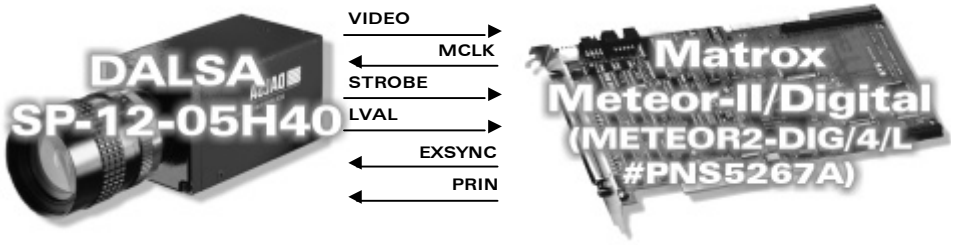
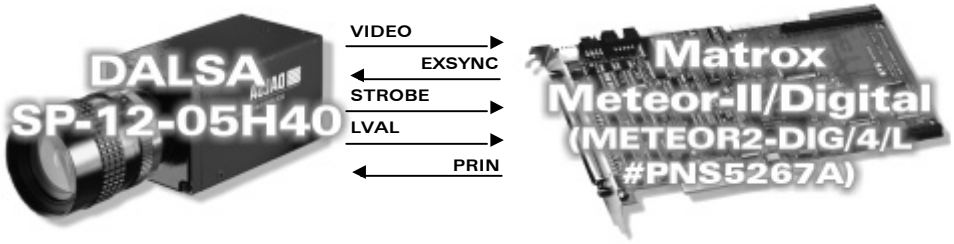
Application Note:
Interfacing non-standard cameras to Matrox Meteor-II

DALSA SP-12-05H40

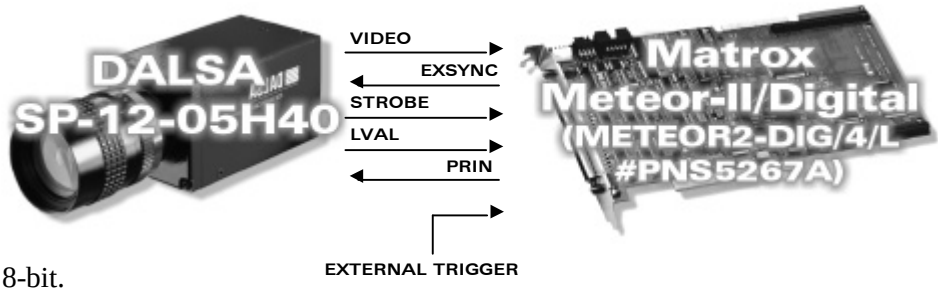
May 15, 2000

Camera Descriptions	• 512 × 8-bit. • Single channel LVDS digital video. • External synchronization required. • External exposure control. • Maximum data rate per output: 40 MHz.
Interface mode	• Fixed line scan rate, variable line scan rate
Camera Interface Briefs	**Mode 1: Fixed line scan rate (clock exchange)**  • 512 × 8-bit. • Single channel LVDS digital video. • DCF configured for 512 lines per virtual frame. • Line scan rate is fixed and determined by EXPOSURE1 (EXSYNC) signal frequency. • Matrox Meteor-II sending EXPOSURE1 (EXSYNC), USER (PRIN), and MASTER CLOCK (MCLK@ 40 MHz) signals to camera; the EXPOSURE1 (EXSYNC) signal initiates line readout and controls exposure time. • Matrox Meteor-II receiving PIXEL CLOCK (STROBE @ 40 MHz), HSYNC (LVAL), and video signals from camera; a high LVAL signal indicates valid pixels. • DCF used: MSP125F1.DCF
	Mode 2: Fixed line scan rate (no clock exchange)  • 512 × 8-bit. • Single channel LVDS digital video. • DCF configured for 512 lines per virtual frame. • Line scan rate is fixed and determined by EXPOSURE1 (EXSYNC) signal frequency. • Matrox Meteor-II sending EXPOSURE1 (EXSYNC) and USER (PRIN) signals to camera; the EXPOSURE1 (EXSYNC) signal initiates line readout and controls exposure time. • Matrox Meteor-II receiving PIXEL CLOCK (STROBE @ 40 MHz), HSYNC (LVAL), and video signals from camera; a high LVAL signal indicates valid pixels. • DCF used: MSP125F2.DCF

