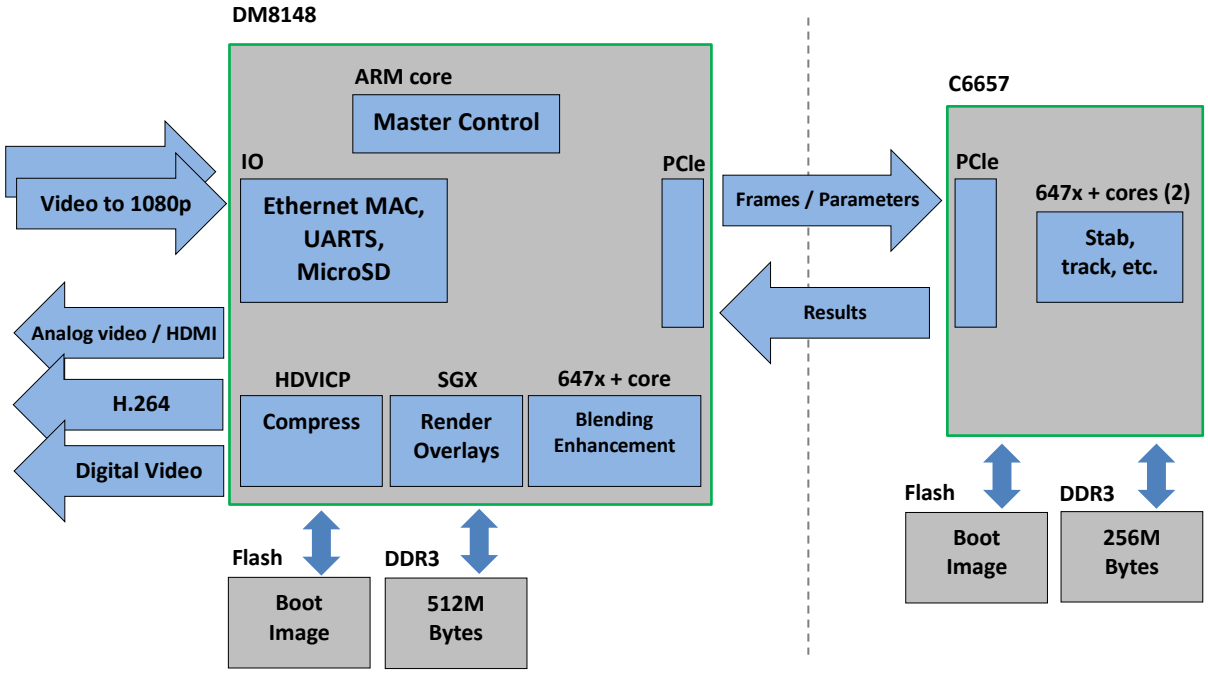

Figure 2: 3000-OEM Hardware Block Diagram

3.5 Design Checklist

- ✓ Provide a sufficient heat sink for the DSP and other major components
- ✓ Expose serial port 0 to connector for debugging
- ✓ Use serial port 1 for command and control, otherwise use Ethernet port. Alternately serial port 2, 3, 4[1] can also be used for command and control
- ✓ Expose Ethernet port for debug, command and control, and firmware update capability
- ✓ Expose analog video output and ground for debugging
- ✓ Provide test points for all serial port signals
- ✓ Expose test point for video sync signals
- ✓ Expose MicroSD card signals for failsafe recovery (future improvements)
- ✓ All serial ports are 3.3V TTL levels (unless otherwise noted)

1 This feature may not be available for all software releases.

3.6 Break-Away Connectors

The 3000-OEM has corners that can be removed or rounded off. When removing the corners use care to not damage the board.

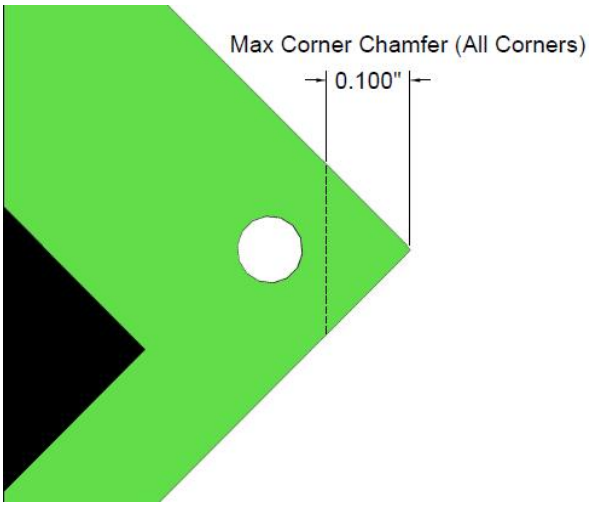

Figure 3: Breakaway Connectors

4 Thermal Management

4.1 Heatsink Guidelines

- Component temp range: -40°C to 85°C
- All hardware uses some form of mechanical heatsink.
- The 3000-OEM typical power consumption is less than 10W @ 12V. Most of the power is used by the two DSP chips. A new single DSP mode is now available that reduces power consumption to approximately 6W, but it has some functional limitations.
- A large heatsink to facilitate bench and early testing is provided by SightLine. It supports convective cooling when there is airflow.

