	<b>Subject:</b>	<b>Basler A102K with mvTITAN-CL</b>	Created	Last change
			07.11.03	10.11.03
Application Note	Project:	Camera adaption	Version 1.0	

## Overview

Camera **Basler A102K with mvTITAN-CL**

### Running modes

Freerunning   
 ExSync mode  Level-controlled or programmable

### Resolution

Horizontal 1392 pixel  
 Vertical 1040 pixel  
 Bits per Pixel 8 or 10 bpp  
 Binning   
 Partial Scan

### Timings

Pixel clock 28 MHz  
 Horizontal [h. freq.] kHz  
 Vertical 14.8 fps

### MATRIX VISION GmbH Frame Grabber

Typ mvTITAN-CL  
 Line Enable by camera  Frame Grabber  external   
 Frame Enable by camera  Frame Grabber  external   
 Trigger by external  Frame Grabber   
 Flash by camera  Frame Grabber  external

### Software

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

### Imprint

MATRIX VISION GmbH  
 Talstraße 16  
 D-71570 Oppenweiler  
 Author: Thomas Wimmer


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.

Email: [info@matrix-vision.de](mailto:info@matrix-vision.de).

Copyright © 2003 MATRIX VISION GmbH all rights reserved

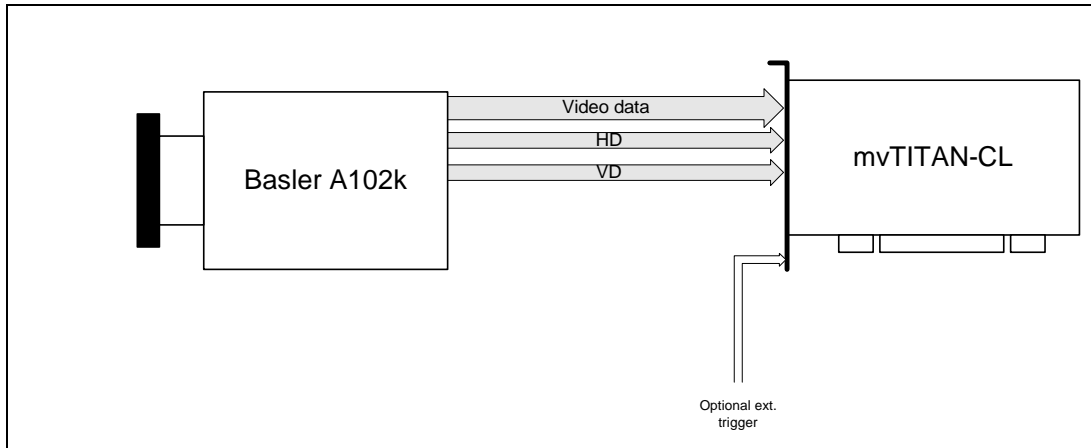
Windows95™, Windows98™, Windows98se™, WindowsNT4.0™, Windows2000™, WindowsXP™ are trademarks of Microsoft, Corp. All other trademarks are the property of their respective holders.

	<b>Subject:</b> Basler A102K with mvTITAN-CL	Created	Last change
		07.11.03	10.11.03
Application Note	Project:	Camera adaption	Version 1.0

## Freerunning Mode

Camera generates its own timing and sends images and signals for synchronization continuously to the frame grabber.

### Signal map



### Camera settings set by software

For setting up the camera the Camera Configuration Tool (CCT+) is needed. You can download the latest version of this tool from the homepage of Basler AG ([www.baslerweb.de](http://www.baslerweb.de)).

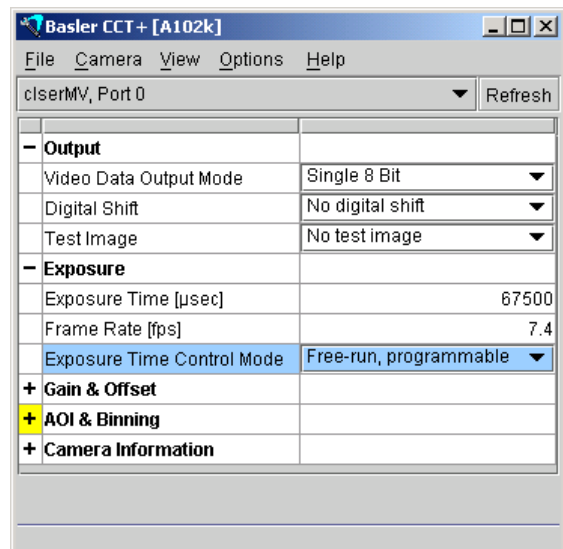
Install this tool and open the mvTITAN-CL before starting CCT+. This is necessary because the serial port of the CameraLink™ connection is only available if the mvTITAN-CL is initialized.

