FASTIMAGE 1300

CAMERA INTEGRATION GUIDE

30002-00183

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MANUAL FIGURES & TABLES

OTHER ALACRON MANUALS

Alacron manuals cover all aspects of FastSeries hardware and software installation and operation. Call Alacron at 603-891-2750 and ask for the appropriate manuals from the list below if they did not come in your FastSeries shipment.

- 30002-00146 FastImage and FastFrame HW Installation for PCI Systems
- 30002-00148 ALFAST Runtime Software Programmer's Guide & Reference
- 30002-00150 FastSeries Library User's Manual
- 30002-00153 Fast I/O Hardware User's Guide
- 30002-00155 FastMem Hardware User's Manual
- 30002-00169 ALRT Runtime Software Programmer's Guide & Reference
- 30002-00170 ALRT, ALFAST & FASTLIB Software Installation Manual for Linux
- 30002-00171 ALRT, ALFAST, & FASTLIB Software Installation for Windows NT
- 30002-00172 FastImage 1300 Hardware User's Guide
- 30002-00173 FastMem Programmer's Guide & Reference
- 30002-00174 FastMem Hardware Installation Manual
- 30002-00180 Fast4 1300 Hardware User's Guide
- 30002-00184 FastSeries Getting Started Manual
- 30002-00185 FastVision Hardware Installation Manual
- 30002-00186 FastVision Software Installation Manual
- 30002-00188 FOIL – **F**astSeries **O**bject **I**maging **L**ibrary

SYSTEM REQUIREMENTS

- Windows™ NT with service pack 6 or Windows™ 2000 with service pack 2 operating systems fully installed.
- Minimum 128MB memory installed.
- Software Development Environment (SDE)
- WinZip software.
- Acrobat Reader Software
- ALFAST & ALRT software is available for Linux and Windows™ NT & Windows™ 2000 operating systems.
- Air circulation of at least 200 LFM is required for the Alacron FastSeries boards.
- The operating temperature range of the FastImage boards is 0° Celsius to 40° Celsius.

I. INTRODUCTION

A. Camera Connections

The FastImage1300 imaging system can process continuous video streams from up to four cameras. The board is designed to operate with analog and digital cameras from most manufacturers. However, each camera and each application may have unique requirements. This manual describes in general terms how to connect a camera to the FastImage1300 and integrate the FastImage1300 in your application. Figure 1 diagrams the issues you must consider.

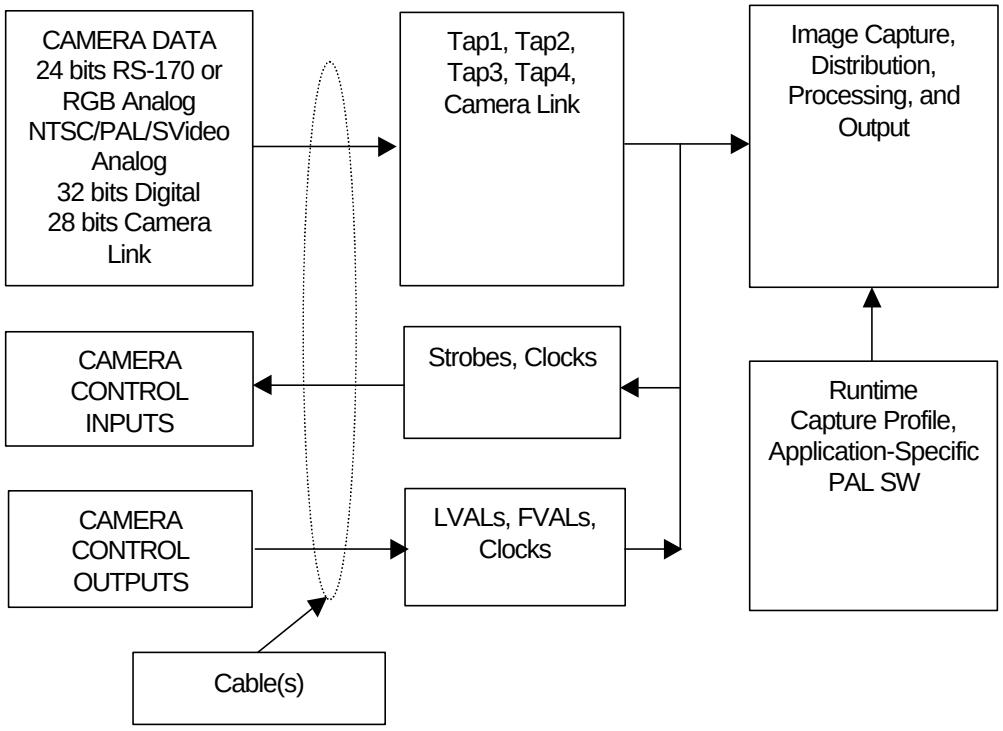

Figure 1. Camera Connections to the FastImage1300

B. Camera Data

The camera data depends on the type of camera you want to integrate.

The video format can be RS-170 analog monochrome or RGB, NTSC/PAL analog, up to 32-bit differential digital, or 28-bit Camera Link digital. The camera format governs the connector and cabling you will need.

The camera can be line scan or area scan (frame). Line scan and area scan cameras use different control signals. You must specify the line or frame rate, and the pixel depth. Together, these parameters set the overall data rate that must be supported.

The camera can be single- or multi-tap. You must specify how the camera divides the image up into its output taps.

C. Input Taps and Camera Link Input

The board has four inputs, Tap1 through Tap4. Each Tap consists of 8 bits data, 2 bits control, and pixel clock. A Tap can be configured for analog input or for digital input (but not both). Tap1 through Tap3 can be populated as either digital input or RS170 compatible analog input. Tap4 can be either digital input or analog input (connected as one-wire NTSC/PAL composite or two-wire NTSC/PAL S-Video component).

The FastImage1300 implements the 28-bit Camera Link digital I/O interface as an option. Compatible cameras or other input devices connect directly to the Camera Link inputs.

The mapping of signals to FastImage1300 inputs depends on the camera type. Subsequent chapters provide the details for each type of camera.

