	Subject:	VDS CCD1300 with mvTITAN-DIG	Created	Last change
			28.07.03	28.07.03
Application Note	Project:	Camera adaption	Version 1.0	

Overview

Camera VDS CCD1300

Running modes

Freerunning Special settings necessary
Image On Demand

Resolution

Horizontal 1280 pixel
Vertical 1024 pixel
Bits per Pixel 12 bpp
Binning
Partial Scan

Timings

Pixel clock 21 MHz
Horizontal 12.8 kHz
Vertical 12.5 fps

MATRIX VISION GmbH Frame Grabber

Typ	mvTITAN-DIG				
Line Enable by	camera	<input checked="" type="checkbox"/>	Frame Grabber	<input type="checkbox"/>	external <input type="checkbox"/>
Frame Enable by	camera	<input checked="" type="checkbox"/>	Frame Grabber	<input checked="" type="checkbox"/>	external <input type="checkbox"/>
Trigger by	external	<input type="checkbox"/>	Frame Grabber	<input checked="" type="checkbox"/>	
Flash by	camera	<input type="checkbox"/>	Frame Grabber	<input checked="" type="checkbox"/>	external <input type="checkbox"/>

Software

MVacquireControl
mvIMPACT Go!
Other [e.g. LabView™, Halcon, etc.]

Imprint

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This document requires the general knowledge of the usage and the technical data of the used frame grabber, camera and application.

Information in this document is subject to change without notice and does not represent a commitment on the part of MATRIX VISION GmbH.

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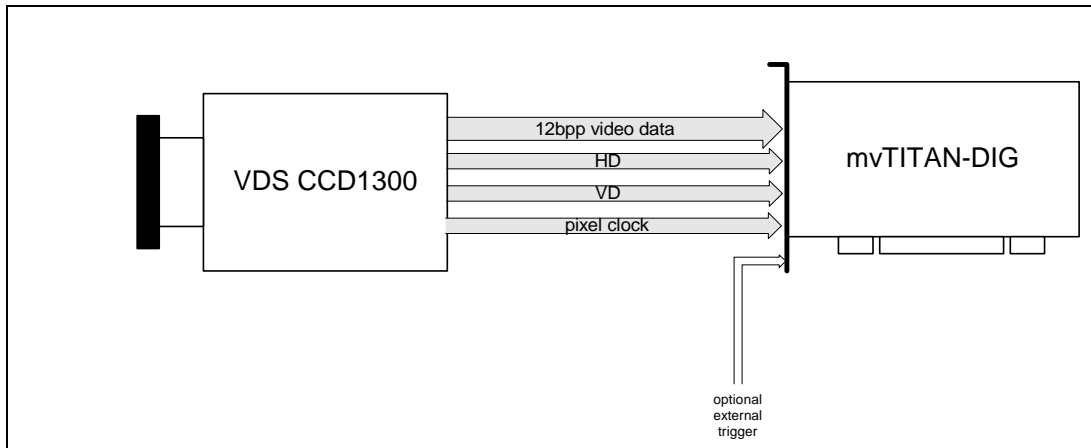
	Subject: VDS CCD1300 with mvTITAN-DIG	Created	Last change
		28.07.03	28.07.03
Application Note	Project:	Camera adaption	Version 1.0

Freerunning Mode

Camera runs with its own timing and sends the image data, pixel clock, HD and VD to the mvTITAN-DIG.

mvTITAN-DIG cannot reset the camera in this mode but control the 2xGain and binning mode.

Signal map




Camera settings by hardware

Condition for this mode is to set the camera not to IOD mode by hardware. With the mvTITAN-DIG it isn't possible to switch the IOD mode by a digital output of the mvTITAN-DIG. This must be done in the camera's 15-pin jack. Pin 9 of the 15-pin jack of the camera must be open. You can check the correct setting on the backside of the camera. There are several LEDs. If the camera runs free the LED *IOD* must be dark and the LED *Fout* must burn.