Be sure parameter *Exposure Time Control Mode* is set to *Free-run, programmable*.

Using output with 8 Bit set *Video Data Output Mode* to *Single 8 Bit*. Further you have to set the videomode to *VM\_DIG8* in your program or better in the used camera definition.


Using output with 8 Bit set *Video Data Output Mode* to *Single 10 Bit*. Further you have to set the videomode to *VM\_DIG10* in your program or better in the used camera definition.

All settings concerning exposure and shutter time must be set as application requires.



### Pin connection (CameraLink™ base standard)

MDR 26 pin			MDR 26 pin	
Pin 1		inner Shield	Pin 26	
Pin 2		Tx Data 0-	Pin 25	
Pin 3		Tx Data 1-	Pin 24	
Pin 4		Tx Data 2-	Pin 23	
Pin 5		XCLK-	Pin 22	
Pin 6		Tx Data 3-	Pin 21	

	<b>Subject:</b>	<b>Basler A102K with mvTITAN-CL</b>	Created	Last change
			07.11.03	10.11.03
Application Note	Project:	Camera adaption	Version 1.0	

Pin 7		SerTC+	Pin 20	
Pin 8		SerTFG-	Pin 19	
Pin 9		CC1-	Pin 18	
Pin 10		CC2+	Pin 17	
Pin 11		CC3-	Pin 16	
Pin 12		CC4+	Pin 15	
Pin 13		inner Shield	Pin 14	
Pin 14		inner Shield	Pin 13	
Pin 15		Tx Data 0+	Pin 12	
Pin 16		Tx Data 1+	Pin 11	
Pin 17		Tx Data 2+	Pin 10	
Pin 18		XCLK+	Pin 9	
Pin 19		Tx Data 3+	Pin 8	
Pin 20		SerTC-	Pin 7	
Pin 21		SerTFG+	Pin 6	
Pin 22		CC1+	Pin 5	
Pin 23		CC2-	Pin 4	
Pin 24		CC3+	Pin 3	
Pin 25		CC4-	Pin 2	
Pin 26		inner Shield	Pin 1	

Recommended cable for this mode from MATRIX VISION GmbH:

- KSCL 03.0, length 3 meters
- KSCL 05.0, length 5 meters
- KSCL 10.0, length 10 meters

### Cameradefinition

For Single output with 8 Bit:

```

/* ----- Basler A102k -----
DefCamType           "A102k" VM_DIG8 NONINTERLACED 15 15625 28000 PCLK_EXTERN
DefCamAcquireSetup   "A102k" VSCAN NOT_INV NEXT_FIELD
DefHorizontalUnit    "A102k" PIXEL
DefVerticalUnit       "A102k" LINES
DefCamHorizontalAcquire "A102k" 0L 1392L 1
DefCamVerticalAcquire  "A102k" 0L 1039L 1

```

For Single output with 10 Bit:

```

/* ----- Basler A102k -----
DefCamType           "A102k" VM_DIG10 NONINTERLACED 15 15625 28000 PCLK_EXTERN
DefCamAcquireSetup   "A102k" VSCAN NOT_INV NEXT_FIELD
DefHorizontalUnit    "A102k" PIXEL
DefVerticalUnit       "A102k" LINES
DefCamHorizontalAcquire "A102k" 0L 1392L 1
DefCamVerticalAcquire  "A102k" 0L 1039L 1

```

### Remarks to programming with standard SDK

Using the Basler A102k in your own program you have to set the following:


#### Single output 8 bit:

Set videomode to Dig8 with *mvSetVideoMode(dev, VM\_DIG8)*; and colormode to greyscale 8bit with *mvSetColorMode(dev, COL\_GREY)*;

With these settings you will get images with a resolution of 8bpp in memory.