D. Control Signals to Camera

Some cameras need sync triggers, exposure timers, or master clocks. These signals are available as outputs to the camera from the FastImage1300.

E. Control Signals from Camera

Cameras provide control signals such as LVAL, FVAL, as well as data or pixel clocks. The FastImage1300 can use these signals to control the image capture operation.

1. Input Signals from Line Cameras

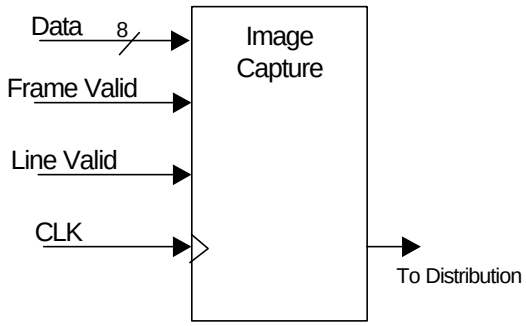

Figure 2. Line Camera Input Signals

For digital line cameras, the Data, Line Valid, and CLK input signals come directly from the connector. For analog line cameras, the input data and controls go through the Sync separators and A/D converters to be converted to the Data, Line Valid, and CLK signals.

2. Input Signals from Frame Cameras

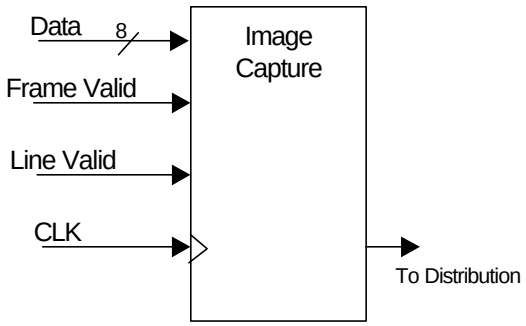

Figure 3. Frame Camera Input Signals and Region of Interest

For digital frame cameras, the Data, Line Valid, Frame Valid, and CLK input signals come directly from the digital input drivers. For analog frame cameras, the input data and controls go through the Sync separators and A/D converters to be converted to the Data, Line Valid, Frame Valid, and CLK signals.

3. NTSC/PAL/S-Video Input Signals

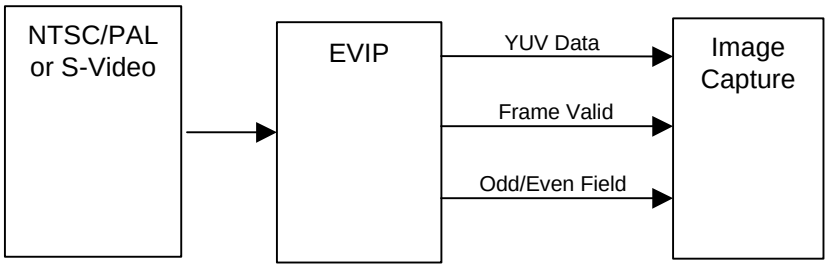

Figure 4. NTSC/PAL/S-Video Input Signals

Composite or component video input to the Enhanced Video Input Processor (EVIP) is converted to YUV data that can be processed directly by the TriMedia. The EVIP provides Frame Valid and Odd/Even field signals.

F. Image Capture, Distribution, Processing, and Output

Analog image data from the camera is captured, converted (as needed) into RGB or YUV digital data by the front end and distributed to the TriMedia processors and to any enabled outputs (SVGA/TV, PMC daughtercards, Host PMC bus).

Digital data inputs pass through two FPGAs, each with an external SDRAM. The FPGAs can perform multiplexing and re-order incoming data for Odd/Even and Left/Right tapped cameras. When using three or four tap cameras, half the bits from each tap are routed to each FPGA, allowing the two parts to operate identically.

1. Region of Interest

A linear region of interest may be specified as begin and end points (X, Y). To accommodate variations in camera timing, the ROI may be specified as a negative value or as a point beyond the upper limit of the line

A rectangular region of interest may be specified as a rectangle with start and end pixels (SP, EP) and start and end lines (SL, EL). To accommodate variations in camera timing, the ROI may be specified using negative values or outside the frame boundaries.

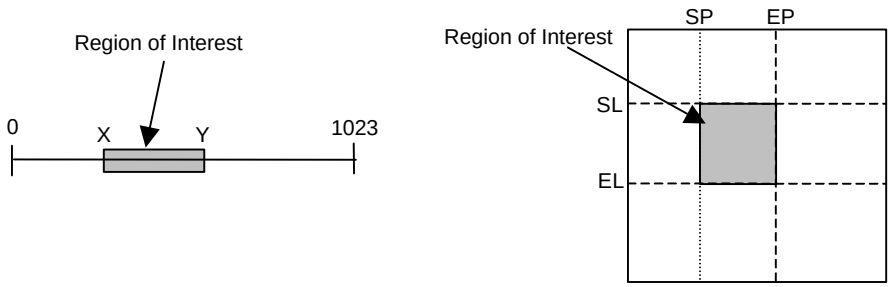

Figure 5. Line and Area Scan Cameras Region of Interest

G. Capture Profile and PAL Software

Image capture, conversion, distribution, processing, and output must be matched to the requirements of the application. The FastImage1300 is configured by programming FPGAs, crosspoint switches, and clock chips on the FastImage1300. The programs for these devices collectively comprise the PAL software for the application.

The PAL SW and other parameters to use for the application are specified in a Runtime Capture Profile. The Capture Profile is loaded and executed by the primary TriMedia on the board at runtime. The Capture Profile specifies the binary files for programming the FPGAs and crosspoint switches. It contains initial register values for the EVIP and default frequencies for the programmable clocks. The Capture Profile specifies the dimensions of the image to be acquired, and the mode of capture (YUV, RAW8, RAW10, MESSAGE PASSING). Each camera type uses a different Capture Profile, but two or more cameras (e.g., the PULNIX TMC-1000 and TMC-6700) can use the same set of PAL binary files.

Many applications can use standard PAL SW furnished with the FastImage1300. Other applications will require customized PAL SW. Custom PAL SW can be created by Alacron to customer specifications under a contract for Non-Recurring Engineering. Contact your Alacron Representative for NRE pricing.