DALSA SP-12-05H40 — May 15, 2000

Camera Interface Briefs

Mode 3: Variable line scan rate



- 512 × 8-bit.
- Single channel LVDS digital video.
- DCF configured for 512 lines per virtual frame.
- Line scan rate is variable and is controlled by external trigger signal.
- Matrox Meteor-II receiving external trigger.
- Matrox Meteor-II sending EXPOSURE1 (EXSYNC) and USER (PRIN) signals to camera; the EXPOSURE1 (EXSYNC) signal initiates line readout and controls exposure time.
- Matrox Meteor-II receiving PIXEL CLOCK (STROBE @ 40 MHz), HSYNC (LVAL), and video signals from camera; a high LVAL signal indicates valid pixels.
- DCF used: MSP125V1.DCF

Camera Interface Details

Mode 1: Fixed line scan rate (clock exchange)

- Matrox Meteor-II sends periodic EXPOSURE1 (EXSYNC), USER (PRIN), MASTER CLOCK (MCLK@ 40 MHz) signals to the camera; the EXPOSURE1 (EXSYNC) signal initiates and controls exposure time. USER (PRIN) signal used to set Level mode (refer to camera manual).
- **Line rate**: The EXPOSURE1 (EXSYNC) frequency in the DCF specifies the line rate of the camera. The EXPOSURE1 (EXSYNC) period is currently set to **10400 pixels**. With a **28.636 MHz** pixel clock this translates to a **2.753 kHz** line rate.
- **Exposure time**: The time between the rising edge and the falling edge of the EXPOSURE1 (EXSYNC) signal is the exposure time. The default exposure time for this DCF is **364 µs**. In order to select the exposure time, the width and deployment time of EXPOSURE1 (EXSYNC) must be set in Matrox Intellicam. The exposure time of the camera can be modified in the DCF using Matrox Intellicam or with the MIL digitizer control function **MdigControl()**. Refer to manual or user guide for additional information.
- **Maximum/minimum exposure time:** Since the Matrox Meteor-II/Digitizer timer is 16-bit wide, the maximum exposure time is calculated to be 65536/28.636 MHz = **2.28 ms**. The maximum line rate of the camera is **70.4 kHz**, therefore the min. exposure time is **58.8** ms.
- **Smallest exposure time increment**: The crystal clock is the reference clock that the exposure time is being set by. The smallest increment of the exposure time is **35 ns.**
- **User-supplied input signals:** Refer to the camera manual for addition details. The following user-supplied input signals are used in this mode to control exposure, binning, Master Clock (MCLK) frequency, and gain settings:

Signal	Controls	Controlled by
BIN	Binning	Camera Control Bit 0
PRIN	Exposure	Camera Control Bit 1
SPEED	MCLK frequency	Camera Control Bit 2
GAIN 0	Gain	Output Bit 0
GAIN 1	Gain	Output Bit 1

Camera Interface Details (continued)	**Mode 2: Fixed line scan rate (No clock exchange)** • Matrox Meteor-II sends periodic EXPOSURE1 (EXSYNC) and USER (PRIN) signals to the camera; the EXPOSURE1 (EXSYNC) signal initiates and controls exposure time. USER (PRIN) signal used to set Level mode (refer to camera manual). • **Line rate**: The EXPOSURE1 (EXSYNC) frequency in the DCF specifies the line rate of the camera. The EXPOSURE1 (EXSYNC) period is currently set to **2400 pixels**. With a **28.636 MHz** pixel clock this translates to an **11.93 kHz** line rate. • **Exposure time**: The time between the rising edge and the falling edge of the EXPOSURE1 (EXSYNC) signal is the exposure time. The default exposure time for this DCF is **84 µs**. In order to select the exposure time, the width and deployment time of EXPOSURE1 (EXSYNC) must be set in Matrox Intellicam. The exposure time of the camera can be modified in the DCF using Matrox Intellicam or with the MIL digitizer control function **MdigControl()**. Refer to the appropriate manual or user guide for additional information. • **Maximum/minimum exposure time:** Since the Matrox Meteor-II timer is 16-bit wide, the maximum exposure time is calculated to be 65536/28.636 MHz = **2.28 ms**. The maximum line rate of the camera is **70.4 kHz**, therefore the minimum exposure time is **58.8** µs. • **Smallest exposure time increment**: The crystal clock is the reference clock that the exposure time is being set by. The smallest increment of the exposure time is **35 ns.** • **User-supplied input signals:** Refer to the camera manual for addition details. The user-supplied input signals are used to control exposure, binning, and gain settings, and are as in *Mode 1: Fixed line scan rate.* **Mode 3: Variable line scan rate** • Once it has received the external trigger signal, Matrox Meteor-II sends the EXPOSURE1 (EXSYNC) and USER (PRIN) signals to the camera. The EXPOSURE1 (EXSYNC) signal initiates and controls exposure time. USER (PRIN) signal used to set Level mode (refer to camera manual). • **Line rate**: Line rate is variable and controlled by the frequency of the external trigger signal. • **Exposure time**: Since the EXPOSURE1 (EXSYNC) signal is controlled by the external trigger signal, the time between the rising edges of the external trigger signal is the exposure time. • **Maximum / minimum exposure time:** The maximum exposure time is equal to the maximum delay between rising edges of the external trigger signal. The minimum exposure time is **58.8** µs. • **Smallest exposure time:** Smallest exposure time is controlled by the external trigger signal. • **User-supplied input signals:** Refer to the camera manual for addition details. The user-supplied input signals are used to control exposure, binning, and gain settings, and are as in *Mode 1: Fixed line scan rate.*

