

# VIDEOLOGY<sup>®</sup>

IMAGING SOLUTIONS INC.

## Application Note

### 20/21D376S, 20/21D379S High Resolution B&W Camera With H&V Lock

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## 1. Introduction

The D379S HR black and white camera family consists of the following range of camera modules:

- 20D379S: EIA CS-mount version.
- 20D376S: EIA integrated lens (M12, .5mm thread pitch).
- 21D379S: CCIR CS-mount version.
- 21D376S: CCIR integrated lens (M12, .5mm thread pitch).
- 20D309: EIA X-tal locked (no external sync.), CS mount version.
- 21D309: CCIR X-tal locked (no external sync.), CS mount version.
- 20D339: EIA line-lock, CS-mount version.
- 21D339: CCIR line-lock, CS-mount version.
- 20D336: EIA line-lock, integrated lens (M12, .5mm thread pitch)
- 21D336: CCIR line-lock, integrated lens (M12, .5mm thread pitch)

## 2. History

Revision	Issue Date	Reason	CN#
Rev A	08-22-2007	Initial release	07-0078
Rev B	07-21-2008	Removed 60PB24VDL option	08-0143

## 3. Controls and Connections

The camera has two connectors:

- J3: This is a 5 pin AMP connector, 173981-5 for: DC power in, Ground, video out, Ext.1, and Iris out
- J2: This is a 6 pin AMP connector, 173981-6 for: MGC, Ground, BLC off, Sel. 1 in, Ext. 2 in and Sel. 2.

Via jumpers and resistors the camera can be put in different modes, such as:

Non-interlaced, fixed shutter speeds (instead of electronic iris), Line lock or H and V lock synchronization mode.

## 4. Features

### 4.1. Gain Control (AGC and Manual):

The camera has an automatic gain control in the default mode. This function is responsible for the output signal remaining constant at a certain level. If the camera is pointed to a gamma reflection chart 0.45 the output should be 1 Vp-p. This control circuit works with an integrator, which generates from the video signal a signal that corresponds with the average value of the signal. This average is compared with an internal reference and depending on the outcome of the gain will increase or decrease.

The Auto Gain Control (AGC, default on), can be overridden by a programming voltage resulting in a Manual Gain Control (MGC) of the video signal.

Connect a 2-4 VDC voltage to pin 1 of the J2 connector. Two volts is minimum gain and four volts is maximum gain.

### 4.2. Back Light Compensation

The camera is capable of compensating for a condition where the object of interest in the central portion of the field of view is too dark due to a large amount of light in the background (e.g. a person standing in front of a window). This is called Backlight Compensation (BLC) and is a default setting in the camera. **To turn this feature off and have the camera use the entire field of view to set the auto exposure, ground pin 3 on connector J2. Please contact us for updated implementation on more aggressive modes of BLC.**

### 4.3. Fixed Shutter Modes

In the default mode, the camera operates in the Electronic Iris mode. This means the output of the CCD, which is dependent on the light intensity, is controlled by the electronics of the camera and not the mechanics of the lens.

The camera uses an OFD pulse to regulate the accumulation of charge in the photocells of the CCD. When the OFD pulse is active, the charge that is built up in the photo diodes is dumped into the substrate of the CCD. When the OFD pulse stops, the accumulation of the charge in the CCD is used to create an image for that field and the charge is output by the vertical transfer pulse. Therefore, by measuring the output of the CCD and comparing it with an internal reference it is possible to control the level of the signal from the CCD (within a certain tolerance).

The camera may also be put into several different fixed integration (shutter) modes. This feature can be beneficial if there is a fast moving object in the scene. The longer the integration time the less sharp the image will be due to the movement of the object during the integration period. Resistors R33-R36 (1 K ohms) may be configured to implement these different modes. The Electronic Iris (auto shutter) modes may also be modified using different combinations of these resistors. See Table 2 and the component layout diagram.

### 4.4. Gamma Correction

The camera automatically adjusts for the non-linear grayscale response of a video monitor by distorting the output voltage of the video signal to a .45 gamma curve. If this effect is not required and a linear signal (gamma distortion = 1) is desired, then place a resistor jumper at position R83.

### 4.5. Synchronization Modes

The camera may be configured to use an External V-sync pulse, Composite sync and V-sync pulse, H-sync pulse and V-sync pulse. See Table 1 for sync input and programming information to implement these modes.

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Internal synchronization is the default mode and is accomplished by an inductance-capacitance circuit.

#### 4.6. Interlaced/ Non-interlaced Operation

The default setting is RS-170 interlaced operation. If the same field is desired to be output without 1/2 line offset then the camera may be put into the non-interlaced mode. This mode will result in a 1/2 reduction of the vertical resolution, however the monitor image will not have the flicker due to the 1/2 line offset. To configure the non-interlaced mode, add a 0 ohm jumper at position R30.

