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Find the *Teledyne Dalsa / Coreco Imaging CL-P1-4096W-518W* at our website: ***Click HERE***

# PIRANHA Cameras

## CL-P1: 2 O/P, 50MHz Total Pixel Rate

*With high line and pixel rates, low noise, high responsivity, CE compliance and LVDS output, the two-output Piranha CL-P1 is the new standard for line scan performance.*




## CL-P1 Features

- 512,1024, 2048, or 4096 resolutions, 10µm square pixels
- 2 outputs for high line rates (max. 79kHz)
- 8-bit data @ 25MHz per output (50MHz total pixel rate)
- Exposure control and antiblooming
- CE-compliant
- EIA-644 (LVDS) data format

## Description

The Piranha CL-P1 line scan cameras provide superb digitized video with excellent responsivity at 25MHz per output on two outputs.

The Piranha cameras use DALSA's patented modular architecture. This system of connecting circuit modules through standardized busses allows DALSA to build a high performance modular camera using the reliability, flexibility, and cost-effectiveness of high-volume interchangeable parts. Within the camera, a driver board provides bias voltages and clocks to the CCD image sensor, a timing board generates all internal timing, and an A/D board processes the video and digitizes it for output. Contact DALSA for further information.

### Applications

Piranha cameras are ideally suited for applications such as:

- High performance document scanning-image lift
- Optical character recognition
- Industrial inspection

### Sensor

The IL-P1 array consists of a line of photoelements, each with a photosensitive area of 10µm x 10µm and a center to center spacing of 10µm. Figure 1 shows a block diagram of the IL-P1 sensor. Photogenerated signal electrons are collected in the photoelements during the integration period, which is the interval between successive pulses of the EXSYNC clock. The integration time can be further reduced with the electronic exposure control provided by the pixel reset clock (PRIN). For more information on the IL-P1 sensor contact DALSA or see the datasheet (document number 03-36-00134).

### Table 1. CL-P1 Camera Configurations

| Specification | 0512 | 1024 | 2048 | 4096 |
|---|---|---|---|---|
| Pixel Pitch | all models: 10µm x 10µm | | | |
| Aperture 10µm x | 5.1mm | 10.2mm | 20.5mm | 41mm |
| Lens Mount | C-mount | | F-mount | |
| Max. Line Rate | 79kHz | 43kHz | 23kHz | 11kHz |
| **Specification** | **W Models, all resolutions** | | | |
| Data Bits | 8 per channel | | | |
| Data Channels | 2 | | | |
| Data Rate | 2 x 25MHz | | | |
| Data Format | EIA-644 (LVDS) | | | |
| CE-compliant | Yes | | | |

**Example Configuration: CL-P1-2048W**

resolution ——— model

## Operation

Cameras provide optimum performance using well-regulated linear supplies. The table below shows the maximum requirements for the camera's DC voltages, overrated to account for all models and operating conditions.

| Voltage | Current Draw | Notes |
|---|---|---|
| +15V | 350mA | Specified at 50ºC ambient. Tolerance for all supplies: ■ ± 50mV ■ <5mV ripple. |
| +5V | 1000mA | |
| -5V | 150mA | |

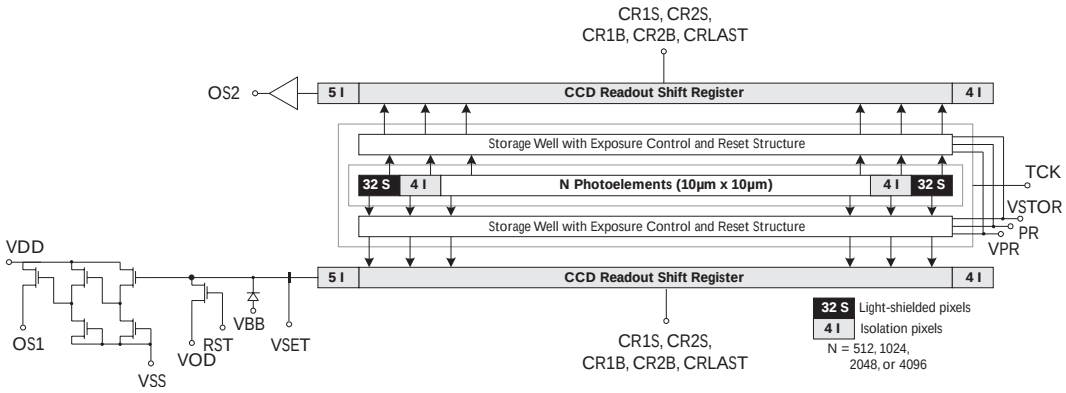
### Optical Interface

The Piranha cameras provide an adapter for C-mount or F-mount (35mm Nikon-compatible) lenses, depending on sensor resolution. The mount threads into a Z-axis alignment ring in the camera's front plate which is optically aligned to provide the proper back focal distance between lens and sensor. The threaded hole can also be used to provide custom optical mounts.