ⓘ **IMPORTANT:** The large heatsink is not intended for long term vehicle integration use.

Most customers design a heatsink in conjunction with their system integration effort that provides a direct conducted path to a significant thermal mass (typically the wall of a gimbal or housing). Others use active cooling (fans) as part of the design.

STEP files for the heatsink interface are available from SightLine that can help with heatsink design and integration.

4.2 Gap Filler (Thermal Grease)

When possible use some form of thermally conductive liquid gap filling material such as Artic Silver rather than an adhesive. Do not use thermal grease in conjunction with gap pads.

4.3 Gap Pads

Use some form of thermally conductive material for filling gaps between the hot components and the heat sink. Examples such as the Bergquist VO Ultra Soft are recommended. Do not use gap pads in conjunction with thermal grease.

4.4 Preliminary Junction-to-Case Thermal Resistance (Theta-JC)

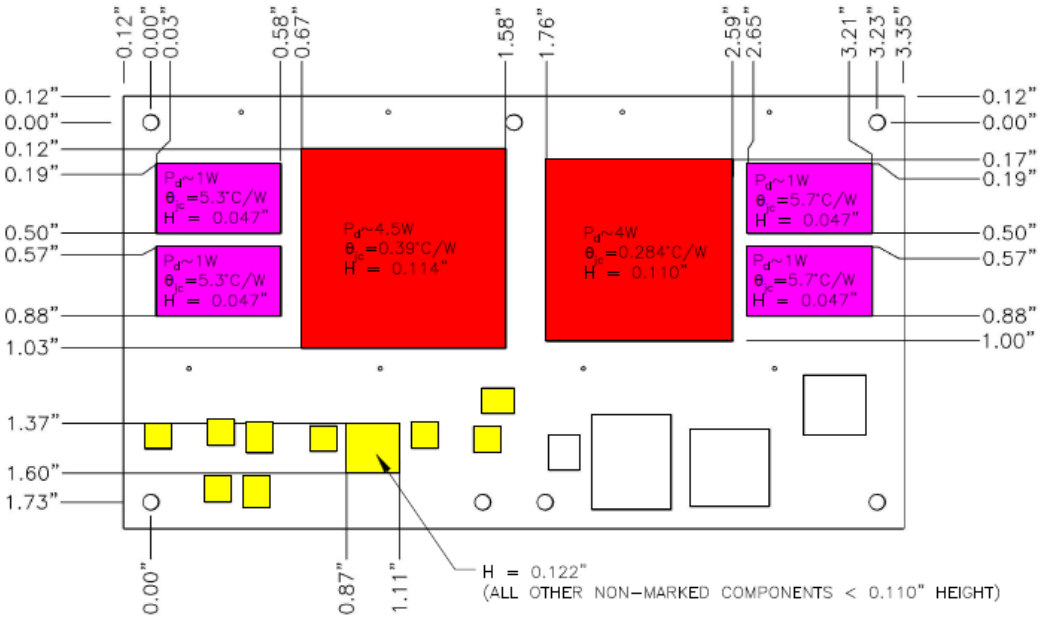

Figure 4: 3000-OEM Thermal Drawing (REV B3)

Drawing notes:

- All dimensions in inches.
- Devices in yellow dissipate less than 1/4W per IC.
- All height (H) values are estimates. Since there is a lot of variation, use gap pads to make good contact.

Table 1: Component Thermal Resistance Specifications

Description	Manufactures PN	Temp Range	Theta-JC
DM8148	TMS320DM8148CCYEA0	-40° to 105°C	0.39 C/W
ISSI memory (for 8148)	IS43TR16128A-15HBLI	-40° to 95°C	5.3 C/W
C6657	TMS320C6657CZHA25	-40° to 100°C	0.284 C/W
Micron memory (for 6657)	MT41J64M16JT-15E IT:G	-40° to 95°C	5.7 C/W

5 Ports, LED, GPIO and Sensors

5.1 LED Summary

Label	Color	Function
D2	Green	Ethernet PHY (activity)
D3	Amber	Ethernet PHY (link)
D8	Green	GP1[8] Pin W2 [REV D]
D9	Blue	GP1[9] Pin V1 [REV D]

5.2 Serial Port Summary

All serial ports are 3.3V TTL. When using a SightLine mezzanine board with a 3-pin connector, use the CAB-03xx for easy break out to either a pig tail, Molex-to-Molex, or DB-9 connector.

Table 2: 3000-OEM Serial Port Summary

Connector	Name	Device	Notes
J1	Serial Port 0	/dev/ttyO0	Reserve for SightLine debug
J1	Serial Port 1	/dev/ttyO1	
J2	Serial Port 4	/dev/ttyO4	
J3	Serial Port 2	/dev/ttyO2	
J4	Serial Port 3	/dev/ttyO3	

5.3 GPIO Summary

The 3000-OEM has several GPIO. These GPIO are used to identify the Input Mezzanine Board Address attached to connectors J2, J3, J4. See current list of IDs in Connector Descriptions.

