Matrox Genesis
Camera Interface Application Note
NED NUF1024D March 22, 2002

Basics about the camera

Camera Descriptions

- Effective resolution: 1024 pixels/line × 8-bit.
- Single tap LVDS digital video output.
- External sync.
- External exposure control.
- 20 MHz pixel clock rate.

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

Interface Modes

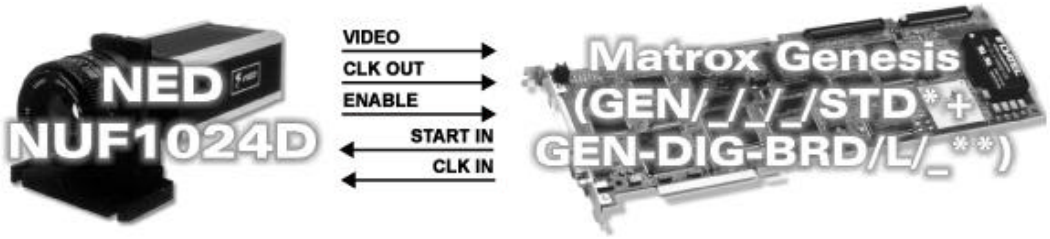
- Fixed line scan
- Variable line scan
- Variable line scan with variable frame size

Basics about the interface modes

Camera Interface Briefs

Mode 1: Fixed line scan

- 1022 pixels/line × 8-bit.
- Single tap LVDS digital video.
- DCF configured for 800 lines per virtual frame.
- Line scan rate is fixed and determined by EXPOSURE1 (START IN) signal frequency.
- Matrox Genesis sending EXPOSURE1 (START IN) and CLOCK OUT (CLOCK IN on camera @ 20 MHz) signals to camera; EXPOSURE1 (START IN) initiates and controls exposure.
- Matrox Genesis receiving HSYNC (ENABLE), PIXEL CLOCK (CLOCK OUTPUT @ 20 MHz) and video signals from camera.
- DCF used: 1024LP.DCF (required GNL 2.07 or higher)



Mode 2: Variable line scan

- 1022 pixels/line × 8-bit.
- Single tap LVDS digital video.
- DCF configured for 800 lines per virtual frame.
- Line scan rate is variable and determined by external trigger frequency.
- Matrox Genesis receiving external trigger signal.

Continued…

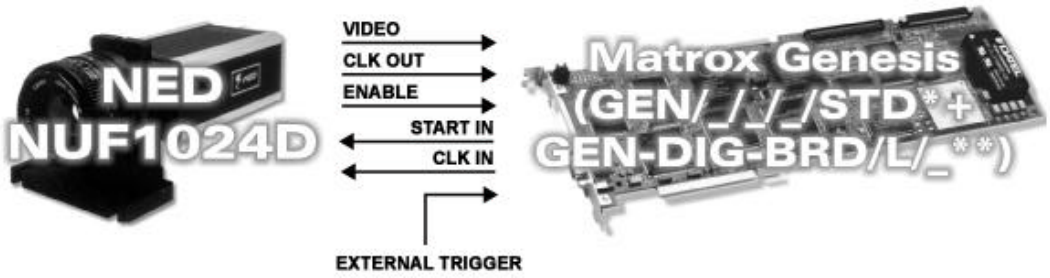
***Matrox Genesis main board with grab module**
****Matrox LVDS digital input board**

Basics about the interface modes

Camera Interface Briefs (continued)