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## Figure 1. IL-P1 Sensor Block Diagram




# Electrical Interface

All connectors are on the camera rear plate. The cameras use separate DB15 connectors for power and control signals, and a DB37 connector for data and clocking signals (two 8-bit channels per connector DB37). Digital data, data clocking, and control signals use the EIA-644 (LVDS differential) standard for data transmission.

# Input Control Signals

The standard Piranha cameras require only one input signal to operate. The line transfer clock EXSYNC is required once each line to trigger line readout. Note that for optimum performance, the cameras use an internal oscillator to control all internal timing, including pixel rate. **The camera does not normally use an external MCLK signal.** Contact DALSA if you want to supply MCLK.

Control signals are differential, requiring complements denoted with a "B" suffix (e.g. EXSYNC, EXSYNCB).

### EXSYNC

EXSYNC is a required user-supplied input signal. Without an EXSYNC input, the camera will not output data. EXSYNC controls camera line rate and integration time. The camera integrates from the rising edge of EXSYNC to the next rising edge of EXSYNC. EXSYNC should not be clocked faster than the camera's specified maximum line rate. Minimum frequency is 300Hz.

| EXSYNC State | |
|---|---|
| Rising Edge | Starts line transfer and readout. |
| Falling Edge | min. 100ns after rising edge |

### PRIN (Exposure Control)

PRIN is an optional user-supplied input signal. PRIN can be used for exposure control to alter exposure time independently of EXSYNC.

| PRIN State | Camera Mode |
|---|---|
| Low | Pixel reset (no exposure) |
| Rising Edge | Exposure begins |
| High | Exposure |
| Unconnected | Exposure |

# Output Signals

These signals indicate when data is valid, allowing you to clock the data from the camera to your acquisition system:

| Clocking Signal | Indicates |
|---|---|
| LVAL (high) | Outputting valid line |
| STROBE (rising edge) | Valid data |

### Digital Data

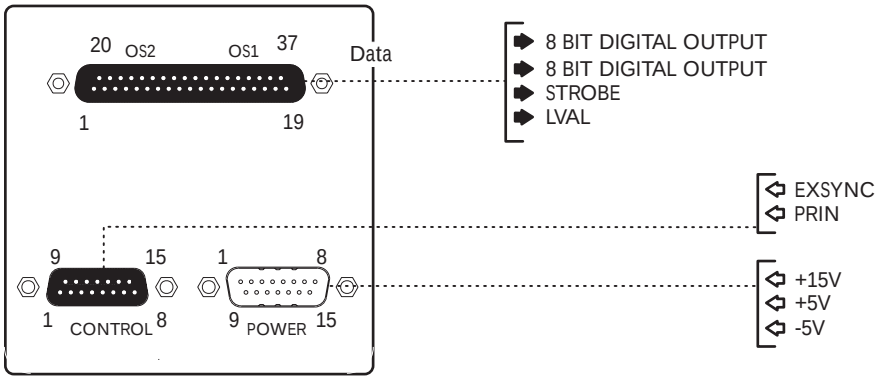
Piranha cameras output 8-bit digital data in EIA-644 (LVDS) format using a DB37 connector. See Figure 4.

**IMPORTANT:** This camera's data is valid on the **rising** edge of STROBE, unlike previous DALSA cameras which used the falling edge.

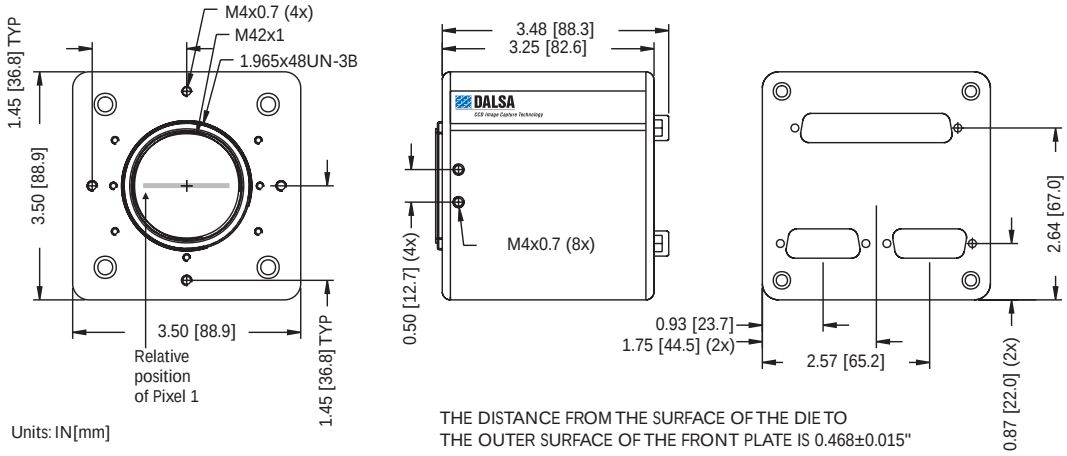


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## Figure 2. Camera Interface




