MATROX GENESIS
CAMERA INTERFACE APPLICATION NOTE
THOMSON-CSF TH78CA15   SEPTEMBER 19, 2001

Camera Descriptions

- 4096 × 12-bit.
- Dual channel RS-422 digital video output.
- Internal or external sync.
- Internal or external exposure control.
- 40 MHz pixel clock rate.

Interface Modes
- Fixed line scan (Free running mode)
- Variable line scan (Triggered mode)

Camera Interface Briefs

Mode 1: Fixed line scan (Free running mode)

- 4096 × 12-bit.
- Dual channel RS-422 digital video.
- DCF configured for 512 lines per virtual frame.
- Line scan rate is fixed and controlled by HSYNC.
- Matrox Genesis receiving PIXEL CLOCK (DATA-CLOCK @ 20 MHz), HSYNC (LEN) and video signals from camera.
- DCF used: 78CA15M0.DCF (fixed exposure)
- DCF used: 78CA15M1.DCF (exposure control)
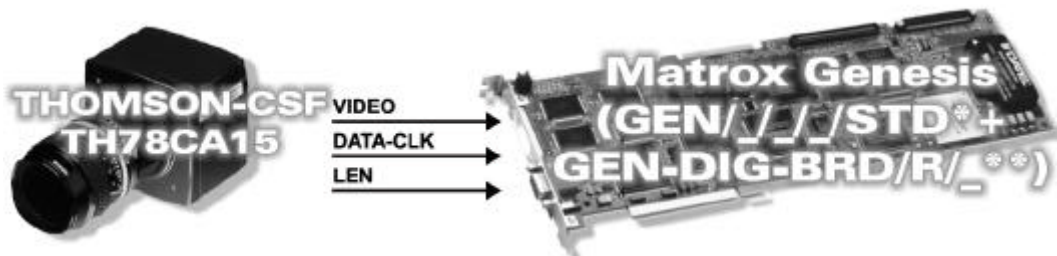
Mode 2: Variable line scan (Triggered mode-periodic)

- 4096 × 12-bit.
- Dual channel RS-422 digital video.
- DCF configured for 512 lines per virtual frame.
- Line scan rate is variable and controlled by EXPOSURE1 (ITC) signal and camera software setting.
- Matrox Genesis sending periodic EXPOSURE1 (ITC) signal to camera to initiate and control exposure time.
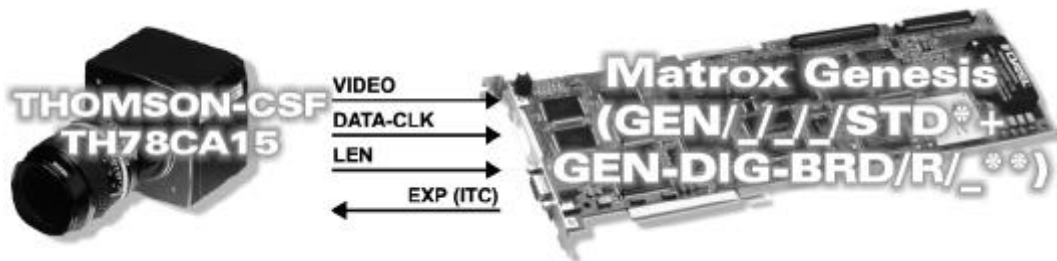- Matrox Genesis receiving PIXEL CLOCK (DATA-CLOCK @ 20 MHz), HSYNC (LEN) and video signals from camera.

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Basics about the interface modes

Camera Interface Briefs (continued)

### Mode 2: Variable line scan (Triggered mode-periodic)
- DCF used: 78CA15M2.DCF

Mode 3: Variable line scan (Triggered mode-external)
- 4096×12-bit.
- Dual channel RS-422 digital video.
- DCF configured for 512 lines per virtual frame.
- Line scan rate is variable and controlled by external trigger signal.
- Matrox Genesis sending EXPOSURE1 (ITC) signal to camera to initiate and control exposure time.
- Matrox Genesis receiving PIXEL CLOCK (DATA-CLOCK @ 20 MHz), HSYNC (LEN) and video signals from camera.
- DCF used: 78CA15M3.DCF
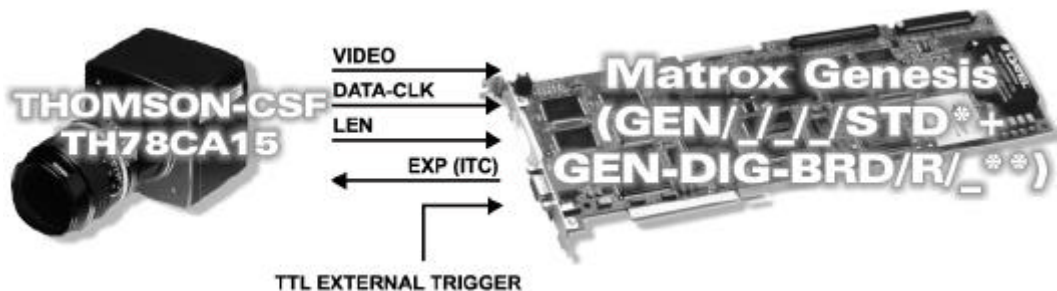
Specifics about the interface modes

Camera Interface Details

Mode 1: Fixed line scan (Free running mode)
- **Line rate:** HSYNC (LEN) period in the DCF specifies the line rate of the camera. The HSYNC (LEN) period is **2510** pixels. With a **20 MHz** pixel clock, this translates to a **9.59 kHz** line rate.
- **Exposure time:** The inverse of the line rate frequency is the exposure time (integration time). The exposure time for this mode is fixed and equal to **208.4 μs**.