#### Single output 10 bit:

Set videomode to Dig10 with *mvSetVideoMode(dev, VM\_DIG10)*; and colormode to greyscale 8bit with *mvSetColorMode(dev, COL\_GREY16)*;

	<b>Subject:</b> Basler A102K with mvTITAN-CL	Created	Last change
		07.11.03	10.11.03
Application Note	Project:	Camera adaption	Version 1.0

With these settings you will get images with a resolution of 16bpp in memory. If nothing special is set the 10bpp are stored LSB aligned in the 16 bit. This means LSB is bit 0 and MSB is bit 9. The remaining bits are undefined.

### Remarks to mvAcquireControl

#### Using camera with single output 8 bit

Load camera definition *A102k* in register *camera*.

Activate *Greyscale* in register *Acquire* and set it to 8 bit.

#### Using camera with single output 10 bit

Load camera definition *A102k* in register *camera* and switch to videomode *VM\_DIG10* in dialog *advanced feature settings* of *Select Camera*.

Activate *Greyscale* in register *Acquire* and set it to 10 bit.

### Remarks to mvIMPACT Go!


Set up the mvAcquireControl so that you get proper images. Close mvAcquireControl or mvCONFIG and start mvIMPACT Go!. It will automatically use the settings made in the *Default* configuration.

#### Using camera with single output 8 bit

Set mvAcquireControl to single output 8bit as described above. mvIMPACT Go! will use these settings and you will get proper 8 bpp images in mvIMPACT Go! without any further settings.

#### Using camera with single output 10 bit

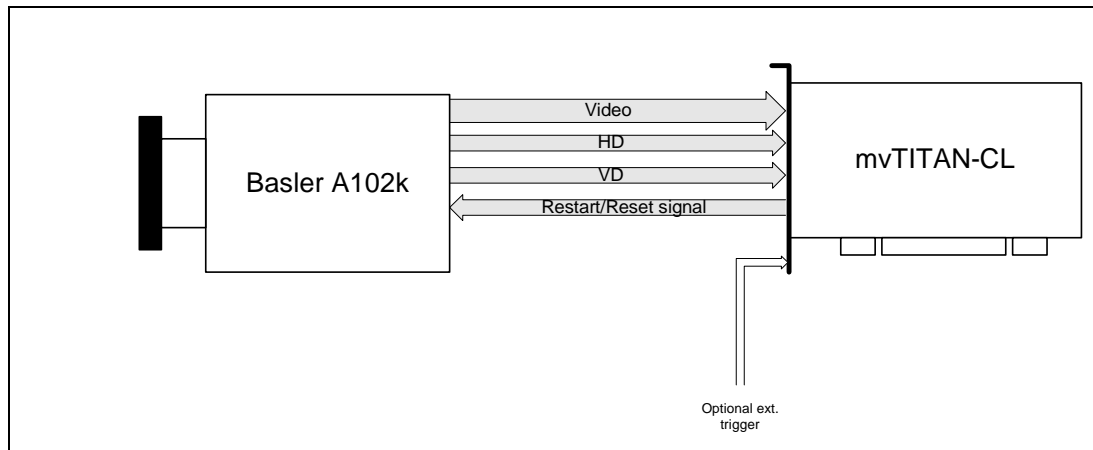
Set mvAcquireControl to single output 10bit as described above. mvIMPACT Go! will acquire 10bpp image but the display will be wrong. So you have to tell the display to display 10 bpp images instead of 16 bpp. For that open menu item *Tools / Options*. Choose 2 (*use for 10 bit images*) in line *Default bitshift for 16 bit images*.

	<b>Subject:</b> Basler A102K with mvTITAN-CL	Created	Last change
		07.11.03	10.11.03
Application Note	Project:	Camera adaption	Version 1.0

## ExSync mode

Camera is reset by the mvTITAN-CL and sends the video data and all synchronization signals to the mvTITAN-CL after Restart/Reset signal. The camera can be used with a predefined exposure time or an exposure time defined by the Restart/Reset signal.

### Signal map



### Camera settings set by software

For setting up the camera the Camera Configuration Tool (CCT+) is needed. You can download the latest version of this tool from the homepage of Basler AG ([www.baslerweb.de](http://www.baslerweb.de)).

Install this tool and open the mvTITAN-CL before starting CCT+. This is necessary because the serial port of the CameraLink™ connection is only available if the mvTITAN-CL is initialized.

