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Pin #	MDR 36-Pin (Male) Frame Grabber	Pin #	Hirose 12-Pin (Female) Camera 2
5	Video2	4	Coax 1 Wire
23	Video2 AGND	3	Coax 1 Shield
6	HS2	6	Coax 2 Wire
22	Digital GND	5	Coax 2 Shield
24	VS2	7	Coax 3 Wire
22	Digital GND	12	Coax 3 Shield
7	Camera Trigger2	9	Coax 4 Wire
22	Digital GND	8	Coax 4 Shield
32	+12V	2	Wire
33	+12V GND	1	Wire

Camera 3

Pin #	MDR 36-Pin (Male) Frame Grabber	Pin #	Hirose 12-Pin (Female) Camera 3
8	Video3	4	Coax 1 Wire
26	Video3 AGND	3	Coax 1 Shield
9	HS3	6	Coax 2 Wire
29	Digital GND	5	Coax 2 Shield
27	VS3	7	Coax 3 Wire
29	Digital GND	12	Coax 3 Shield
10	Camera Trigger3	9	Coax 4 Wire
29	Digital GND	8	Coax 4 Shield
30	+12V	2	Wire
31	+12V GND	1	Wire

BNC

Pin #	MDR 36-Pin (Male) Frame Grabber	BNC (Female) Connector Trigger In
18	Ext_Trig1+	Coax Wire
17	Ext_Trig1-	Coax Shield
Pin #	MDR 36-Pin (Male) Frame Grabber	DALSA Connector
11	Strobe1	Coax Wire
12	Digital GND	Coax Shield

Cable 6: Standard interface to one Hirose 12-pin with WEN and trigger pulse on pin 11

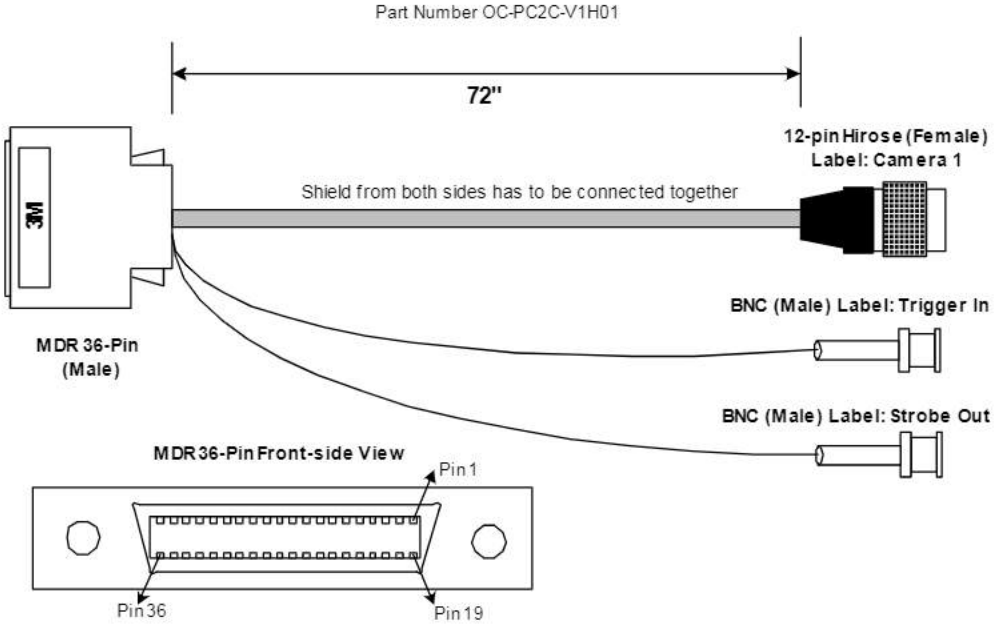


Figure 47: Single camera Hirose-12 cable, trigger on pin 11

Note: A "coax" appellation following by a number (for example, coax 1) identifies which coax cable within the Hirose cable is used for a specific connection.

Pin #	MDR 36-Pin (Male) Frame Grabber	Pin #	Hirose 12-pin (Female)
1	Video1	4	Coax 1 Wire
19	Video1 AGND	3	Coax 1 Shield
2	HS1	6	Coax 2 Wire
4	Digital GND	5	Coax 2 Shield
20	VS1	7	Coax 3 Wire
22	Digital GND	12	Coax 3 Shield
3	Camera Trigger1	11	Coax 4 Wire
29	Digital GND	8	Coax 4 Shield
21	WEN1	10	Wire
30	+12V	2	Wire
31	+12V GND	1	
18	Ext_Trig1+		Coax Wire
17	Ext_Trig1-		Coax Shield

11	Strobe1		Coax Wire
12	Digital GND		Coax Shield

Cable 7: Standard interface to three Hirose 12-pin connectors with WEN and trigger pulse on pin-11

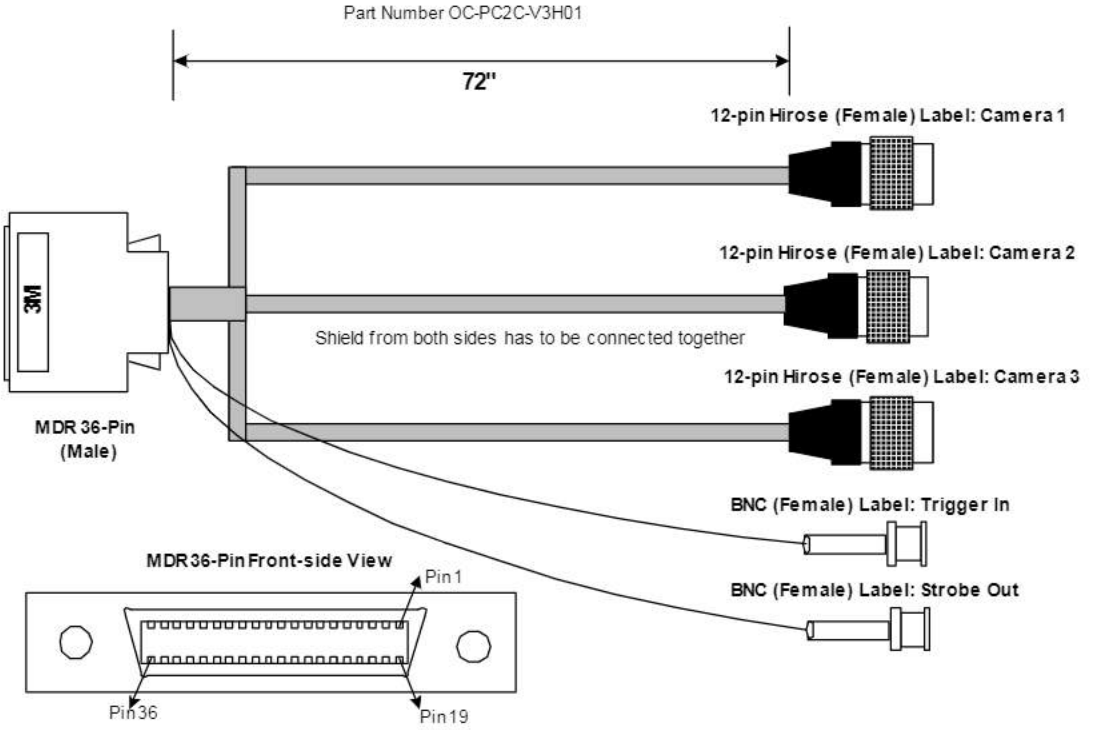


Figure 48: Three camera Hirose-12 cable, trigger on pin 11

Note: A "coax" appellation following by a number (for example, coax 1) identifies which coax cable within the Hirose cable is used for a specific connection.

Camera 1			
Pin #	MDR 36-Pin (Male) Frame Grabber	Pin #	Hirose 12-Pin (Female) Camera 1
1	Video1	4	Coax 1 Wire
19	Video1 AGND	3	Coax 1 Shield
2	HS1	6	Coax 2 Wire
4	Digital GND	5	Coax 2 Shield
20	VS1	7	Coax 3 Wire
4	Digital GND	12	Coax 3 Shield
3	Camera Trigger1	11	Coax 4 Wire
4	Digital GND	8	Coax 4 Shield
21	WEN1	10	Wire
30	+12V	2	Wire
31	+12V GND	1	Wire
Camera 2			
Pin #	MDR 36-Pin (Male) Frame Grabber	Pin #	Hirose 12-Pin (Female) Camera 2
5	Video2	4	Coax 1 Wire
23	Video2 AGND	3	Coax 1 Shield
6	HS2	6	Coax 2 Wire
22	Digital GND	5	Coax 2 Shield
24	VS2	7	Coax 3 Wire
22	Digital GND	12	Coax 3 Shield
7	Camera Trigger2	11	Coax 4 Wire
22	Digital GND	8	Coax 4 Shield
25	WEN2	10	Wire
32	+12V	2	Wire
33	+12V GND	1	Wire
Camera 3			
Pin #	MDR 36-Pin (Male) Frame Grabber	Pin #	Hirose 12-Pin (Female) Camera 3
8	Video3	4	Coax 1 Wire
26	Video3 AGND	3	Coax 1 Shield
9	HS3	6	Coax 2 Wire
29	Digital GND	5	Coax 2 Shield
27	VS3	7	Coax 3 Wire
29	Digital GND	12	Coax 3 Shield
10	Camera Trigger3	11	Coax 4 Wire
29	Digital GND	8	Coax 4 Shield
28	WEN3	10	Wire
30	+12V	2	Wire

31	+12V GND	1	Wire
BNC			
Pin #	MDR 36-Pin (Male) Frame Grabber	BNC (Female) Connector Trigger In	
18	Ext_Trig1+	Coax Wire	
17	Ext_Trig1-	Coax Shield	
11	Strobe1	Coax Wire	
12	Digital GND	Coax Shield	

Cable 8: Standard interface for one Jai camera

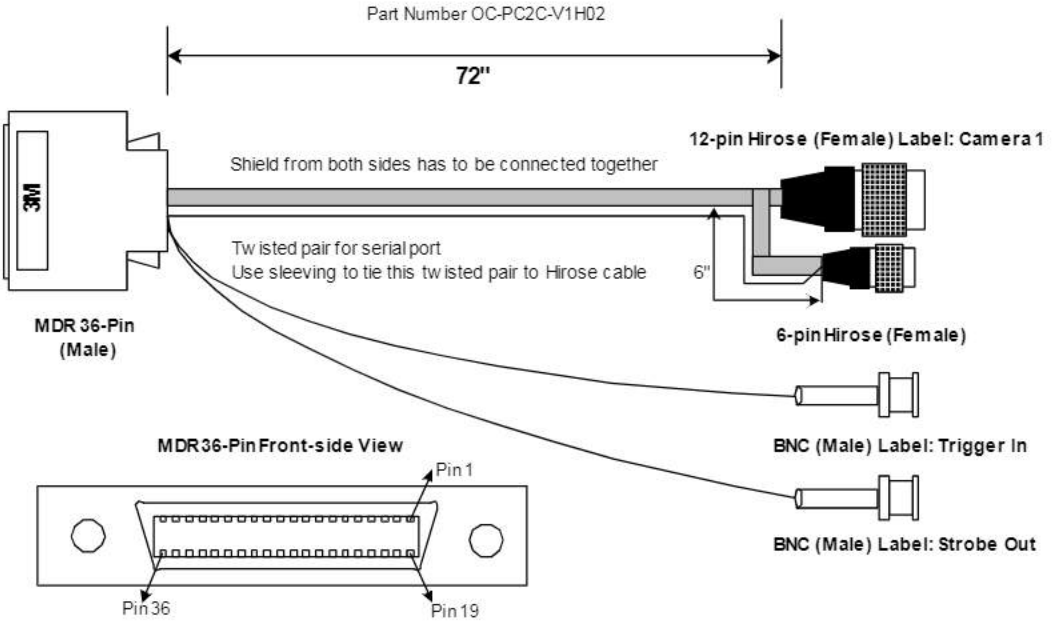


Figure 49: Single camera Hirose-12 + Hirose-6 for Jai

Note: A "coax" appellation following by a number (for example, coax 1) identifies which coax cable within the Hirose cable is used for a specific connection.

A "twisted pair" appellation refers to a separate cable used to supplement the twelve conductors on the Hirose cable. This cable must use sleeving to attach it to the corresponding Hirose cable.

Camera 1			
Pin #	MDR 36-Pin (Male) Frame Grabber	Pin #	Hirose 12-pin (Female)
1	Video1	4	Coax 1 Wire
19	Video1 AGND	3	Coax 1 Shield
2	HS1	6	Coax 2 Wire
4	Digital GND	5	Coax 2 Shield
20	VS1	7	Coax 3 Wire
22	Digital GND	12	Coax 3 Shield
21	WEN1	10	Wire
30	+12V	2	Wire
31	+12V GND	1	Wire
Pin #	MDR 36-Pin (Male) Frame Grabber	Pin #	Hirose 6-pin (Female)
3	Camera Trigger1	5	Coax 4 Wire
29	Digital GND	4	Coax 4 Shield
34	RX1	1	Twisted pair conductor 1
35	TX1	2	Twisted pair conductor 1
BNC			
Pin #	MDR 36-Pin (Male) Frame Grabber	BNC Male Connector Label: Trigger In	
18	Ext_Trig1+	Coax Wire	
17	Ext_Trig1-	Coax Shield	
11	Strobe1	Coax Wire	
12	Digital GND	Coax Shield	

Cable 9: Standard interface for Jai cameras

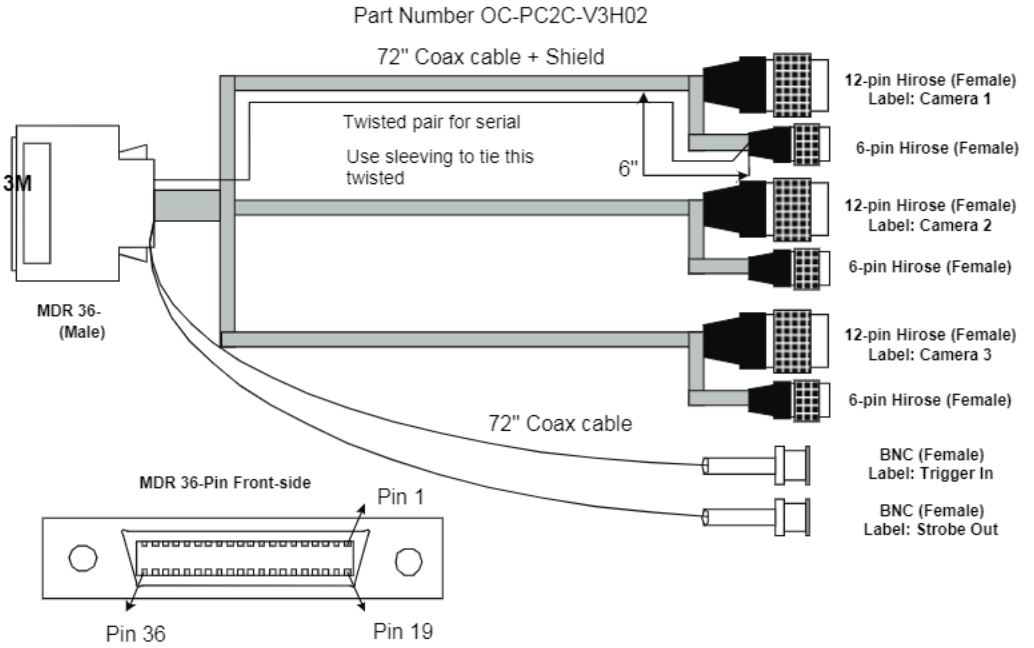


Figure 50: Three camera Hirose-12 + Hirose-6 for Jai

Note: A "coax" appellation following by a number (for example, coax 1) identifies which coax cable within the Hirose cable is used for a specific connection.

A "twisted pair" appellation refers to a separate cable used to supplement the twelve conductors on the Hirose cable. This cable must use sleeving to attach it to the corresponding Hirose cable.