Pin connection

mvTITAN-DIG		Direction	VDS CCD1300	
1	Ground	←	16	GND
2	MSB(+)	←	15	D11 (MSB)
3	MSB -1 (+)	←	14	D10
4	MSB -2 (+)	←	13	D9
5	MSB -3 (+)	←	12	D8
6	MSB -4 (+)	←	11	D7
7	MSB -5 (+)	←	10	D6
8	MSB -6 (+)	←	9	D5
9	MSB -7 (+)	←	8	D4
10	MSB -8 (+)	←	7	D3
11	MSB -9 (+)	←	6	D2
13	MSB -10 (+)	←	5	D1
14	MSB -11 (+)	←	4	D0 (LSB)
17	DigOut0 (+)	→	36	TREX +
18	DigOut1 (+)	→	19	Option: 25fps
25	Frame Ena. In (+)	←	3	FEN
26	Line Ena. In (+)	←	2	LEN
29	Pixel Clock In (+)	←	1	PCLK
30	DigOut 2 (+) / Expose (+)	→	18	SV2 +
35	Ground	←	35	GND
36	MSB (-)	←	34	D11-

	Subject: VDS CCD1300 with mvTITAN-DIG	Created	Last change
		28.07.03	28.07.03
Application Note	Project:	Camera adaption	Version 1.0

37	MSB -1 (-)	←	33	D10-
38	MSB -2 (-)	←	32	D9-
39	MSB -3 (-)	←	31	D8-
40	MSB -4 (-)	←	30	D7-
41	MSB -5 (-)	←	29	D6-
42	MSB -6 (-)	←	28	D5-
43	MSB -7 (-)	←	27	D4-
44	MSB -8 (-)	←	26	D3-
45	MSB -9 (-)	←	25	D2-
47	MSB -10 (-)	←	24	D1-
48	MSB -11 (-)	←	23	D0-
51	DigOut0 (-)	→	17	TREX -
59	Frame Ena. In (-)	←	22	FEN -
60	Line Ena. In (-)	←	21	LEN -
63	Pixel Clock In (-)	←	20	PCLK -

With this pinning it is possible to switch the 2xGain and the binning mode with GPout1 and GPout2.

Recommended cable for this mode from MATRIX VISION GmbH: KS55-0187 05.0 (including camera's power supply by mvTITAN-DIG/P).

Cameradefinition

```

/* ----- Vosskühler CCD-1300 12Bit ----- */
/* SetInputPitch 1280 */
DefCamType "CCD1300" VM_DIG12 NONINTERLACED 8 9375 15000 PCLK_EXTERN
DefCamAcquireSetup "CCD1300" VSCAN INV_SYNC NEXT_FIELD
DefHorizontalUnit "CCD1300" PIXEL
DefCamHorizontalAcquire "CCD1300" 0L 1280L 1
DefVerticalUnit "CCD1300" LINES
DefCamVerticalAcquire "CCD1300" 0L 1024L 1

```

Remarks to mvAcquireControl

For opening the mvTITAN-DIG properly add the command *SetInputPitch* to the used INI-file (in general *grabber.ini*) to tell the mvTITAN-DIG the number of pixel clocks between two HD signals the camera sends.

Example:

```


...
[TITAN]
...
InitBoard
...
SetInputPitch 1280
...

```

In mvAcquireControl you have to choose the camera definition *CCD1300*. Activate the option *Greyscale* in register *Acquire* and set it to *12bit*.

Be sure the *Shutter Control* in register *Shutter* is deactivated. Otherwise you can get distortions in the acquired images.

Using the recommended connection it is possible to switch the 2xGain and the binning mode with digital output GPout1 and GPout2. Because the camera wants active high signals it is needed to set these two outputs to high state that the camera runs in normal mode. For doing this switch to register *Signals* and change the *Bitmask* of line *Integration Off* to *'xxxxxxxxxxx11x'*. The *Integration Off* bitmask is set automatically when opening the mvTITAN-DIG. If these outputs are not programmed their state is low.

	Subject: VDS CCD1300 with mvTITAN-DIG	Created	Last change
		28.07.03	28.07.03
Application Note	Project:	Camera adaption	Version 1.0

If you have connected an external trigger signal to the mvTITAN-DIG you can activate the *ext. Trigger* in the register *Trigger*. With this setting the mvTITAN-DIG will acquire images only when a trigger signal was arrived on the external trigger input of the mvTITAN-DIG.