#### 4.7. Iris Output

Connector J3 Pin 5 drives an active (video) auto iris lens.

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## 5. Block Diagram

The camera has 4 major blocks:

1. CCD and V-driver
  2. Timing generator
  3. Processing
  4. Power
- The CCD (U60) converts the incoming light (via the lens) into an electrical signal. To transport the charge from inside the CCD to the output, the CCD has two transport mechanisms: Vertical and Horizontal. The horizontal can be done with pulses of 0-5V. The vertical pulses however should be from -9 to +15 V. Therefore a driver (U50) is required.
  - The Timing generator (U1) is responsible for all required timing pulses.
  - The processing (U11) converts the output of the CCD into a standard video signal. The AGC and Gamma functions are implemented within the processing block.
  - The camera requires 4 different DC voltage levels: -9V, 0V, +5V and +15V. All these voltages are generated in the power supply block. This is a switch mode for the generation of +5. The switch mode pulse is used for making the -9 and +15. The 3.3 is derived from the 5V.

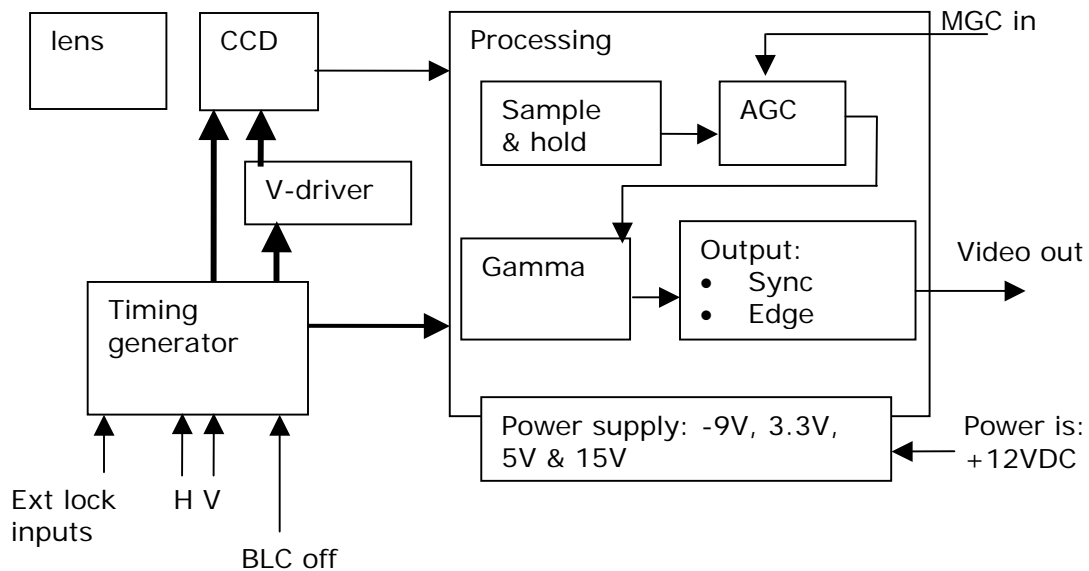


Figure 1. Block Diagram

### 5.1. IC Description

- U1: LZ95G71: Timing generator.
- U11: IR3Y30M1: Analog Camera processing IC.
- U50: LR36685: Vertical Driver IC (voltage converter)
- U60: LZ2354J: EIA CCD for 20D37x versions  
LZ2364J: CCIR CCD for 21D37x versions

## 5.2. Pixel Frequency:

- 28.636 MHz for EIA
- 28.375 MHz for CCIR

## 6. Lenses

### 6.1. Models

- 20D376S / 21D376S Integrated Lens M-12 Thread
- 20D379S / 21D379S CS Standard
- 20D379S / 21D379S The camera module is equipped with a standard CS- mount (1-32 UN) so fixed and manual lenses can be used.

*\*NOTE: C-mount lenses are applicable as well when using a 5mm spacer (CICS mount adapter)*

### 6.2. Mounting a Lens

- Remove the protection cover from the CS mount ring.
- If a C-mount lens is used, mount a 5mm spacer (C/CS mount adapter ring) between lens and camera.
- Screw the lens on the camera. Do not allow any dust to enter the space between the lens and the CCD element, if necessary blow it away with clean air.
- Adjust the back-focus distance as described below.
- Aim the camera and focus the lens to the object or area to be observed.
- If a manual iris lens is used, adjust the iris for best picture quality. A large aperture gives the best light sensitivity, a small aperture the largest depth of field.