Camera 1			
Pin #	MDR 36-Pin (Male) Frame Grabber	Pin #	Hirose 12-Pin (Female)
1	Video1	4	Coax 1 Wire
19	Video1 AGND	3	Coax 1 Shield
2	HS1	6	Coax 2 Wire
4	Digital GND	5	Coax 2 Shield
20	VS1	7	Coax 3 Wire

4	Digital GND	12	Coax 3 Shield
21	WEN1	10	Wire
30	+12V	2	Wire
31	+12V GND	1	Wire
Pin #	MDR 36-Pin (Male) Frame Grabber	Pin #	Hirose 6-Pin (Female)
3	Camera Trigger1	5	Coax 4 Wire
4	Digital GND	4	Coax 4 Shield
34	RX1	1	Twisted pair conductor 1
35	TX1	2	Twisted pair conductor 2
Camera 2			
Pin #	MDR 36-Pin (Male) Frame Grabber	Pin #	Hirose 12-Pin (Female)
5	Video2	4	Coax 1 Wire
23	Video2 AGND	3	Coax 1 Shield
6	HS2	6	Coax 2 Wire
22	Digital GND	5	Coax 2 Shield
24	VS2	7	Coax 3 Wire
22	Digital GND	12	Coax 3 Shield
25	WEN2	10	Wire
32	+12V	2	Wire
33	+12V GND	1	Wire
Pin #	MDR 36-Pin (Male) Frame Grabber	Pin #	Hirose 6-Pin (Female)
7	Camera Trigger2	5	Coax 4 Wire
22	Digital GND	4	Coax 4 Shield
Camera 3			
Pin #	MDR 36-Pin (Male) Frame Grabber	Pin #	Hirose 12-Pin (Female)
8	Video3	4	Coax 1 Wire
26	Video3 AGND	3	Coax 1 Shield
9	HS3	6	Coax 2 Wire
29	Digital GND	5	Coax 2 Shield
27	VS3	7	Coax 3 Wire
29	Digital GND	12	Coax 3 Shield
28	WEN3	10	Wire
30	+12V	2	Wire
31	+12V GND	1	Wire
Pin #	MDR 36-Pin (Male) Frame Grabber	Pin #	Hirose 6-Pin (Female)

10	Camera Trigger3	5	Coax 4 Wire
29	Digital GND	4	Coax 4 Shield
BNC			
Pin #	MDR 36-Pin (Male) Frame Grabber	BNC (Male) Connector Trigger In	
18	Ext_Trig1+	Coax Wire	
17	Ext_Trig1-	Coax Shield	
11	Strobe1	Coax Wire	
12	Digital GND	Coax Shield	

Cable 10: Jai CV-M77 RGB cable

Part Number OC-PC2C-V1D00

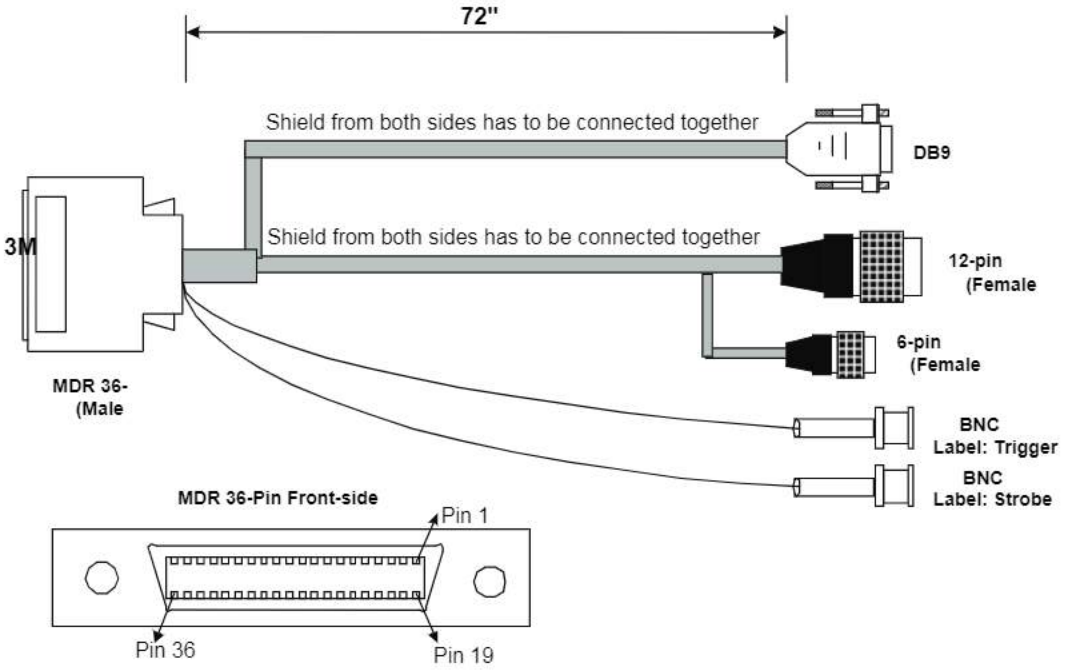


Figure 51: Jai CV-M77 RGB camera cable

Hirose Cable 1			
Pin #	MDR 36-Pin (Male) Frame Grabber	Pin #	Hirose 12-pin Connector (Female)
2	HS1	6	Coax 1 Wire
4	Digital GND	5	Coax 1 Shield
20	VS1	7	Coax 2 Wire
22	Digital GND	12	Coax 2 Shield
21	WEN1	10	Coax 3 Wire
22	Digital GND	8	Coax 3 Shield
30	+12V	2	Wire
31	+12V GND	1	Wire
Pin #	MDR 36-Pin (Male) Frame Grabber	Pin #	Hirose 6-pin Connector (Female)
34	RX1	1	Wire
35	TX1	2	Wire
3	Camera Trigger 1	5	Coax 4 Wire
4	Digital GND	3	Coax 4 Shield
Hirose Cable 2			
Pin #	MDR 36-Pin (Male) Frame Grabber	Pin #	DB9 Connector (Male)
1	Video1 (Blue)	5	Coax 1 Wire
19	Video1 AGND (Blue AGND)	2	Coax 1 Shield
5	Video2 (Green)	4	Coax 2 Wire
23	Video2 AGND (Green AGND)	2	Coax 2 Shield
8	Video3 (Red)	3	Coax 3 Wire
26	Video3 AGND (Red AGND)	2	Coax 3 Shield
13	-CSync1	7	Coax 4 Wire
12	Digital G ND	8	Coax 4 Shield
Separate Coax Cables			
Pin #	MDR 36-Pin (Male) Frame Grabber		BNC Male Connector Label: Trigger In
18	Ext_Trig1+		Coax Wire
17	Ext_Trig1-		Coax Shield
11	Strobe1		Coax Wire
12	Digital GND		Coax Shield

Cable 11: PC2-Vision Interface Cable to three PULNIX camera

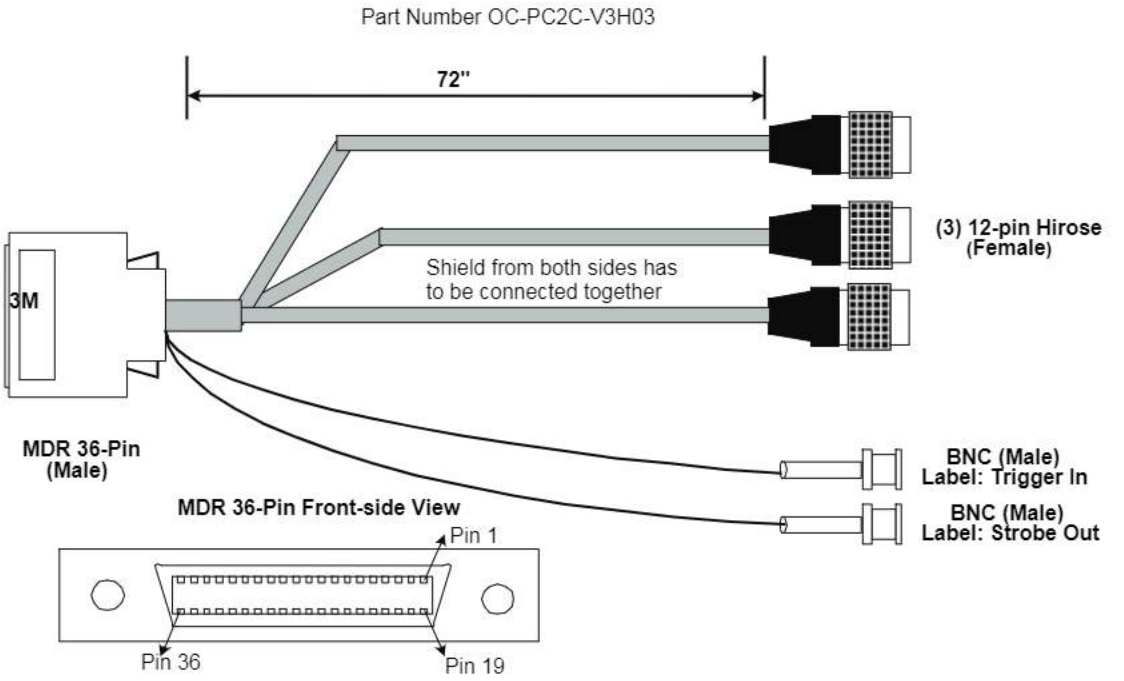


Figure 52: Interface cable

Hirose Cable 1			
Pin #	MDR 36-Pin (Male) Frame Grabber	Pin #	Hirose 12-Pin (Female)
2	HS1	9	Coax 1 Wire
4	Digital GND	5	Coax 1 Shield
20	VS1	7	Coax 2 Wire
22	Digital GND	8	Coax 2 Shield
1	Video 1	4	Coax 3 Wire
19	Analog GND	3	Coax 3 Shield
30	+12V	2	Wire
31	+12V GND	1	Wire
3	V init/Camera Trig. 1	6	Coax 4 Wire
22	Digital GND	5	Coax 4 Shield
Hirose Cable 2			
Pin #	MDR 36-Pin (Male) Frame Grabber	Pin #	Hirose 12-Pin (Female)
6	HS2	9	Coax 1 Wire

16	Digital GND	5	Coax 1 Shield
24	VS2	7	Coax 2 Wire
29	Digital GND	8	Coax 2 Shield
5	Video 2	4	Coax 3 Wire
23	Analog GND	3	Coax 3 Shield
30	+12V	2	Wire
31	+12V GND	1	Wire
7	V init/Camera Trig. 2	6	Coax 4 Wire
29	Digital GND	5	Coax 4 Shield
Hirose Cable 3			
Pin #	MDR 36-Pin (Male) Frame Grabber	Pin #	Hirose 12-Pin (Female)
9	HS3	9	Coax 1 Wire
12	Digital GND	5	Coax 1 Shield
27	VS3	7	Coax 2 Wire
12	Digital GND	8	Coax 2 Shield
8	Video 3	4	Coax 3 Wire
26	Analog GND	3	Coax 3 Shield
32	+12V	2	Wire
33	+12V GND	1	Wire
10	V init/Camera Trig. 3	6	Coax 4 Wire
16	Digital GND	5	Coax 4 Shield
Separate Coax Cables			
Pin #	MDR 36-Pin (Male) Frame Grabber	BNC (Male) Connector Trigger In	
18	Ext_Trig1+	Coax Wire	
17	Ext_Trig1-	Coax Shield	
Pin #	MDR 36-Pin (Male) Frame Grabber	BNC (Male) Connector Strobe	
11	Strobe1	Coax Wire	
12	Digital GND	Coax Shield	

Cable 12: JAI CV-M Cameras (Pixel Clock and WEN pulse)

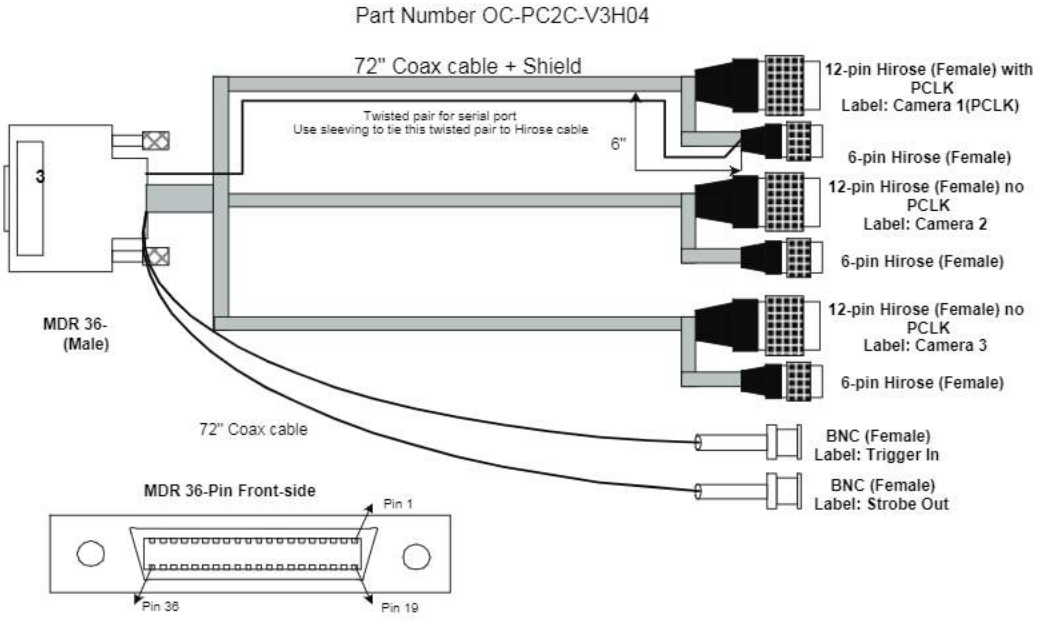


Figure 53: JAI CV-M camera cable

Note: A "coax" appellation following by a number (for example, coax 1) identifies which coax cable within the Hirose cable is used for a specific connection.

A "twisted pair" appellation refers to a separate cable used to supplement the twelve conductors on the Hirose cable. This cable must use sleeving to attach it to the corresponding Hirose cable.

Camera 1			
Pin #	MDR 36-Pin (Male) Frame Grabber	Pin #	Hirose 12-Pin (Female)
1	Video1	4	Coax 1 Wire
19	Video1 AGND	3	Coax 1 Shield
2	HS1	6	Coax 2 Wire
4	Digital GND	5	Coax 2 Shield
20	VS1	7	Coax 3 Wire
4	Digital GND	12	Coax 3 Shield
36	Pixel Clock	9	Coax 4 Wire
29	Digital GND	8	Coax 4 Shield
30	+12V	2	Wire
31	+12V GND	1	Wire
Pin #	MDR 36-Pin (Male) Frame Grabber	Pin #	Hirose 6-Pin (Female)
3	Camera trigger 1	5	Wire
34	RX1	1	Twisted pair conductor 1
35	TX1	2	Twisted pair conductor 2
21	WEN1 (Write Enable) Out	6	Wire
Camera 2			
Pin #	MDR 36-Pin (Male) Frame Grabber	Pin #	Hirose 12-Pin (Female)
5	Video2	4	Coax 1 Wire
23	Video2 AGND	3	Coax 1 Shield
6	HS2	6	Coax 2 Wire
22	Digital GND	5	Coax 2 Shield
24	VS2	7	Coax 3 Wire
22	Digital GND	12	Coax 3 Shield
32	+12V	2	Wire
33	+12V GND	1	Wire
7	Camera trigger2	5	Coax 4 Wire
22	Digital GND	3	Coax 4 Shield
25	WEN2 (Write enable) Out	6	Wire
Camera 3			
Pin #	MDR 36-Pin (Male) Frame Grabber	Pin #	Hirose 12-Pin (Female)

8	Video3	4	Coax 1 Wire
26	Video3 AGND	3	Coax 1 Shield
9	HS3	6	Coax 2 Wire
29	Digital GND	5	Coax 2 Shield
27	VS3	7	Coax 3 Wire
29	Digital GND	12	Coax 3 Shield
30	+12V	2	Wire
31	+12V GND	1	Wire
10	Camera trigger3	5	Coax 4 Wire
29	Digital GND	3	Coax 4 Shield
28	WEN3 (Write Enable) Out	6	Wire
BNC			
Pin #	**MDR 36-Pin (Male) Frame Grabber**	**Pin #**	**BNC (Male) Connector Trigger In**
18	Ext_Trig1+		Coax Wire
17	Ext_Trig1-		Coax Shield
Pin #	MDR 36-Pin (Male) Frame Grabber	Pin #	BNC (Male) Connector Strobe Out
11	Strobe1		Coax Wire
12	Digital GND		Coax Shield

Recommendation: It is recommended to use a 3M 10336-52F0-008 MDR36 shell or a 3M 10336-A200-00 MDR36 metal shell when constructing a cable connecting the PC2-Vision and camera. These shells use a quick release latch mechanism. Contact the 3M web page [http://www.3m.com/] for further information.

Sapera LT

Sapera Server and Parameters

The following table lists the Sapera Server available for PC2-Vision. Note that a single server supports both monochrome and RGB cameras.

Servers		Resources			
Name	**Description**	**Type**	**Name**	**Index**	**Description**
PC2-Vision_1	PC2-Vision	Acquisition	Mono 1	0	First monochrome video channel
			Mono 2	1	Second monochrome video channel
			Mono 3	2	Third monochrome video channel
			Mono 4	3	Fourth monochrome video channel
			Mono 5	4	Fifth monochrome video channel
			Mono 6	5	Sixth monochrome video channel
			RGB 1	0	First RGB video channel (J1)
			RGB 2	1	Second RGB video channel (J2)

The following tables describe the Sapera parameters and values supported by PC2-Vision. Refer to *Sapera Acquisition Parameters Reference* manual for a thorough description of each parameter.

