

Matrox Meteor-II/Camera Link

Camera Interface Application Note

DALSA S2-11-0xk40

November 12, 2004

*Basics about the
camera*

*Mode of operations as
per Matrox Imaging (in
parentheses as per
camera manufacturer)*

*Basics about the
interface modes*

Camera Descriptions

- Effective resolution: up to 2048 pixels/line @ 65k line per second.
- Camera Link BASE interface (single 10-bit tap).
- External and internal sync.
- External or internal exposure control.
- 40 MHz pixel clock rate.

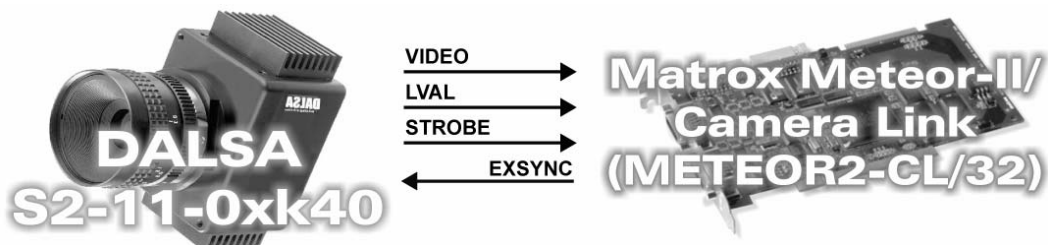
Interface Mode

- Fixed line scan rate (Smart EXSYNC or Free Run mode)
- Variable line scan rate (Smart EXSYNC mode)
- Fixed line scan rate with frame trigger (Smart EXSYNC mode)
- Variable line scan rate with frame trigger (Smart EXSYNC mode)
- Fixed line scan rate with variable frame size (Smart EXSYNC mode)
- Variable line scan rate with variable frame size (Smart EXSYNC mode)

Camera Interface Briefs

Mode 1: Fixed line scan rate

- 1024 pixels/line.
- Camera Link BASE interface (single 10-bit tap).
- DCF configured for 1000 lines per virtual frame.
- Matrox Meteor-II/Camera Link sending periodic EXPOSURE1 (EXSYNC) signal to camera.
- Matrox Meteor-II/Camera Link receiving HSYNC (LVAL), PIXEL CLOCK (STROBE @ 40 MHz) and video data from camera.
- DCF used: [S211xk40_1024_10bit1tapFLS.DCF](#)



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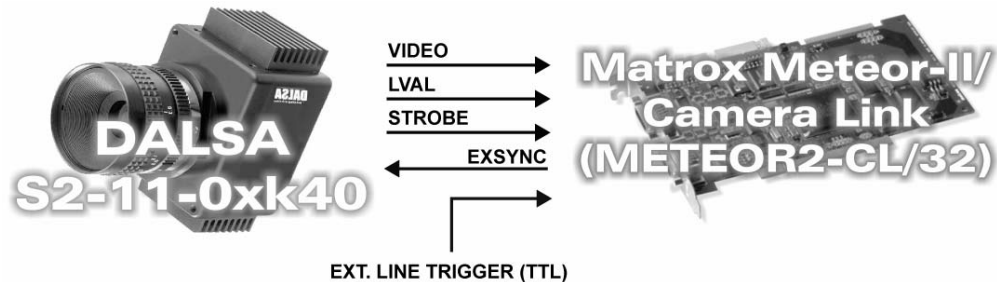
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*Basics about the
interface modes*

Camera Interface Briefs (continued)