After bootup, the GPIO may be used for generic Input and Output.

5.4 I2C Port Summary

The I2C Ports available for camera control are on the following ports

Table 3: 3000-OEM I2C Port Summary

Connector	Name	Device	Notes
J2	I2C Bus 0	/dev/i2c-1	Linux I2C bus number is 1
J3	I2C Bus 0	/dev/i2c-1	Linux I2C bus number is 1
J4	I2C Bus 3	/dev/i2c-4	Linux I2C bus number is 4

5.5 Temperature Sensor - U4

Temperature is read by on onboard NXP LM75BGD. The temperature is queried once per second. The temperature can be requested by sending the Get Version (0x00) command. The sensor is located on the bottom of the board.

To get an accurate reading, the U4 sensor chip should share the same heat sync as the DSPs.

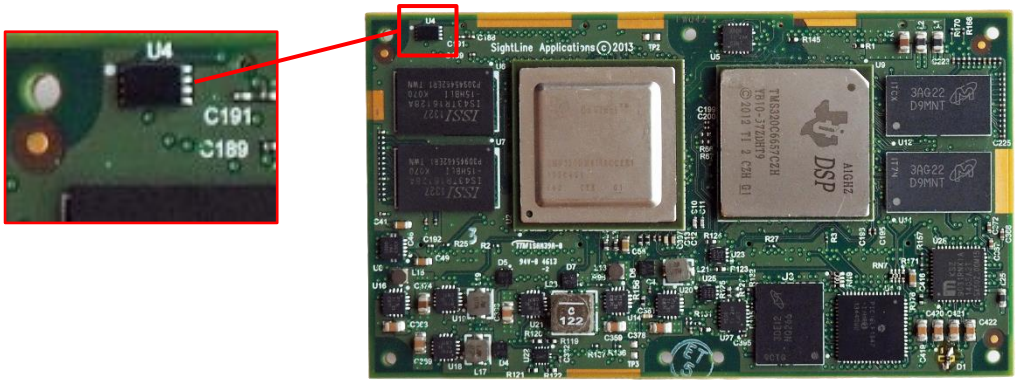

Figure 5: Temperature Sensor

6 Connector Descriptions

Table 4: Connector Descriptions

Connector	Description
Connector J1: Main	Power, serial port 0, serial port 1, analog video out, HDMI out, 10/100 Ethernet, MicroSD
Connector J2: Digital Video Output	Digital video out, serial port 4, I2C0
Connector J3: Video Input 0	Digital video in 0, serial port 2, I2C0, GPIO
Connector J4: Video Input 1	Digital video in 1, serial port 3, I2C3, GPIO
P1	JTAG (internal use only)

6.1 Connector J1: Main

Connector: DF12(3.0)-60DS-0.5V(86)

Mates with: DF12(3.0)-60DP-0.5V(86)

Table 5: 3000-OEM J1 Pinout

Pin	Description	Pin	Description	Pin	Description	Pin	Description
1	Vin	2	Ground	31	TXPA	32	TXPC
3	Vin	4	Ground	33	TXNA	34	TXNC
5	Vin	6	Ground	35	TXPB	36	TXPD
7	Vin	8	Ground	37	TXNB	38	TXND
9	Vin	10	Ground	39	Ground	40	Ground
11	Vin	12	Ground	41	HDMICLK+	42	HDMID1+
13	Vin	14	Ground	43	HDMICLK-	44	HDMID1-
15	Vin	16	Ground	45	HDMID0+	46	HDMID2+
17	Vin	18	Ground	47	HDMID0-	48	HDMID2-
19	SD0_DAT2	20	SD0_CLK	49	HDMI_SCL	50	HDMI_SDA
21	SD0_CD/DAT3	22	SD0_DAT0	51	Ground	52	Ground
23	SD0_CMD	24	SD0_DAT1	53	+3.3V (out)	54	+3.3V (out)
25	Ground	26	Ground	55	+1.8V (out)	56	+1.8V (out)
27	RX0	28	TX0	57	Video Out 0	58	Video Out 1
29	RX1	30	TX1	59	Video Ground	60	Video Ground

6.1.1 Serial Ports

On connector J1, serial port 0 and serial port 1 (RX0/TX0, RX1/TX1)) are 3.3VTTL. Serial port 0 should be reserved for debugging. Serial port 1 can be used for command and control. TX pins transmit from the 3000-OEM, RX pins receive.

6.1.2 Ethernet

On connector J1, pin 31 through pin 38 represent the Ethernet connection. Currently only 10/100BASE-T has been implemented (Pins 31,33,35,37). 1000BASE-T has not yet been enabled (pins 32, 34, 36, 38).

TXPA/TXNA is sending info from Sightline product., TXPB/TXNB is receiving.