H. Cables

Alacron can supply standard cables for Analog and Digital input, and for Camera Link Input. The details on the standard cables are given in subsequent chapters.

Many applications will require custom cabling to complete the integration. Alacron can create custom cables to customer specifications under a contract for Non-Recurring Engineering. Contact your Alacron Representative for NRE pricing.

I. Power Considerations

The FastImage1300 does not supply any power to the camera. Power must be supplied to the camera by an external source.

The FastImage1300 has two auxiliary power connections. The FastImage1300 requires approximately 8 amps of +5V. 6.5 amps are drawn from the PC power supply via the power cable 10024-00160. The remainder, as well as +/-12V @100MA max, is drawn from the Host PCI connector.

The application may require an Alacron FastMem or Fast4 PMC daughtercard. One or two daughter cards can be mounted. One source of +3.3V must be connected via power cable 10024-00160 for each FastMem or Fast4, using two power cables when two daughtercards are mounted.

II. ANALOG CAMERAS

A. Analog Video Input

The FastImage1300 supports capture from analog cameras using composite NTSC/PAL one-wire connection, component S-Video two-wire connection, monochrome RS-170, or RGB RS-170 data.

1. NTSC/PAL Composite and S-Video Component Input

An Enhanced Video Input Processor (EVIP) with four RS-170 level video inputs allows selection from four composite video sources or two pairs of S-video signals.

The EVIP digitizes composite or S-video from any source adhering to the NTSC, PAL or SECAM standards for 525-line 59.94 Hz and 625-line 50 Hz video. The chip has four inputs VID1 through VID4 as shown in Table 1. Each input can receive a separate composite video source, one of which is selected to be sent through the processors. Two S-video sources can be connected (Y on VID1,UV on VID3 or Y on VID2, UV on VID4), one of which is the selected input. These inputs are multiplexed into a common converter (two converters in S-video mode). The primary TriMedia controls the input selection.

J1B Pins	J1B Signal	Analog In to EVIP	EVIP Input Pin
58, 59	Tap4_D0, GND	VID1	AI11
56, 57	Tap4_D1, GND	VID2	AI12
54, 55	Tap4_D2, GND	VID3	AI21
52, 53	Tap4_D3, GND	VID4	AI22

Table 1. Composite Analog Video Inputs

The EVIP outputs 8-bit parallel digitized video encoded per ITU-R BT.656 which can be directly acquired by the TriMedia processors or the S3 Virge GX2. The pixel rate is phase locked to the horizontal scan rate of the input image and is nominally 13.5 MHz. Since each pixel requires 16 bits of data, the data output clock rate is 27 MHz. Color video requires three values per pixel. NTSC and PAL use Y (luminance) Cr (red portion of chroma) and Cb (blue portion of chroma). For eight-bit resolution of each component, 24 bits per pixel would be required.

The pixel size of 16 bits (rather than 24 bits) is realized by sub-sampling the chroma portion of the input signal per ITU-R BT.601 (ITU recommendation - broadcast television 601, formerly known as CCIR601) 13.5 MHz 4:2:2 encoding standard. The mnemonic 4:2:2 refers to the fact that for every four pixels, luminance (Y) is sampled four times, while chroma (Cr and Cb) components are only sampled twice. This sub-sampling is in line with the chroma bandwidth limits of the NTSC / PAL standards and does not cause a degradation of picture quality.

2. Monochrome and RGB Analog Video Input

Three 8-bit RS-170 level video inputs can be used to capture images from three monochrome cameras or one RGB camera. Each channel has sync detection and pixel clock generation to allow simultaneous acquisition from three independent (non-genlocked) sources. Sync and pixel clocks may also be driven from an external RS-422 source. Independent offset and gain controls are available for each of the three channels. Maximum conversion rate (pixel clock) is 80 Mpixels/s. Output from the A/D converters can be further processed.

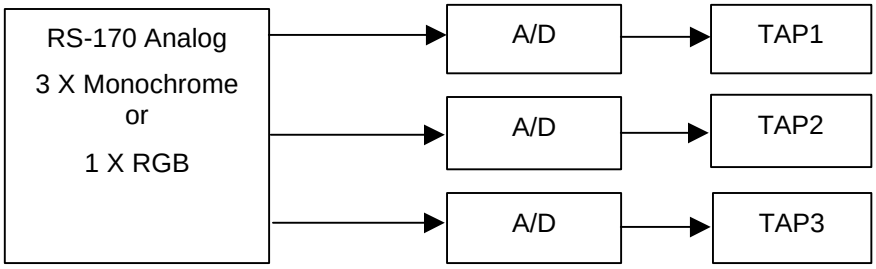

Figure 6. RS-170 Analog Video Input

Table 2 shows the connector pins and associated taps for RS-170 Analog input on the FastImage1300.

Pins	Signal
J1A-10, J1A-11	Tap1-D0, GND
J1A-58, J1A-59	Tap2-D0, GND
J1B-10, J1B-11	Tap3-D0, GND

Table 2. 8-Bit Analog Input Channels

B. Analog Input Connector (J1A/J1B)

The Analog Input connector is on the Rear PCI Bracket: JA1/J1B is a Dual 68-Pin Connector (Table 3). Analog signals connect to the lower-numbered pins with return on the higher-numbered pins. Here is a summary of the analog input pins on this connector.