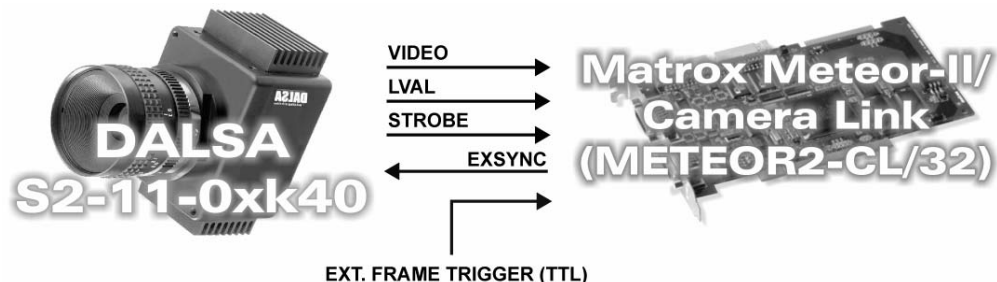
Mode 2: Variable line scan rate

- 1024 pixels/line.
- Camera Link BASE interface (single 10-bit tap).
- DCF configured for 1000 lines per virtual frame.
- Matrox Meteor-II/Camera Link receiving external TTL line trigger signal.
- Matrox Meteor-II/Camera Link sending EXPOSURE1 (EXSYNC) signal to camera.
- Matrox Meteor-II/Camera Link receiving HSYNC (LVAL), PIXEL CLOCK (STROBE @ 40 MHz) and video data from camera.
- DCF used: [S211xk40_1024_10bit1tapVLS.DCF](#)



Mode 3: Fixed line scan rate with frame trigger

- 1024 pixels/line.
- Camera Link BASE interface (single 10-bit tap).
- DCF configured for 1000 lines per virtual frame.
- Matrox Meteor-II/Camera Link receiving external TTL frame (virtual) trigger signal.
- Matrox Meteor-II/Camera Link sending periodic EXPOSURE1 (EXSYNC) signal to camera.
- Matrox Meteor-II/Camera Link receiving HSYNC (LVAL), PIXEL CLOCK (STROBE @ 40 MHz) and video data from camera.
- DCF used: [S211xk40_1024_10bit1tapFLSFT.DCF](#)



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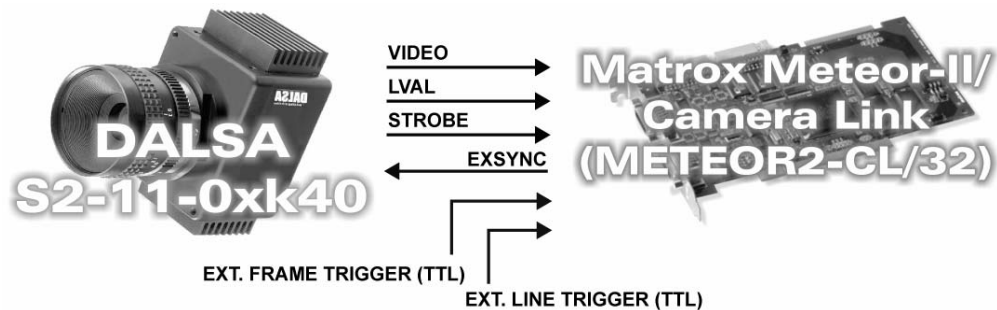
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*Basics about the
interface modes*

Camera Interface Briefs (continued)

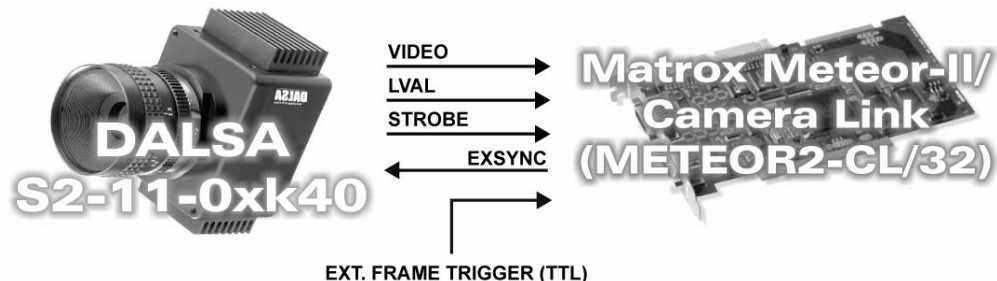
Mode 4: Variable line scan rate with frame trigger