TXPA = TX+
TXNA = TX-
TXPB = RX+
TXNB = RX-

The 3000-OEM uses the embedded Ethernet approach. This consists of 0.033uF capacitors placed in series on the Ethernet lines (AC coupled) onboard. There are no Ethernet magnetics on either the 3000-OEM or the 3000-IO. If the distance is less than a few meters and there is a common ground, there should not be any issues with Ethernet connectivity (even in EMI testing).

IMPORTANT:

If the Ethernet needs to be changed to use external magnetics, the OEM board should be modified by changing the board capacitors (and possibly other passives) to zero-ohm jumpers. Contact Support for modification assistance.

Analog Video output on J1 is incompatible with Digital Video outputs (Vout, Vout1, HDMI) Contact Support for more information.

6.2 Connector J2: Digital Video Output

Connector: DF12(3.0)-60DP-0.5V(86)

Mates with: DF12(3.0)-60DS-0.5V(86)

Table 6: 3000-OEM J2 Pinout

Pin	Description	Pin	Description	Pin	Description	Pin	Description
1	VOUT0_CLK	2	USB0_ID	31	VOUT0_RSR_3	32	VOUT0_RSR_2
3	Ground	4	USB0_DRVBUS	33	Ground	34	Ground
5	VOUT0_GYYC_9	6	VOUT0_GYYC_8	35	VOUT0_HSYNC	36	USB0_DP
7	VOUT0_GYYC_7	8	VOUT0_GYYC_6	37	VOUT0_VSYNC	38	USB0_DM
9	VOUT0_GYYC_5	10	VOUT0_GYYC_4	39	VOUT0_FLD	40	USB0_VBUSIN
11	VOUT0_GYYC_3	12	VOUT0_GYYC_2	41	VOUT0_AVID	42	USB0_CE
13	Ground	14	Ground	43	Ground	44	Ground
15	VOUT0_BSBC_9	16	VOUT0_BSBC_8	45	RX4	46	TX4
17	VOUT0_BSBC_7	18	VOUT0_BSBC_6	47	I2C0_SCL	48	I2C0_SDA
19	VOUT0_BSBC_5	20	VOUT0_BSBC_4	49	GP0_16	50	GP0_17
21	VOUT0_BSBC_3	22	VOUT0_BSBC_2	51	GP0_22	52	GP0_23
23	Ground	24	Ground	53	GP0_24	54	GP0_28
25	VOUT0_RSR_9	26	VOUT0_RSR_8	55	+3.3V (out)	56	+3.3V (out)
27	VOUT0_RSR_7	28	VOUT0_RSR_6	57	Ground	58	Ground
29	VOUT0_RSR_5	30	VOUT0_RSR_4	59	+1.8V (out)	60	+1.8V (out)

See Video Input Port Description for more details.

6.3 Connector J3: Video Input 0 (VIN0)

Connector: DF12(3.0)-80DP-0.5V(86)

Mates with: DF12(3.0)-80DS-0.5V(86)

In the Notes column:

Y = luminance

CbCr = Chrominance

G = Grayscale

A = Indicates port A data bits

B = Denotes port B data bits

See Supported Data Formats (Video Input 0 and 1).

Table 7: 3000-OEM J3 Pinout

Pin	Description	Notes	Pin	Description	Notes
2	VIN0_**B**CLK		1	VIN0_**A**CLK	
4	Ground		3	Ground	
6	VIN0_D22		5	VIN0_D23	
8	VIN0_D20		7	VIN0_D21	
10	VIN0_D18		9	VIN0_D19	
12	VIN0_D16		11	VIN0_D17	
14	Ground		13	Ground	
16	VIN0_D14	**Y**6, **G**6, **B**6	15	VIN0_D15	**Y**7, **G**7, **B**7
18	VIN0_D12	**Y**4, **G**4, **B**4	17	VIN0_D13	**Y**5, **G**5, **B**5
20	VIN0_D10	**Y**2, **G**2, **B**2	19	VIN0_D11	**Y**3, **G**3, **B**3
22	VIN0_D8	**Y**0, **G**0, **B**0	21	VIN0_D9	**Y**1, **G**1, **B**1
24	Ground		23	Ground	
26	VIN0_D6	**CbCr**6, **G**14, **A**6	25	VIN0_D7	**CbCr**7, **G**15, **A**7
28	VIN0_D4	**CbCr**4, **G**12, **A**4	27	VIN0_D5	**CbCr**5, **G**13, **A**5
30	VIN0_D2	**CbCr**2, **G**10, **A**2	29	VIN0_D3	**CbCr**3, **G**11, **A**3
32	VIN0_D0	**CbCr**0, **G**8, **A**0	31	VIN0_D1	**CbCr**1, **G**9, **A**1
34	Ground		33	Ground	
36	NC		35	NC[2]	
38	NC		37	NC	
40	NC		39	NC	

2 J4 Pins 35,37,39,41 have alternate functionality NYI. When building an adapter board DO NOT CONNECT.

(3000-OEM J3 Pinout table continued)