Cabling Requirements

Mode 1 and 2: Fixed line scan rate

- DBHD100-TO-OPEN cable required for digital data, synchronization and control signals.
- Connections between the 36-pin connector (**MDR36F**) of the camera and the 100-pin connector of the Matrox Meteor-II/Digital PNS # 5267A are as follows:

DALSA SP-12-05H40 (36-pin connector – MDR36F)			**METEOR2-DIG/4/L PNS # 5267A (100-pin connector)**	
Pin name	***Pin no.***		***Pin name***	***Pin no.***
D7 (MSB)	09	→	DATA, INPUT, 7+	15
D7B	27	→	DATA, INPUT, 7-	16
D6	10	→	DATA, INPUT, 6+	13
D6B	28	→	DATA, INPUT, 6-	14
D5	11	→	DATA, INPUT, 5+	11
D5B	29	→	DATA, INPUT, 5-	12
D4	12	→	DATA, INPUT, 4+	09
D4B	30	→	DATA, INPUT, 4-	10
D3	13	→	DATA, INPUT, 3+	07
D3B	31	→	DATA, INPUT, 3-	08
D2	14	→	DATA, INPUT, 2+	05
D2B	32	→	DATA, INPUT, 2-	06
D1	15	→	DATA, INPUT, 1+	03
D1B	33	→	DATA, INPUT, 1-	04
D0	16	→	DATA, INPUT, 0+	01
D0B	34	→	DATA, INPUT, 0-	02
STROBE	17	→	CLOCK, INPUT, +	39
STROBEB	35	→	CLOCK, INPUT, -	40
LVAL	18	→	HSYNC, INPUT, +	33
LVALB	36	→	HSYNC, INPUT, +	34
SPEED	01	←	**CAMCTRL2 OUTPUT +**	**45***
SPEEDB	19	←	**CAMCTRL2 OUTPUT -**	**46***
PRIN	06	←	**CAMCTRL1 OUTPUT +**	**83***
PRINB	24	←	**CAMCTRL1 OUTPUT -**	**84***
BIN	08	←	**CAMCTRL0 OUTPUT +**	**85***
BINB	26	←	**CAMCTRL0 OUTPUT -**	**86***
MCLK	05	←	CLOCK, OUTPUT, +	89
MCLKB	23	←	CLOCK, OUTPUT, -	90
GAIN0	02	←	USER, OUTPUT, 0+	91
GAIN0B	20	←	USER, OUTPUT, 0-	92
GAIN1	04	←	USER, OUTPUT, 1+	93
GAIN1B	22	←	USER, OUTPUT, 1-	94
EXSYNC	07	←	EXPOSURE1, OUTPUT, +	95
EXSYNCB	25	←	EXPOSURE1, OUTPUT, -	96

* These pin-outs are modifications to the Matrox Meteor-II/Digital as per PNS # 5267A

Cabling Requirements (continued)

- **Note,** the DB-9 female connector can be connected directly to some most DALSA compliant power supplies that have a DB-9 male connector. For Camera Power Supply guidelines and vendor list, please refer to the DALSA documentation. Moreover ±5 V and ±12 V are available on the DB-9 connector of DALSA compliant power supplies.
- Connections between the 6-pin power connector on the camera and the 9-pin connector of the power supply (DB-9) are as follows:

DALSA SP-12-05H40 (6-pin HIROSE connector)			**Power Supply (9-pin connector-DB9F)**	
Pin name	***Pin no.***		***Pin name***	***Pin no.***
+12V	01	←	+12V	03
+12V	02	←	+12V	08
NC	03		NC	09
NC	04		NC	02
GND	05	←	GROUND	04
GND	06	←	GROUND	05

Mode 3: Variable line scan rate

- DBHD100-TO-OPEN cables required for digital data, synchronization and control signals.
- TTL external trigger source should be connected to Pin 2 and 7 (OPTO TRIG) on the Trigger Input connector (9-pin female connector on the RS-232/Trigger Input bracket).
- All other connections are as in Mode 1: *Fixed line scan rate*

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