CAMERA PARAMETERS	Values
CORACQ_PRM_CAM_NAME	Default Area Scan
CORACQ_PRM_CAM_RESET_DURATION	min = 1 µs max = 65535000 µs step = 1 µs
CORACQ_PRM_CAM_RESET_METHOD	CORACQ_VAL_CAM_RESET_METHOD_1 (0x1)
CORACQ_PRM_CAM_RESET_POLARITY	CORACQ_VAL_ACTIVE_LOW (0x1) CORACQ_VAL_ACTIVE_HIGH (0x2)
CORACQ_PRM_CAM_TIME_INTEGRATE_DURATION_MAX	65535000 µs
CORACQ_PRM_CAM_TIME_INTEGRATE_DURATION_MIN	1 µs
CORACQ_PRM_CAM_TRIGGER_DURATION	min = 1 µs max = 65535000 µs step = 1 µs

CORACQ_PRM_CAM_TRIGGER_METHOD	CORACQ_VAL_CAM_TRIGGER_METHOD_1 (0x1)
CORACQ_PRM_CAM_TRIGGER_POLARITY	CORACQ_VAL_ACTIVE_LOW (0x1) CORACQ_VAL_ACTIVE_HIGH (0x2)
CORACQ_PRM_CHANNEL	CORACQ_VAL_CHANNEL_SINGLE (0x1)
CORACQ_PRM_CHANNELS_ORDER	CORACQ_VAL_CHANNELS_ORDER_NORMAL (0x1)
CORACQ_PRM_COUPLING	CORACQ_VAL_COUPLING_AC (0x1)
CORACQ_PRM_DETECT_HACTIVE	Not available
CORACQ_PRM_DETECT_PIXEL_CLK	Not available
CORACQ_PRM_DETECT_VACTIVE	Not available
CORACQ_PRM_FIELD_ORDER	CORACQ_VAL_FIELD_ORDER_ODD_EVEN (0x1) CORACQ_VAL_FIELD_ORDER_EVEN_ODD (0x2) CORACQ_VAL_FIELD_ORDER_NEXT_FIELD (0x4)
CORACQ_PRM_FRAME	CORACQ_VAL_FRAME_INTERLACE (0x1) CORACQ_VAL_FRAME_PROGRESSIVE (0x2)
CORACQ_PRM_FRAME_INTEGRATE_METHOD	Not available
CORACQ_PRM_FRAME_INTEGRATE_POLARITY	Not available
CORACQ_PRM_HACTIVE	min = 4 pixels max = 2048 pixels step = 4 pixels
CORACQ_PRM_HBACK_PORCH	min = 0 pixel max = 2044 pixels step = 1 pixel
CORACQ_PRM_HFRONT_PORCH	min = 0 pixel max = 2044 pixel step = 1 pixel
CORACQ_PRM_HSYNC	min = 1 pixel max = 2044 pixels step = 1 pixel
CORACQ_PRM_HSYNC_POLARITY	CORACQ_VAL_ACTIVE_LOW (0x1) CORACQ_VAL_ACTIVE_HIGH (0x2)
CORACQ_PRM_INTERFACE	CORACQ_VAL_INTERFACE_ANALOG (0x1)
CORACQ_PRM_PIXEL_CLK_11	12270000 Hz
CORACQ_PRM_PIXEL_CLK_DETECTION	CORACQ_VAL_RISING_EDGE (0x4)
CORACQ_PRM_PIXEL_CLK_EXT	min = 7000000 Hz max = 40000000 Hz step = 1 Hz
CORACQ_PRM_PIXEL_CLK_INT	min = 7000000 Hz max = 40000000 Hz step = 1 Hz
CORACQ_PRM_PIXEL_CLK_SRC	CORACQ_VAL_PIXEL_CLK_SRC_INT (0x1) CORACQ_VAL_PIXEL_CLK_SRC_EXT (0x2)
CORACQ_PRM_PIXEL_DEPTH	8 bits
CORACQ_PRM_SCAN	CORACQ_VAL_SCAN_AREA (0x1)
CORACQ_PRM_SIGNAL	CORACQ_VAL_SIGNAL_SINGLE_ENDED (0x1)

CORACQ_PRM_SYNC	CORACQ_VAL_SYNC_COMP_VIDEO (0x1) CORACQ_VAL_SYNC_COMP_SYNC (0x2) CORACQ_VAL_SYNC_SEP_SYNC (0x4) CORACQ_VAL_SYNC_INT_SYNC (0x8) CORACQ_VAL_SYNC_RED (0x10) CORACQ_VAL_SYNC_GREEN (0x20) CORACQ_VAL_SYNC_BLUE (0x40)
CORACQ_PRM_TAP_1_DIRECTION	CORACQ_VAL_TAP_DIRECTION_LR (0x1) CORACQ_VAL_TAP_DIRECTION_UD (0x4) CORACQ_VAL_TAP_DIRECTION_FROM_TOP (0x10)
CORACQ_PRM_TAP_OUTPUT	CORACQ_VAL_TAP_OUTPUT_SEGMENTED (0x2)
CORACQ_PRM_TAPS	min = 1 tap max = 1 tap step = 1 tap
CORACQ_PRM_TIME_INTEGRATE_METHOD	CORACQ_VAL_TIME_INTEGRATE_METHOD_1 (0x1) CORACQ_VAL_TIME_INTEGRATE_METHOD_2 (0x2) CORACQ_VAL_TIME_INTEGRATE_METHOD_3 (0x4) CORACQ_VAL_TIME_INTEGRATE_METHOD_4 (0x8) CORACQ_VAL_TIME_INTEGRATE_METHOD_5 (0x10) CORACQ_VAL_TIME_INTEGRATE_METHOD_6 (0x20) CORACQ_VAL_TIME_INTEGRATE_METHOD_7 (0x40)
CORACQ_PRM_TIME_INTEGRATE_PULSE0_DELAY	min = 0 µs max = 65535000 µs step = 1 µs
CORACQ_PRM_TIME_INTEGRATE_PULSE0_DURATION	min = 0 µs max = 65535000 µs step = 1 µs
CORACQ_PRM_TIME_INTEGRATE_PULSE0_POLARITY	CORACQ_VAL_ACTIVE_LOW (0x1) CORACQ_VAL_ACTIVE_HIGH (0x2)
CORACQ_PRM_TIME_INTEGRATE_PULSE1_DELAY	min = 0 µs max = 65535000 µs step = 1 µs
CORACQ_PRM_TIME_INTEGRATE_PULSE1_DURATION	min = 0 µs max = 65535000 µs step = 1 µs
CORACQ_PRM_TIME_INTEGRATE_PULSE1_POLARITY	CORACQ_VAL_ACTIVE_LOW (0x1) CORACQ_VAL_ACTIVE_HIGH (0x2)
CORACQ_PRM_VACTIVE	min = 1 line max = 2048 lines step = 1 line
CORACQ_PRM_VBACK_INVALID	min = 0 line max = 100 lines step = 1 line

CORACQ_PRM_VBACK_PORCH	min = 0 line max = 2047 lines step = 1 line
CORACQ_PRM_VFRONT_PORCH	min = 0 line max = 2047 lines step = 1 line
CORACQ_PRM_VIDEO	CORACQ_VAL_VIDEO_MONO (0x1) CORACQ_VAL_VIDEO_RGB (0x8)
CORACQ_PRM_VIDEO_LEVEL_MAX	Default = 0 µV
CORACQ_PRM_VIDEO_LEVEL_MIN	Default = 0 µV
CORACQ_PRM_VIDEO_STD	CORACQ_VAL_VIDEO_STD_NON_STD (0x1) CORACQ_VAL_VIDEO_STD_RS170_NTSC (0x2) CORACQ_VAL_VIDEO_STD_CCIR_PAL (0x4)
CORACQ_PRM_VSYNC	min = 1 line max = 2047 lines step = 1 line
CORACQ_PRM_VSYNC_POLARITY	CORACQ_VAL_ACTIVE_LOW (0x1) CORACQ_VAL_ACTIVE_HIGH (0x2)
CORACQ_PRM_WEN_POLARITY	CORACQ_VAL_ACTIVE_LOW (0x1) CORACQ_VAL_ACTIVE_HIGH (0x2)

VIC PARAMETERS	**Values**
CORACQ_PRM_BIT_ORDERING	CORACQ_VAL_BIT_ORDERING_STD (0x1)
CORACQ_PRM_BRIGHTNESS	min = -20000 (1/1000 %) max = 29000 (1/1000 %) step = 196 (1/1000 %)
CORACQ_PRM_BRIGHTNESS_BLUE	min = -20000 (1/1000 %) max = 29000 (1/1000 %) step = 196 (1/1000 %)
CORACQ_PRM_BRIGHTNESS_GREEN	min = -20000 (1/1000 %) max = 29000 (1/1000 %) step = 196 (1/1000 %)
CORACQ_PRM_BRIGHTNESS_RED	min = -20000 (1/1000 %) max = 29000 (1/1000 %) step = 196 (1/1000 %)
CORACQ_PRM_CAM_RESET_DELAY	min = 0 µs max = 65535000 µs step = 1 µs
CORACQ_PRM_CAM_RESET_ENABLE	TRUE FALSE
CORACQ_PRM_CAM_TRIGGER_DELAY	min = 0 µs max = 65535000 µs step = 1 µs
CORACQ_PRM_CAM_TRIGGER_ENABLE	TRUE FALSE
CORACQ_PRM_CAMSEL	CAMSEL_MONO = from 0 to 5

	CAMSEL_COLOR not available CAMSEL_YC not available CAMSEL_RGB = from 0 to 1
CORACQ_PRM_CONTRAST	min = 60000 (1/1000 %) max = 170000 (1/1000 %) step = 1000 (1/1000 %)
CORACQ_PRM_CONTRAST_BLUE	min = 60000 (1/1000 %) max = 170000 (1/1000 %) step = 1000 (1/1000 %)
CORACQ_PRM_CONTRAST_GREEN	min = 60000 (1/1000 %) max = 170000 (1/1000 %) step = 1000 (1/1000 %)
CORACQ_PRM_CONTRAST_RED	min = 60000 (1/1000 %) max = 170000 (1/1000 %) step = 1000 (1/1000 %)
CORACQ_PRM_CROP_HEIGHT	min = 1 line max = 2048 lines step = 1 line
CORACQ_PRM_CROP_LEFT	min = 0 pixel max = 2044 pixels step = 1 pixel
CORACQ_PRM_CROP_TOP	min = 0 line max = 2047 lines step = 1 line
CORACQ_PRM_CROP_WIDTH	min = 4 pixels max = 2048 pixels step = 4 pixels
CORACQ_PRM_DC_REST_MODE	CORACQ_VAL_DC_REST_MODE_AUTO (0x1) CORACQ_VAL_DC_REST_MODE_ON (0x2) CORACQ_VAL_DC_REST_MODE_OFF (0x4)
CORACQ_PRM_DC_REST_START	min = 0 pixel max = 2047 pixels step = 1 pixel
CORACQ_PRM_DC_REST_WIDTH	min = 0 pixel max = 2047 pixels step = 1 pixel
CORACQ_PRM_DECIMATE_COUNT	Default = 0
CORACQ_PRM_DECIMATE_METHOD	CORACQ_VAL_DECIMATE_DISABLE (0x1) CORACQ_VAL_DECIMATE_ODD (0x8) CORACQ_VAL_DECIMATE_EVEN (0x10)
CORACQ_PRM_EXT_TRIGGER_DETECTION	CORACQ_VAL_ACTIVE_LOW (0x1) CORACQ_VAL_ACTIVE_HIGH (0x2) CORACQ_VAL_RISING_EDGE (0x4) CORACQ_VAL_FALLING_EDGE (0x8)
CORACQ_PRM_EXT_TRIGGER_DURATION	min = 0 µs max = 255 µs step = 1 µs
CORACQ_PRM_EXT_TRIGGER_ENABLE	CORACQ_VAL_EXT_TRIGGER_OFF (0x1) CORACQ_VAL_EXT_TRIGGER_ON (0x8)

CORACQ_PRM_EXT_TRIGGER_FRAME_COUNT	Default = 1 frame
CORACQ_PRM_EXT_TRIGGER_LEVEL	CORACQ_VAL_LEVEL_TTL (0x1) CORACQ_VAL_LEVEL_422 (0x2)
CORACQ_PRM_EXT_TRIGGER_SOURCE	0: automatic selection 1: first MDR-36 (J1) 2: second MDR-36 (J2)
CORACQ_PRM_FIX_FILTER_ENABLE	TRUE FALSE
CORACQ_PRM_FIX_FILTER_SELECTOR	0: 6 MHz 1: 12 MHz
CORACQ_PRM_FLIP	Not available
CORACQ_PRM_FRAME_INTEGRATE_COUNT	Not available
CORACQ_PRM_FRAME_INTEGRATE_ENABLE	Not available
CORACQ_PRM_FRAME_LENGTH	CORACQ_VAL_FRAME_LENGTH_FIX (0x1)
CORACQ_PRM_HSYNC_REF	CORACQ_VAL_SYNC_REF_BEGIN (0x1)
CORACQ_PRM_HUE	Not available
CORACQ_PRM_INT_FRAME_TRIGGER_ENABLE	TRUE FALSE
CORACQ_PRM_INT_FRAME_TRIGGER_FREQ	min = 1 milli-Hz max = 1000000000 milli-Hz step = 1 milli-Hz
CORACQ_PRM_LUT_ENABLE	TRUE FALSE
CORACQ_PRM_LUT_FORMAT	Default = CORACQ_VAL_OUTPUT_FORMAT_MONO8
CORACQ_PRM_LUT_MAX	1
CORACQ_PRM_LUT_NENTRIES	256 entries
CORACQ_PRM_LUT_NUMBER	Default = 0
CORACQ_PRM_MASTER_MODE	CORACQ_VAL_MASTER_MODE_DISABLE (0x0) CORACQ_VAL_MASTER_MODE_HSYNC_VSYNC (0x1) CORACQ_VAL_MASTER_MODE_HSYNC (0x2) CORACQ_VAL_MASTER_MODE_VSYNC (0x4)
CORACQ_PRM_MASTER_MODE_HSYNC_POLARITY	CORACQ_VAL_ACTIVE_LOW (0x1) CORACQ_VAL_ACTIVE_HIGH (0x2)
CORACQ_PRM_MASTER_MODE_VSYNC_POLARITY	CORACQ_VAL_ACTIVE_LOW (0x1) CORACQ_VAL_ACTIVE_HIGH (0x2)
CORACQ_PRM_OUTPUT_FORMAT	CORACQ_VAL_OUTPUT_FORMAT_MONO8 CORACQ_VAL_OUTPUT_FORMAT_RGB8888
CORACQ_PRM_PIXEL_MASK	Not available
CORACQ_PRM_PLANAR_INPUT_SOURCES	Bitflag where each bit (from to 5) represent the corresponding camera index 0x00: disabled 0x03: CAM1 and CAM2 0x07: CAM1, CAM2 and CAM3 0x18: CAM4 and CAM5

	0x38: CAM4, CAM5 and CAM6
CORACQ_PRM_PROG_FILTER_ENABLE	Not available
CORACQ_PRM_PROG_FILTER_FREQ	Not available
CORACQ_PRM_SATURATION	Not available
CORACQ_PRM_SCALE_HORZ	min = 4 pixels/line max = 2048 pixels/line step = 4 pixels/line
CORACQ_PRM_SCALE_HORZ_METHOD	CORACQ_VAL_SCALE_METHOD_DISABLE (0x1) CORACQ_VAL_SCALE_METHOD_POW2 (0x8)
CORACQ_PRM_SCALE_VERT	min = 1 lines/frame max = 2048 lines/frame step = 1 lines/frame
CORACQ_PRM_SCALE_VERT_METHOD	CORACQ_VAL_SCALE_METHOD_DISABLE (0x1) CORACQ_VAL_SCALE_METHOD_POW2 (0x8)
CORACQ_PRM_SHARED_CAM_RESET	Not available
CORACQ_PRM_SHARED_CAM_TRIGGER	Not available
CORACQ_PRM_SHARED_EXT_TRIGGER	Not available
CORACQ_PRM_SHARED_FRAME_INTEGRATE	Not available
CORACQ_PRM_SHARED_STROBE	Not available
CORACQ_PRM_SHARED_TIME_INTEGRATE	Not available
CORACQ_PRM_SHARPNESS	min = 0 max = 0 step = 1
CORACQ_PRM_SNAP_COUNT	Default = 1 frame
CORACQ_PRM_STROBE_DELAY	min = 0 µs max = 65535000 µs step = 1 µs
CORACQ_PRM_STROBE_DELAY_2	min = 0 µs max = 65535000 µs step = 1 µs
CORACQ_PRM_STROBE_DURATION	min = 0 µs max = 65535000 µs step = 1 µs
CORACQ_PRM_STROBE_ENABLE	TRUE FALSE
CORACQ_PRM_STROBE_LEVEL	CORACQ_VAL_LEVEL_TTL (0x1)
CORACQ_PRM_STROBE_METHOD	CORACQ_VAL_STROBE_METHOD_1 (0x1) CORACQ_VAL_STROBE_METHOD_2 (0x2) CORACQ_VAL_STROBE_METHOD_4 (0x8)
CORACQ_PRM_STROBE_POLARITY	CORACQ_VAL_ACTIVE_LOW (0x1) CORACQ_VAL_ACTIVE_HIGH (0x2)
CORACQ_PRM_TIME_INTEGRATE_DELAY	min = 0 µs max = 65535000 µs step = 1 µs
CORACQ_PRM_TIME_INTEGRATE_DURATION	min = 0 µs

	max = 65535000 µs step = 1 µs
CORACQ_PRM_TIME_INTEGRATE_ENABLE	TRUE FALSE
CORACQ_PRM_VIC_NAME	Default Area Scan
CORACQ_PRM_VSYNC_REF	CORACQ_VAL_SYNC_REF_BEGIN (0x1)
CORACQ_PRM_VSYNC_TIMEOUT	Not available
CORACQ_PRM_WEN_ENABLE	TRUE FALSE

ACQUISITION PARAMETERS	**Values**
CORACQ_PRM_EVENT_TYPE	CORACQ_VAL_EVENT_TYPE_START_OF_FIELD (0x10000) CORACQ_VAL_EVENT_TYPE_START_OF_ODD (0x20000) CORACQ_VAL_EVENT_TYPE_START_OF_EVEN (0x40000) CORACQ_VAL_EVENT_TYPE_START_OF_FRAME (0x80000) CORACQ_VAL_EVENT_TYPE_END_OF_FIELD (0x100000) CORACQ_VAL_EVENT_TYPE_END_OF_ODD (0x200000) CORACQ_VAL_EVENT_TYPE_END_OF_EVEN (0x400000) CORACQ_VAL_EVENT_TYPE_END_OF_FRAME (0x800000) CORACQ_VAL_EVENT_TYPE_EXTERNAL_TRIGGER (0x1000000) CORACQ_VAL_EVENT_TYPE_VERTICAL_SYNC (0x2000000)
CORACQ_PRM_LABEL	Analog Interface
CORACQ_PRM_SIGNAL_STATUS	CORACQ_VAL_SIGNAL_HSYNC_PRESENT (0x1) CORACQ_VAL_SIGNAL_HSYNC_LOCK (0x10)

TRANSFER PARAMETERS	**Values**
CORXFER_PRM_EVENT_TYPE	CORXFER_VAL_EVENT_TYPE_END_OF_FRAME (0x00800000) CORXFER_VAL_EVENT_TYPE_END_OF_FIELD (0x00100000) CORXFER_VAL_EVENT_TYPE_END_OF_TRANSFER (0x04000000)

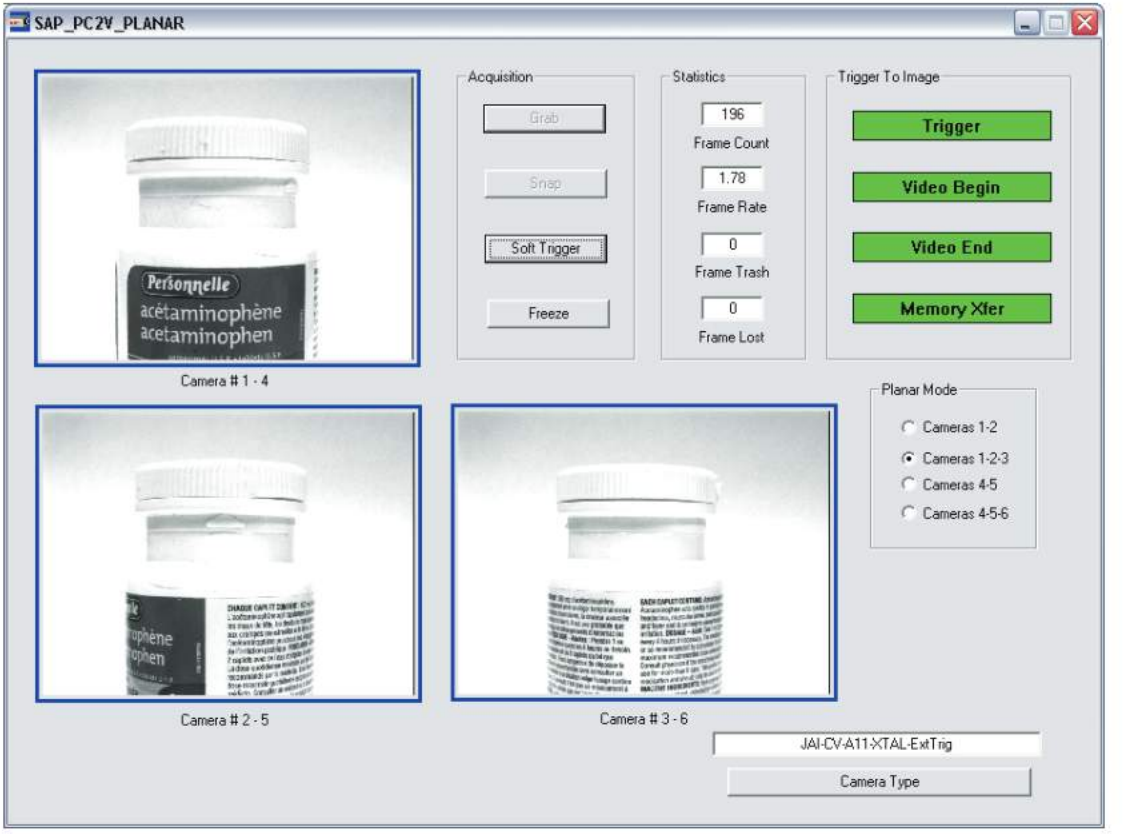
PC2-Vision Specific Sapera Examples

PC2-Vision Sapera driver installation package comes with the following example programs for PC2-Vision. Full source code is included. You need Microsoft Visual C++ 6.0 or later to recompile the examples.