Pin	Description	Notes	Pin	Description	Notes
42	Port ID (out)	See pin notes below	41	NC	
44	Ground		43	Ground	
46	NC		45	VIN0_HSYNC	
48	NC		47	VIN0_VSYNC	
50	NC		49	VIN0_FLD	
52	NC		51	VIN0_DE	Optional
54	Ground		53	Ground	
56	Passthrough ground		55	Passthrough VIN	See J1
58	Passthrough ground		57	Passthrough VIN	See J1
60	Passthrough ground		59	Passthrough VIN	See J1
62	Passthrough ground		61	Passthrough VIN	See J1
64	Ground		63	Ground	
66	TX2	3.3V TTL	65	RX2	3.3V TTL
68	I2C0_SDA	/dev/i2c-1	67	I2C0_SCL	/dev/i2c-1
70	GP0_8_**ID1**	See below sys/class/gpio/ gpio8	69	GP0_25_**ID0**	See below sys/class/gpio/gpio25
72	GP0_10_**ID3**	sys/class/gpio/ gpio10	71	GP0_9_**ID2**	sys/class/gpio/ gpio9
74	GP0_15	sys/class/gpio/ gpio15	73	GP0_14	sys/class/gpio/gpio14
76	+3.3V (out)		75	+3.3V (out)	
78	Ground		77	Ground	
80	+1.8V (out)		79	+1.8V (out)	

Connector pin notes:

- Port ID = Ground for VIN0. This is used to identify the port (VIN0(J3) or Vin1(J4)) to an external board attached to this port.
- Board ID pins (ID0, ID1, ID2, ID3) are used to identify the type of board attached to this connector. See Input Mezzanine Board Address section for details.
- Passthrough VIN and ground are passed through from main connector (J1) VIN and ground.
- See Video Input Port Description for details.

6.4 Connector J4: Video Input 1 (VIN1)

Connector: DF12(3.0)-80DP-0.5V(86)

Mates with: DF12(3.0)-80DS-0.5V(86)

Similar pin-out as J3, except for the following:

PortID = +3.3V for Video Input 1, VINx = VIN1 for Video Input 1

Table 8: Video Input Pins

Pin	Description	Notes	Pin	Description	Notes
66	TX3	3.3V TTL	65	RX3	3.3V TTL
68	I2C3_SDA	/dev/i2c-4	67	I2C3_SCL	/dev/i2c-4
70	GP1_16_**ID1**	/sys/class/gpio/gpio48	69	GP0_20_**ID0**	sys/class/gpio/gpio20
72	GP1_18_**ID3**	/sys/class/gpio/gpio50	71	GP1_17_**ID2**	sys/class/gpio/gpio49
74	GP0_19	sys/class/gpio/gpio19	73	GP0_18	sys/class/gpio/gpio18

Connector pin notes:

- Port ID = +3.3 for VIN1. This is used to identify the port (VIN0(J3) or Vin1(J4)) to an external board attached to this port.
- Board ID pins (ID0, ID1, ID2, ID3) are used to identify the type of board attached to this connector. See Input Mezzanine Board Address section for details.
- Passthrough VIN and ground are passed through from main connector (J1) VIN and ground.
- See Video Input Port Description for details.

ⓘ SIGHTLINE USE ONLY

6.5 Connector J5: JTAG, JTAG, PIC Programmer

Connector: ZF5S-25-01-T-WT-TR

Mates with:

SightLine cable:

Test Points:

Label	Signal
TP1	Ground
TP2	Ground
TP3	Ground

7 Video Output Port Description

7.1.1 Signal Levels

Unless otherwise specified, all video signal levels are 3.3 Volts. See the table in Section 10 for example video card accessories.

7.1.2 Power

There are multiple rails available on the connectors to power a mezzanine board or accessories. On the 3.3V rail, do not exceed 0.8A. On the 1.8V rail, do not exceed 0.7A.

7.2 Video Output

Vout (J2):

Digital video output supporting 1080p @ 60 8/16/24 YCbCr / 24-bits (RGB)

Embedded sync or external sync modes

Vout1 (alternate J3) (not currently implemented):

- 20-bit (10-bit Y, 10 CbCR) Digital video output
- Digital video output supporting up to 16-bit (YCbCr) / 24-bits (RGB)
- Other non-native formats such as 20-bit (10-bit Y, 10 CbCr) input may be possible with driver level development
- SD Composite / S-video (NTSC/PAL): ITU-R BT 470.6

HDMI Output (J1):

HDMI 1.3a (TBD 1.4a) compliant interface.

The HDMI output format is specified by the resolution and format specified through Panel Plus. The HDMI output ignores any EDID HDMI format information in the external HDMI sink device.

ⓘ **IMPORTANT:** Digital Video outputs (Vout, Vout1, HDMI) are incompatible with Analog video output on J1. Some combinations of Vout and HDMI can work simultaneously. Contact Support for more information.

8 Video Input Port Description

8.1 Signal Levels

Unless otherwise specified, all video signal levels are 3.3 Volts. See table in Section 10 for example video card accessories.

8.2 Power

There are multiple rails available on the connectors to power a mezzanine board or accessories. On the 3.3V rail, do not exceed 0.8A. On the 1.8V rail, do not exceed 0.7A.

