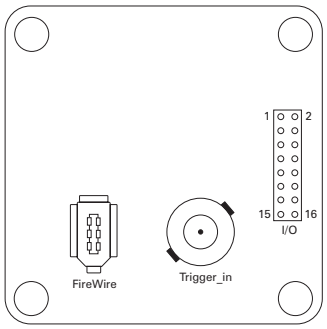
Dxx 21BF04, Dxx 31BF03, Dxx 41BF02
Using the trigger and the digital I/Os

- Please use any 50 Ohm BNC cable to connect the trigger input
- Please use an appropriate connector for the I/O pin header (16 pins, pitch 2.00 x 2.00 mm, 2-rows)

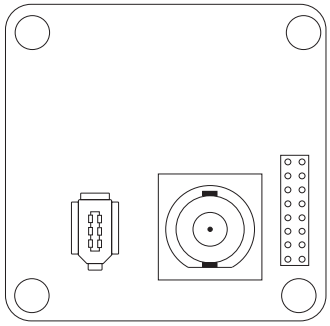
Connector		Signal	I/O	Remarks	Characteristics			
					Min	Typ	Max	Unit
BNC		Trigger_in	I	Start of exposure (optocoupler)	3.3		12.0	V
I/O pin header	Pin 1	Trigger_in (+)	I	ditto (signal)	3.3		12.0	V
	Pin 2	Trigger_in (-)	I	ditto (ground)	-	-	-	-
	Pin 3	FW_PWR	O	Direct connection to the power supply of the FireWire bus (unfused). Please note that the voltage may vary between 8 and 30 V.				
	Pin 4	FW_PWR	O					
	Pin 5	do not use	-	For future release	-	-	-	-
	Pin 6	Strobe_out	O	Flash control (open drain)			24.0[1]	V
	Pin 7	GP_out	O	General purpose output (open drain)			24.0[1]	V
	Pin 8	GP_in	I	General purpose input, V_{IH} = High Level Input Voltage V_{IL} = Low Level Input Voltage	0.6		24.0	V_{IH}
					-0.3	0	0.2	V_{IL}
	Pin 9	GND	G	External ground	-	-	-	-
	Pin 10	GND	G	External ground	-	-	-	-
	Pin 11	do not use	-	For future release	-	-	-	-
	Pin 12	do not use	-	For future release	-	-	-	-
	Pin 13	do not use	-	For future release	-	-	-	-
	Pin 14	do not use	-	For future release	-	-	-	-
	Pin 15	GND	G	External ground	-	-	-	-
	Pin 16	GND	G	External ground	-	-	-	-

Please note:
[1] max. 0.2 A (I_D) for open drain MOSFET

I/O pin legend:
G External ground
I Input
O Output



Please ask if you encounter this layout:



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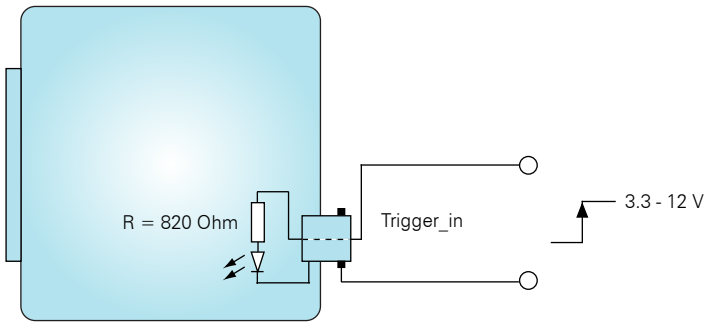
Using the trigger input (Trigger_in)

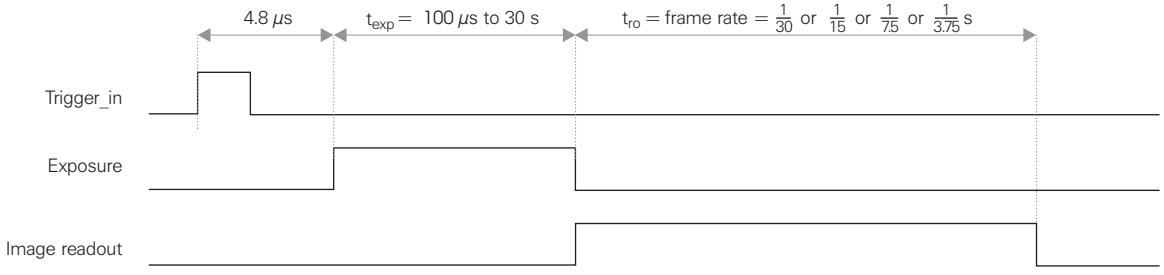


Exposure and image readout timing

The family of The Imaging Source FireWire cameras Dxx 21BF04, Dxx 31BF03 and Dxx 41BF02 offers two different modes of operation:

Free running: The cameras generate a stream of 30 or 15 images/s. To considerably reduce the amount of data, the frame rates may be reduced to 7.5 or 3.75 images/s. The exposures length is software adjustable in the range of 100 μs to 30 s. Please note, however, that the cameras clock generator determines the actual **moment** of exposure. Thus, it is not controllable externally, but measurable using the strobe output. Therefore, this mode of operation is called "free running".