J1A/J1B Pins	J1A Signal	J1B Signal	J1A/J1B Pins	J1A Signal	J1B Signal
1,2	Tap1_LVAL	Tap3_LVAL	35, 36	STROBE_1	STROBE_3
3, 4	Tap1_FVAL	Tap3_FVAL	37, 38	STROBE_2	STROBE_4
5, 6	Tap1_PXCK	Tap3_PXCK	39, 40	MASTER_CK1	MASTER_CK3
7, 8	GPIN1	GPIN3	41, 42	MASTER_CK2	MASTER_CK4
9	GND	GND	43	GND	GND
10, 11	Analog RS170 Input 1	Analog RS170 Input 3	44, 45	Not used	Not used
12, 13	Not used	Not used	46, 47	Not used	Not used
14, 15	Not used	Not used	48, 49	Not used	Not used
16, 17	Not used	Not used	50, 51	Not used	Not used
18, 19	Not used	Not used	52, 53	Not used	Analog Composite 4, S-Video C2
20, 21	Not used	Not used	54, 55	Not used	Analog Composite 3, S-Video C1
22, 23	Not used	Not used	56, 57	Not used	Analog Composite 2, S-Video Y2
24, 25	Not used	Not used	58, 59	Analog RS170 Input 2	Analog Composite 1, S-Video Y1
26	GND	GND	60	GND	GND
27, 28	EXT_TRIG1	EXT_TRIG2	61, 62	GPIN2	GPIN4
29, 30	GPIN5	GPIN6	63, 64	Tap2_LVAL	Tap4_LVAL
31, 32	GPOUT1	GPOUT3	65, 66	Tap2_FVAL	Tap4_FVAL
33, 34	GPOUT2	GPOUT4	67, 68	Tap2_PXCK	Tap4_PXCK

Table 3. Analog Input Connector J1A/J1B

C. *Analog Camera Cables*

1. Alacron Analog Input Cable

The Alacron Analog Input cable 10024-00162 has a 68-pin connector (Cable-P1) on one end and four output connectors, three BNC (Cable-P2, -P3, and -P4) and one DB-9F (Cable-P5). The Three BNC connectors are labeled P2, P3, and P4. Cable-P1 mates with one of the 68-pin sockets in the dual 68-pin input connector, J1A/J1B on FastImage. Table 4 shows the signals for the pins of P2, P3, P4, and P5 when connected to either J1A or J1B.

Conn-Pin	J1A/J1B Pin	J1A Signal	J1B Signal
P2-Center	10	Tap1 RS170 In	Tap3 RS170 In
P2-Shell	11	Tap1 RS170 Return	Tap3 RS170 Return
P3-Center	54	Not Used for Analog	Tap4 EVIP VID3 In (Comp/C)
P3-Shell	55	Not Used for Analog	Tap4 EVIP VID3 Return
P4-Center	58	Tap2 RS170 In	Tap4 EVIP VID1 In (Comp/Y)
P4-Shell	59	Tap2 RS170 Return	Tap4 EVIP VID1 Return
P5-1	1	Tap1 Line Valid Pos	Tap3 Line Valid Pos
P5-2	5	Tap1 Pixel Clock Pos	Tap3 Pixel Clock Pos
P5-3	26	GND	GND
P5-4	27	Ext Trigger 1 Pos	Ext Trigger 2 Pos
P5-5	37	Strobe 2 Pos	Strobe 4 Pos
P5-6	2	Tap1 Line Valid Neg	Tap3 Line Valid Neg
P5-7	6	Tap1 Pixel Clock Neg	Tap3 Pixel Clock Neg
P5-8	28	Ext Trigger 1 Neg	Ext Trigger 2 Neg
P5-9	38	Strobe 2 Neg	Strobe 4 Neg

Table 4. Analog Input Cable 10024-00161

The cable to J1A provides RS170 analog video inputs to Tap1 and Tap2. The cable to J1B provides RS170 analog input to Tap3 and composite or component video inputs to Tap4. A composite video source (NTSC/PAL/SECAM) can connect to either VID1 or VID3 (the input to the EVIP is software-downloadable). A component (S-video) source connects the Y (luma) component to VID1 and the C (chroma) component to VID3.

2. Camera-Specific Cables

Alacron has developed cables for many analog camera models. Ask your Alacron Representative for details.

D. *Analog Input PAL Files*

Alacron provides standard sets of FastImage1300 PAL SW files for analog video capture and processing as examples in the ALFAST Runtime SW.

1. PALs for RS-170 Analog

These PALs (**RS-170.ex2**) implement analog video capture for 60 Hz / 525 line interlaced cameras. These PALs are example 2 of the ALFAST distribution.

The timing parameters are programmed into the PALs and require re-compilation to change. Because of the split “crosspoint switch” in the FastImage 1300, the mapping of input taps to processors is as follows:

Tap 1 (RS-170)	**-**	**TriMedia 0**
Tap 2 (RS-170)	**-**	**TriMedia 2**
Tap 3 (RS-170)	**-**	**TriMedia 1**
Tap 4 (NTSC / PAL)	**-**	**TriMedia 3**

2. PALs for NTSC Analog

These PALs (**NTSC.ex3**) implement analog video capture for NTSC/PAL cameras. These PALs are example 3 of the ALFast distribution.

The “crosspoint switch” PALs (PAL3 and PAL4) connect the output of the EVIP to all four TriMedia.

3. Camera-Specific PAL Files

Alacron has developed integration PALs for many analog camera models. Ask your Alacron Representative for details.

III. DIGITAL CAMERAS

A. Digital Input

Digital video input lines allow direct connection of digital line-scan or area-scan cameras of up to 32 bits. The 32 Digital data inputs are received by high-speed LVDS differential receivers.

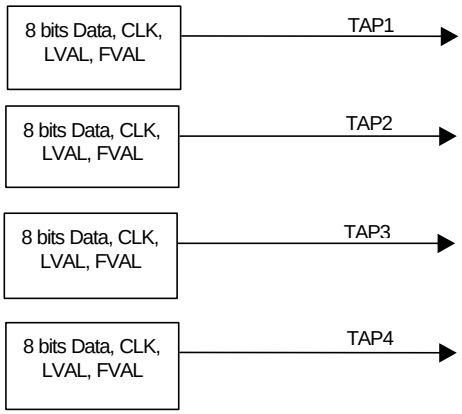

Figure 7. Digital Video Input

B. Digital Control Inputs

Four clock inputs (Tap*n*_PIXCK) come in through the input connector J1A/J1B. These inputs are received by high-speed differential receivers. The outputs of these receivers go to dedicated global clock inputs. PIX_CLK1 should be used for multi-tap cameras. Programmable clock polarity and input delay allow compensation for clock to data skew.

Eight additional control inputs (Tap*n*_LVAL and Tap*n*_FVAL) come in through the Digital input connector J1A/J1B. These inputs are received by high-speed differential receivers. The outputs of these receivers (LVAL*n*, FVAL*n*) go to the FPGAs. These lines may be used for frame valid and line valid signals when attaching multiple cameras.