SAP_PC2V_Planar	Simultaneous acquisition and display of three genlocked cameras
SAP_PC2V_ManualCamSwitch	Manual camera switching from up to six monochrome cameras
SAP_PC2V_Parallel_IO	Parallel I/O access techniques

SAP_PC2V_Planar

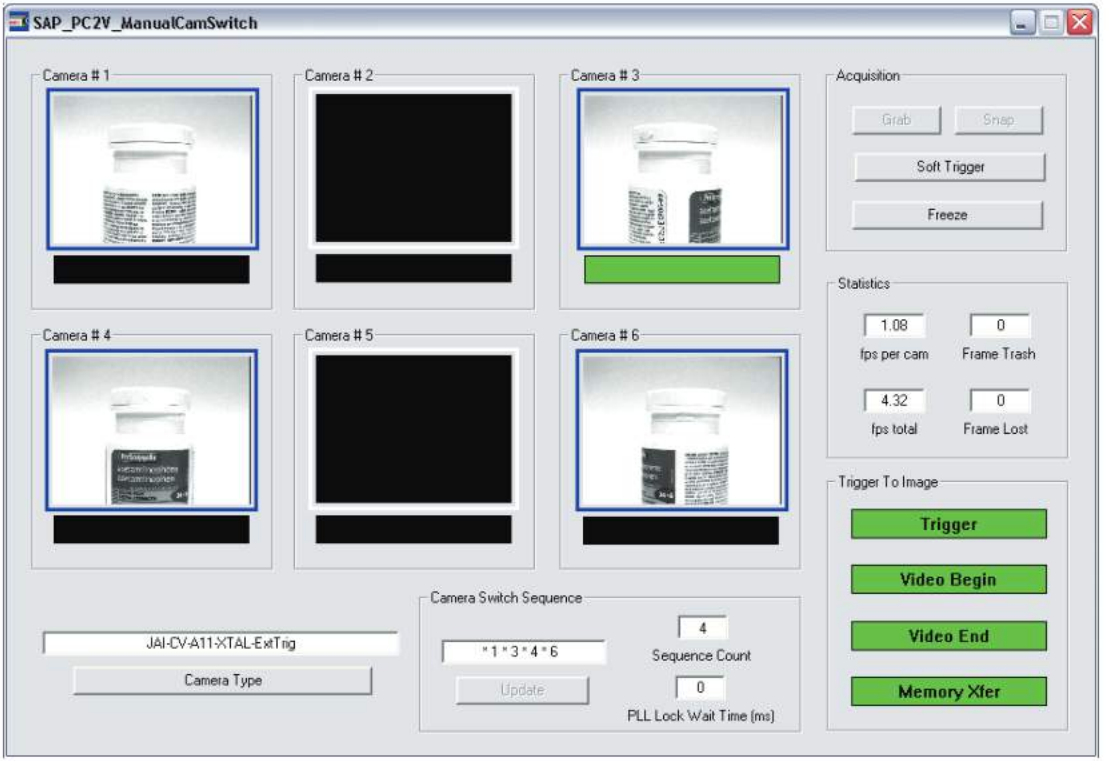
Title	**Acquisition from three genlocked cameras**
Description	Simultaneous acquisition and display of three genlocked cameras in Planar transfer mode
Features	- 3 independent displays - Camera and port selection - Grab or snap - SW trigger - Statistics indicators - Frame Trash count for host buffer memory management - Frame Lost count for PCI bandwidth problems - Trigger-to-image indicators
Setup	- 3 genlockable monochrome cameras (must accept external VD and HD signals) - Camera cable supporting three monochrome cameras - 1 PC2-Vision
Project location	**Installation Directory\PC2-Vision\Demos\SAP_PC2V_Planar**



SAP_PC2V_ManualCamSwitch

Title	Manual camera switching, one camera at a time
Description	Camera switching between (and up to) six cameras. Camera can be in PLL mode or genlocked.
Features	- 6 independent displays - Camera and switching sequence selection - Grab or snap - SW trigger - Statistics indicators - Frame Trash count for host buffer memory management - Frame Lost count for PCI bandwidth problems - PLL Lock wait time parameter to compensate for PLL lock delay. - Trigger-to-image indicators

Setup	- From 1 to 6 genlocked cameras - 1 or 2 camera cables - 1 PC2-Vision
Project location	**Installation Directory\PC2-Vision\Demos\SAP_PC2V_ManualCamSwitch**



SAP_PC2V_Parallel_IO

Title	Parallel I/O port access
Description	Shows how to use the PC2-Vision's Parallel I/O port.
Features	- States indicator for each input and output pin - Parallel I/O interrupt support
Setup	- Cable for Parallel I/O port - 1 PC2-Vision
Project location	**Installation Directory\PC2-Vision\Demos\SAP_PC2V_Parallel_IO**



Sapera Software Example

Grab Demo Overview

Program	**Start•Programs•Sapera LT•Demos•Grab Demo**
Program file	**\DALSA\Sapera\Demos\Classes\vc\GrabDemo\Release\GrabDemo.exe**
Workspace	**\DALSA\Sapera\Demos\Classes\vc\SapDemos.dsw**
Description	This program demonstrates the basic acquisition functions included in the Sapera library. The program allows you to acquire images, either in continuous or in one-shot mode, while adjusting acquisition parameters. The program code can be extracted for use within your own application.
Remarks	Grab Demo was built using Visual C++ 6.0 by means of the MFC library and is based on the Sapera standard API and Sapera C++ classes. See the Sapera User's and Reference manuals for further information.

Using the Grab Demo

Server Selection

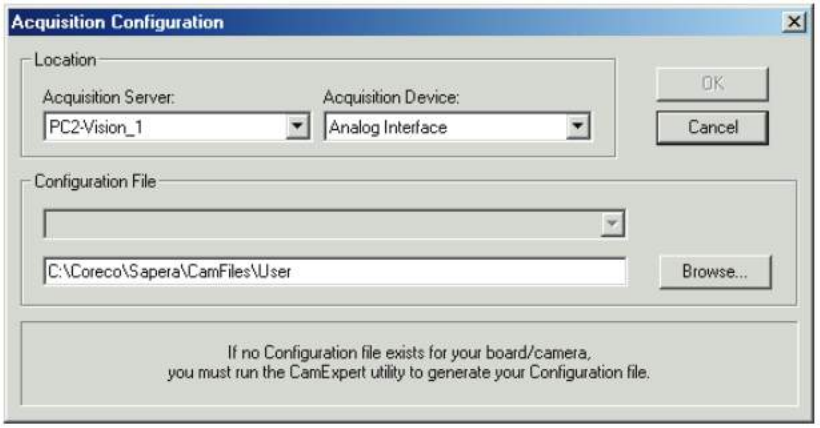
Run Grab Demo from the Start Menu: **Start•All Programs•DALSA•Sapera LT•Demos•Frame Grabbers•Grab Demo**.

When activated, Grab Demo first displays the "Acquisition Configuration" window. The first drop down menu allows you to select any installed Sapera acquisition server (that is, installed DALSA acquisition hardware using Sapera drivers). The second drop down menu allows you to select the available input devices present on the selected server.

CCF File Selection

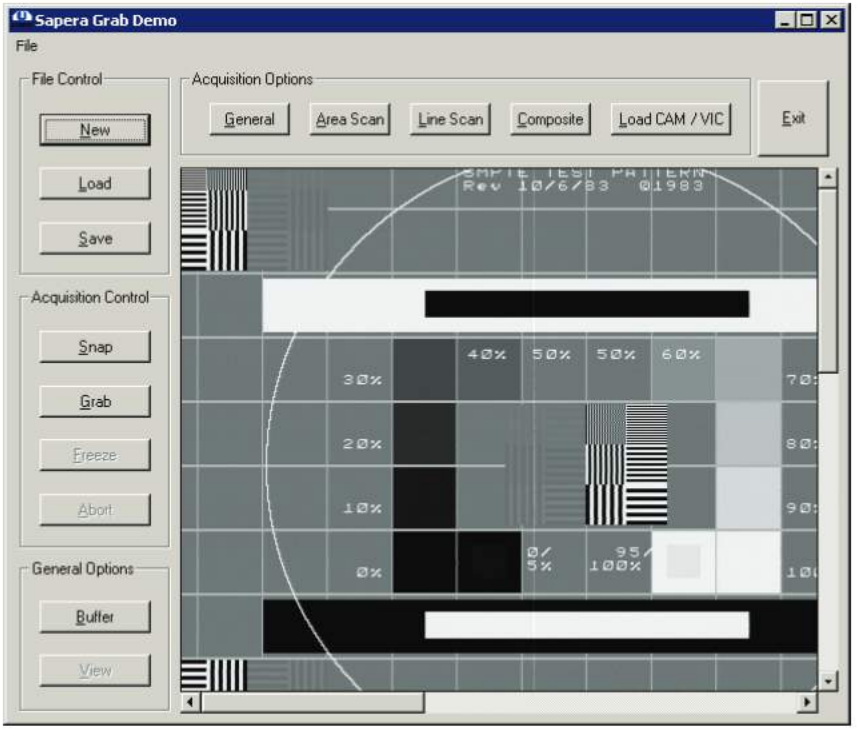
The "Acquisition Configuration" window is also used to select the camera configuration file required for the connected camera. Sapera camera files contain timing parameters and video conditioning parameters. The default folder used for camera configuration files is also used by the CamExpert utility to save user generated or modified camera files.

Use Sapera CamExpert to generate the camera configuration file based on the timing and control parameters entered. The CamExpert live acquisition window allows immediate verification of the parameters. CamExpert reads both Sapera *.cca and *.cvi files for backwards compatibility with the original Sapera camera files.



Grab Demo Main Window

The main window provides control buttons and a central region where the grabbed image is displayed. Developers can use the source code supplied with the demo as a foundation to quickly create and test the desired imaging application.



The various functions are described below:

File Control

Three controls are provided for image file transfers

- **New:** Clears the current image frame buffer.
- **Load:** Retrieves images in BMP, TIF, CRC, JPG, and RAW formats.
- **Save:** Prompts for a file name, file save location, and image format.

Acquisition Options

Note that unsupported functions are grayed out and not selectable. Function support is dependent on the frame grabber hardware in use.

- **General – Acquisition Settings:** Allows for PC2-Vision external trigger mode enabling.
- **Area Scan – Camera Control:** Provides trigger, reset, and integrate controls when supported by the current hardware and driver. Also offers master HS and VS output.
- **Line Scan – Camera Control:** This dialog is not applicable to the PC2-Vision.
- **Composite - Conditioning:** Offers Brightness and Contrast controls.
- **Load CAM/VIC:** Opens the dialog window Acquisition Parameters allowing the user to load a new set of camera files. This is the same window displayed when the Sapera Acquisition Demo is first started.

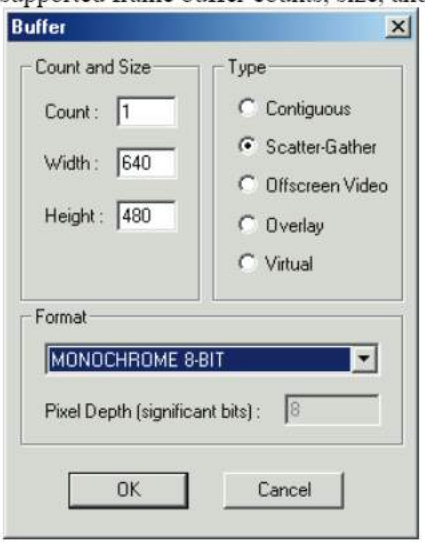
Acquisition Control

- **Grab:** Displays live digitized video from your video source. If your source is a camera, focus and adjust the lens aperture for the best exposure. Use a video generator as a video source to acquire reference images.
- **Freeze:** Stops live grab mode. The grabbed image can be saved to disk via the **File Control•Save** control.
- **Snap:** A single video frame is grabbed.
- **Abort** Exits the current grab process immediately. If any video signal problem prevents the freeze function from ending the grab, click **Abort**.

General Options

Note: functions grayed out are not supported by acquisition hardware.

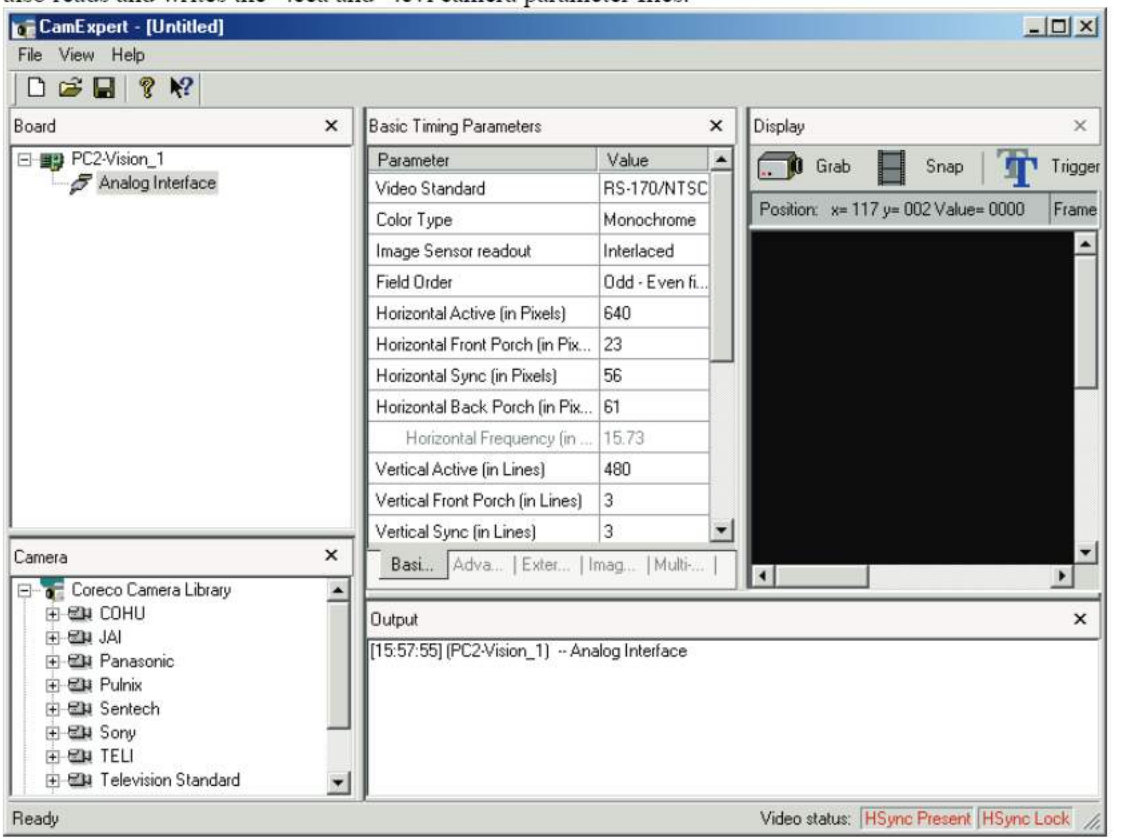
- **Buffer:** Select from supported frame buffer counts, size, and types.



- **Count and Size**: Select the number of frame buffers and the image size here.
- Type – **Contiguous**: Frame buffers are allocated in contiguous system memory (single memory block - no segmentation).
- Type – **Scatter-Gather**: Frame buffers are allocated throughout system memory in noncontiguous memory (paged pool). Pages are locked in physical memory so a scatter-gather list can be constructed. This type allows for the allocation of very large size buffers or large buffer counts.
- Type – **Off-screen Video**: The buffer is allocated in off-screen video memory and uses the display adapter hardware to perform a fast copy from video memory to video memory.
- Type – **Overlay**: The frame buffer is allocated in video memory where the display adapter overlay hardware uses color-keying to view the overlay buffer.
- **Format**: Shows frame buffer pixel formats as supported by the hardware and camera files used.

Using Sapera CamExpert with PC2-Vision

CamExpert is the camera interfacing tool for frame grabber boards supported by the Sapera library. CamExpert generates the Sapera camera configuration file (*yourcamera.ccf*) based on timing and control parameters entered. For backward compatibility with previous versions of Sapera, CamExpert also reads and writes the *.cca and *.cvi camera parameter files.



An important component of CamExpert is its live acquisition display window which allows immediate verification of timing or control parameters without the need to run a separate acquisition program.