Trigger: The cameras offer a trigger input to determine the **moment** of exposure. The exposure begins 4.8 μs after the occurrence of a trigger pulse. The exposures length is software adjustable from 100 μs to 30 s. The duration of the image readout is the reciprocal of the current frame rate. Once the image readout has finished, the cameras is able to accept a new trigger pulse at any time.



Programming examples with IC Imaging Control

Below are brief examples in Visual Basic to give you an idea of how to use IC Imaging Control. You can learn more about IC Imaging Control and download sample source code at www.imagingcontrol.com. Additionally, our support department (support@imagingcontrol.com) has some more detailed programming examples available for you.

Using the trigger

The program begins by assigning the video `Device` (in this case the FireWire camera DMK 21BF04), defines a `VideoFormat` and sets the camera's operation mode to `DeviceTrigger`.

After the command `LiveStart`, the camera is ready to shoot: the camera now waits for a trigger pulse. `MemorySnapImage` instructs IC Imaging Control to put the next image (which has been captured due to the trigger pulse) into a buffer (Memory) for further processing. Take as an example `MemorySaveImage`, which saves the content of this buffer to `Triggered.bmp`.

```
Private Sub Form_Load()
    ICImagingControl1.Device = "DMK 21BF04"
    ICImagingControl1.VideoFormat = "Y800 (640x480)"
    ICImagingControl1.DeviceTrigger = True

    ICImagingControl1.LiveStart
    ICImagingControl1.MemorySnapImage

    ' Do something with the image - for instance:
    ICImagingControl1.MemorySaveImage "Triggered.bmp"
End Sub
```

Activating the strobe output

FireWire cameras typically have a set of properties - such as "exposure time" or "gain". IC Imaging Control makes these properties available in the class `VCDSimpleProperty`. The program begins by defining the variable `VCDProp` that will later contain these properties.

Secondly, the video `Device` is assigned (in this case the FireWire camera DMK 21BF04) and then we define a `VideoFormat`. The function `GetSimplePropertyContainer` assings the properties of the opened camera to the variable `VCDProp`.

The command `VCDProp.Switch(VCDID_Strobe) = True` activates the strobe output. Therefore, after having started the camera with `LiveStart`, pin 6 (see page 1) indicates the CCDs exposure.

```
Private Sub Form_Load()
    Dim VCDProp As VCDSimpleProperty
    ICImagingControl1.Device = "DMK 21BF04"
    ICImagingControl1.VideoFormat = "Y800 (640x480)"
    Set VCDProp = GetSimplePropertyContainer(ICImagingControl1.VCDPropertyItems)

    VCDProp.Switch(VCDID_Strobe) = True
    ICImagingControl1.LiveStart
End Sub
```

Reading the digital input

The first three program lines are similar to those of the preceeding example (Activating the strobe output). The main difference is to be found at the programs end: The command `VCDProp.OnePush VCDElement_GPIORead` reads the digital inputs state, while `Debug.Print VCDProp.RangeValue(VCDElement_GPIOIn)` indicates this state in terms of a debug output.

```
Private Sub Form_Load()
    Dim VCDProp As VCDSimpleProperty
    ICImagingControl1.Device = "DMK 21BF04"
    Set VCDProp = GetSimplePropertyContainer(ICImagingControl1.VCDPropertyItems)

    VCDProp.OnePush VCDElement_GPIORead
    Debug.Print VCDProp.RangeValue(VCDElement_GPIOIn)
End Sub
```

Setting the digital output

The first three program lines are similar to those of the preceeding example (Reading the digital input). The main difference is to be found at the programs end: The command `VCDProp.RangeValue` sets the variable `VCDElement_GPIOOut` to 0, whereupon `VCDProp.OnePush VCDElement_GPIOWrite` copies the content of this variable (0 in our case) to the digital output.

```
Private Sub Form_Load()
    Dim VCDProp As VCDSimpleProperty
    ICImagingControl1.Device = "DMK 21BF04"
    Set VCDProp = GetSimplePropertyContainer(ICImagingControl1.VCDPropertyItems)

    VCDProp.RangeValue(VCDElement_GPIOOut) = 0
    VCDProp.OnePush VCDElement_GPIOWrite
End Sub
```