8.3 Video Formats

The 3000-OEM can accept many types of digital video input. For optimal processing performance we recommend the height and width of the image be a multiple of 16. The 3000-OEM only has one discrete HS/VS/etc. input per video input port. When possible, use embedded sync signals to get around this limitation. In Embedded sync video sync codes are embedded in the data bits, and the VSync, HSync, and Field lines are ignored.

The 3000-OEM supports progressive video in embedded sync and external sync modes. Starting in 2.24 release the 3000-OEM supports interlaced video in embedded sync mode only.

Vin0 (J3):

16-bit YCbCr (up to1920 x 1200 @ 60Hz).

16-bit grayscale (up to1920 x 1200 @ 60Hz).

Embedded sync or external sync modes.

Dual clock independent 8-bit SD input. Port B supports embedded sync only.

Vin1 (J4):

16-bit YCbCr (up to 1920 x 1200 @ 60Hz)

16-bit grayscale (up to1920 x 1200 @ 60Hz)

Embedded sync or external sync modes

Dual clock independent 8-bit SD input. Port B supports embedded sync only *(currently not functional)*.

8.3.1 Camera Configuration Checks

Check the following:

- ✓ Adapter ID. Some adapters may only work on Vin0 (J3), but not on Vin1 (J4)
- ✓ Software settings (Set Acq Params (0x37))*
- ✓ Advanced Capture Params (0x7B)
- ✓ Set Video Mode (0x1F)

* Required to save parameters and a reboot the board

8.3.2 Camera Naming Convention

	When used as one 16-/24-bit input:	*When used as two 8-bit inputs:*
Connector	Appears in software as:	Appears in software as:
J3 (Vin0)	Camera 0 (Cam 0)	Camera 0 and Camera 1
J4 (Vin1)	Camera 2 (Cam 2)	Camera 2 and Camera 3*

8.4 Supported Data Formats (Video Input 0 and 1)

Color camera data: 16-bit YCbCr 4:2:2 (refer to the table in Connector J3: Video Input 0)

8-bit luminance Y0->Y7

8-bit chrominance CbCr0->CbCr7

For 10-bit digital inputs use upper 8-bits of 10-bit data for both Y and CbCr

Discrete sync signals on VINx_HSYNC, VINx_VSYNC, VINx_ACLK, VINx_FLD,VINx_DE (where X is 0,1)

Embedded Sync BT.1120, SMTPE296M/274M

Color camera data: 8-bit BT.656 (refer to the table in Connector J3: Video Input 0)

Two camera inputs support port A and B

8-bits in A0->A7 VIN0_ACLK (pixel clock)

8-bits on B0->B7 VIN0_BCLK (pixel clock). Port B not currently available on VIN1 (see Connector J4: Video Input 1)

If port A is configured in 16 or 24-bit mode, port B is unavailable:

Port A	**Port B**
8-bit	OFF
16-bit	OFF
24-bit	OFF
8-bit	8-bit
OFF	8-bit

Grayscale camera data: up to 16-bit (refer to the table in Connector J3: Video Input 0)

8-bit data in G0 → G7 (G8 → G15 should be tied low)

14-bit data in G0 → G13 (G14 → G15 should be tied low)

16-bit data in G0 → G15

Discrete sync signals on VINx_HSYNC, VINx_VSYNC, VINx_ACLK, VINx_FLD,VINx_DE (where x is 0,1)

* Not yet implemented

8.5 Synchronization Signals (Video Input 0 and 1)

The following synchronization signals are used. VINx refers to VIN0 or VIN1 depending on video input 0 or 1:

VINx_VSYNC vertical sync - A rising edge (default) indicates the start of a new frame. This can be configured through acquisition parameters to falling edge.

VINx_HSYNC horizontal sync - A rising edge (default) indicates the start of a new line. This can be configured through acquisition parameters to falling edge.

VINx_ACLK pixel clock - Pixel data is sampled on the rising edge. Maximum input rate is 165 MHz. Clock edge is not currently configurable through acquisition parameters.

VINx_FLD - This is the field signal for interlaced video. The 3000-OEM does not currently support interlaced acquisition using the field signal. However, starting in 2.24, the 3000-OEM will support interlaced video in embedded sync mode (still does not use *VINx_FLD)*.

VINx_DE - This is data enable or data valid. This signal is high only when active sensor pixel data is available. This signal will be low during vertical and horizontal blanking.

For detailed timing information, see TI document SPRS647e. Section 8.10.1 HDVPSS Electrical Data/Timing.

8.6 Active Video Area and Blanking

Digital video signals contain blanking lines at the top of each frame known as vertical blanking. Blank pixels at the start of each line are known as horizontal blanking.

The active picture region is where the pixel data from the sensor is displayed (Figure 6). This example shows there are 45 blanking lines at the start of each frame, and 280 blanking pixels at the start of each row.

Every camera will have different vertical and horizontal blanking values. The same camera, when configured for different resolutions, can have different vertical and horizontal blanking values. Refer to the camera specific technical documentation for the correct settings.