Four general purpose static inputs (GPIN*n*) are provided. These inputs are received by differential receivers. The outputs of these receivers can be read by the primary TriMedia via the I^2C bus.

C. Digital Control Outputs

Two outputs are provided for line or frame start. The two frame start signals are generated in the CPLD in response to external trigger inputs (after a programmed delay) or on command of the primary TM1300. These differential outputs are intended for use with line scan or area scan cameras which require a scan start pulse.

Two outputs are provided for exposure control. These differential outputs are intended for use with line scan or area scan cameras which require a scan start pulse. They are generated in the CPLD in response to external trigger inputs (without a delay) or on command of the primary TM1300. Camera exposure time is controlled by the delay between these signals and the line / frame start signals.

Two master clock outputs are provided to generate a time base for cameras. These RS422 differential outputs are intended for use with line scan or area scan cameras which require an external time base.

Four general purpose static outputs are provided. These RS422 differential outputs can be written directly by the primary TM1300 via the I^2C bus.

1. Frame/Line Start and Exposure

Four strobe lines, STROBE1-STROBE4, are output to connector J1A/J1B. These RS422 differential outputs are for line scan or area scan cameras which require a scan start pulse, readout, or exposure control signals (e.g., EXSYNC and PRIN to Dalsa cameras).

The CPLD has two counters for generating line/frame start and exposure timing signals. STROBE1 outputs Counter1 start, STROBE2 outputs Counter1 exposure. STROBE3 outputs Counter2 start, and STROBE4 outputs Counter2 exposure.

The camera control signals provide a flexible control interface. In a typical application, a Cmp1 signal could be used to start camera exposure. The corresponding Cmp2 signal could initiate transmission of the camera data to the FastImage.

2. Master Clocks

Four master clock outputs (MASTER_CK*n*) to connector J1A/J1B are provided to generate a time base for cameras. These RS422 differential outputs are intended for use with line scan or area scan cameras which require an external time base. Master clock outputs are generated by the primary and secondary TriMedia's using the AI_OSCLK outputs. Only one clock source is available on the single processor model. These pins can generate any frequency from 1 Hz to 40 MHz in .07 Hz steps using the direct digital synthesizer of the TriMedia. Nominal jitter on these outputs due to digital synthesis is 3.3

nanoseconds. This is reduced to less than 1 nanosecond in the TM1300 when the improved mode is used. In TM1300 improved mode, the frequency resolution is 0.3 Hz.

3. General-Purpose Outputs

Four general purpose static outputs (GPOUT0-3) are provided to connector J1A/J1B. These RS422 differential outputs can be written out through the UART by the primary TriMedia (via the I^2C bus).

D. Digital Input Connector (J1A/J1B)

The Digital Input connector is on the Rear PCI Bracket: JA1/J1B is a Dual 68-Pin Connector, with 32-bit Digital Inputs and Control (Table 6). Digital signals are differential, consisting of a positive and a negative signal pair; in the table, they are combined (e.g., differential signals Tap1_LVALP and Tap1_LVALN* are shown as just Tap1_LVAL). The positive signal is always the lower-numbered pin in each pair; the negative signal is the higher-numbered pin.

J1A/J1B Pins	J1A Signal	J1B Signal	J1A/J1B Pins	J1A Signal	J1B Signal
1,2	Tap1_LVAL	Tap3_LVAL	35, 36	STROBE_1	STROBE_3
3, 4	Tap1_FVAL	Tap3_FVAL	37, 38	STROBE_2	STROBE_4
5, 6	Tap1_PXCK	Tap3_PXCK	39, 40	MASTER_CK1	MASTER_CK3
7, 8	GPIN1	GPIN3	41, 42	MASTER_CK2	MASTER_CK4
9	GND	GND	43	GND	GND
10, 11	Tap1_D0	Tap3_D0	44, 45	Tap2_D7	Tap4_D7
12, 13	Tap1_D1	Tap3_D1	46, 47	Tap2_D6	Tap4_D6
14, 15	Tap1_D2	Tap3_D2	48, 49	Tap2_D5	Tap4_D5
16, 17	Tap1_D3	Tap3_D3	50, 51	Tap2_D4	Tap4_D4
18, 19	Tap1_D4	Tap3_D4	52, 53	Tap2_D3	Tap4_D3
20, 21	Tap1_D5	Tap3_D5	54, 55	Tap2_D2	Tap4_D2
22, 23	Tap1_D6	Tap3_D6	56, 57	Tap2_D1	Tap4_D1
24, 25	Tap1_D7	Tap3_D7	58, 59	Tap2_D0	Tap4_D0
26	GND	GND	60	GND	GND
27, 28	EXT_TRIG1	EXT_TRIG2	61, 62	GPIN2	GPIN4
29, 30	GPIN5	GPIN6	63, 64	Tap2_LVAL	Tap4_LVAL
31, 32	GPOUT1	GPOUT3	65, 66	Tap2_FVAL	Tap4_FVAL
33, 34	GPOUT2	GPOUT4	67, 68	Tap2_PXCK	Tap4_PXCK

Table 5. Analog and Digital Input Connector J1A/J1B

E. Digital Input Cables

1. Alacron Digital Input Cable

The Alacron Digital Input Cable 10024-00161 is a Y cable with one 68-pin connector (Cable-P1) and two 37-pin female DSUB37 connectors (Cable-P2 on the direct cable to Cable-P1 and Cable-P3 at the end of the Y). Cable-P1 mates with one of the 68-pin sides on the dual 68-pin connector (J1A/J1B). Tables 1 and 2 show the signals at the pins of P2 and P3 (respectively) when connected to either J1A or J1B. Each digital input signal is a differential pair. The positive-true signal has suffix P; the negative-true signal has suffix N.