### 6.3. Back-Focus Adjustment

- Set the lens focus ring, if present, to infinity and the iris ring, if present, to its maximum opening.
- Aim the camera at an object at a distance of at least 15 meters / 45 feet.
- Loosen the back-focus locking ring at the front of the camera by turning it counter-clockwise.
- Rotate the lens, including the CS mount ring, until the picture on the monitor is sharp.
- Keeping the lens in place, tighten the back-focus locking ring by turning it clockwise.

## 7. Connectors

J2-Pin 1 = Manual gain control (gain of signal can be controlled by a DC voltage ranging from 2 to 4 volts. 2 V is minimum and 4 V is maximum gain.)

J2-Pin 2 = Ground

J2-Pin 3 = Back light control (connect to ground for BLC off)

J2-Pin 4 = Sel 1 (see table 1: Synchronization)

J2-Pin 5 = Ext. 2 (see table1: Synchronization)

J2-Pin 6 = Sel. 2 (see table 1: Synchronization)

J3-Pin 1 = +12 V DC in

J3-Pin 2 = Ground

J3-Pin 3 = Video Out

J3-Pin 4 = Ext. 1 (see table 1: Synchronization)

J3-Pin 5 = Iris out

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## 8. Power

The camera module must be powered with a regulated DC power source supply.  
10.5VDC to 13.5VDC (12VDC Optimal) consumption: <1.5 W

## 9. Precautions

1. **Never** aim the camera at the sun or other extremely bright light source. Whether in use or not, exposure to extremely bright light sources may harm the CCD image sensor or will cause smear on the picture.
2. **Do not** operate the camera beyond its temperature or power source ratings. The void operating temperature should fall between  $-15^{\circ}$  and  $+55^{\circ}$  **Do not** use power sources that exceed the specified values.
3. **Cleaning the sensor**  
Avoid unnecessary exposure of the sensor to dust. If the surface of the sensor has to be cleaned, never use any cloth, tissue or brush and strictly avoid the use of any kind of cleaning fluid. Only use dry air to blow particles from the surface of the sensor.

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## 10. Specification

	<b>20D376S/ 20D379S</b>	<b>21D376S/ 21D379S</b>
<b>Electrical</b>	<b>EIA</b>	<b>CCIR</b>
Image Sensor	1/3" IL Sony CCD, mounted on PCB	
Active Pixels (HxV)	768 x 494	752 x 582
Resolution	>570 TVL	
Sensitivity	<0.05 lux at 50 IRE (F1.2)	
Signal To Noise Ratio	> 50 dB	
Gamma	Default 0.45, selectable 1.0	
Gain	Automatic 32dB or manual via external DC voltage	
Synchronization	External, H&V	
Back Light Compensation	Default off/selectable on	
Shutter Speed	1/60 to <1/100,000	1/50 to <1/100,000
	Fixed shutter speeds (8 settings selectable)	
Contour Enhancement	Default on/selectable off	
Iris Controls	Electronic	
Video Output	1Vp-p baseband video, 75 ohms	
Power Supply	Nominal 12V, 9-15V DC	
Power Consumption	<1.5W	
<b>Environmental</b>		
Operating Temperature	-20° C ~ 55° C (-04° F ~ 131° F)	
Storage Temperature	-25° C ~ 70° C (-13° F ~ 158° F)	
<b>Mechanical</b>		
Dimensions W x H x D	42mm x 42mm x 12.3mm (1.65" x 1.65" x 0.48")	
Lens Mount	20/21D376S	Integrated lens with M-12, 0.5 thread CS standard
	20/21D379S	
Connectors	5pin AMP unterminated 6pin AMP unterminated	

### Accessories

Optional	24VAC power board
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*\*Note: The features described in this document may not represent all modifications and capabilities of these camera models. Please contact Videology Imaging Solutions, Inc. For further information*