## Figure 3. Mechanical Dimensions

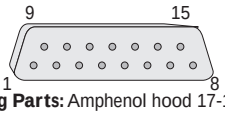





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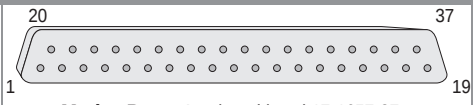
## Figure 4. CL-P1 W Model Pinouts

### DB15F—Control (Inputs)




**Mating Parts:** Amphenol hood 17-1657-15
AMP plug 205206-3, AMP pin 745254-7,
Belden cable 9807 28AWG (or equivalents)

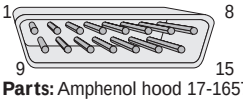
| Pin | Signal | Pin | Signal |
|---|---|---|---|
| 1 | Future use | 9 | Future use |
| 2 | Future use | 10 | Future use |
| 3 | Future use | 11 | Future use |
| 4 | EXSYNCB | 12 | EXSYNC |
| 5 | PRIN | 13 | PRINB |
| 6 | Future use | 14 | Future use |
| 7 | No connection | 15 | No connection |
| 8 | No connection | | |




**Mating Parts:** Amphenol hood 17-1657-37
AMP plug 205210-3, AMP pin 745254-7
Belden cable 9819 28AWG (or equivalents)

| Pin | Signal | Pin | Signal B |
|---|---|---|---|
| 1 | BD7 (MSB) | 20 | BD7B |
| 2 | BD6 | 21 | BD6B |
| 3 | BD5 | 22 | BD5B |
| 4 | BD4 | 23 | BD4B |
| 5 | BD3 | 24 | BD3B |
| 6 | BD2 | 25 | BD2B |
| 7 | BD1 | 26 | BD1B |
| 8 | BD0 (LSB) | 27 | BD0B |

### DB15M—Power

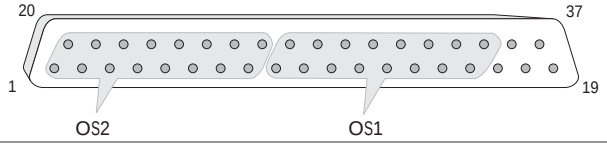



**Mating Parts:** Amphenol hood 17-1657-15
AMP receptacle 205205-2, AMP socket 745253-7,
Belden cable 9946 22AWG (or equivalents)

| Pin | Signal | Pin | Signal |
|---|---|---|---|
| 1 | DGND | 9 | +5V Digital |
| 2 | +5V Digital | 10 | DGND |
| 3 | Future use | 11 | Future use |
| 4 | -5V Digital | 12 | Future use |
| 5 | Future use | 13 | -5V Analog |
| 6 | +15V Analog | 14 | AGND |
| 7 | +15V Analog | 15 | +5V Analog |
| 8 | AGND | | |

| | | | |
|---|---|---|---|
| 9 | AD7 (MSB) | 28 | AD7B |
| 10 | AD6 | 29 | AD6B |
| 11 | AD5 | 30 | AD5B |
| 12 | AD4 | 31 | AD4B |
| 13 | AD3 | 32 | AD3B |
| 14 | AD2 | 33 | AD2B |
| 15 | AD1 | 34 | AD1B |
| 16 | AD0 (LSB) | 35 | AD0B |
| 17 | STROBE | 36 | STROBEB |
| 18 | LVAL | 37 | LVALB |
| 19 | No connection | | |