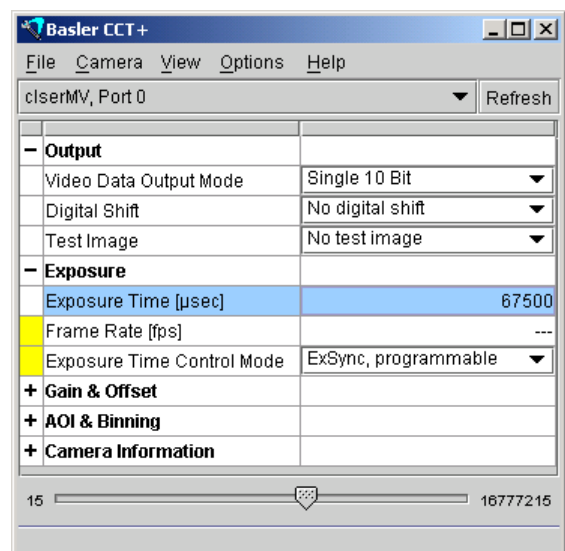
### Exposure Time predefined in camera

Be sure parameter *Exposure Time Control Mode* is set to *ExSync, level-controlled*.

Using output with 8 Bit set *Video Data Output Mode* to *Single 8 Bit*. Further you have to set the videomode to *VM\_DIG8* in your program or better in the used camera definition.


Using output with 8 Bit set *Video Data Output Mode* to *Single 10 Bit*. Further you have to set the videomode to *VM\_DIG10* in your program or better in the used camera definition.

Now the camera must be reset externally to acquire and send images. If no Restart/Reset signal is sent to the camera the LED on the backside lights 3 times periodically.



You can define the wanted exposure time in line *Exposure Time [µsec]*. So the pulse length of the Restart/Reset signal doesn't influence the integration time.

Please note that the exposure time influences the maximum possible frame rate.

	<b>Subject:</b>	<b>Basler A102K with mvTITAN-CL</b>	Created	Last change
			07.11.03	10.11.03
Application Note	Project:	Camera adaption	Version 1.0	

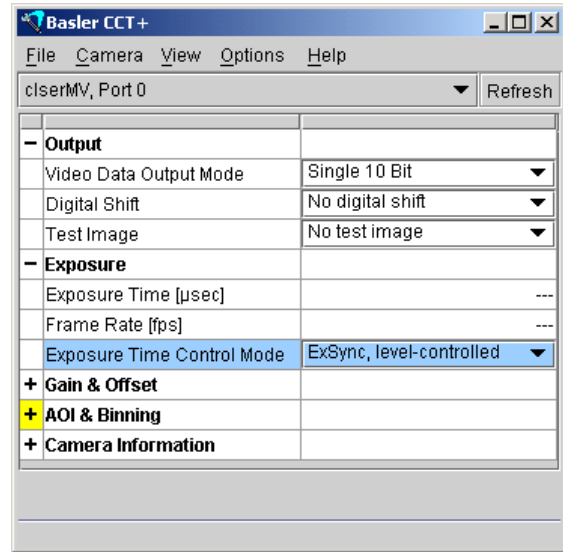
### Exposure Time defined by pulse width of Restart/Reset signal

Be sure parameter *Exposure Time Control Mode* is set to *ExSync, level-controlled*.

Using output with 8 Bit set *Video Data Output Mode* to *Single 8 Bit*. Further you have to set the videomode to *VM\_DIG8* in your program or better in the used camera definition.

Using output with 8 Bit set *Video Data Output Mode* to *Single 10 Bit*. Further you have to set the videomode to *VM\_DIG10* in your program or better in the used camera definition.

Now the camera must be reset externally to acquire and send images. If no Restart/Reset signal is sent to the camera the LED on the backside lights 3 times periodically.




In this mode the exposure time is equal to pulse length of the Restart/Reset signal. Please note that the exposure time influences the maximum possible frame rate.