Conn-Pin	J1A Signal	J1B Signal
P2-1	EXT_TRIG1P	EXT_TRIG2P
P2-2	STROBE_1P (Output)	STROBE_3P (Output)
P2-3	GPOUT1P (Output)	GPOUT3P (Output)
P2-4	MASTER_CK1P (Output)	MASTER_CK3P (Output)
P2-5	GND	GND
P2-6	Tap1_D7P	Tap3_D7P
P2-7	Tap1_D6P	Tap3_D6P
P2-8	Tap1_D5P	Tap3_D5P
P2-9	Tap1_D4P	Tap3_D4P
P2-10	Tap1_D3P	Tap3_D3P
P2-11	Tap1_D2P	Tap3_D2P
P2-12	Tap1_D1P	Tap3_D1P
P2-13	Tap1_D0P	Tap3_D0P
P2-14	GND	GND
P2-15	Tap1_PXCKP	Tap3_PXCKP
P2-16	GPIN1P	GPIN3P
P2-17	Tap1_LVALP	Tap3_LVALP
P2-18	Tap1_FVAL	Tap3_FVALP
P2-19	N/C	N/C
P2-20	EXT_TRIG1N	EXT_TRIG2N
P2-21	STROBE_1N (Output)	STROBE_3N (Output)
P2-22	GPOUT1N (Output)	GPOUT3N (Output)
P2-23	MASTER_CK1N (Output)	MASTER_CK3N (Output)
P2-24	N/C	N/C
P2-25	Tap1_D7N	Tap3_D7N
P2-26	Tap1_D6N	Tap3_D6N
P2-27	Tap1_D5N	Tap3_D5N
P2-28	Tap1_D4N	Tap3_D4N
P2-29	Tap1_D3N	Tap3_D3N
P2-30	Tap1_D2N	Tap3_D2N
P2-31	Tap1_D1N	Tap3_D1N
P2-32	Tap1_D0N	Tap3_D0N
P2-33	N/C	N/C
P2-34	Tap1_PXCKN	Tap3_PXCKN
P2-35	GPIN1N	GPIN3N
P2-36	Tap1_LVALN	Tap3_LVALN
P2-37	Tap1_FVALN	Tap3_FVALN

Table 6. Digital Input Cable 10024-00161, DSUB37 Connector P2

Conn-Pin	J1A Signal	J1B Signal
P3-1	GPIN5P	GPIN6P
P3-2	STROBE_2P (Output)	STROBE_4P (Output)
P3-3	GPOUT2P (Output)	GPOUT4P (Output)
P3-4	MASTER_CK2P (Output)	MASTER_CK4P (Output)
P3-5	GND	GND
P3-6	Tap2_D7P	Tap4_D7P
P3-7	Tap2_D6P	Tap4_D6P
P3-8	Tap2_D5P	Tap4_D5P
P3-9	Tap2_D4P	Tap4_D4P
P3-10	Tap2_D3P	Tap4_D3P
P3-11	Tap2_D2P	Tap4_D2P
P3-12	Tap2_D1P	Tap4_D1P
P3-13	Tap2_D0P	Tap4_D0P
P3-14	GND	GND
P3-15	Tap2_PXCKP	Tap4_PXCKP
P3-16	GPIN2P	GPIN4P
P3-17	Tap2_LVALP	Tap4_LVALP
P3-18	Tap2_FVALP	Tap4_FVALP
P3-19	N/C	N/C
P3-20	GPIN5N	GPIN6N
P3-21	STROBE_2N (Output)	STROBE_4N (Output)
P3-22	GPOUT2N (Output)	GPOUT4N (Output)
P3-23	MASTER_CK2N (Output)	MASTER_CK4N (Output)
P3-24	N/C	N/C
P3-25	Tap2_D7N	Tap4_D7N
P3-26	Tap2_D6N	Tap4_D6N
P3-27	Tap2_D5N	Tap4_D5N
P3-28	Tap2_D4N	Tap4_D4N
P3-29	Tap2_D3N	Tap4_D3N
P3-30	Tap2_D2N	Tap4_D2N
P3-31	Tap2_D1N	Tap4_D1N
P3-32	Tap2_D0N	Tap4_D0N
P3-33	N/C	N/C
P3-34	Tap2_PXCKN	Tap4_PXCKN
P3-35	GPIN2N	GPIN4N
P3-36	Tap2_LVALN	Tap4_LVALN
P3-37	Tap2_FVALN	Tap4_FVALN

Table 7. Digital Input Cable 10024-00161, DSUB37 Connector P3

2. Camera-Specific Cables

Alacron has developed cables for many digital camera models. Ask your Alacron Representative for details.

F. Digital Input PAL Files

Alacron provides off-the-shelf sets of FastImage1300 PAL SW files for digital video capture and processing.

1. 16-Bit Digital Line Scan Cameras

These PALs (**2by16bitLS**) implement a 16-bit line-scan camera input for the FastImage board. Two TriMedias are fed from each 16-bit line-scan camera. Each TriMedia can start or stop capture at the end of a line using the I2C bus.

PAL1 does all of the data capture for processors 0 and 1. PAL2 provides for a second camera input which connects to processors 2 and 3.

Processors must use raw 8-bit capture mode and set the buffer size to an integral number of lines. Note that in continuous capture mode it is possible to set the buffer as small as 1 line, however this places a high interrupt overhead on the TriMedia processor as it needs to set up for the next buffer as each buffer is filled.

Taps 1 and 2 provide data inputs for the odd and even bytes of the first camera respectively. Strobe (pixel clock) and Line Valid signals must be presented on Tap 1.

Taps 3 and 4 provide data inputs for the odd and even bytes of the second camera respectively. Strobe (pixel clock) and Line Valid signals must be presented on Tap 3.

Data and control are sampled on the rising edge of the pixel clock. The cabling below represents a swap in the STROBE differential pair to effectively invert the clock to the frame grabber.