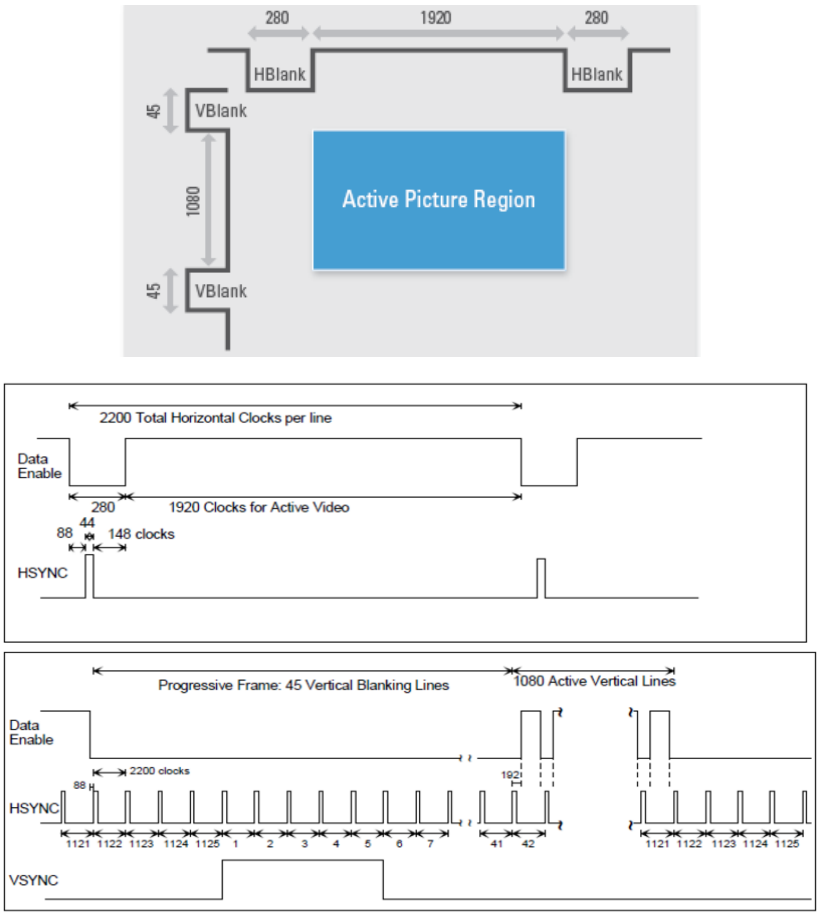

Figure 6: Vertical and Horizontal Blanking

8.6.1 Minimum Vertical Blanking Requirements

720P YCbCr video requires a minimum of 21 vertical blanking lines.

1080P YCbCr video requires a minimum of 30 vertical blanking lines.

ⓘ **IMPORTANT:** If the vertical blanking requirements are not met, the video may display the color artifacts along the top of the video as shown in Figure 7.

Figure 7: Color Artifacts in Video Example

Corrections:

Increase the vertical blanking of the camera output.

SightLine's default capture starts on rising edge of VSync. It is possible to start capture on the falling edge of VSync, which happens earlier, to get enough lines of blanking before active video starts. In Panel Plus, select the *Invert V-Sync Polarity* checkbox in *Acquisition Settings*. In the *Camera Type* drop down menu, select G*eneric Digital for the* camera type.

8.6.2 Removing Blanking Lines and Pixels

Blanking lines and pixels should automatically be removed when the video is acquired by the 3000-OEM.

There are two ways to set up automatic removal. In in the *Acquisition Settings* dialog window in Panel Plus, select the *Data Valid Signal* option in *Sync/Crop*, or if the Data Valid Signal is not supported, manually enter the *Vertical* and *Horizontal Front Porch* settings.

Data Valid Signal (if supported)

If the camera's data enable signal goes high when valid pixel data is available (active picture region), in the *Acquisition Settings* dialog, select *Data Valid Signal* in the *Syn/Crop* dropdown menu. Leave *Vertical Front Porch* and *Horizontal Front Porch* set to 0. The 3000-OEM hardware will use the data valid signal to remove blanking lines and pixels from the acquired video.

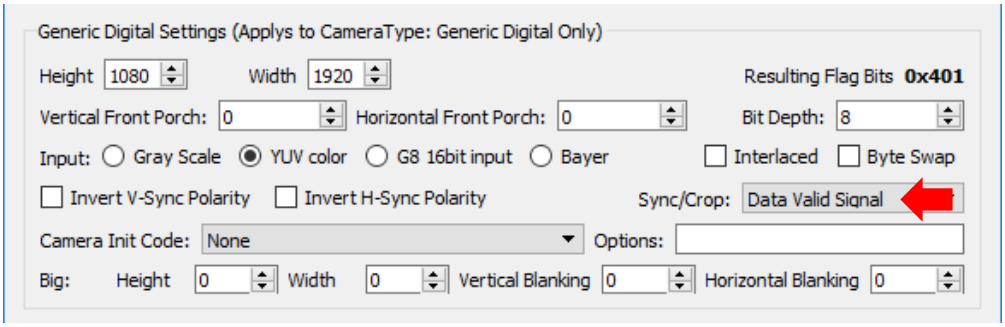

Figure 8: Data Valid Supported

Vertical and Horizontal Front Porch (manual blanking entry)

If the camera does not support Data Valid Signal setting, set the *Sync/Crop* to *None*. Set the *Vertical Front Porch* (blanking) to *45*. Set *Horizontal Front Porch* (blanking) to *280*.