- 1024 pixels/line.
- Camera Link BASE interface (single 10-bit tap).
- DCF configured for 1000 lines per virtual frame.
- Matrox Meteor-II/Camera Link receiving external TTL frame (virtual) and line trigger signals.
- Matrox Meteor-II/Camera Link sending EXPOSURE1 (EXSYNC) signal to camera.
- Matrox Meteor-II/Camera Link receiving HSYNC (LVAL), PIXEL CLOCK (STROBE @ 40 MHz) and video data from camera.
- DCF used: [S211xk40_1024_10bit1tapVLSFT.DCF](#)



Mode 5: Fixed line scan rate with variable frame size

- 1024 pixels/line.
- Camera Link BASE interface (single 10-bit tap).
- DCF configured for 1000 lines per virtual frame.
- Matrox Meteor-II/Camera Link receiving external TTL frame (virtual) trigger signal.
- Matrox Meteor-II/Camera Link sending periodic EXPOSURE1 (EXSYNC) signal to camera.
- Matrox Meteor-II/Camera Link receiving HSYNC (LVAL), PIXEL CLOCK (STROBE @ 40 MHz) and video data from camera.
- DCF used: [S211xk40_1024_10bit1tapFLSVF.DCF](#)



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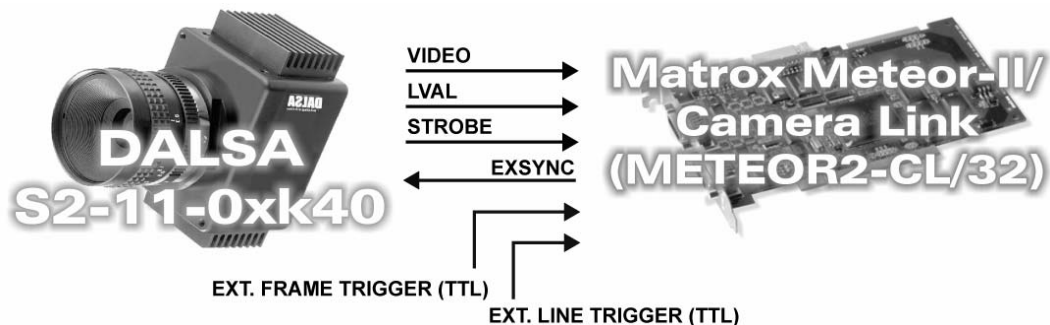
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Basics about the
interface modes

Camera Interface Briefs (continued)

Mode 6: Variable line scan rate with variable frame size

- 1024 pixels/line.
- Camera Link BASE interface (single 10-bit tap).
- DCF configured for 1000 lines per virtual frame.
- Matrox Meteor-II/Camera Link receiving external TTL frame (virtual) and line trigger signals.
- Matrox Meteor-II/Camera Link sending EXPOSURE1 (EXSYNC) signal to camera.
- Matrox Meteor-II/Camera Link receiving HSYNC (LVAL), PIXEL CLOCK (STROBE @ 40 MHz) and video data from camera.
- DCF used: [S211xk40_1024_10bit1tapVLSVF.DCF](#)



Specifics about the
interface modes

Camera Interface Details

Mode 1: Fixed line scan rate

- **Line rate:** The frequency of the periodic EXPOSURE1 (EXSYNC) signal determines the camera's line rate. The EXPOSURE1 (EXSYNC) signal period is set in the DCF to **80 μ s** which translates into a **12.5 kHz** line rate. The maximum line rate for this camera equals **65 kHz**.
- **Exposure time:** For **Smart EXSYNC** mode the exposure time is the high level period between the rising and falling edges of the EXPOSURE1 (EXSYNC) signal. The default exposure time for this DCF equals **30 μ s**. Maximum/minimum exposure time per line for this DCF is **1 ms** and **25 ns** respectively. The exposure time can be modified in the DCF using Matrox Intellicam or with the MIL MdigControl() function. Consult the respective manual for more information.

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Specifics about the
interface modes

Camera Interface Details (continued)

Mode 1: Fixed line scan rate

- **Camera communication:** This DCF will work with **Free Run** and **Smart EXSYNC** modes. Set the mode (as shown in table below) using the Matrox Imaging ASCII Communication utility (CLSSERTST.EXE) available on-line (<ftp://ftp.matrox.com/pub/imaging/util/m2cl/clsertst.zip>). Refer to the camera manual for command descriptions and the CLSSERTST README file (included with the utility) for information on installation and usage.