Minimum connections for each camera:

Camera:	Signal:	Alacron 10024-00161 cable (Mates with 2 x DB37 male)
OS1-1	D7	P2-6
OS1-2	D7B	P2-25
OS1-3	D6	P2-7
OS1-4	D6B	P2-26
OS1-5	D5	P2-8
OS1-6	D5B	P2-27
OS1-7	D4	P2-9
OS1-8	D4B	P2-28
OS1-9	D3	P2-10
OS1-10	D3B	P2-29
OS1-11	D2	P2-11
OS1-12	D2B	P2-30
OS1-13	D1	P2-12
OS1-14	D1B	P2-31
OS1-15	D0	P2-13
OS1-16	D0B	P2-32
OS1-17	STROBE P2-34	
OS1-18	STROBEB	P2-15
OS1-19	LVAL	P2-17
OS1-20	LVALB	P2-36
OS2-1	D7	P3-6
OS2-2	D7B	P3-25
OS2-3	D6	P3-7
OS2-4	D6B	P3-26
OS2-5	D5	P3-8
OS2-6	D5B	P3-27
OS2-7	D4	P3-9
OS2-8	D4B	P3-28
OS2-9	D3	P3-10
OS2-10	D3B	P3-29
OS2-11	D2	P3-11
OS2-12	D2B	P3-30
OS2-13	D1	P3-12
OS2-14	D1B	P3-31
OS2-15	D0	P3-13
OS2-16	D0B	P3-32

2. 32-bit Digital Line Scan Cameras

This PAL set (**FI32bitLS**) takes a single 1- to 4-tap digital line-scan camera and runs the data from each tap to a separate TriMedia processor.

Each TriMedia can control its Data Valid input using the I2C lines. When capture is enabled by pulsing the SDA line low while leaving SCL high, the Data Valid input will come on at the beginning of the next line.

If the camera has a total number of clocks per line which is not a multiple of 64, the line is padded out at the end to the next multiple of 64. A line counter in the FPGA sources the data during this padding interval. Pad data can then be used to synchronize the TriMedias to the same line. This feature is not available if the camera produces a multiple of 64 valid pixel clocks per line.

3. 8-bit Digital Area Scan Cameras

These PALs (**D4x8bit.ex1**) implement a four 8-bit digital area-scan camera input capture. Each of the four cameras is fed to a separate TriMedia processor. The PULNIX TM9700 or TM9701 monochrome camera is presumed for the camera in the example capture profile. These PALs were generated for example 1 of the software distribution. They can work with a variety of cameras because the capture area is defined by the camera LVAL and FVAL signals and not internal counters in the PALs. Because of the split "crosspoint switch" in the FastImage 1300, the mapping of input taps to processors is as follows:

Tap 1	**-**	**TriMedia 0**
Tap 2	**-**	**TriMedia 2**
Tap 3	**-**	**TriMedia 1**
Tap 4	**-**	**TriMedia 3**

4. 12-Bit Digital Area Scan Cameras

These files (**D1x12bit** and **D2x12bit**) are for capturing from a single 12-bit digital camera with the FastImage 1300 board. Data from the camera is fed to all four TriMedia processors. Alternately (with 2camera.cap) 2 cameras may be used, each feeding 2 TriMedia processors. Capture profile **1camera.cap** is set up for one 3K by 2K camera (SMD 6M3P). frame.c uses this capture profile but only displays the upper left 640 by 480 of the picture. **2camera.cap** is set up for two 3K x 2K cameras, each feeding two TriMedias.

Camera control signals and the low order 8 bits of data come in on Tap 1. The upper 4 data bits come in on Tap 2's low order 4 bits. Output data from the FPGA is clocked by PROG_CLK1. This is set to about 50 MHz in the current version. It needs to be at least twice the input clock rate. Maximum value is 80 MHz. Operation was tested with a smaller format (SMD BT-25) camera.

5. 32-bit Digital Area Scan Cameras

This PAL set (**FI32bitAS**) takes a single 4-tap digital camera and runs the data from each tap to a separate TriMedia processor.

Each TriMedia can control its Data Valid input using the I2C lines. When capture is enabled by pulsing the SDA line low while leaving SCL high, the Data Valid input will come on at the beginning of the next frame.

If the camera has a total number of clocks per frame which is not a multiple of 64, the frame is padded out at the end to the next multiple of 64. A frame counter in the FPGA sources the data during this padding interval. Pad data can then be used to synchronize

the TriMedias to the same frame. This feature is not available if the camera produces a multiple of 64 valid pixel clocks per frame.

6. Camera-Specific PAL Files

Alacron has developed integration PALs for many digital camera models. Ask your Alacron Representative for details.

IV. CAMERA LINK CAMERAS

The FastImage1300 implements the 28-bit Camera Link digital I/O interface as an option. Compatible cameras can be connected directly to the Channel Link inputs.

A. Camera Link Connector (J2)

Camera Link Connector J2 is the 68-Pin connector on the Rear PCI Bracket.

Pin	Signal	Pin	Signal
1	Not Used	68	CL_RXIN3P
2	Not Used	67	CL_RXIN3N
3	Not Used	66	GND
4	Not Used	65	GND
5	Not Used	64	CL-RXCLKINP
6	Not Used	63	CL-RXCLKINN
7	Not Used	62	GND
8	Not Used	61	GND
9	Not Used	60	CL_RXIN2P
10	Not Used	59	CL_RXIN2N
11	Not Used	58	GND
12	GND	57	GND
13	RS232-HSHKO	56	CL_RXIN1P
14	GND	55	CL_RXIN1N
15	CL_TXOUT3P	54	GND
16	CL_TXOUT3N	53	GND
17	GND	52	CL_RXIN-0P
18	GND	51	CL_RXIN0N
19	CL_TXCLKOUTP	50	GND
20	CL_TXCLKOUTN	49	GND
21	GND	48	Not Used
22	GND	47	Not Used
23	CL_TXOUT2P	46	Not Used
24	CL_TXOUT2N	45	Not Used
25	GND	44	Not Used
26	GND	43	Not Used
27	CL_TXOUT1P	42	Not Used
28	CL_TXOUT1N	41	Not Used
29	GND	40	Not Used
30	GND	39	Not Used
31	CL_TXOUT0P	38	Not Used
32	CL_TXOUT0N	37	Not Used
33	GND	36	Not Used
34	GND	35	Not Used

Table 8. Camera Link Connector J2

B. Camera Link Cable

The FastImage1300 Multifunction cable 10024-00175 has a 68-pin connector (Cable-P1) on one end and five connectors on the other, one of which is the mini-D-26-ribbon connector, P6, for Channel Link Input (not Output)