**Note:** The DB37 connectors supplies two channels of data

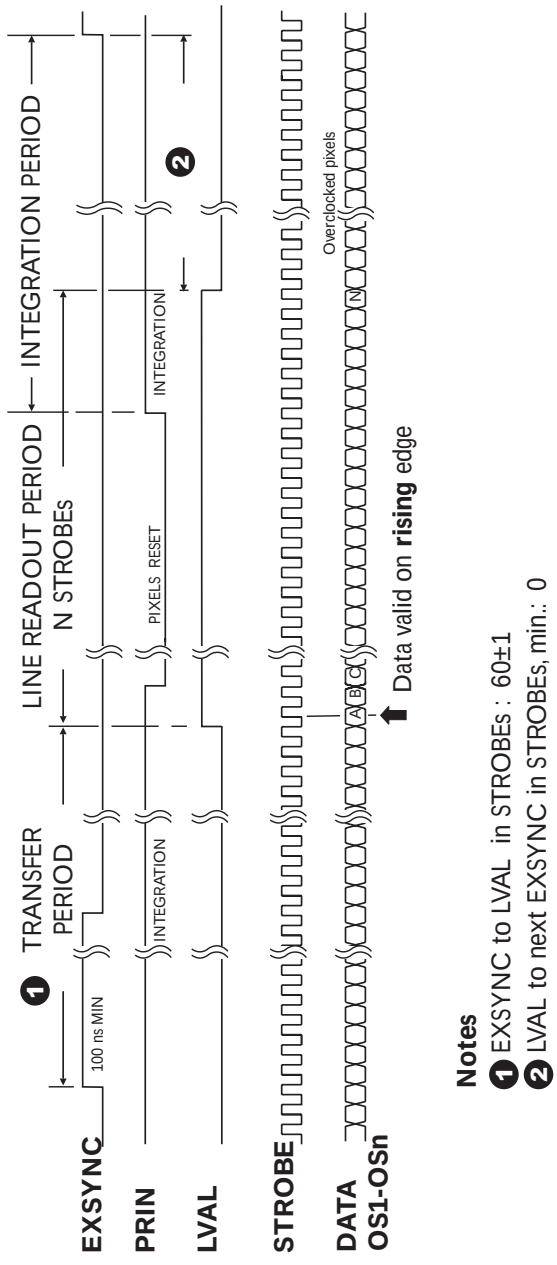



**Note:** Do not connect to "Factory use," "Future use," or "No connect" pins.



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## Figure 5. Camera Timing Overview






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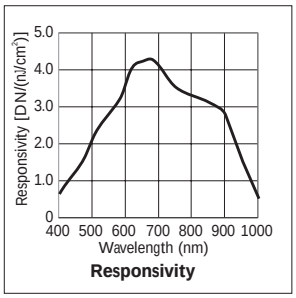
# Table 2. Performance Specifications

| Calibration Conditions | Units | Min. | Typ. | Max. | Notes |
|---|---|---|---|---|---|
| Data Rate (STROBE) | MHz | 25 | 25 | | |
| Light Intensity | µW/cm$^2$ | | 45 | | *1* |
| **Line Rate (LVAL), max.** | **Units** | | **CT-P1** | | **CL-P1** |
| 512 | kHz | | NA | | 79 |
| 1024 | kHz | | 79 | | 43 |
| 2048 | kHz | | 43 | | 23 |
| 4096 | kHz | | 23 | | 11 |
| **Specification** | **Units** | **Min.** | **Typ.** | **Max.** | **Notes** |
| Saturation Output Amplitude | DN | 243 | 250 | 254 | |
| Output Gain Mismatch | DN | | | 5 | |
| Photoresponse Non-Uniformity (PRNU) | | | | | |
| Global, exposure control disabled | DN | | 8 | 15 | |
| Pixel-pixel, exposure control disabled | DN | | 4 | 8 | |
| Global, 50% exposure control | DN | | 8 | 15 | |
| Pixel-pixel, 50% exposure control | DN | | 4 | 8 | |
| Fixed Pattern Noise (FPN) | | | | | |
| Global, exposure control disabled | DN | | 2 | 3 | *2,3* |
| Pixel-pixel, exposure control disabled | DN | | 2 | 3 | *2,3* |
| Global, 50% exposure control | DN | | 2 | 3 | *2,4* |
| Pixel-pixel, 50% exposure control | DN | | 2 | 3 | *2,4* |
| DC Offset | DN | 2 | 4 | 7 | *3* |
| DC Offset Mismatch | DN | | | 3 | *1* |
| Exposure Control Offset | DN | 2 | 4 | 7 | *4* |
| Random Noise (pk-pk) | DN | | 2 | 4 | *3* |
| (rms) | DN | | 0.5 | 0.8 | *3* |
| Noise Equivalent Exposure | pJ/cm$^2$ | | 121 | | |
| Saturation Equivalent Exposure | nJ/cm$^2$ | | 60 | | |
| Responsivity | DN/(nJ/cm$^2$) | | 4.12 | | |
| Dynamic Range | ratio | | 496:1 | | |
| Supply Current +15.0 V | mA | | 200 | 400 | |
| Supply Current +5.0 V (25MHz, terminated) | mA | | 1025 | 1300 | |
| Supply Current +5.0 V(25MHz, unterminated) | mA | | 925 | 1200 | |
| Supply Current -5.0 V | mA | | 175 | 200 | |

**Notes**

- DN = digital numbers, also known as “levels” (0-255 for 8-bit systems).

1. DC light source, bulb color temp. 3150°K, integrating sphere, HR750 hot mirror.
2. No pixel exclusions.
3. Exposure control disabled.
4. Exposure control enabled.



**Responsivity**

**ISO 9001** DALSA maintains a registered quality system meeting the ISO 9001 standard.

**Life Support Applications**
These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. DALSA customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify DALSA for any damages resulting from such improper use or sale.



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