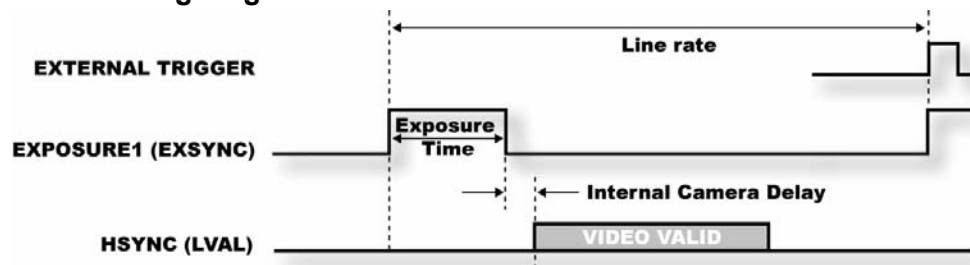
Command	Short Form	Parameter	Description
Set_exposure_mode	sem	1 or 2	Free Run
Set_exposure_mode	sem	4	Smart EXSYNC mode

Mode 2: Variable line scan rate

- **Line rate:** The line rate is controlled by the frequency of the external TTL line trigger signal. The line trigger signal period must be larger than the total duration of the exposure time (high level duration of the timer), the internal delay of the camera (**1.42 μ s**) and the line read out (**25.6 μ s**).
- **Exposure time:** Refer to Mode 1: Fixed line scan rate.
- **Camera communication:** Set the mode (as shown in table below) via the CLSSERTST utility. See Mode 1 for details.

Command	Short Form	Parameter	Description
Set_exposure_mode	sem	4	Smart EXSYNC mode

- **Timing diagram:**



Mode 3: Fixed line scan rate with frame trigger

- **Line/frame rate:** The line rate is fixed and controlled by the period of EXPOSURE1 (EXSYNC) signal. The virtual frame rate is variable and controlled by the period of the external frame trigger signal, however the external trigger period must always be greater than the total time of the number of lines captured. The number of lines per virtual frame (maximum of 1000 for this DCF) is fixed and controlled by the vertical timing of the DCF. Capture of the lines will start with the rising edge of the frame trigger signal.
- **Exposure time:** Refer to Mode 1: Fixed line scan rate.

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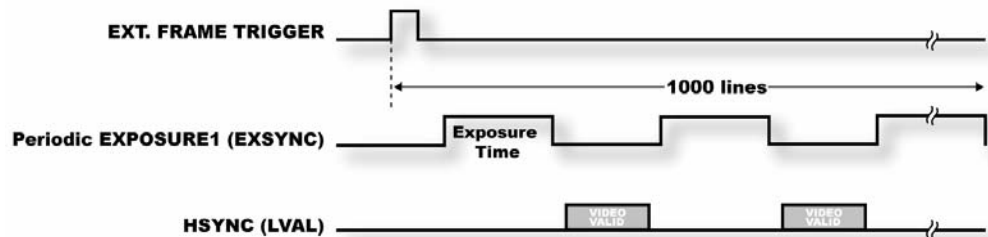
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Specifics about the
interface modes

Camera Interface Details (continued)

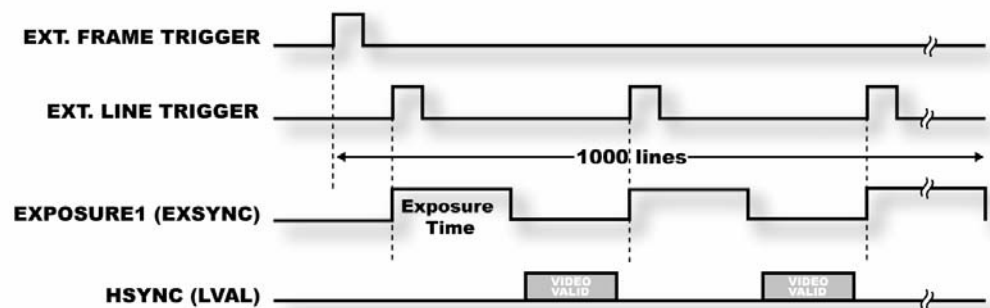
Mode 3: Fixed line scan rate with frame trigger