### Pin connection (CameraLink™ base standard)

MDR 26 pin			MDR 26 pin	
Pin 1		inner Shield	Pin 26	
Pin 2		Tx Data 0-	Pin 25	
Pin 3		Tx Data 1-	Pin 24	
Pin 4		Tx Data 2-	Pin 23	
Pin 5		XCLK-	Pin 22	
Pin 6		Tx Data 3-	Pin 21	
Pin 7		SerTC+	Pin 20	
Pin 8		SerTFG-	Pin 19	
Pin 9		CC1-	Pin 18	
Pin 10		CC2+	Pin 17	
Pin 11		CC3-	Pin 16	
Pin 12		CC4+	Pin 15	
Pin 13		inner Shield	Pin 14	
Pin 14		inner Shield	Pin 13	
Pin 15		Tx Data 0+	Pin 12	
Pin 16		Tx Data 1+	Pin 11	
Pin 17		Tx Data 2+	Pin 10	
Pin 18		XCLK+	Pin 9	
Pin 19		Tx Data 3+	Pin 8	
Pin 20		SerTC-	Pin 7	
Pin 21		SerTFG+	Pin 6	
Pin 22		CC1+	Pin 5	
Pin 23		CC2-	Pin 4	
Pin 24		CC3+	Pin 3	
Pin 25		CC4-	Pin 2	
Pin 26		inner Shield	Pin 1	

Recommended cable for this mode from MATRIX VISION GmbH:  
 KSCL 03.0, length 3 meters  
 KSCL 05.0, length 5 meters

	<b>Subject:</b>	<b>Basler A102K with mvTITAN-CL</b>	Created	Last change
			07.11.03	10.11.03
Application Note	Project:	Camera adaption	Version 1.0	

KSCL 10.0, length 10 meters

## Cameradefinition

For Single output with 8 Bit:

```

/* ----- Basler A102k -----
DefCamType           "A102k"  VM_DIG8  NONINTERLACED 15 15625 28000 PCLK_EXTERN
DefCamAcquireSetup   "A102k"  VSCAN  NOT_INV  NEXT_FIELD
DefHorizontalUnit    "A102k"  PIXEL
DefVerticalUnit       "A102k"  LINES
DefCamHorizontalAcquire "A102k"  0L 1392L 1
DefCamVerticalAcquire  "A102k"  0L 1039L 1

```

For Single output with 10 Bit:

```

/* ----- Basler A102k -----
DefCamType           "A102k"  VM_DIG10 NONINTERLACED 15 15625 28000 PCLK_EXTERN
DefCamAcquireSetup   "A102k"  VSCAN  NOT_INV  NEXT_FIELD
DefHorizontalUnit    "A102k"  PIXEL
DefVerticalUnit       "A102k"  LINES
DefCamHorizontalAcquire "A102k"  0L 1392L 1
DefCamVerticalAcquire  "A102k"  0L 1039L 1

```

## Remarks to programming with standard SDK

Using the Basler A102k in your own program you have to set the following:

### Single output 8 bit:

Set videomode to Dig8 with *mvSetVideoMode(dev, VM\_DIG8)*; and colormode to greyscale 8bit with *mvSetColorMode(dev, COL\_GREY)*;

With these settings you will get images with a resolution of 8bpp in memory.

### Single output 10 bit:

Set videomode to Dig10 with *mvSetVideoMode(dev, VM\_DIG10)*; and colormode to greyscale 8bit with *mvSetColorMode(dev, COL\_GREY16)*;


With these settings you will get images with a resolution of 16bpp in memory. If nothing special is set the 10bpp are stored LSB aligned in the 16 bit. This means LSB is bit 0 and MSB is bit 9. The remaining bits are undefined.

## Generating Restart/Reset signal

To generate the needed Restart/Reset signal the following calls are necessary:

1. Define the Restart/Reset signal  
Use command *mvDefPulseSeq(dev, output, startvalue, pulse)*; to define the signal.  
*output*: 0, must be 1<sup>st</sup> output (CC1)  
*startvalue*: 1, because camera expects active high signals  
The used array (*pPulse*) should be like that:  
element [0]: pulse width in number of lines  
element [1]: -1, end of array
2. Define the way the output of the Restart/Reset signal is controlled.  
Decide whether you want to control the output frequently by a predefined period or by an external signal.  
If you decide to output the signal frequently set the period time with *mvSetTriggerPeriod(dev, time)*. Where time is given in milliseconds [ms]. If necessary deactivate the external trigger input with *mvSelExtTrig(dev, 0)*  
If you want to output the Restart/Reset signal synchronized to an external trigger signal activate the input on the mvTITAN-CL by *mvSelExtTrig(dev, 1)* and provide the *Trigger In* pin of the mvTITAN-CL with the external trigger signal.

You will find more about the shutter control in the mvTITAN-CL's manual in chapter 3 *Sequence programming*.