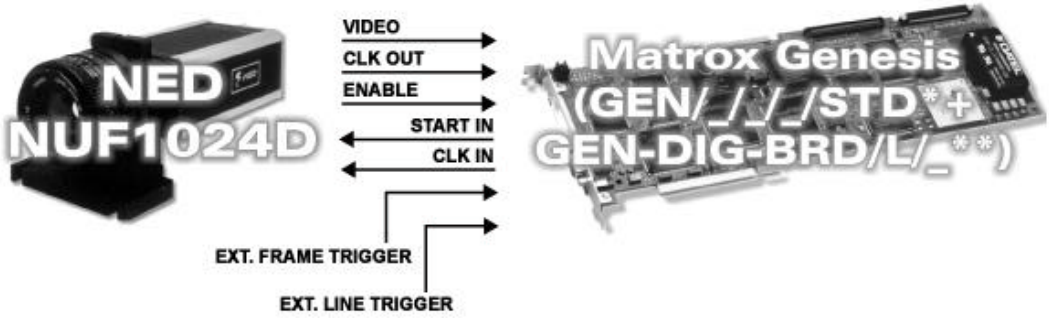
Mode 2: Variable line scan

- Matrox Genesis sending EXPOSURE1 (START IN) and CLOCK OUT (CLOCK IN on camera @ 20 MHz) signals to camera; EXPOSURE1 (START IN) initiate and controls exposure.
- Matrox Genesis receiving HSYNC (ENABLE), PIXEL CLOCK (CLOCK OUTPUT @ 20 MHz) and video signals from camera.
- DCF used: 1024LV.DCF (required GNL 2.07 or higher)



Mode 3: Variable line scan with variable frame size

- 1022 pixels/line × 8-bit.
- Single tap LVDS digital video.
- Number of lines per virtual frame is determined by the TTL external frame trigger period.
- Line scan rate is variable and determined by the LVDS external line trigger frequency.
- Matrox Genesis receiving external frame and line trigger signals.
- Matrox Genesis sending EXPOSURE1 (START IN) and CLOCK OUT (CLOCK IN on camera @ 20 MHz) signals to camera; EXPOSURE1 (START IN) initiate and controls exposure.
- Matrox Genesis receiving HSYNC (ENABLE), PIXEL CLOCK (CLOCK OUTPUT @ 20 MHz) and video signals from camera.
- DCF used: 1024FVLV.DCF (required GNL 2.07 or higher)



***Matrox Genesis main board with grab module**
****Matrox LVDS digital input board**

Specifics about the interface modes

Camera Interface Details

Mode 1: Fixed line scan

- **Line rate:** The frequency of the periodic EXPOSURE1 (START IN) signal controls the camera's line rate. The EXPOSURE1 (START IN) signal period is set to **1304 pixels**, with a **20 MHz** pixel clock, this translates to a **15.34 kHz** line rate. Refer to the camera manual for more information.
- **Exposure time:** Exposure time is the period between both rising edges of the EXPOSURE1 (START IN) signal. The default exposure time for this DCF is equal to **65 ms**. The exposure time can be modified in the DCF using Matrox Intellicam, Genesis Native Library (GNL) imCamControl() or with the MIL MdigControl() function. Consult the respective manual for more information.
- **Maximum/Minimum exposure times:** Since the Matrox Genesis timer is 16-bit wide, the maximum exposure time is calculated to be 65536/20MHz = **3.28 ms**. The maximum line rate of the camera is **19.9 kHz**; therefore the minimum exposure time is ≈ **52 ms.**
- **Smallest exposure time increment:** The camera's clock (20 MHz) is the reference clock in which the exposure time is being set by, therefore the smallest exposure time increment is **50 ns**.

Mode 2: Variable line scan

- **Line rate:** The line rate is variable and controlled by the frequency of the external trigger signal.
- **Exposure time:** Exposure time is equal to the external trigger signal period.
- **Minimum exposure times:** Minimum exposure time is ≈ **52 ms.**
- **Smallest exposure time increment:** Same as in Mode 1: *Fixed line scan.*

Mode 3: Variable line scan with variable frame size

- **Line rate:** The line rate is variable and controlled by the frequency of the LVDS external line trigger signal.
- **Frame rate:** The maximum number of lines per virtual frame is 800. The frequency of the TTL external frame trigger determines the pseudo-frame rate. NOTE: If a successive frame trigger arrived before 800 lines are captured, the Matrox Genesis will reset the display buffer.
- **Exposure time:** Same as in Mode 2: *Variable line scan.*
- **Minimum exposure times:** Same as in Mode 2: *Variable line scan.*
- **Smallest exposure time increments:** Same as in Mode 1: *Fixed line scan.*

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Cabling details for this interface mode

Cabling Requirements

Mode 1: Fixed line scan

- **Cable:** DBHD100-TO-OPEN (open ended) cable required for video, synchronization and control signals.
- **Connection:** Connections between the 36-pin connector of the camera and the 100-pin connectors of the Matrox Genesis are as follows:

NED NUF1024D (36-pin connector)			**GEN-DIG-BRD/L/_ (100-pin connector)**	
Pin name	***Pin no.***		***Pin name***	***Pin no.***
D9+	28	→	DATA, INPUT, 9+	19
D9-	29	→	DATA, INPUT, 9-	20
D8+	09	→	DATA, INPUT, 8+	17
D8-	10	→	DATA, INPUT, 8-	18
D7+	26	→	DATA, INPUT, 7+	15
D7-	27	→	DATA, INPUT, 7-	16
D6+	07	→	DATA, INPUT, 6+	13
D6-	08	→	DATA, INPUT, 6-	14
D5+	24	→	DATA, INPUT, 5+	11
D5-	25	→	DATA, INPUT, 5-	12
D4+	05	→	DATA, INPUT, 4+	09
D4-	06	→	DATA, INPUT, 4-	10
D3+	22	→	DATA, INPUT, 3+	07
D3-	23	→	DATA, INPUT, 3-	08
D2+	03	→	DATA, INPUT, 2+	05
D2-	04	→	DATA, INPUT, 2-	06
D1+	20	→	DATA, INPUT, 1+	03
D1-	21	→	DATA, INPUT, 1-	04
D0+	01	→	DATA, INPUT, 0+	01
D0-	02	→	DATA, INPUT, 0-	02
CLOCK OUT+	11	→	CLOCK, INPUT, +	39
CLOCK OUT-	12	→	CLOCK, INPUT, -	40
ENABLE +	13	→	HSYNC, INPUT, +	33
ENABLE -	14	→	HSYNC, INPUT, +	34
START IN +	33	←	EXPOSURE1, OUTPUT +	95
START IN -	34	←	EXPOSURE1, OUTPUT -	96
CLOCK IN +	16	←	CLOCK, OUTPUT, +	89
CLOCK IN -	17	←	CLOCK, OUTPUT, -	90

Cabling details for the interface modes

Cabling Requirements (Continued)

Mode 2: Variable line scan

- **Cable:** DBHD100-TO-OPEN (open ended) cable required for video, synchronization and control signals.
- **Connection:** Same as in Mode 1: *Fixed line scan*, except for the following additional connections:

GEN-DIG-BRD/L/_ (100-pin connector)			**LVDS EXTERNAL LINE TRIGGER SOURCE**	
Pin name	***Pin no.***		***Pin name***	***Pin no.***
TRIGGER INPUT+	47	←	--	--
TRIGGER INPUT-	48	←	--	--

Mode 3: Variable line scan with variable frame size

- **Cable:** IMG-7W2-TO-5BNC and DBHD100-TO-OPEN (open ended) cables required for video, synchronization and control signals.
- **Connection:** Same as in Mode 1: *Fixed line scan*.
- **External trigger:** Connections between the external line trigger source and the 100-pin connectors of the Matrox Genesis are as follows:

GEN-DIG-BRD/L/_ (100-pin connector)			**LVDS EXTERNAL LINE TRIGGER SOURCE**	
Pin name	***Pin no.***		***Pin name***	***Pin no.***
TRIGGER INPUT+	47	←	--	--
TRIGGER INPUT-	48	←	--	--
GEN-DIG-BRD/L/_ (BNC connector)			**TTL EXTERNAL FRAME TRIGGER SOURCE**	
Pin name	***Pin no.***		***Pin name***	***Pin no.***
GRAY BNC (OPTO TRIG)	--	←	--	--

- **Jumper:** The following jumper connections are required on the 100-pin connector:

GEN-DIG-BRD/L/_ (100-pin connector)			**GEN-DIG-BRD/L/_ (100-pin connector)**	
Pin name	***Pin no.***		***Pin name***	***Pin no.***
EXPOSURE2, OUTPUT+	97	→	VSYNC, INPUT+	35
EXPOSURE2, OUTPUT-	98	→	VSYNC, INPUT-	36

The DCF(s) mentioned in this application note can be found on the MIL, Native Library CD or our FTP site (ftp.matrox.com). 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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