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Specifics about the interface modes

Camera Interface Details (continued)

Mode 1: Fixed line scan (Free running mode)

▪ **Camera switch settings:** Refer to the camera manual for additional information. Switches for this mode should be set as follows:

| Setting	Command
Timing	T = *
Integration**	I= xxx

* 0 (78ca15m0.dcf) or 1 (78ca15m0.dcf)
** this setting for 78ca15m1.dcf only.

Mode 2: Variable line scan (Triggered mode-periodic)

▪ **Line rate:** EXPOSURE1 (EXSYNC) period in the DCF specifies the line rate of the camera. The EXPOSURE1 (EXSYNC) period is currently set to **2510** pixels. With a **20 MHz** pixel clock, this translates to a **9.59 kHz** line rate.

▪ **Exposure time:** The Integration setting in the camera configuration software (CommCam) controls the exposure time (integration time). The maximum exposure time is **13000 µs** and the minimum exposure time is **75 µs**.

▪ **Camera switch settings:** Refer to the camera manual for additional information. Switches for this mode should be set as follows:

Setting	Command
Timing	T = 2
Integration	I= xxx

▪ **Timing diagram:**

EXPOSURE1 (ITC)

Exposure Time

HSYNC (LEN)

Readout
(4096 pixels)
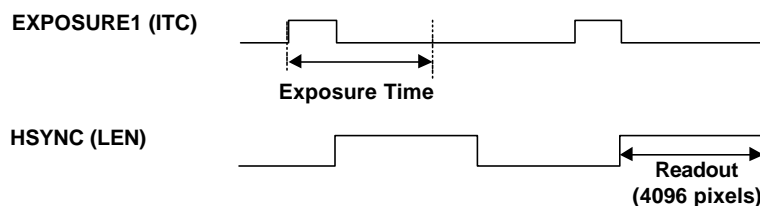
Mode 3: Variable line scan (Triggered mode-external)

▪ **Line rate:** Line rate is variable and controlled by the frequency of the external trigger signal.

▪ **Exposure time:** Since the EXPOSURE1 (ITC) signal is controlled by the external trigger signal, the active (pulse) period of the external trigger signal is the exposure time. The default exposure time for this DCF is **15.5 ms**. This value 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.
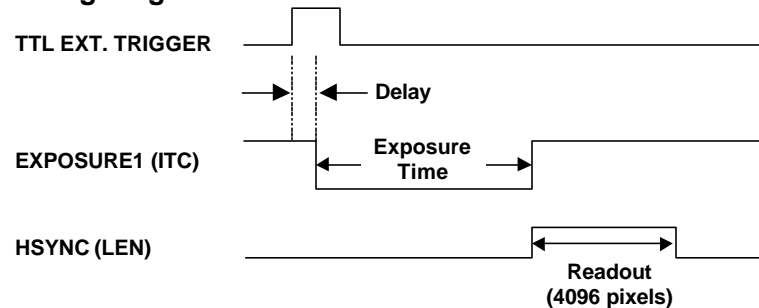
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Camera Interface Details (continued)

Mode 3: Variable line scan (Triggered mode-external)

- **Camera switch settings:** Refer to the camera manual for additional information. Switches for this mode should be set as follows:

Setting	Command
Timing	T = 3

- **Timing diagram:**

TTL EXT. TRIGGER

Delay

EXPOSURE1 (ITC)

Exposure
Time

HSYNC (LEN)

Readout
(4096 pixels)

Cabling Requirements

Modes 1 and 2: Fixed/variable line scan

- **Cable:** DBHD100-TO-OPEN (open ended) cable required for video, synchronization and control signals.
- **Connection:** Connections between the 37-pin connector (ODD DATA/SYNC) of the camera and the 100-pin connector of the Matrox Genesis are as follows:

GEN-DIG-BRD/R/_ (100-pin connector) Pin name	Pin no.		THOMSON TH78CA15 (37-pin connector) Pin name	Pin no.
DATA, INPUT, 0+	01	←	Odd D00+	04
DATA, INPUT, 0-	02	←	Odd D00-	23
DATA, INPUT, 1+	03	←	Odd D01+	05
DATA, INPUT, 1-	04	←	Odd D01-	24
DATA, INPUT, 2+	05	←	Odd D02+	06
DATA, INPUT, 2-	06	←	Odd D02-	25
DATA, INPUT, 3+	07	←	Odd D03+	07
DATA, INPUT, 3-	08	←	Odd D03-	26
DATA, INPUT, 4+	09	←	Odd D04+	08
DATA, INPUT, 4-	10	←	Odd D04-	27
DATA, INPUT, 5+	11	←	Odd D05+	09
DATA, INPUT, 5-	12	←	Odd D05-	28
DATA, INPUT, 6+	13	←	Odd D06+	10
DATA, INPUT, 6-	14	←	Odd D06-	29