	<b>Subject:</b> Basler A102K with mvTITAN-CL	Created	Last change
		07.11.03	10.11.03
Application Note	Project:	Camera adaption	Version 1.0

## Remarks to mvAcquireControl

### Using camera with single output 8 bit

Load camera definition *A102k* in register *camera*.

Activate *Greyscale* in register *Acquire* and set it to 8 bit.

### Using camera with single output 10 bit

Load camera definition *A102k* in register *camera* and switch to videomode *VM\_DIG10* in dialog *advanced feature settings* of *Select Camera*.

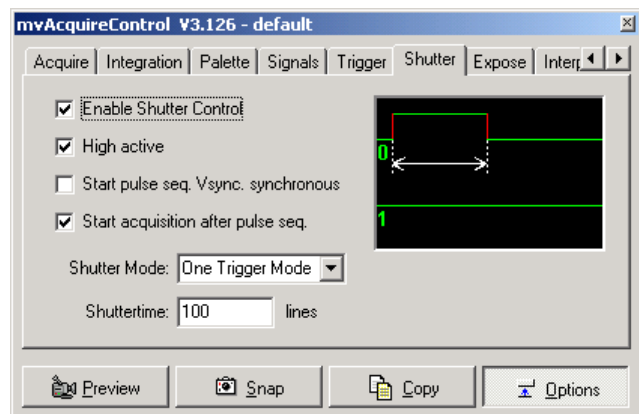
Activate *Greyscale* in register *Acquire* and set it to 10 bit.

### Setting up Restart/Restart signal

The Restart/Reset signal is set up with the *shutter control* of the mvAcquireControl. Switch to this register and activate the shutter control.

Be sure the following is set in the *Shutter* register:

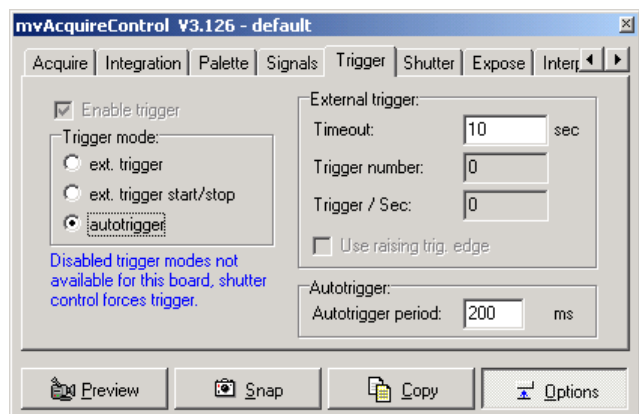
- *Enable Shutter Control*: Enabled
- *High active*: Enabled
- *Start acquisition after pulse seq.*: Enabled
- Shutter Mode must be set to *One Trigger Mode*
- Shuttertime defines the pulse width of the Restart/Reset signal. Depending on the camera mode this width defines the integration time or not. The width is defined in number of lines.




Switch to register *Trigger* and set the trigger method fitting to your application.

Set *autotrigger* if you want to output the Restart/Reset signal frequently without using an external trigger signal. You define the frequency by setting up the *Autotrigger period*.

If you want to synchronize the output of the Restart/Reset signal with an external trigger signal choose *ext. trigger*. Now you have to supply the external trigger signal to the *Trigger In* input of the mvTITAN-CL.





	<b>Subject:</b> Basler A102K with mvTITAN-CL	Created	Last change
		07.11.03	10.11.03
Application Note	Project:	Camera adaption	Version 1.0

**Remarks to mvIMPACT Go!**


Set up the mvAcquireControl so that you get proper images. Close mvAcquireControl or mvCONFIG and start mvIMPACT Go!. It will automatically use the settings made in the *Default* configuration.

**Using camera with single output 8 bit**

Set mvAcquireControl to single output 8bit as described above. mvIMPACT Go! will use these settings and you will get proper 8 bpp images in mvIMPACT Go! without any further settings.

**Using camera with single output 10 bit**

Set mvAcquireControl to single output 10bit as described above. mvIMPACT Go! will acquire 10bpp image but the display will be wrong. So you have to tell the display to display 10 bpp images instead of 16 bpp. For that open menu item *Tools / Options*. Choose 2 (*use for 10 bit images*) in line *Default bitshift for 16 bit images*.

	<b>Subject:</b> Basler A102K with mvTITAN-CL	Created	Last change
		07.11.03	10.11.03
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.