For context sensitive help, click on the  button then click on a camera configuration parameter. A short description of the configuration parameter will be shown in a popup. Click on the  button to open the help file for more descriptive information on CamExpert.

The central section of CamExpert provides access to the various Sapera parameters of PC2-Vision. It is divided into five tabs.

Basic Timing Parameters	Basic parameters used to define the timing of the camera. This includes the vertical, horizontal, and pixel clock frequency. This tab is sufficient to configure a free-running camera.
Advanced Control Parameters	Advanced parameters used to configure camera control mode and strobe output. Also provides analog signal conditioning (brightness, contrast, DC restoration, etc.)
External Trigger Parameters	Parameters to configure the external trigger characteristics.
Image Buffer and AOI Parameters	Control of the host buffer dimension and format.
Multi-Camera Control Parameters	Provides camera selection. Includes planar transfer.

Camera Files Distributed with Sapera

The Sapera distribution CD-ROM includes camera files that are compatible to PC2-Vision supported cameras. When using the Sapera CamExpert program, you may use the camera files (CCA) provided to generate a camera configuration file (CCF) that describes the desired camera and frame grabber configuration.

DALSA continually updates their camera application library that contains application information and prepared camera files. Along with the camera search utility on the DALSA web site, a number of camera files are ready to download from the DALSA FTP site [ftp://ftp.DALSA.com/public/Sapera/CamFile_Updates]. Camera files are ASCII text and can be read with Windows Notepad on any computer without having Sapera installed.

Overview of Sapera Acquisition Parameter Files (*.ccf or *.cca/*.cvi)

Concepts and Differences between the Parameter Files

There are two components to the legacy Sapera acquisition parameter file set: CCA files (also called cam files) and CVI files (also called VIC files, that is, video input conditioning). The files store video-signal parameters (CCA) and video conditioning parameters (CVI), which in turn simplifies programming the frame grabber acquisition hardware for the camera in use. **Sapera LT 5.10** introduces a new camera configuration file (**CCF**) that combines the CCA and CVI files into one file.

Typically, a camera application will use a CCF file per camera operating mode (or one CCA file in conjunction with several CVI files, where each CVI file defines a specific camera operating mode). An application can also have multiple CCA/CCF files so as to support different image format modes supported by the camera or sensor (such as image binning or variable ROI).

CCF File Details

Files using the ".CCF" extension (DALSA Camera Configuration file) are essentially the camera (CCA) and frame grabber (CVI) parameters grouped into one file for easier configuration file management. This is the default Camera Configuration file used with Sapera LT 5.10 and the CamExpert utility.

CCA File Details

DALSA distributes camera files using the ".CCA" extension (DALSA CAMERA files) that contains all parameters describing the camera video signal characteristics and operation modes (that is, what the camera outputs). The Sapera parameter groups located within the file are:

- Video format and pixel definitions.
- Video resolution (pixel rate, pixels per line, and lines per frame).
- Synchronization source and timings.
- Channels/Taps configuration.
- Supported camera modes and related parameters.
- I/O hardware signal assignment.

CVI File Details

Legacy files using the ".CVI" extension (DALSA VIDEO files) contain all operating parameters related to the frame grabber board, that is, what the frame grabber can actually do with camera controls or incoming video. The Sapera parameter groups located within the file:

- Activates and sets any supported camera control mode or control variable.
- Defines the integration mode and duration.
- Defines the strobe output control.
- Allocates the frame grabber transfer ROI, the host video buffer size and buffer type (RGB888, RGB101010, MONO8, MONO16).
- Configuration of line/frame trigger parameters such as source (internal via the frame grabber /external via some outside event), electrical format (TTL, LVDS, OPTO-isolated), and signal active edge or level characterization.

Camera Interfacing Check List

Before undertaking the task of interfacing a camera from scratch using CamExpert:

- Confirm that DALSA has not already published an application note with camera files (http://www.dalsa.com/mv).
- Confirm that Sapera does not already have a .cca file for your camera installed on your hard disk. If there is a .cca file supplied with Sapera, then use CamExpert to automatically generate the .ccf file with default parameter values matching the frame grabber capabilities.
- Check if the Sapera installation has a similar type of camera file. A similar .cca file can be loaded into CamExpert where it is modified to match timing and operating parameters for your camera and then save them as Camera Configuration files (.ccf), or as a new .cca & .cvi camera file pair for applications built with Sapera 4.2 or earlier.
- Finally, if your camera type has never been interfaced, run CamExpert after installing Sapera and the acquisition board driver, select the board acquisition server, and enter the camera parameters.

IFC

IFC Software Examples

IFC Examples for PC2-Vision

IFC installation package comes with the following example programs for PC2-Vision. Full source code is included. You need Microsoft Visual C++ 6.0 or later to recompile the examples.

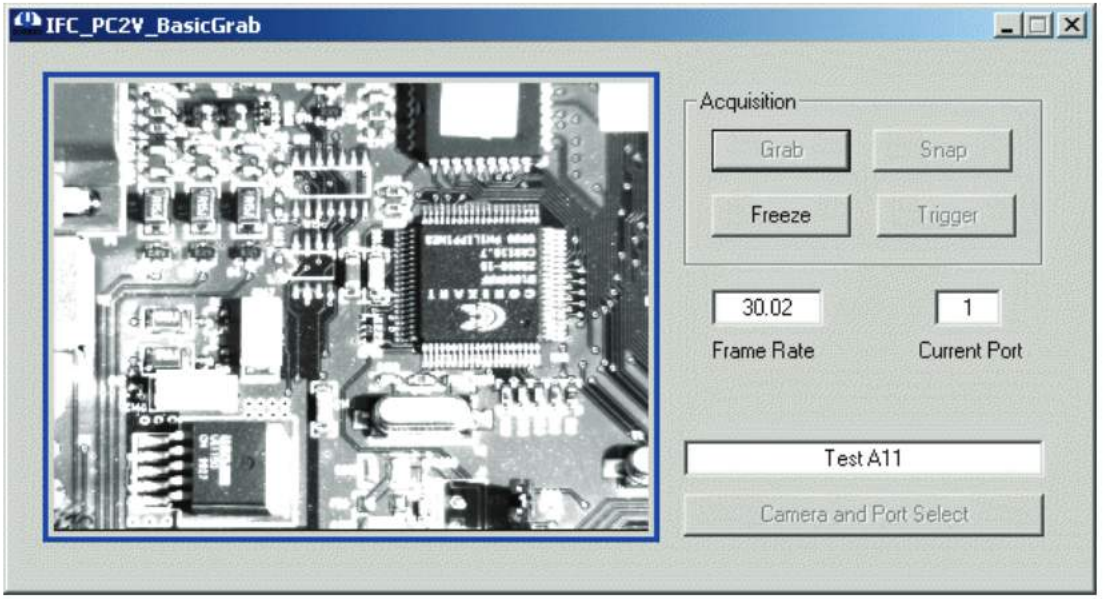
Examples are divided into five categories:

Basic Examples	
BasicGrab	Basic acquisition and display
BasicSoftOverlay	Basic acquisition and display along with text drawing in a software overlay
BasicHardOverlay	Basic acquisition and display in a hardware overlay
Parallel I/O	Demonstrates how to access the I/O pins present on the Parallel I/O connector
ThreadProc	Demonstrates how to do acquisition in host buffer and perform image processing
ThreadTrig	Triggers camera with an external trigger pulse
Camera Switching Examples	
6Cam-2Grab	Synchronized acquisition from 2 groups of 3 cameras using fast camera switching
CamSwitch	Dynamic switching between (and/or up to) 6 synchronized cameras
CamSwitch-Planar Vertical	Shows how to acquire and switch between 2 groups of 3 cameras with a single ring and a single buffer
Manual CamSwitch	Manual camera switching based on the Snap function call
Switcher	Fast camera switching from up to six synchronized cameras
Frame Delay Readout Examples	
FrameDelay	Demonstrates how to acquire six cameras (maximum) simultaneously
FrameDelayDlg	Dialog-box-based application demonstrating frame delay readout
FrameDelay-Planar Vertical	Shows how to acquire from 6 cameras in frame delay mode using the planar vertical mode

Miscellaneous Examples	
4Boards	Demonstrates how to acquire from up to 4 PC2-Vision boards
Interrupt	Demonstrates how to use interrupts available on PC2-Vision
PulseGen	Use Vixn to generate high-precision pulses on the Parallel I/O output
SeqSnap	Snaps a small number of images into host memory and replays them
Vixn	Shows how to use Vixn and explains why the response is fast and steady
Planar Transfer Examples	
3Cameras	Simultaneous acquisition and display of three synchronized cameras (dialog-box application)
3Cam-Planar Vertical	Shows how to acquire from 3 cameras with a single ring and a single buffer
3Cams-1Grab	Acquisition from 3 synchronized cameras (MDI application)
3Cams-1Ring	Simultaneous acquisition and display of three genlocked cameras in planar mode in a single ring of acquisition buffers
Grab3	Simultaneous acquisition from 3 monochrome cameras with live display

IFC_PC2V_BasicGrab

Title	Basic grabbing
Description	Basic acquisition and display with an Image Server. Memory allocation not required.
Features	- Dialog-box-based application - Camera and port selection - Grab or snap - SW trigger - Frame rate indicator
Setup	- Any RS-170 or CCIR camera - Camera cable - 1 PC2-Vision
Project location	**Installation Directory\examples\PC2-Vision\IFC_PC2V_BasicGrab**



IFC_PC2V_BasicSoftOverlay

Title	Basic software overlay
Description	Basic acquisition and display with text drawing in a software overlay. The software overlay allows you to draw over your live image using the Windows GDI. It is not in the video memory and it is not as fast as a hardware overlay.
Features	- Dialog-box-based application - Camera and port selection - Grab or snap - SW trigger - Frame rate indicator
Setup	- Any RS-170 or CCIR camera - Camera cable - 1 PC2-Vision
Project location	**Installation Directory\examples\PC2-Vision\IFC_PC2V_BasicSoftOverlay**

IFC_PC2V_BasicHardOverlay

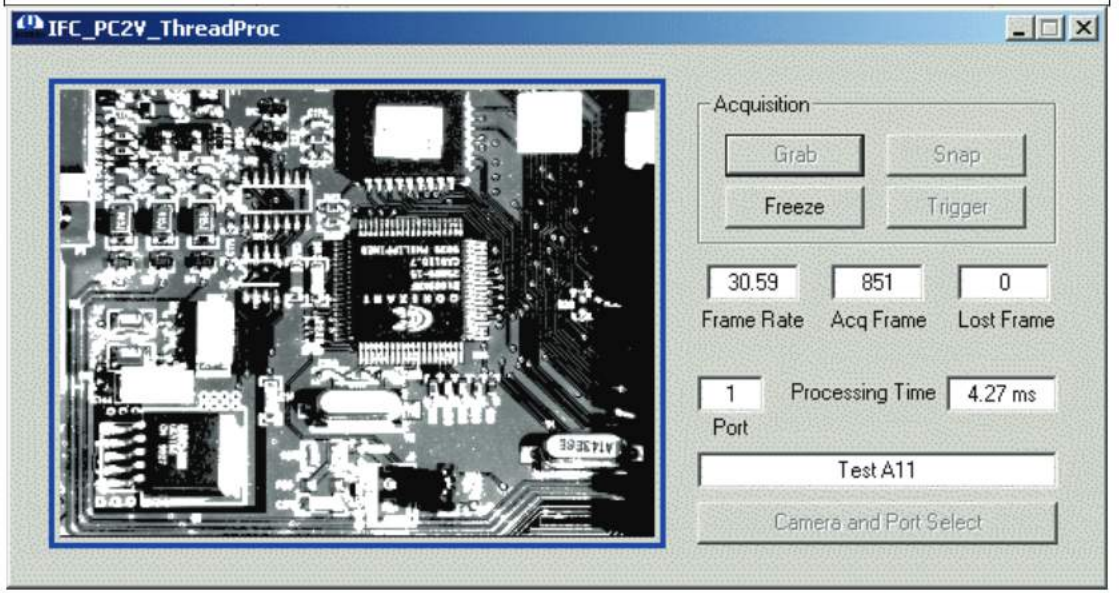
Title	Basic hardware overlay
Description	Basic acquisition and display in a hardware overlay with text drawing in the standard graphic surface. The hardware overlay is physically in the video memory of your display controller and converts in real-time, pixels in Y-Cr-Cb color format to the R-G-B format of your monitor. It also takes care of the scaling in real-time (zoom). The benefit of using a hardware overlay is an extremely fast live display because the host CPU does not have to do the pixel conversion and the image scaling. Keep in mind that the live image is in the overlay and the drawn text is in the standard graphic surface. The overlay, and hence the live image, is visible only if you draw the keying color in the standard graphic surface over the overlay.
Features	- Dialog-box-based application - Camera and port selection - Grab or snap - SW trigger - Frame rate indicator
Setup	- Any RS-170 or CCIR camera - Camera cable - 1 PC2-Vision - Display Controller with a hardware overlay
Project location	**Installation Directory\examples\PC2-Vision\IFC_PC2V_BasicHardOverlay**

IFC_PC2V_Parallel_IO

Title	Parallel Input/Output Connector
Description	Access to all I/O pins of the Parallel I/O connector
Features	- Dialog-box-based application -8 general inputs -8 general outputs -Control of strobe pins -Interrupt pin
Setup	-1 PC2-Vision -Connector on the Parallel I/O 26-pin header
Project location	**Installation Directory\examples\PC2-Vision\IFC_PC2V_Parallel_IO**

IFC_PC2V_ThreadProc

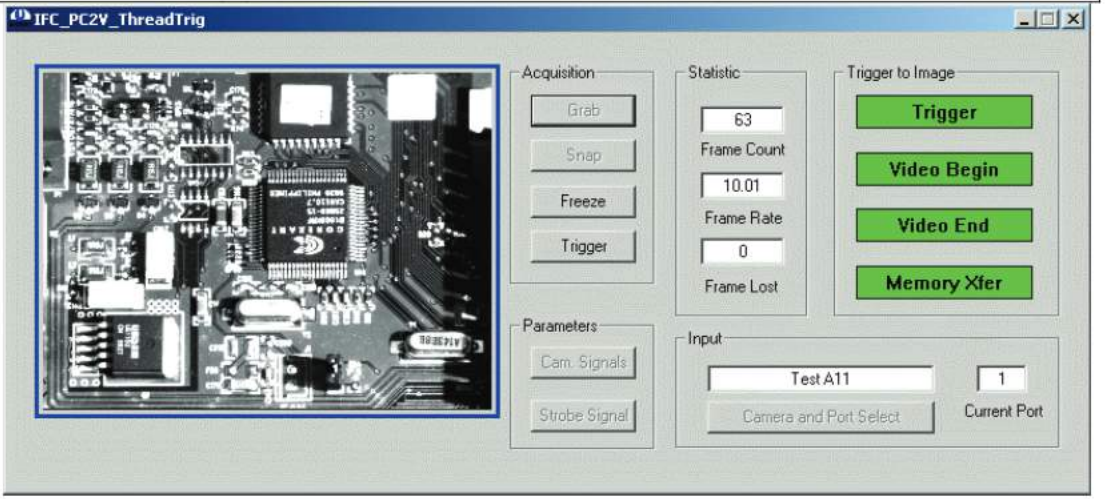
Title	Processing using a thread
Description	Shows how to do acquisition in the host buffer and the display as well as applying processing on every frame using a thread. The processing time is computed and shown. Processing function for this demo is simple thresholding.
Features	- Dialog-box based application - Camera and port selection - Grab or snap - SW trigger - Statistics indicators - Processing time indicator
Setup	- Any RS-170 or CCIR camera - Camera cable - 1 PC2-Vision
Project location	**Installation Directory\examples\PC2-Vision\IFC_PC2V_ThreadProc**



IFC_PC2V_ThreadTrig

Title	Acquisition and display with external camera triggering
Description	The goal of this demo is to trigger the camera with an external trigger pulse instead of a free-running camera. This mode is useful to synchronize the images to an event and/or to capture fast moving objects. Using a progressive scan camera is recommended for fast moving objects. Study carefully the different trigger modes offered by your camera (edge pre-select,

	pulse width control, etc). Note that your config file must be in External Trigger mode. Demo uses visual indicators to represent the Trigger-To-Image reliability model. An indicator is available for each acquisition interrupt.
Features	- Dialog-box-based application - Camera and port selection - Grab or snap - SW trigger - Statistics indicators - Trigger To Image indicators - Camera signal timing (external trigger, frame reset, VSync, Strobe) edit box - Strobe edit box
Setup	- Progressive scan camera supporting asynchronous reset (camera must accept external VD and HD signals as well as camera trigger signals) - Camera cable - 1 PC2-Vision - Trigger source
Project location	**Installation Directory\examples\PC2-Vision\IFC_PC2V_ThreadTrig**



6Cam2Grab

Title	Fast camera switching from six synchronized cameras
Description	Synchronized acquisition from 2 groups of 3 cameras using fast camera switching
Features	MDI application with one window associated to each camera
Setup	- MDI-based application - 6 genlocked cameras - 2 camera cables - 1 PC2-Vision
Project location	**Installation Directory\examples\PC2-Vision\ 6Cam2Grab**

IFC_PC2V_CamSwitch

Title	Fast camera switching one camera at a time
Description	Dynamic switching between (and up to) six synchronized cameras (XTAL).
Features	- Dialog-box-based application - Camera and port selection - Grab or snap - SW trigger - Statistics indicators - Trigger -to -image indicator
Setup	- From 1 to 6 genlocked cameras - 1 or 2 camera cables - 1 PC2-Vision
Project location	**Installation Directory\examples\PC2-Vision\IFC_PC2V_CamSwitch**

IFC_PC2V_CamSwitchPlanarVertical

Title	Fast camera switching combined with vertical planar transfer
Description	Two blocks of three genlocked cameras acquiring in planar vertical mode using a single ring of buffers. Each buffer contains three images and is displayed in a single window where each camera image is on top of each other. The two blocks of three cameras are dynamically switched.
Features	- Dialog-box-based application - Frame rate indicator - Trigger presence indicator
Setup	- From 1 to 6 genlocked cameras