- **Exposure time:** Refer to Mode 1: Fixed line scan rate.
- **Camera communication:** Refer to Mode 2: Variable line scan rate.
- **Timing diagram:**



Mode 4: Variable line scan rate with frame trigger

- **Line/frame rate:** The line rate is controlled by the frequency of the external TTL line trigger signal. The line trigger signal period must be larger than the total duration of the exposure time (high level duration of the timer), the internal delay of the camera ($1.42 \mu\text{s}$) and the line rate ($25.6 \mu\text{s}$). The virtual frame rate is variable and controlled by the period of the external frame trigger signal, however the external trigger period must always be greater than the total time of the number of lines captured. The number of lines per virtual frame (maximum of 1000 for this DCF) is fixed and controlled by the vertical timing of the DCF. Capture of the lines will start with the rising edge of the frame trigger signal.
- **Exposure time:** Refer to Mode 1: Fixed line scan rate.
- **Camera communication:** Refer to Mode 2: Variable line scan rate.
- **Timing diagram:**



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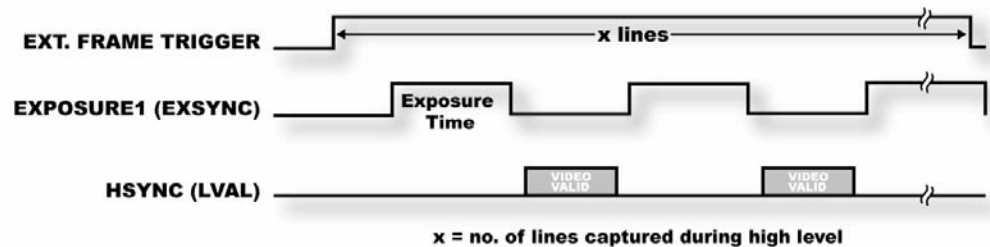
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Specifics about the
interface modes

Camera Interface Details (continued)

Mode 5: Fixed line scan rate with variable frame size

- **Line/frame rate:** The line rate is fixed and controlled by the period of EXPOSURE1 (EXSYNC) signal. The number of lines per virtual frame (maximum of 1000 for this DCF) is variable and controlled by the frame trigger signal. Matrox Odyssey captures lines during the high level of the frame trigger signal. To modify the maximum amount of lines captured, change the active vertical timing period in the DCF. Capture of the lines will start with the rising edge of the frame trigger signal.
- **Exposure time:** Refer to Mode 1: Fixed line scan rate.
- **Camera communication:** Refer to Mode 2: Variable line scan rate.
- **Timing diagram:**



Mode 6: Variable line scan rate with variable frame size

- **Line/frame rate:** The line rate is variable and controlled by the external line trigger frequency. The number of lines per virtual frame (maximum of 1000 for this DCF) is variable and controlled by the frame trigger signal. Matrox Odyssey captures lines during the high level of the frame trigger signal. To modify the maximum amount of lines captured, change the active vertical timing period in the DCF. Capture of the lines will start with the rising edge of the frame trigger signal.
- **Exposure time:** Refer to Mode 1: Fixed line scan rate.
- **Camera communication:** Refer to Mode 2: Variable line scan rate.

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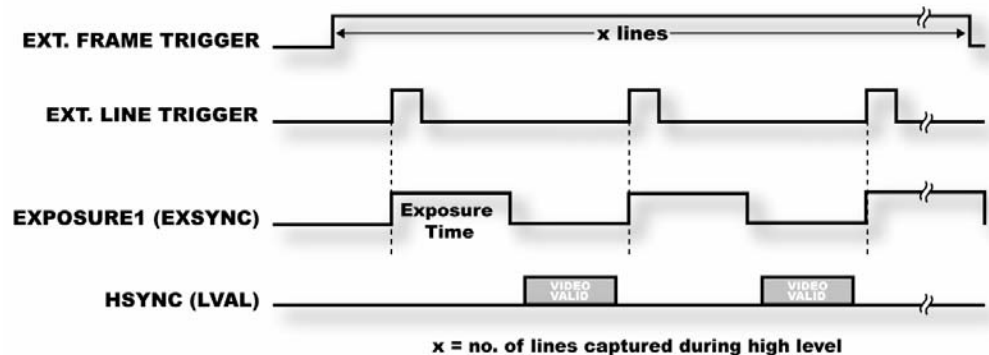
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Specifics about the
interface modes