Remarks to mvIMPACT Go! and mvIMPACT S

Condition for proper images with mvIMPACT Go! and mvIMPACT S is the same as described in *Remarks to mvAcquireControl*.

Because mvIMPACT Go! and mvIMPACT S are using a double buffer method for the live preview mode it needs a size of the DMA buffer which is twice as great than one image. In 16 bit it will be about $2 \times 2,7\text{MB} = 5,4\text{MB}$. The size after a standard installation is 4MB so you will have to increase the size to at least 6MB. To do this use in case of Windows NT4.0, Windows 2000 or Windows XP the file `..\windows\matrix\setdma.exe`.

Additionally it is needed to tell mvIMPACT Go! and mvIMPACT S that the acquired images have a resolution of 12bpp. To do this open the menu item *Tools / Options*. Set the entry for *Default bitshift for 16bit images* to 4 (use for 12bit images).

Remarks to programming

For opening the mvTITAN-DIG properly add the command *SetInputPitch* to the used INI-file to tell the mvTITAN-DIG the number of pixel clocks between two HD signals the camera sends.

Example:

```
...
[TITAN]
...
InitBoard
...
SetInputPitch 1280
...
```

Using the VDS CCD1300 and the mvTITAN-DIG in your own program you have to set at least the videomode to *VM_DIG12* and the colormode to either *COL_GREY* or *COL_GREY16*. With *COL_GREY* you will get the image data as an 8bpp image in the DMA-buffer where the upper 8bit of the 12bit are used. With *COL_GREY16* you will get the 12bit data LSB aligned in the 16bit. To vary the position of the MSB you can use the function *mvSetMSBDataPos()*.

Using the recommended connection it is possible to switch the 2xGain and the binning mode with digital output GPout1 and GPout2. Because the camera expects active high signals it is needed to set these two outputs to high state that the camera runs in normal mode. For doing this you can for example use the command *mvWriteDigIOBit (dev, 1,1)* and *mvWriteDigIOBit (dev, 2,1)*. If these outputs are not programmed their state is low.

More about programming the mvTITAN-DIG you will find in the mvTITAN-DIG's manual.


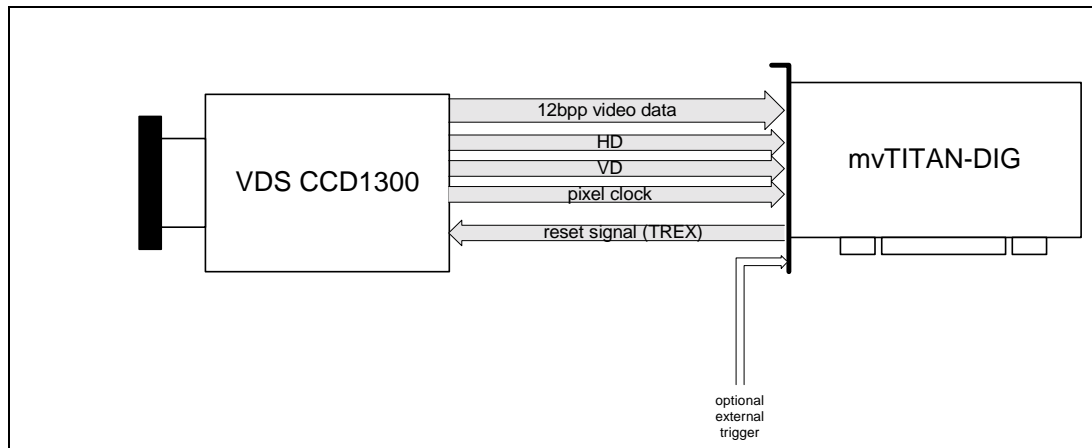
	Subject: VDS CCD1300 with mvTITAN-DIG	Created	Last change
		28.07.03	28.07.03
Application Note	Project:	Camera adaption	Version 1.0

Image On Demand (IOD) mode

Camera is reset by the mvTITAN-DIG. The camera integrates an image and sends the image and the needed signals for synchronization (pixel clock, HD and VD) to the mvTITAN-DIG. The integration time is nearly equal to the pulse length of the reset signal.