Continued…

*Cabling details for the
interface modes*

Cabling Requirements (Continued)

Modes 1 and 2: Fixed/variable line scan

GEN-DIG-BRD/R/_ (100-pin connector) Pin name	Pin no.		THOMSON TH78CA15 (37-pin connector) Pin name	Pin no.
DATA, INPUT, 7+	15	←	Odd D07+	11
DATA, INPUT, 7-	16	←	Odd D07-	30
DATA, INPUT, 8+	17	←	Odd D08+	12
DATA, INPUT, 8-	18	←	Odd D08-	31
DATA, INPUT, 9+	19	←	Odd D09+	13
DATA, INPUT, 9-	20	←	Odd D09-	32
DATA, INPUT, 10+	21	←	Odd D10+	14
DATA, INPUT, 10-	22	←	Odd D10-	33
DATA, INPUT, 11+	23	←	Odd D11+	15
DATA, INPUT, 11-	24	←	Odd D11-	34
HSYNC, INPUT, +	33	←	LEN+	17
HSYNC, INPUT, -	34	←	LEN-	36
CLOCK, INPUT, +	39	←	DATA CLOCK+	37
CLOCK, INPUT, -	40	←	DATA CLOCK-	18
CLOCK, OUTPUT, +	89	→	CLOCKIN-	02
CLOCK, OUTPUT, -	90	→	CLOCKIN+	21
EXPOSURE1, OUTPUT +	95*	→	ITC IN+	03*
EXPOSURE1, OUTPUT -	96*	→	ITC IN-	22*

* These connections are not required for this mode, however allows this cable to be used with all modes.

- **Connection:** Connections between the 37-pin connector (EVEN DATA) of the camera and the 100-pin connector of the Matrox Genesis are as follows:

GEN-DIG-BRD/R/_ (100-pin connector) Pin name	Pin no.		THOMSON TH78CA15 (37-pin connector) Pin name	Pin no.
DATA, INPUT, 16+	51	←	Even D00+	01
DATA, INPUT, 16-	52	←	Even D00-	14
DATA, INPUT, 17+	53	←	Even D01+	02
DATA, INPUT, 17-	54	←	Even D01-	15
DATA, INPUT, 18+	55	←	Even D02+	03
DATA, INPUT, 18-	56	←	Even D02-	16
DATA, INPUT, 19+	57	←	Even D03+	04
DATA, INPUT, 19-	58	←	Even D03-	17
DATA, INPUT, 20+	59	←	Even D04+	05
DATA, INPUT, 20-	60	←	Even D04-	18
DATA, INPUT, 21+	61	←	Even D05+	06
DATA, INPUT, 21-	62	←	Even D05-	19

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Cabling details for the interface modes

Cabling Requirements (Continued)

Modes 1 and 2: Fixed/variable line scan

GEN-DIG-BRD/R/_ (100-pin connector) Pin name	Pin no.		THOMSON TH78CA15 (37-pin connector) Pin name	Pin no.
DATA, INPUT, 22+	63	←	Even D06+	07
DATA, INPUT, 22-	64	←	Even D06-	20
DATA, INPUT, 23+	65	←	Even D07+	08
DATA, INPUT, 23-	66	←	Even D07-	21
DATA, INPUT, 24+	67	←	Even D08+	09
DATA, INPUT, 25-	68	←	Even D08-	22
DATA, INPUT, 25+	69	←	Even D09+	10
DATA, INPUT, 25-	70	←	Even D09-	23
DATA, INPUT, 26+	71	←	Even D10+	11
DATA, INPUT, 26-	72	←	Even D10-	24
DATA, INPUT, 27+	73	←	Even D11+	12
DATA, INPUT, 27-	74	←	Even D11-	25
GROUND	50	--	GROUND	13

Mode 3: Variable line scan (Triggered mode-external)

- **Cable:** IMG-7W2-TO-5BNC and DBHD100-TO-OPEN (open ended) cables required for video, synchronization and control signals.
- **External trigger:** TTL external trigger signal should be connected to trigger input BNC (gray) of the IMG-7W2-TO-5BNC cable.
- **Connection:** Connections between the 37-pin connector (ODD DATA/SYNC) of the camera and the 100-pin connector of the Matrox Genesis are as in Mode 1 and 2: *Fixed/variable line scan* including the following:

GEN-DIG-BRD/R/_ (100-pin connector) Pin name	Pin no.		THOMSON TH78CA15 (37-pin connector) Pin name	Pin no.
EXPOSURE1, OUTPUT +	95	→	ITC IN+	03
EXPOSURE1, OUTPUT -	96	→	ITC IN-	22

The DCF(s) mentioned in this application note can be found on the MIL 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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