FastImage1300 Signal	Board Pin	Camera Pin	Camera Signal
GND	P1-50	P6-14	SHIELD
CL_RXIN0N	P1-51	P6-2	X0-
CL_RXIN0P	P1-52	P6-15	X0+
GND	P1-54	P6-14	SHIELD
CL_RXIN1N	P1-55	P6-2	X1-
CL_RXIN1P	P1-56	P6-15	X1+
GND	P1-58	P6-14	SHIELD
CL_RXIN2N	P1-59	P6-2	X2-
CL_RXIN2P	P1-60	P6-15	X2+
GND	P1-62	P6-14	SHIELD
CL_RXCLKINN	P1-63	P6-2	XCLK-
CL_RXCLKINP	P1-64	P6-15	XCLK+
GND	P1-66	P6-14	SHIELD
CL_RXIN3N	P1-67	P6-2	X3-
CL_RXIN3P	P1-68	P6-15	X3+

Table 9. Camera Link Cable

V. TROUBLESHOOTING

There are several things you can try before you call Alacron Technical Support for help.

_____ Make sure the computer is plugged in. Make sure the power source is on.

_____ Go back over the hardware installation to make sure you didn't miss a page or a section.

_____ Go back over the software installation to make sure you have installed all necessary software.

_____ Run the Installation User Test to verify correct installation of both hardware and software.

_____ Run the user-diagnostics test for your main board to make sure it's working properly.

_____ Insert the Alacron CD-ROM and check the various Release Notes to see if there is any information relevant to the problem you are experiencing.

The release notes are available in the directory: **\usr\alacron\alinfo**

_____ Compile and run the example programs found in the directory: **\usr\alacron\src\examples**

_____ Find the appropriate section of the Programmer's Guide & Reference or the Library User's Manual for the particular library and problem you are experiencing. Go back over the steps in the guide.

_____ Check the programming examples supplied with the runtime software to see if you are using the software according to the examples.

_____ Review the return status from functions and any input arguments.

_____ Simplify the program as much as possible until you can isolate the problem. Turning off any operations not directly related may help isolate the problem.

_____ Finally, first **save your original work**. Then remove any extraneous code that doesn't directly contribute to the problem or failure.

VI. ALACRON TECHNICAL SUPPORT

Alacron offers technical support to any licensed user during the normal business hours of 9 a.m. to 5 p.m. EST. We offer assistance on all aspects of processor board and PMC installation and operation.

A. Contacting Technical Support

To speak with a Technical Support Representative on the telephone, call the number below and ask for Technical Support:

Telephone: **603-891-2750**

If you would rather FAX a written description of the problem, make sure you address the FAX to Technical Support and send it to:

Fax: **603-891-2745**

You can email a description of the problem to ***support@alacron.com***

Before you contact technical support have the following information ready:

_____ Serial numbers and hardware revision numbers of all of your boards. This information is written on the invoice that was shipped with your products.

_____ Also, each board has its serial number and revision number written on either in ink or in bar-code form.

_____ The version of the ALRT, ALFAST, or FASTLIB software that you are using.

_____ You can find this information in a file in the directory: **\usr\alfast\alinfo**

_____ The type and version of the host operating system, i.e., Windows 98.

_____ Note the types and numbers of all your software revisions, daughter card libraries, the application library and the compiler

_____ The piece of code that exhibits the problem, if applicable. If you email Alacron the piece of code, our Technical-Support team can try to reproduce the error. It is necessary, though, for all the information listed above to be included, so Technical Support can duplicate your hardware and system environment.

B. Returning Products for Repair or Replacements

Our first concern is that you be pleased with your Alacron products.

If, after trying everything you can do yourself, and after contacting Alacron Technical Support, you feel your hardware or software is not functioning properly, you can return the product to Alacron for service or replacement. Service or replacement may be covered by your warranty, depending upon your warranty.

The first step is to call Alacron and request a "Return Materials Authorization" (RMA) number.

This is the number assigned both to your returning product and to all records of your communications with Technical Support. When an Alacron technician receives your returned hardware or software he will match its RMA number to the on-file information you have given us, so he can solve the problem you've cited.

When calling for an RMA number, please have the following information ready:

_____ Serial numbers and descriptions of product(s) being shipped back

_____ A listing including revision numbers for all software, libraries, applications, daughter cards, etc.

_____ A clear and detailed description of the problem and when it occurs

_____ Exact code that will cause the failure

_____ A description of any environmental condition that can cause the problem

All of this information will be logged into the RMA report so it's there for the technician when your product arrives at Alacron.

Put boards inside their anti-static protective bags. Then pack the product(s) securely in the original shipping materials, if possible, and ship to:

Alacron Inc.
71 Spit Brook Road, Suite 200
Nashua, NH 03060
USA

Clearly mark ***the outside of your package:***

Attention **RMA #80XXX**

Remember to include your return address and the name and number of the person who should be contacted if we have questions.

C. Reporting Bugs

We at Alacron are continually improving our products to ensure the success of your projects. In addition to ongoing improvements, every Alacron product is put through extensive and varied testing. Even so, occasionally situations can come up in the fields that were not encountered during our testing at Alacron.

If you encounter a software or hardware problem or anomaly, please contact us immediately for assistance. If a fix is not available right away, often we can devise a work-around that allows you to move forward with your project while we continue to work on the problem you've encountered.

It is important that we are able to reproduce your error in an isolated test case. You can help if you create a stand-alone code module that is isolated from your application and yet clearly demonstrates the anomaly or flaw.

Describe the error that occurs with the particular code module and email the file to us at:

support@alacron.com

We will compile and run the module to track down the anomaly you've found.

If you do not have Internet access, or if it is inconvenient for you to get to access, copy the code to a disk, describe the error, and mail the disk to Technical Support at the Alacron address below.

If the code is small enough, you can also:

FAX the code module to us at 603-891-2745

If you are faxing the code, write everything large and legibly and remember to include your description of the error.

When you are describing a software problem, include revision numbers of all associated software.

For documentation errors, photocopy the passages in question, mark on the page the number and title of the manual, and either FAX or mail the photocopy to Alacron.

Remember to include the name and telephone number of the person we should contact if we have questions.

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Web site:
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Electronic Mail:
sales@alacron.com
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