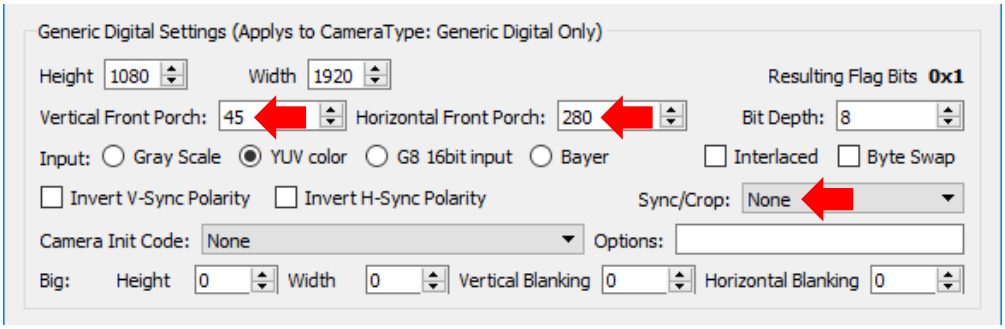

Figure 9: Data Valid Not Supported

If using a custom camera, or a technical reference manual that shows the vertical and horizontal blanking is not available:

1. Set *Vertical Front Porch* and *Horizontal Front Porch* to *0*.
2. Turn off stabilization (Panel Plus main menu *» Configure » Stabilization » Disable All Processing*).
3. Disable *AutoChop* for the camera (Panel Plus main menu » *Configure » Margin Chopping*).
4. Save the parameters to the board, and then reboot the system. The network video should be viewable in Panel Plus.
5. Point the camera at a bright white scene. Rows at the top or columns at the left that remain gray are blanking areas.
6. Performa an SD card snapshot with Capture as the source. See EAN-File Recording.
7. Download the snapshot and open it in an image viewer application. Zoom in and count the number of blank lines at the top (vertical blanking) and blank columns at the left (horizontal blanking).
8. If an SD Card snapshot cannot be taken, change the horizontal and vertical blanking values. Save the parameters to the board, and then restart the board. View the video in Panel Plus and repeat until all the blanking lines have been removed.

9 Power Supplies

(Maximum load TBD)

ⓘ **IMPORTANT:** The supply voltage level must be compatible with camera adapter board and connected cameras. For example, the 3000-Sony camera adapter board passes supply voltage directly to the attached camera. A Sony EH series camera can only support 6V - 12V, which would limit the supply voltage of the 3000-OEM to this range.

10 Input Mezzanine Board Address

Each of SightLine's camera adapter boards is assigned a unique adapter ID to simplify setup and configuration. This applies to any board connected to J3 or J4. Use 10k Ohm resistors to pull up (bit value 1) or pull down (bit value 0) to set the address.

In the future, camera configuration will be overwritten in software using SightLine's Command and Control Protocol. If designing a custom camera board to connect to the 3000-OEM, contact SightLine Applications to discuss the correct board address to use.

Table 9: 3000-OEM Mezzanine Board ID Table

Board ID	72	71	70	69	Board Description	Part Number
0x0	0	0	0	0	No board	(Default) No Board Connected. No video acquired.
0x1	0	0	0	1	Sony block adapter	SLA-3000-Sony
0x2	0	0	1	0	Camera Link® adapter	SLA-3000-CL
0x3	0	0	1	1	Analog video adapter	SLA-3000-AB (Dual Analog)
0x4	0	1	0	0	HDSDI adapter	SLA-3000-HDSDI Input
0x5	0	1	0	1	Hitachi adapter	SLA-3000-HITACHI
0x6	0	1	1	0	FFC/FPC adapter	SLA-3000-FFC, SLA-3000-FPC
0x7	0	1	1	1	HDMI camera	SLA-3000-HDMI
0x8 – 0xC	-	-	-	-	Reserved	
0xD	1	1	0	1	Generic adapter	Generic Adapter Board *(see below)
0xE	1	1	1	0	Special custom board	Do not use
0xF	1	1	1	1	*Reserved for future use*	

***** *For Generic Adapter ID (0xD) the GPIO pins must be pulled to 0xD by the adapter board. For customer designed adapter boards that copy the SLA adapter board schematics, make sure any decoder or other adapter hardware will be enabled with these GPIO pins at 0xD. It is common for SLA designed adapter boards to repurpose these GPIO pins once the Board ID is read; the same cannot be assumed for generic adapter boards.*

11 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.