	- 1 or 2 camera cables
	- 1 PC2-Vision
Project location	**Installation Directory\examples\PC2-Vision\ IFC_PC2V_CamSwitchPlanarVertical**

IFC_PC2V_ManualCamSwitch

Title	**Manual camera switching**
Description	Up to 6 asynchronous cameras are acquired sequentially using SNAPs. This is typically used with PLL mode cameras (when cameras are not synchronized).
Features	- Dialog-box-based application
	- Independent config file selection for each of the 6 cameras
	- Frame rate indicator
	- Switching sequence selection
	- Trigger presence indicator
Setup	- From 1 to 6 cameras
	- 1 or 2 camera cables
	- 1 PC2-Vision
Project location	**Installation Directory\examples\PC2-Vision\ IFC_PC2V_ManualCamSwitch**

Switcher

Title	**Switcher using fast camera switching**
Description	Fast camera switching using up to 6 synchronized cameras
Features	- MDI-based application
	- Selection of switching sequence
	- Optional use of a single ring buffer
Setup	- From 1 to 6 genlocked cameras
	- 1 or 2 camera cables
	- 1 PC2-Vision
Project location	**Installation Directory\examples\PC2-Vision\ Switcher**

FrameDly

Title	**Frame Delay Readout (MDI)**
Description	Demonstrates how to acquire 6 cameras (maximum) simultaneously
Features	- SDI-based application
	- Camera presence selection

	- Save sequence to AVI format
Setup	- From 1 to 6 cameras supporting frame delay readout
	- 1 or 2 camera cables
	- 1 PC2-Vision
Project location	**Installation Directory\examples\PC2-Vision\ FrameDly**

IFC_PC2V_FrameDelay

Title	**Frame Delay Readout (Dialog-box-based)**
Description	Shows how to acquire from up to 6 cameras simultaneously in frame delay readout mode.
Features	- Dialog-box-based application
	- Grab or snap
	- SW trigger
	- Statistics indicators
	- Trigger-to-image indicator
Setup	- From 1 to 6 cameras supporting frame delay readout
	- 1 or 2 camera cables
	- 1 PC2-Vision
Project location	**Installation Directory\examples\PC2-Vision\IFC_PC2V_FrameDelay**

IFC_PC2V_FrameDelayPlanarVertical

Title	**Frame Delay Readout using Vertical Planar Transfer**
Description	Up to 6 cameras capture an image at the same moment and are subsequently acquired three at a time. They are stored in the host memory in a planar manner and displayed in a vertical planar manner.
Features	- Dialog-based application
	- 2 vertical planar displays
	- Selection of trigger source
	- Frame count and frame rate indicators
	- Trigger presence indicator
Setup	- From 1 to 6 cameras supporting frame delay readout
	- 1 or 2 camera cables
	- 1 PC2-Vision
Project location	**Installation Directory\examples\PC2-Vision\ IFC_PC2V_FrameDelayPlanarVertical**

IFC_PC2V_4Boards

Title	Acquisition with up to four PC2-Vision boards
Description	Shows how to acquire from up to 4 PC2-Vision boards within the same system. In this demo, each PC2-Vision requires one camera. Use serial numbers to identify which PC2-Vision board corresponds to which PCI slot.
Features	- Dialog-box-based application - Camera and port selection - Grab or snap - SW trigger - Statistics indicators - Serial number indicator for each card
Setup	- From 1 to 4 RS-170 or CCIR cameras - From 1 to 4 camera cables - From 1 to 4 PC2-Vision
Project location	**Installation Directory\examples\PC2-Vision\IFC_PC2V_4Boards**

Interrupt

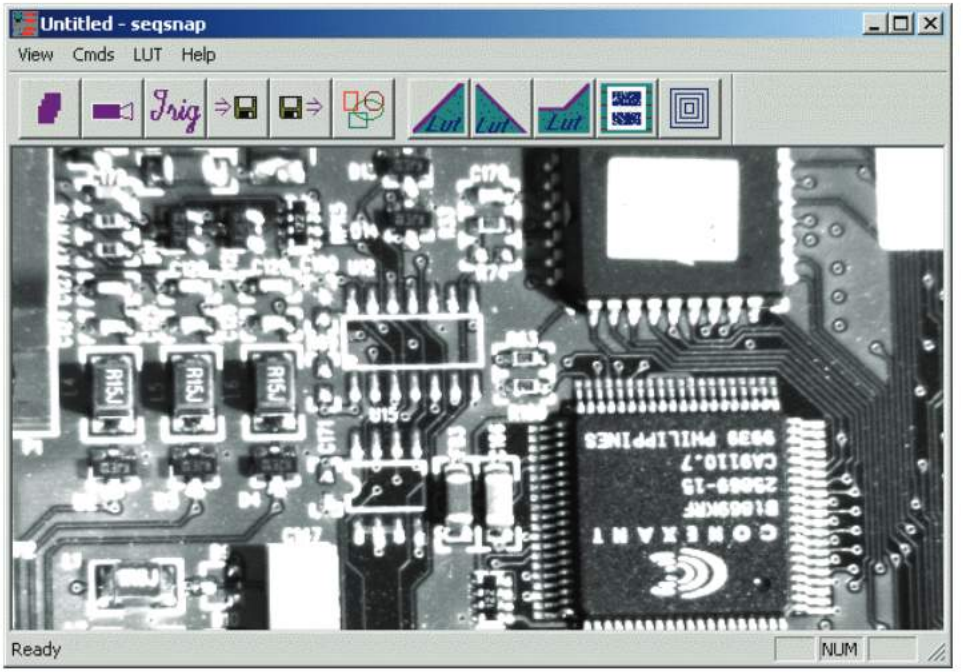
Title	Interrupt
Description	Shows how to register to the interrupts available on the PC2-Vision board. Camera trigger setup can be changed from within this application.
Features	- Uses **P2VTEST.TXT** for configuration - Support for all acquisition interrupts - External trigger configuration dialog - SW trigger generation
Setup	- Any RS-170 or CCIR camera on port 0 - Camera cable - 1 PC2-Vision - Source of external trigger
Project location	**Installation Directory\examples\PC2-Vision\IntrEx**

PulseGen

Title	Pulse Generator using Vixn
Description	Use the Vixn timer to generate high-precision pulses on the Parallel I/O output
Features	- Selection of pulse frequency - Selection of pulse width
Setup	- 1 PC2-Vision
Project location	**Installation Directory\examples\PC2-Vision\ PulseGen**

SeqSnap

Title	Sequential Snap
Description	Snaps a small number of images into host memory and replays them.
Features	- Uses **P2VTEST.TXT** for configuration - Snaps a short sequence of frames to host memory and replays this sequence. - Camera and port selection - Camera control for external trigger, frame reset, and strobe - Overlay demonstration - LUT demonstration - Window generator dialog - Saves AVI sequence
Setup	- Any camera - Camera cable - 1 PC2-Vision
Project location	**Installation Directory\examples\PC2-Vision\SeqSnap**

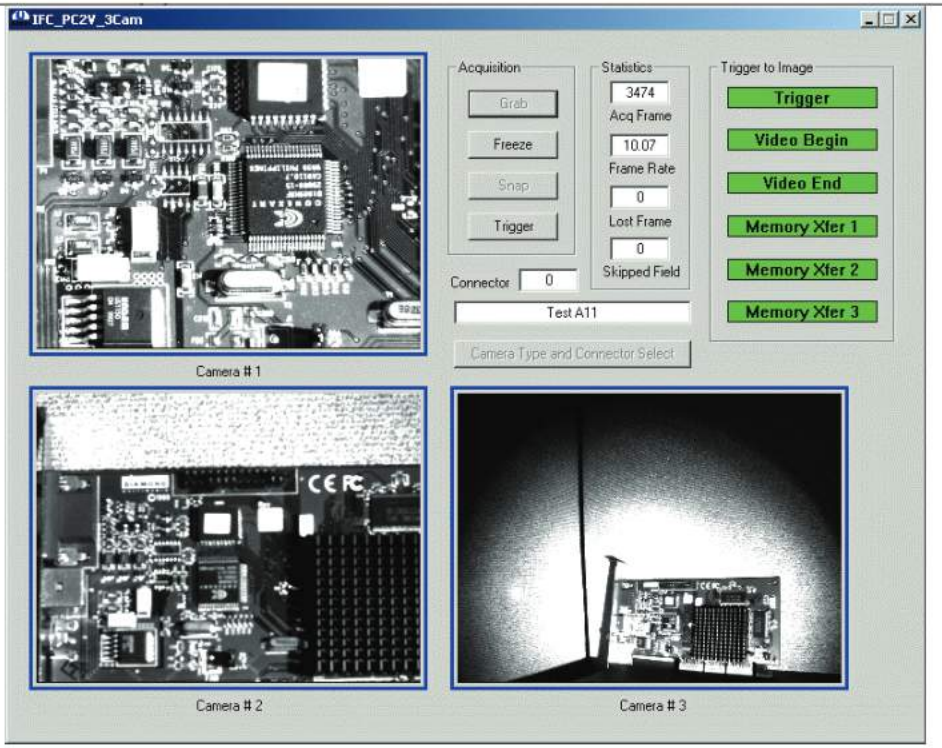


IFC_PC2V_Vixn

Title	Vixn versus regular callback latency and jitter comparison
Description	This demo shows how fast and constant a VIXN interrupt callback is achieved by comparing graphically the response time jitter of both a VIXN and a regular callback
Features	- Dialog-box-based application -Latency and jitter statistics for Vixn callbacks -Latency and jitter statistics for regular event callbacks -Frame rate indication
Setup	- Any camera - Camera cable - 1 PC2-Vision
Project location	**Installation Directory\examples\PC2-Vision\ IFC_PC2V_Vixn**

IFC_PC2V_3Cam

Title	Acquisition from three genlocked cameras
Description	Simultaneous acquisition and display of three genlocked cameras in Planar transfer mode.
Features	- Camera and port selection - Grab or snap - SW trigger - Statistics indicators - Trigger To Image indicators
Setup	- 3 genlockable monochrome cameras (must accept external VD and HD signals) - Camera cable supporting three monochrome cameras - 1 PC2-Vision
Project location	**Installation Directory\examples\PC2-Vision\IFC_PC2V_3Cam**



IFC_PC2V_3CamPlanarVertical

Title	Three Cameras Acquisition with Planar Vertical Transfer
Description	Acquisition and display of 3 genlock monochrome cameras using a single ring and a single buffer for all 3 channels.
Features	-Dialog box-based application -Trigger-to-image reliability indicators -Statistics for frame count, frame rate, frame lost, frame not acquired, and frame not displayed. -Camera selection
Setup	- 3 genlockable monochrome cameras (must accept external VD and HD signals) - Camera cable supporting three monochrome cameras - 1 PC2-Vision
Project location	**Installation Directory\examples\PC2-Vision\ IFC_PC2V_3CamPlanarVertical**

3Cam1Grab

Title	Three Cameras using a single Grab call
Description	Acquisition from 3 synchronized cameras
Features	- MDI-based application - Simultaneous display of 3 cameras outputs
Setup	- 3 genlockable monochrome cameras (must accept external VD and HD signals) - Camera cable supporting three monochrome cameras - 1 PC2-Vision
Project location	**Installation Directory\examples\PC2-Vision\ 3Cam1Grab**

IFC_PC2V_3Cam1Ring

Title	Planar Acquisition from three cameras into a single ring buffer
Description	Simultaneous acquisition and display of three genlocked cameras in planar mode in a single ring of acquisition buffers. Planar mode means that the three images are at three different locations in memory. In this demo, IFC assumes that it is grabbing from a single RGB camera; but, the three colors signals could be, in fact, three monochrome signals coming from three cameras.
Features	-Dialog-box-based application -Grab statistics: frame count, frame rate, frame lost, frame not acquired, frame not displayed. -Trigger-to-image reliability indicators

	-Camera selection
Setup	- 3 genlockable monochrome cameras (must accept external VD and HD signals)
	- Camera cable supporting 3 monochrome cameras
	- 1 PC2-Vision
Project location	**Installation Directory\examples\PC2-Vision\ IFC_PC2V_3Cam1Ring**

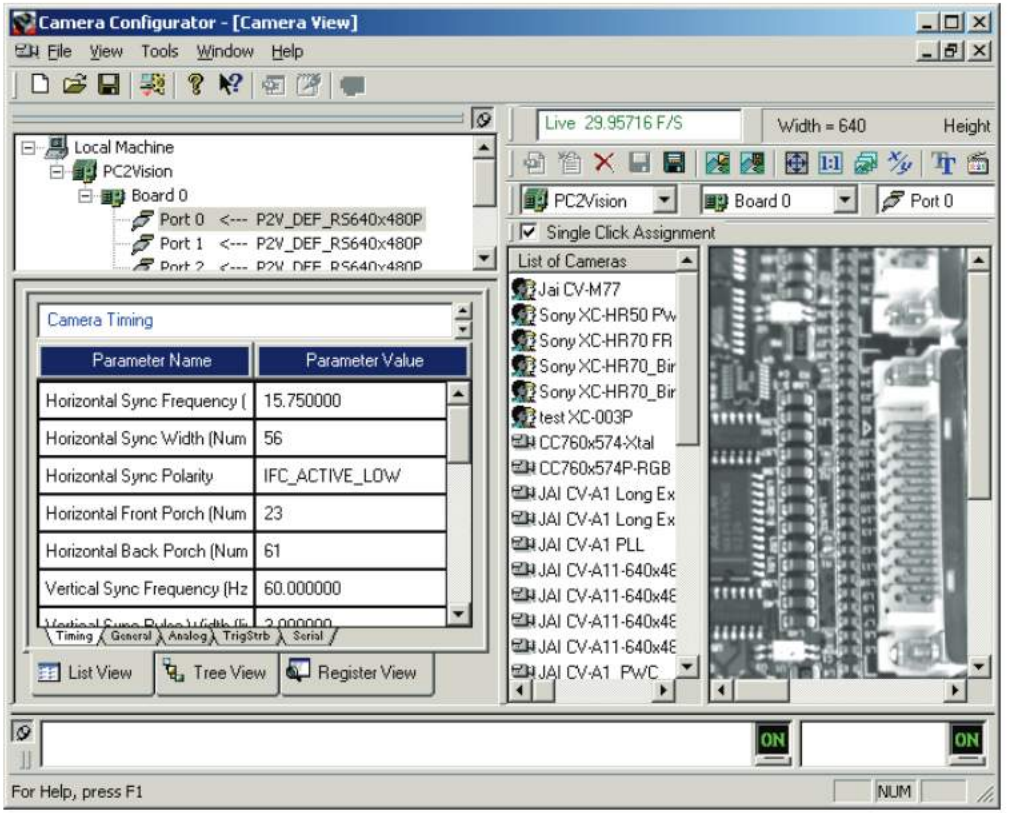
Grab3

Title	**Acquisition from three genlocked cameras**
Description	Simultaneous acquisition from three genlocked monochrome cameras with live display.
Features	Uses **P2VTEST.TXT** for configuration
Setup	- 3 genlockable monochrome cameras (must accept external VD and HD signals)
	- Camera cable supporting three monochrome cameras
	- 1 PC2-Vision
Project location	**Installation Directory\examples\PC2-Vision\Grab3**

Applying IFC Camera Configurator to PC2-Vision

Interfacing Cameras with IFC Camera Configurator

The IFC Camera Configurator® program is the camera interfacing tool for frame grabber boards supported by the IFC library, such as the PC2-Vision. Camera Configurator® generates the required camera configuration file (*yourconfig.txt*) based on the timing and control parameters entered.



The live acquisition window is an important tool within Camera Configurator®. It performs immediate verification on timing or control parameters without the need to run a separate acquisition program. An overview on how to use the Camera Configurator® is available via the IFC Configurator help file installed within the IFC folder accessed from the Start Menu.

This section provides information concerning interfacing between analog cameras and the PC2-Vision. Note that this applies to monochrome and RGB cameras.

Configuration Files Distributed with IFC

The IFC distribution CD-ROM includes a selection of supported camera configuration (.txt) files. Using the IFC Camera Configurator® program, your camera files can be reviewed or modified and corresponding .txt files quickly generated.

IFC Camera Application Library

DALSA created and frequently updates a camera application library composed of application information and prepared camera configuration files. Refer to the "Camera Search" utility on the DALSA web site [http://www.dalsa.com/mv/downloads] for application notes and camera configuration files that you can download.

A Note about Cameras

Many cameras have jumpers or a serial port to control their internal configuration. Make certain that they match your camera configuration file.

Interfacing Check List

Before undertaking the task of interfacing a camera from scratch using the Camera Configurator®:

- Confirm that DALSA has not already published an application note with camera configuration files (see "IFC Camera Application Library" on page 136).
- Check to see if the IFC installation has a similar type of camera file. A similar .txt file can be loaded into the Camera Configurator® where it would then be modified to match the timing and operating parameters for your camera and then saved as a new .txt camera configuration file.

Note: It is easier to find camera timing in free-running mode. Make certain that your camera operates correctly in free-running mode before attempting to use asynchronous reset mode.

Interfacing Free Running Cameras

Interfacing Camera to PC2-Vision with Camera Configurator®

To interface a new camera to your PC2-Vision, select a default camera (such as P2V_DEF_RS640x480P) and follow these steps.

General Acquisition Parameter Group

In Camera Configurator®, select the **General** tab in the "parameter view" on the left.

Since you are configuring a non-standard camera (standard cameras already have configuration files), set the following parameter:

```
Video Standard = IFC_VIDEO_STANDARD_NONE
```

Monochrome or RGB

Next, indicate if your camera is monochrome or RGB. In the "Parameter" section of the Camera Configurator®, select the **General** tab and go to *Color* parameter.

For monochrome:

```
Color = IFC_MONO    (8-bit monochrome)
```

For RGB:

```
Color = IFC_RGB     (32-bit zero-padded RGB)
```

Note: On PC2-Vision, the *Pixel Size* parameter is always 8-bits (read-only). For RGB video, each color plane has 8 bits.

Note: You can connect a maximum of two RGB cameras to one PC2-Vision. The first RGB camera uses ports 0, 1, and 2; the second camera uses ports 3, 4, and 5. The camera configuration file must be applied to port 0 or 3, respectively. Port 0 is blue, port 1 is green and port 2 is red for the first RGB camera. Port 3 is blue, port 4 is green and port 5 is red for the second RGB camera.