Camera Interface Details (continued)

Mode 6: Variable line scan rate with variable frame size

▪ Timing diagram:



Cabling details for the
interface modes

Cabling Requirements

Mode 1: Fixed line scan rate

- **Cable and Connection:** Standard Camera Link cable.

Mode 2: Variable line scan rate

- **Cable and Connection:** Standard Camera Link.
- **External trigger:** External line trigger should be connected to the OPTO TRIG input of the 9-pin connector (pins 7 and 2) on the External I/O adapter bracket:

EXTERNAL I/O BRACKET

(9-pin connector)

Pin Name Pin no.

OPTO_AUX_IN0 + 07

OPTO_AUX_IN0 - 02

External Trigger Source

Pin Name

← LINE TRIGGER (TTL FORMAT)

← LINE TRIGGER (GROUND)

Mode 3: Fixed line scan rate with frame trigger

- **Cable and Connection:** Standard Camera Link.
- **External trigger:** External line trigger should be connected to the OPTO TRIG input of the 9-pin connector (pins 4 and 5) on the External I/O adapter bracket:

EXTERNAL I/O BRACKET

(9-pin connector)

Pin Name Pin no.

TTL TRIG 01

GND 06

External Trigger Source

Pin Name

← FRAME TRIGGER (TTL FORMAT)

← FRAME TRIGGER (GROUND)

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*Cabling details for the
interface modes*

Cabling Requirements

Mode 4: Variable line scan rate with frame trigger

- **Cable and Connection:** Standard Camera Link.
- **External trigger:** External frame and line triggers should be connected to the OPTO TRIG inputs of the 9-pin connector on the External I/O adapter bracket:

EXTERNAL I/O BRACKET (9-pin connector)

Pin name	Pin no.		External Trigger Sources Pin name
TTL TRIG	01	←	FRAME TRIGGER (TTL FORMAT)
GND	06	←	FRAME TRIGGER (GROUND)
OPTO_AUX_IN0 +	07	←	LINE TRIGGER (TTL FORMAT)
OPTO_AUX_IN0 -	02	←	LINE TRIGGER (GROUND)

Mode 5: Fixed line scan rate with variable frame size

- **Cable and Connection:** Standard Camera Link.
- **External trigger:** External trigger should be connected to the OPTO TRIG input (pins 4 and 5) of the 9-pin connector on the External I/O adapter bracket:

EXTERNAL I/O BRACKET (9-pin connector)

Pin name	Pin no.		External Trigger Sources Pin name
TTL TRIG	01	←	FRAME TRIGGER (TTL FORMAT)
GND	06	←	FRAME TRIGGER (GROUND)

Mode 6: Variable line scan rate with variable frame size

- **Cable and Connection:** Standard Camera Link.
- **External trigger:** External frame and line triggers should be connected to the OPTO TRIG inputs of the 9-pin connector on the External I/O adapter bracket:

EXTERNAL I/O BRACKET (9-pin connector)

Pin name	Pin no.		External Trigger Sources Pin name
TTL TRIG	01	←	FRAME TRIGGER (TTL FORMAT)
GND	06	←	FRAME TRIGGER (GROUND)
OPTO_AUX_IN0 +	07	←	LINE TRIGGER (TTL FORMAT)
OPTO_AUX_IN0 -	02	←	LINE TRIGGER (GROUND)

The DCF(s) mentioned in this application note can be found on our FTP site ([ftp.matrox.com/pub/imaging/](ftp://ftp.matrox.com/pub/imaging/)). The information furnished by Matrox Electronics System, Ltd. is believed to be accurate and reliable. Please verify all interface connections with camera documentation or manual. Contact your local sales representative or Matrox Sales office or Matrox Imaging Applications at 514-822-6061 for assistance.

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