The mvTITAN-DIG can control the 2xGain and binning mode.

Signal map




Camera settings by hardware

Condition for this mode is to set the camera to IOD mode by hardware. With the mvTITAN-DIG it isn't possible to switch the IOD mode by a digital output of the mvTITAN-DIG. This must be done in the camera's 15-pin jack. Pin 9 of the 15-pin jack of the camera must be connected to ground. You can check the correct setting on the backside of the camera. There are several LEDs. If the camera runs in IOD mode the LED *IOD* must light.

The 2x gain and the binning mode can be set by digital outputs of the mvTITAN-DIG. We recommend to use the positive pins of DigOut1 and DigOut2.

Pin connection

mvTITAN-DIG		Direction	VDS CCD1300	
1	Ground	←	16	GND
2	MSB(+)	←	15	D11 (MSB)
3	MSB -1 (+)	←	14	D10
4	MSB -2 (+)	←	13	D9
5	MSB -3 (+)	←	12	D8
6	MSB -4 (+)	←	11	D7
7	MSB -5 (+)	←	10	D6
8	MSB -6 (+)	←	9	D5
9	MSB -7 (+)	←	8	D4
10	MSB -8 (+)	←	7	D3
11	MSB -9 (+)	←	6	D2
13	MSB -10 (+)	←	5	D1
14	MSB -11 (+)	←	4	D0 (LSB)
17	DigOut0 (+)	→	36	TRES +
18	DigOut1 (+)	→	19	Option: 25fps
25	Frame Ena. In (+)	←	3	FEN
26	Line Ena. In (+)	←	2	LEN
29	Pixel Clock In (+)	←	1	PCLK
30	DigOut 2 (+) / Expose (+)	→	18	SV2 +

	Subject: VDS CCD1300 with mvTITAN-DIG	Created	Last change
		28.07.03	28.07.03
Application Note	Project:	Camera adaption	Version 1.0

35	Ground	←	35	GND
36	MSB (-)	←	34	D11-
37	MSB -1 (-)	←	33	D10-
38	MSB -2 (-)	←	32	D9-
39	MSB -3 (-)	←	31	D8-
40	MSB -4 (-)	←	30	D7-
41	MSB -5 (-)	←	29	D6-
42	MSB -6 (-)	←	28	D5-
43	MSB -7 (-)	←	27	D4-
44	MSB -8 (-)	←	26	D3-
45	MSB -9 (-)	←	25	D2-
47	MSB -10 (-)	←	24	D1-
48	MSB -11 (-)	←	23	D0-
51	DigOut0 (-)	→	17	TREX -
59	Frame Ena. In (-)	←	22	FEN -
60	Line Ena. In (-)	←	21	LEN -
63	Pixel Clock In (-)	←	20	PCLK -

With this pinning the needed reset signal is transmitted through the pins DigOut0(+) and DigOut0(-).

Recommended cable for this mode from MATRIX VISION GmbH: KS55-0187 05.0 (including camera's power supply by mvTITAN-DIG/P).

Camera definition

```

/* ----- Vosskühler CCD-1300 12Bit ----- */
/* SetInputPitch 1280 */
DefCamType "CCD1300" VM_DIG12 NONINTERLACED 8 9375 15000 PCLK_EXTERN
DefCamAcquireSetup "CCD1300" VSCAN INV_SYNC NEXT_FIELD
DefHorizontalUnit "CCD1300" PIXEL
DefCamHorizontalAcquire "CCD1300" 0L 1280L 1
DefVerticalUnit "CCD1300" LINES
DefCamVerticalAcquire "CCD1300" 0L 1024L 1

```

Remarks to mvAcquireControl

For opening the mvTITAN-DIG properly add the command *SetInputPitch* to the used INI-file (in general *grabber.ini*) to tell the mvTITAN-DIG the number of pixel clocks between two HD signals the camera sends.

Example:

```

...
[TITAN]
...
InitBoard
...
SetInputPitch 1280
...

```

In mvAcquireControl you have to choose the camera definition *CCD1300*. Activate the option *Greyscale* in register *Acquire* and set it to *12bit*.