Interlaced or Non-interlaced

Select the scan method used by your camera: interlaced or non-interlaced scan.

For interlaced cameras:

```
Scan mode = IFC_ILACED
First Field in Frame = IFC_ODD_FIELD
```

For non-interlaced (progressive scan) cameras:

```
Scan mode = IFC_NILACED
First Field in Frame = IFC_NEXT_FIELD
```

Other parameters must be set to the default value:

```
Fields Processed = P2V_FIELD_PROCESS_ALL
Multi-tap mode = P2V_SINGLE_TAP
```

Cropper

The Cropper is used to define the region of interest (ROI) to capture within the active video region. This excludes the back and front porch. The ROI can be the whole frame size or a smaller area.

The Cropper applies to the horizontal and vertical active period. Therefore, the ROI refers to the image portion transferred to the host by the PC2-Vision. The cropped image area in the figure below illustrates this.

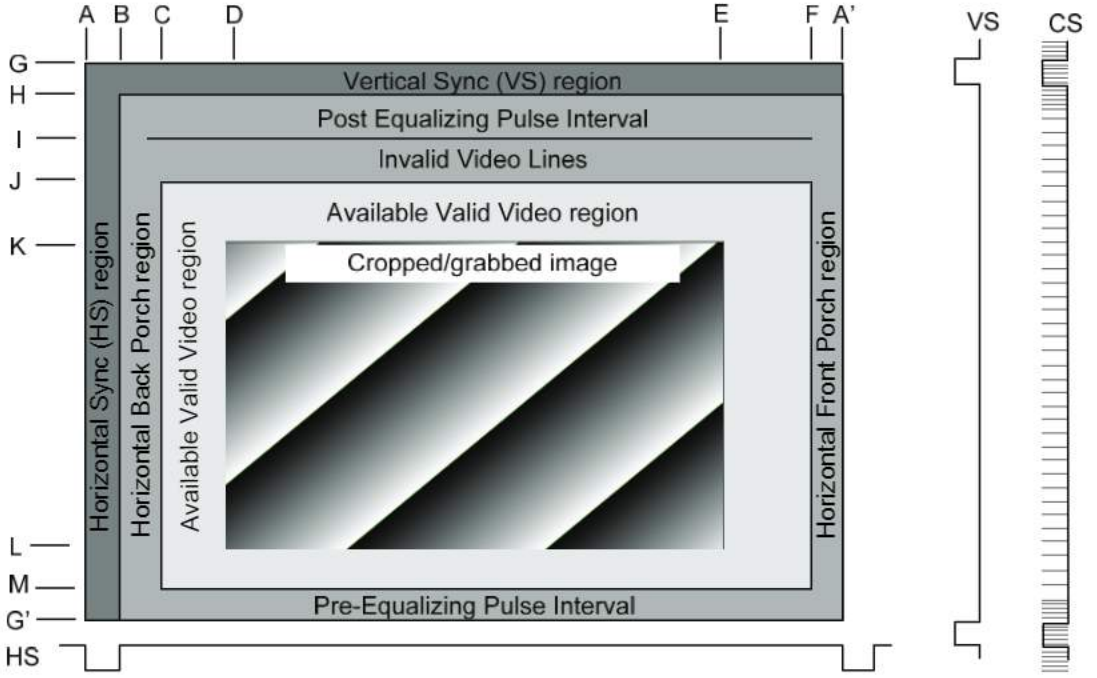


Figure 54: Cropper

Ref	Hardware signal	Description	Ref	Hardware signal	Description
A	sHLeadEdge_p	Horizontal Sync Leading Edge	M		First Line of Pre-Equalizing Pulse Interval
A'		Same as A + 1 line	(A,G)	sVLeadEdge_p	Vertical Sync Leading Edge (± ½ line)
B	sHTrailEdge_p	Horizontal Sync Trailing Edge aka Start of Horizontal Back Porch	(A, H)	sVTrailEdge	Vertical Sync Trailing Edge (± ½ line)
C		Horizontal Start of Valid Video	(D,K)	sSOFi_p	Start of Field (occur on first pixel of a grabbed field)
D	sSOL_p	First grabbed pixel of line (SOL: Start of Line) aka Horizontal Blank Stop	(D,K)	sSOF_p	Start of Frame (occur on first pixel of a grabbed frame)
E	sEOL_p	Last grabbed pixel of line (EOL: End of Line)	(D,K)	sSOF_p	Start of Transfer (only occur in first frame on first pixel of a grabbed stream)
E+1		Horizontal Blank Start	(E,L)	sEOFi_p	End Of Field (occur on last pixel of a grabbed field)
F		Start of Horizontal Front Porch	(E,L)	sEOF_p	End Of Frame (occur on last pixel of a grabbed frame)
G		First line of Vertical Sync	(E,L)	sEOF_p	End Of Transfer (only occur in last frame on last pixel of a grabbed stream)
G'		Same as G = 1 field/frame	A' – A		Line Width
H		First line of Post Equalizing Pulse Interval	B – A		HS Width
I		Last line of Post Equalizing Pulse Interval	A' – E + D		Horizontal Blank Width
J		First line of Valid Video provided by the camera	G' – G		Field/Frame Height/Width
K		First grabbed line of Field/Frame (usually K=J_	H – G		VS Height/Width
L		Last grabbed line of Field/Frame (usually L=M-1)	G' – L + K		Vertical Blank Height/Height/Width

Note: During camera configuration file development, it is better to use a window much smaller than the camera nominal size: the frame grabber needs to see at least the number of pixels defined by the window generator in order to correctly capture the image. By defining a smaller ROI, you ensure enough pixels are captured to fill the frame buffer.

Example1: Your camera has a nominal frame size of 1024 pixels by 768 lines and you want to capture the entire frame:

```
Horizontal Offset = 0
Width = 1024
Vertical Offset = 0
Height = 768
```

Example 2: You want to extract a ROI of 128 x 64 located 100 pixels to the right and 50 lines below the upper left corner of the image:

```
Horizontal Offset = 100
Width = 128
Vertical Offset = 50
Height = 64
```

Timing Parameter Group

Select the **Timing** tab in Camera Configurator®.

PLL, XTAL or VScan

In PLL (phase lock loop) mode, the frame grabber uses the timing information provided by the camera to digitize pixels. The HS (horizontal synchronization) and VS (vertical synchronization) information can be either:

- Embedded in the video signal (composite video).
  A single signal carries both sync and video.
- Provided on the same signal (composite sync).
  Two signals are required: csync and video.
- Provided on its own signal (separate sync).
  Three signals are required: hsync, vsync, and video.
- For a RGB camera, you can also define on which color channel the timing information is embedded (red, green, or blue).

In XTAL (crystal) mode, the frame grabber provides this timing to the camera. XTAL mode is also called Master Mode since the frame grabber is the timing master for the acquisition process.

In VScan (variable scan) mode, the camera provides the HS, VS, and pixel clock information to the frame grabber.

Note: It is possible with PC2-Vision to use a combination of Master Mode and External Sync. For example, the frame grabber can drive HD/VD to the camera but nonetheless use the composite video to extract the HS/VS used for digitization. DALSA recommends using synchronization from the composite video if the camera provides it.

For PLL mode:

```
Source of Input Sync. = P2V_SYNC_COMPOSITE_VIDEO  or P2V_SYNC_COMPOSITE_SYNC or
P2V_SYNC_SEPARATE_SYNC
Master HSync Enable = IFC_DISABLE
VSync Pulse Enable = P2V_VSYNC_DISABLE
Pixel Clock Source = P2V_PIXEL_CLOCK_INTERNAL
```

For XTAL mode:

```
Source of Input Sync. = P2V_SYNC_INTERNAL_SYNC
Master HSync Enable = IFC_ENABLE
VSync Pulse Enable = P2V_VSYNC_LINE_WIDTH
Pixel Clock Source = P2V_PIXEL_CLOCK_INTERNAL
```

Note: On the PC2-Vision, in XTAL mode with frame reset, the VD pulse is not automatically resynchronized to the frame reset pulse in contrast to the PC-Series, which does resynchronize to the frame reset pulse in XTAL mode with frame reset. To synchronize VD to frame reset, you must select *VSync Pulse Enable* = P2V_VSYNC_DISABLE.

For VScan Mode:

```
Source of Input Sync. = P2V_SYNC_SEPARATE_SYNC
Master HSync Enable = IFC_DISABLE
VSync Pulse Enable = P2V_VSYNC_DISABLE
Pixel Clock Source = P2V_PIXEL_CLOCK_EXTERNAL
```

Pixel Clock Timing

The Pixel Clock is used by the analog-to-digital converter (ADC) to digitize the video signal. The most important characteristic is the pixel clock frequency of your camera.

```
Pixel Clock Frequency = 'value from your camera datasheet (in MHz)'
Pixel Clock Polarity = IFC_RISING_EDGE
```

Horizontal Timing

The figure below reviews the basic horizontal timings of a typical analog camera. Note that the black level V_P is specific to the NTSC/RS-170/EIA video standard whereas other common video standards define black level as V_T.

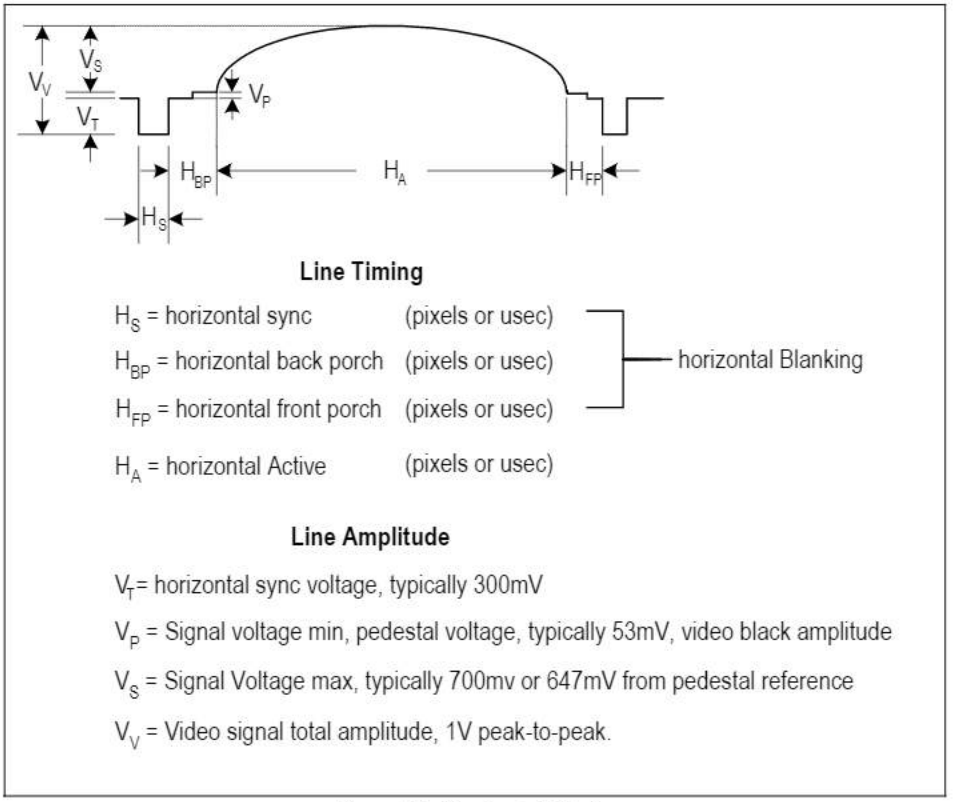


Figure 55: Horizontal Timing

PC2-Vision has the corresponding horizontal timing parameters:

Horizontal Sync Frequency: Line frequency of the camera. It is given by the following formula:

$$P_HSYNC_FREQ = \frac{1}{H_S + H_{BP} + H_A + H_{FP}}$$

Where H_S, H_{BP}, H_A and H_{FP} are expressed in seconds.

Horizontal Sync Width: horizontal sync pulse width in pixels. H_S in diagram above.

Horizontal Sync Polarity: Horizontal sync. pulse may be active high or active low. Active low is the most common.

Horizontal Front Porch: Horizontal front porch duration in pixels. H_{FP} in diagram above.

Horizontal Back Porch: Horizontal back porch duration in pixels. H_{BP} in diagram above. The horizontal back porch indicates the start of the frame to digitize. If its value is too low, a black bar appears on the left of the image. If the value is too high, you lose some of the first pixels in the image. If this information is not available from your camera datasheet, you may need to tweak a bit until you are right on the edge of the image.

Vertical Timing

The figure below reviews the basic vertical timings of a typical analog camera. The vertical synchronization shown in this example is called double-serration vertical sync, because the horizontal sync frequency is doubled during nine line periods. The double pulses are ignored by the frame grabber; therefore, the vertical sync parameter in the Camera Configurator® is always the number of true horizontal lines.

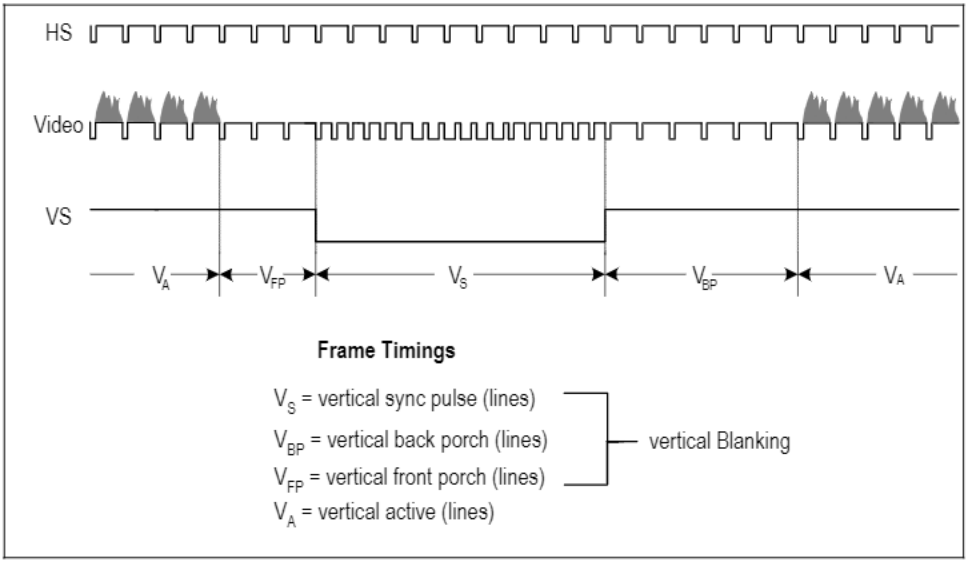


Figure 56: Vertical Timing

For interlaced video cameras, the HS to VS phase relationship changes from one field to the next (ODD/EVEN fields). This example represents the ODD field.

PC2-Vision has the corresponding vertical timing parameters:

Vertical Sync Frequency: Vertical sync. frequency. For interlaced scan cameras, this is the field rate (twice the frame rate). For progressive scan, this is the frame rate.
Vertical Sync Pulse Width: Vertical sync. pulse width in lines. V_s in diagram above.
Vertical Sync Polarity: Vertical sync. pulse may be active high or active low. Active low is the most common.
Vertical Front Porch: Vertical front porch duration in lines. V_{FP} in diagram above.
Vertical Back Porch: Vertical back porch duration in lines. V_{BP} in diagram above.

WEN Signal

Write Enable (WEN) is a signal available on some cameras to indicate the presence of valid data on the video signal. If it is available on your camera, WEN can be activated to replace the VS as the triggering condition to start digitizing a new frame.

```
WEN Input Enable = IFC_Enable
WEN Input Polarity = IFC_ACTIVE_HIGH or IFC_ACTIVE_LOW
WEN Vertical Offset = 'number of lines to skip after WEN'
```

Note: When WEN is activated, it is used internally by PC2-Vision to trigger the presence of a valid image. This is true for all sources of synchronization available (composite video, separate sync, and internal sync).

Analog Parameters Group

Select the **Analog** tab in Camera Configurator®.

Clamping

A programmable clamp pulse is used to establish the reference black video level. A region is defined on the horizontal back porch. This is required in order to assure proper image intensity.

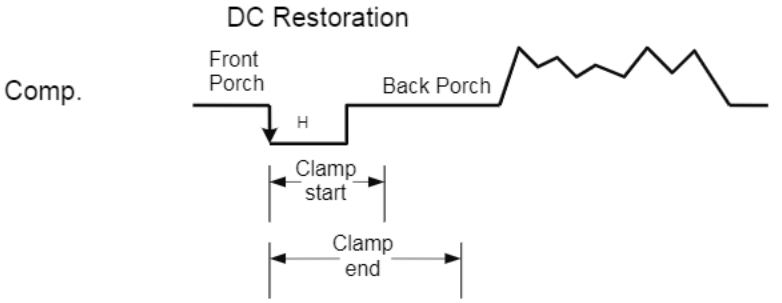


Figure 57: DC Restoration (Clamping)

```
Enable Clamping = IFC_ENABLE
Back Porch Clamp Start Delay = 'Clamp start' value on figure above
Back Porch Clamp End Delay = 'Clamp end' value on figure above
```

Note: If the clamp pulse region is defined in the HS sync pulse, the image will be too bright. If the clamp pulse region is defined in the active video, the image will generally be too dark. Clamp needs to be defined in the back porch to obtain the proper intensity.

Note: With Internal Sync mode, the horizontal reference is the edge of HD, as shown in "Figure 13: HD relation to HS" on page 35. With this synchronization scheme, clamp start and clamp end values refer to the first edge of HD, not to HS coming from composite video.

Anti-aliasing Filter

This low-pass filter is used to prevent aliasing during the digitization process. The Nyquist theorem states that to prevent aliasing, the maximal frequency of an analog signal must be less than twice the digitization rate. For example, if your pixel clock is 12MHz, you should enable a 6MHz filter to prevent aliasing.

PC2-Vision supports a 6MHz, 12MHz and a filter bypass option.

```
Low Pass Filter Control: Select appropriate filter for your Pixel Clock.
```

External Trigger and Strobe

PC2-Vision supports two external triggers and two strobe signals, one on each of the two MDR-36 camera connectors. In the Camera Configurator®, go to the **TrigStrb** tab.