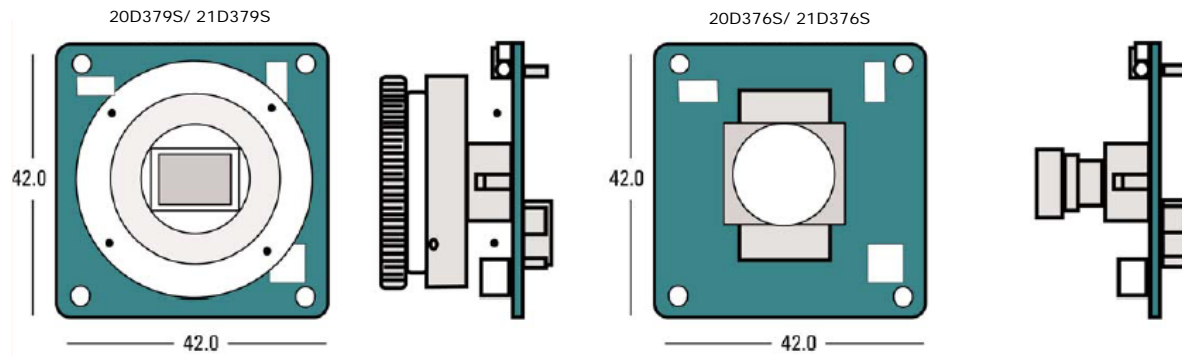


Figure 2. Diagram

Table 1. Synchronization

	Ext. 1	Ext. 2	Sel. 2	Sel. 1
<b>Internal Sync.</b>	No connection	No connection	Open	Open
<b>Line Lock</b>	External Vd or Line Pulse	No connection	Open	+5V
<b>C-SYNC &amp; VD lock *</b>	Csync. Pulse (inverted)	Vsync. Pulse	Gnd	+5V
<b>External Hd &amp; Vd Lock</b>	Hd Pulse	Vd Pulse	Gnd	Open

\*R22 must be removed

**Functions:** (See diagram for jumper placement)

Gamma Correction: R83 in = Gamma 1  
R83 out = Gamma.45

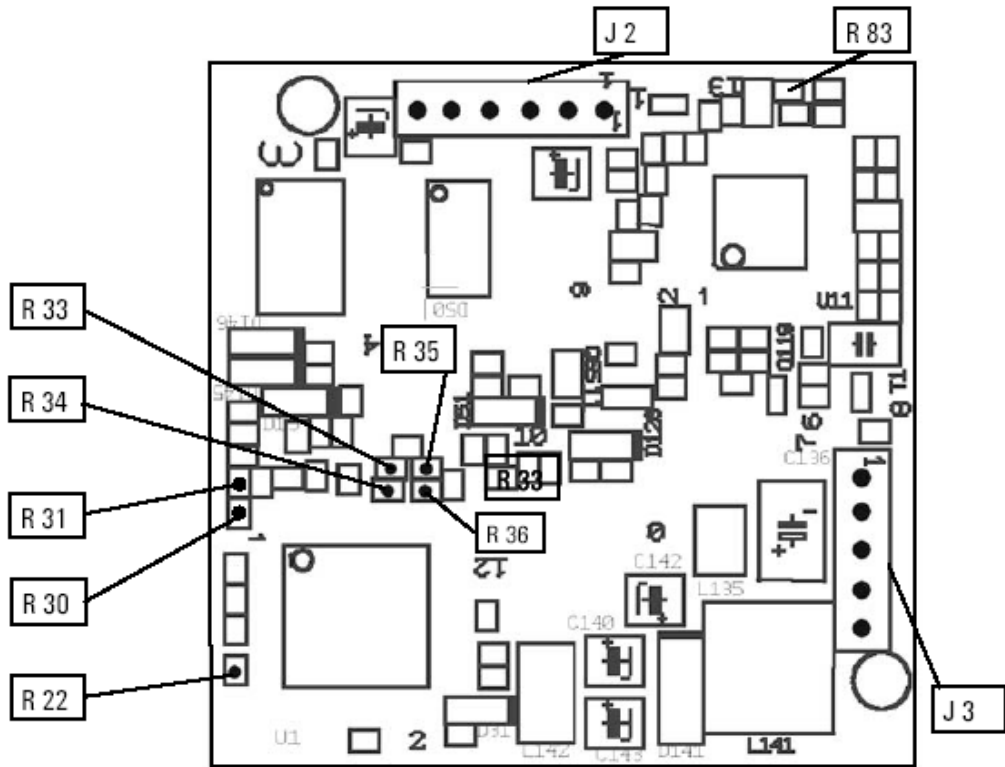
Non- interlaced Select: R30 out = Interlaced mode  
R30 in = Non-Interlaced mode

Note: Polarity of sync pulses should be active low (negative going)

Table 2. Shutter Speed Selectors

R36	R35	R34	R33	Shutter Mode	Setting
In	In	In	In	Fixed Shutter Modes	1/60 (EIA) 1/ 50 (CCIR)
In	Out	In	In		1/100 (EIA) 1/ 120 (CCIR)
In	In	Out	In		1/ 250
In	Out	Out	In		1/ 500
In	In	In	Out		1/ 1,000
In	Out	In	Out		1/ 2,000
In	In	Out	Out		1/ 5,000
In	Out	Out	Out		1/ 12,000
Out	Out	XX	XX	Electronic Iris Mode	Max Shutter Speed 1/ 100,000
Out	In	XX	XX		Max Shutter Speed 1/ 39,000
Out	XX	Out	XX		Start Shutter Speed 1/ 100,000
Out	XX	In	XX		Start Shutter Speed 1/ 2,000

Figure 3. Board Configuration



## 11.Contact

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*Please note that data in this application note is subject to change without notification!*

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