To set up the reset signal go to register *Shutter* and enable *shutter control*.

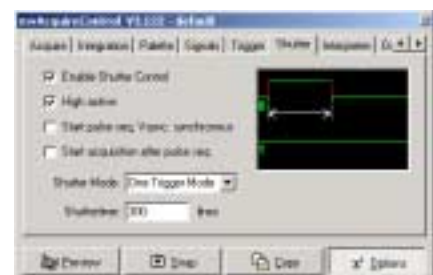
The camera expects an active high signal on the TREX pins.


So it is necessary to activate the checkbox *High active*.

Choose the shutter mode *One Trigger Mode*.

The Shuttertime defines the pulse length of the reset signal and so the integration time in the camera.

For the Shuttercontrol trigger signals are needed. If no



	Subject: VDS CCD1300 with mvTITAN-DIG	Created	Last change
		28.07.03	28.07.03
Application Note	Project:	Camera adaption	Version 1.0

external trigger is supplied to the mvTITAN-DIG you must use the *autotrigger mode*. Do this setting in the register *Trigger*. The autotrigger is automatically activated when shuttercontrol is enabled.

Using the recommended connection it is possible to switch the 2xGain and the binning mode with digital output GPout1 and GPout2. Because the camera wants active high signals it is needed to set these two outputs to high state that the camera runs in normal mode. For doing this switch to register *Signals* and change the *Bitmask* of line *Integration Off* to 'xxxxxxxxxxx11x'. The *Integration Off* bitmask is set automatically when opening the mvTITAN-DIG. If these outputs are not programmed their state is low.

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Additionally it is needed to tell mvIMPACT Go! and mvIMPACT S that the acquired images have a resolution of 12bpp. To do this open the menu item *Tools / Options*. Set the entry for *Default bitshift for 16bit images* to 4 (use for 12bit images).

Remarks to programming

For opening the mvTITAN-DIG properly add the command *SetInputPitch* to the used INI-file to tell the mvTITAN-DIG the number of pixel clocks between two HD signals the camera sends.

Example:

```
...
[TITAN]
...
InitBoard
...
SetInputPitch 1280
...
```

Using the VDS CCD1300 and the mvTITAN-DIG in your own program you have to set at least the videomode to *VM_DIG12* and the colormode to either *COL_GREY* or *COL_GREY16*. With *COL_GREY* you will get the image data as an 8bpp image in the DMA-buffer where the upper 8bit of the 12bit are used. With *COL_GREY16* you will get the 12bit data LSB aligned in the 16bit. To vary the position of the MSB you can use the function *mvSetMSBDataPos()*.


To define the needed reset signal and its pulse length use the function *mvDefPulsSeq()*.

Trigger signals are needed for output pulse sequences. You have three possibilities for this trigger signals:

1. External Trigger: an external trigger signal is connected to the Ext. Trigger input of the mvTITAN-DIG. To activate this input use *mvSelExtTrig(dev,1)*;
2. Autotrigger: the trigger signal is periodically simulated on the mvTITAN-DIG itself, so no external signal must be supplied. Use function *mvSetTriggerPeriode()*; to define the periode time of the simulated trigger signal
3. Single software trigger: single trigger signals can be done by software without supplying an external trigger signal with function *mvWriteDigIOBit(dev,15,1)*;

Using the recommended connection it is possible to switch the 2xGain and the binning mode with digital output GPout1 and GPout2. Because the camera expects active high signals it is needed to set these two outputs to high state that the camera runs in normal mode. For doing this you can for example use the command *mvWriteDigIOBit(dev, 1,1)* and *mvWriteDigIOBit(dev, 2,1)*. If these outputs are not programmed their state is low.

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	Subject: VDS CCD1300 with mvTITAN-DIG	Created	Last change
		28.07.03	28.07.03
Application Note	Project:	Camera adaption	Version 1.0

Glossary

Expression	Explanation
VD	Vertical drive, signal is sent to signalize next field (noninterlaced) or frame (interlaced). Also called Frame Enable, VSync or frame start signal.
HD	Horizontal drive, signal is sent to signalize next line. Also called Line Enable, HSync or line start signal.
Bpp	Bits per pixel