Configuring the External Trigger

External Trigger Support

The external trigger is an input signal to the frame grabber indicating when to initiate an acquisition. PC2-Vision supports differential or TTL inputs.

Pinout:

MDR-36 pin 17: Ext_Trigger-
MDR-36 pin 18: Ext_Trigger+

Enabling Trigger

You first need to activate the external trigger:

```
Trigger Enable = IFC_ENABLE
```

Trigger Pulse

Next, define the physical attributes of the trigger.

Trigger Source: Source of the external trigger. Can be from first MDR-36 (IFC_EXT0_TRIG), second MDR-36 (IFC_EXT1_TRIG), connector holding the camera (IFC_EXT_AUTO_TRIG) or a software-generated trigger (IFC_SOFT_TRIG).

Trigger Polarity: Trigger can be detected on the rising edge (P2V_RISING_EDGE) or on the falling edge (P2V_FALLING_EDGE).

Trigger Debounce: This value indicates the minimal valid trigger pulse duration in µs. Any trigger pulse shorter than this value is rejected.

Frame Timing Related to Trigger

The remaining two trigger parameters are used to indicate trigger relation to the frames being acquired.

Frames per Trigger: Number of frames to capture when a valid external trigger is detected. This is normally set to 1 frame (each trigger fires the acquisition of one frame).

VSync to Wait before Grab: Indicates the number of VSync pulses to wait after a trigger before starting the acquisition. Normally set to 1 to start grabbing at the next VSync (grab the next valid frame).

Configuring the Strobe

Strobe Support

The strobe is an output signal from the frame grabber that is normally used to control a strobe light to illuminate the object while it is acquired.

Pinout:

MDR-36 pin 11: Strobe

The strobe is implemented using a timer. This timer can generate pulse duration up to 65 seconds.

Fast Strobe Mode

In Fast Strobe mode, the strobe pulse is sent immediately when the external trigger is detected. This is shown in following diagram. This mode is generally used for asynchronous reset cameras.

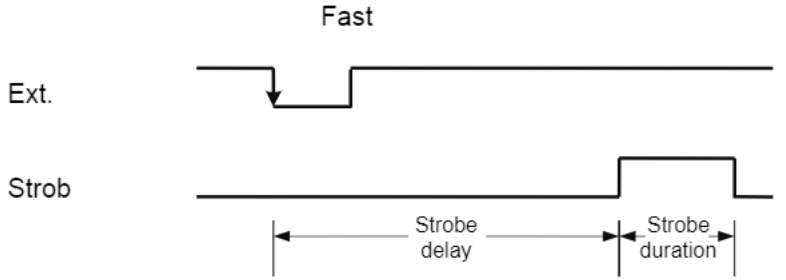


Figure 58: Fast Strobe

```
Strobe Output Enable = IFC_ENABLE
Strobe Mode = IFC_FAST_STROBE
Strobe Polarity: Active high (IFC_ACTIVE_HIGH) or active low (IFC_ACTIVE_LOW)
Strobe Duration: Duration of strobe pulse in µs
Strobe Delay = Defines the delay from Ext. Trigger before firing the strobe pulse.
Strobe Aligned on Horz Sync: Enable if you want strobe pulse to be aligned on HS
```

Note: PC2-Vision Fast Strobe mode does not support an exclusion region.

Slow Strobe Mode

In Slow Strobe mode, the strobe pulse is sent after the first VS following the external trigger. In this case, the strobe delay represents the amount of time after VS before the strobe is fired, as shown in diagram below. This mode is generally used for free-running cameras.

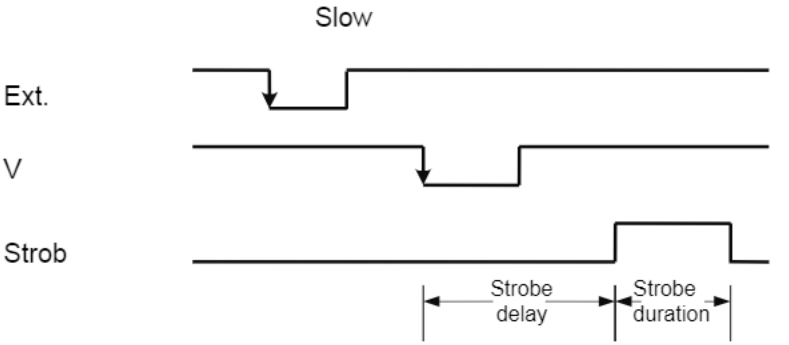


Figure 59: Slow Strobe

```
Strobe Output Enable = IFC_ENABLE
Strobe Mode = IFC_SLOW_STROBE
Strobe Polarity: Active high (IFC_ACTIVE_HIGH) or active low (IFC_ACTIVE_LOW)
Strobe Duration: Duration of strobe pulse in µs.
Strobe Delay: Define the delay from VS before firing the strobe pulse.
Strobe Aligned on Horz Sync: Enable if you want strobe pulse to be aligned on HS
```

Caution: the strobe pulse is aligned to the VS used by the PC2-Vision board. 'Source of Sync' of P2V_SYNC_COMPOSITE_VIDEO means that the VS is coming from the camera. 'Source of Sync' of P2V_SYNC_INTERNAL_SYNC means that the VS is generated by PC2-Vision. When 'VSync Pulse Enable' is set to P2V_VSYNC_LINE_WIDTH, the master mode engine generating VS is asynchronous to the external trigger. Your strobe pulse might therefore shift in time.

Asynchronous Reset Mode

Theory of Operation for PC2-Vision

Asynchronous Reset mode uses one (or more) pulse sent to the camera to control the exposure and acquisition.

Note: In Asynchronous Reset mode with synchronization on Internal Sync activated, use P2V_VS_PULSE_ENABLE = IFC_VSYNC_DISABLE in order for the frame reset and internal VS pulse to be synchronized together. Otherwise, your image will shift vertically while grabbing since the Master Mode VS is not synchronized to frame reset.

Pulse Width Control Mode

In Pulse Width Control, the integration time of the CCD is controlled by the duration of the frame reset pulse sent to the camera. This pulse can be optionally aligned to HS.

The frame reset is implemented using a timer. This timer can generate pulse duration up to 65 seconds.

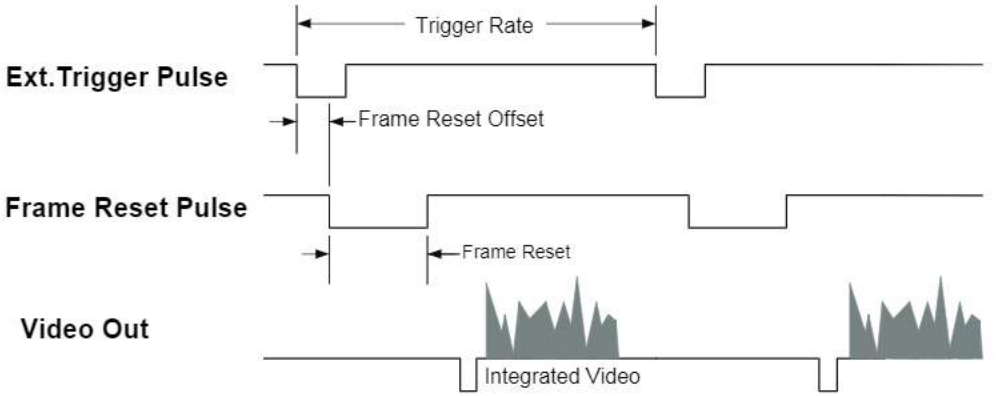


Figure 60: Pulse Width Control

The following parameters are located under the **TrigStrb** tab:

```
Frame Reset Mode = IFC_ENABLE
Frame Reset Polarity = IFC_ACTIVE_LOW or IFC_ACTIVE_HIGH
Frame Reset Offset: Offset in µs after external trigger pulse before asserting frame
reset.
Frame Reset Size: Duration in µs of frame reset pulse.
Add Frame Reset to VSync = IFC_DISABLE
Frame Reset Aligned on Horz Sync = IFC_ENABLE
```

Refer to "Configuring the External Trigger" on page 146 section to set external trigger parameters.

Edge Pre-Select Mode

Edge Pre-Select is equivalent to "pulse width control" except for one characteristic: the exposure period is governed by a camera setting (and not by the duration of the frame reset pulse). The first edge of the frame reset pulse triggers the camera.

Restart-Reset/Long Time Exposure Mode in Free Running

The integration time is controlled by the interval between two VD pulses. Vertical sync and horizontal sync are input to the camera.

The VSync is implemented using a timer. This timer can generate pulse duration up to 65 seconds.

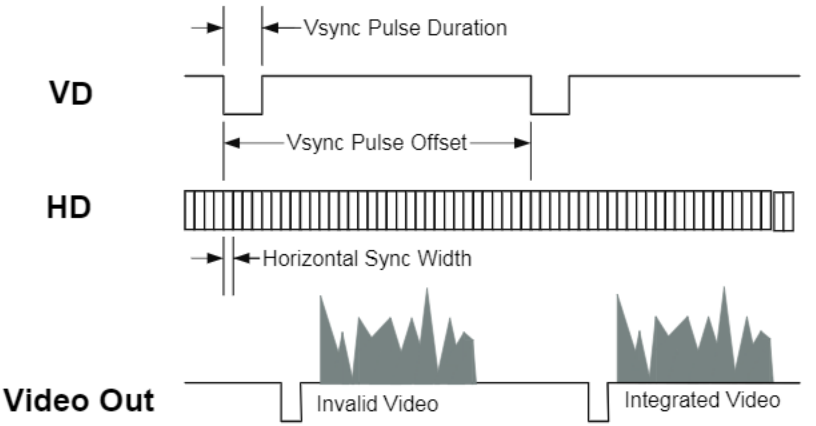


Figure 61: Restart-Reset/Long Time Exposure (Free Running)

The VSync pulse parameters are located under the **Timing** tab. They control the VD pulse.

VSync Pulse Enable = P2V_VSYNC_TIME_WIDTH
VSync Pulse Offset: Delay between VD pulses sent to camera. This corresponds to the frame rate for non-interlaced cameras.
VSync Pulse Duration: Size of the VD pulse in µs.
Add VSync to Frame Reset = IFC_DISABLE
Vertical Sync Polarity = IFC_ACTIVE_LOW or IFC_ACTIVE_HIGH
VSync Aligned on Horz Sync = IFC_ENABLE

The horizontal timing parameters are located under the **Timing** tab. They control HD pulses.

Master HSync Enable = IFC_ENABLE
Horizontal Sync Frequency: Line frequency of the camera in kHz.
Horizontal Sync Width: Size of the HD pulse in number of pixels.
Horizontal Sync Polarity = IFC_ACTIVE_LOW or IFC_ACTIVE_HIGH

Restart-Reset/Long Time Exposure Mode with External Trigger

An external trigger fires the acquisition process. Two timers (VS and Frame Reset) must be combined onto the VS signal to define the exposure. Each timer is independent and is fired by the external trigger.

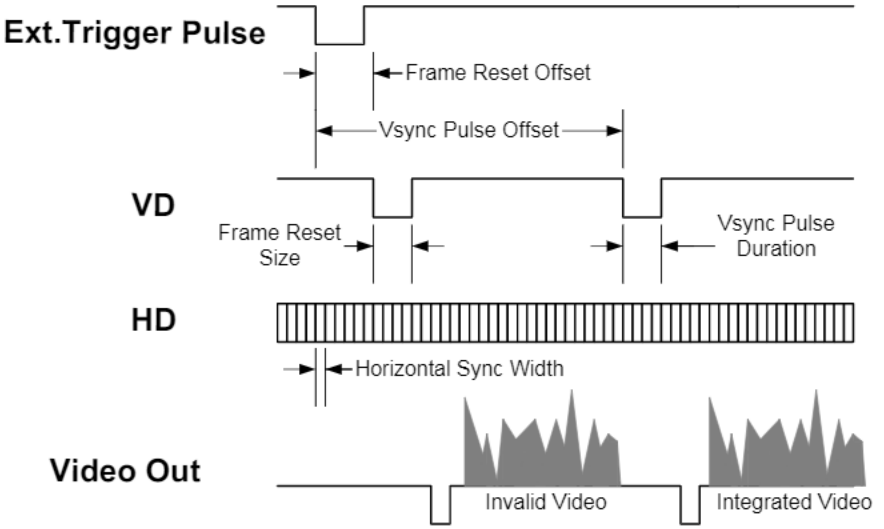


Figure 62: Restart-Reset/Long Time Exposure Mode (External Trigger)

Frame reset parameters are located under the **TrigStrb** tab. They control the first VD pulse.

```
Frame Reset Mode = IFC_ENABLE
Frame Reset Polarity = IFC_ACTIVE_LOW or IFC_ACTIVE_HIGH (same as VS polarity)
Frame Reset Offset: Offset in µs after external trigger before asserting first VD
pulse.
Frame Reset Size: Size of the first VD pulse in µs.
Add Frame Reset to VSync = IFC_ENABLE
Frame Reset Aligned on Horz Sync = IFC_ENABLE
```

VSync pulse parameters are located under the **Timing** tab. They control the second VD pulse.

```
VSync Pulse Enable = P2V_VSYNC_TIME_WIDTH
VSync Pulse Offset: Offset in µs after external trigger before asserting second VD
pulse.
VSync Pulse Duration: Size of the second VD pulse in µs.
Add VSync to Frame Reset = IFC_DISABLE
Vertical Sync Polarity = IFC_ACTIVE_LOW or IFC_ACTIVE_HIGH (same as frame reset
polarity)
VSync Aligned on Horz Sync = IFC_ENABLE
```

Horizontal timing parameters are located under the **Timing** tab. They control HD pulses.

```
Master HSync Enable = IFC_ENABLE
Horizontal Sync Frequency: Line frequency of the camera in kHz.
Horizontal Sync Width: Size of the HD pulse in number of pixels.
Horizontal Sync Polarity = IFC_ACTIVE_LOW or IFC_ACTIVE_HIGH
```

Refer to "Configuring the External Trigger" on page 146 to set external trigger parameters.

E-Donpisha/Start-Stop Trigger Mode

Exposure time starts on the frame reset signal and ends on VD. The frame grabber drives both of these signals.

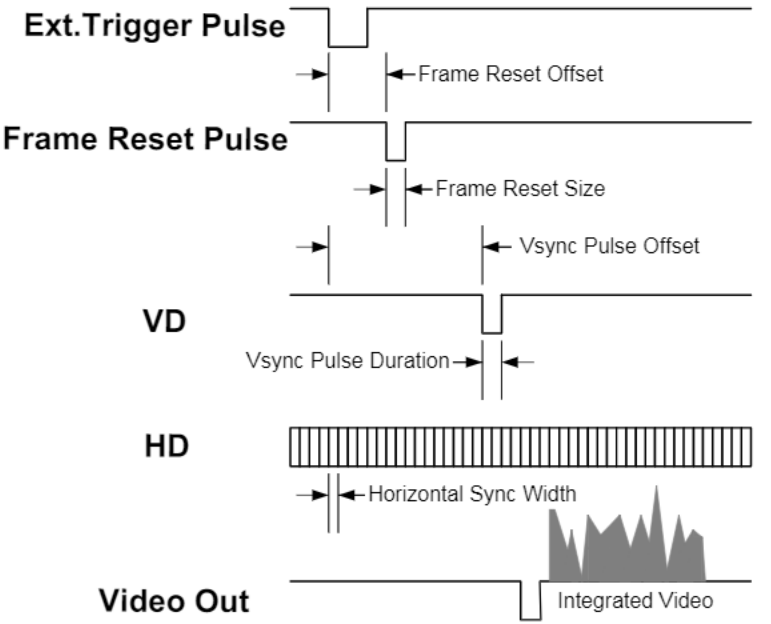


Figure 63: E-Donpisha/Start-Stop Trigger

Frame reset parameters are located under the **TrigStrb** tab. They control the frame reset pulse.

```
Frame Reset Mode = IFC_ENABLE
Frame Reset Polarity = IFC_ACTIVE_LOW or IFC_ACTIVE_HIGH
Frame Reset Offset: Offset in µs after external trigger before asserting frame reset.
Frame Reset Size: Size of the frame reset pulse in µs.
Add Frame Reset to VSync = IFC_DISABLE
Frame Reset Aligned on Horz Sync = IFC_ENABLE
```

VSync pulse parameters are located under the **Timing** tab. They control the VD pulse.

```
VSync Pulse Enable = P2V_VSYNC_TIME_WIDTH
VSync Pulse Offset: Offset in µs after external trigger before asserting VD pulse.
VSync Pulse Duration: Size of the VD pulse in µs.
Add VSync to Frame Reset = IFC_DISABLE
Vertical Sync Polarity = IFC_ACTIVE_LOW or IFC_ACTIVE_HIGH
VSync Aligned on Horz Sync = IFC_ENABLE
```

Horizontal timing parameters are located under the **Timing** tab. They control HD pulses.

```
Master HSync Enable = IFC_ENABLE
Horizontal Sync Frequency: Line frequency of the camera in kHz.
Horizontal Sync Width: Size of the HD pulse in number of pixels.
Horizontal Sync Polarity = IFC_ACTIVE_LOW or IFC_ACTIVE_HIGH
```

Refer to "Configuring the External Trigger" (on page 146) section to set external trigger parameters.

Serial Port

Serial Port Selection

The serial port must be mapped to the appropriate MDR-36 connector in order to control the camera. Under the **General** tab:

```
Select Active Uart Port = P2V_UART_PORT_AUTO to use same connector as the active
camera (first MDR-36 for camera 1, 2, and 3; second MDR-36 for port 4, 5, and 6)
P2V_UART_PORT_CON1  for first MDR-36 (J1); P2V_UART_PORT_CON2 for second MDR-36 (J2).
```

Additional Information

Note on Analog Camera Timing Relationships

For analog cameras, the following formulas show the relationship between the PCLK parameter and the Horizontal and Vertical total. These values must be accurate if the acquisition board drives the synchronization signals to the camera (board is in XTAL/Master Mode).

- The HS and VS signal frequencies are:

$$\frac{1}{HS_{freq}} = \frac{1}{PCLK_{freq}} * H_{total} \qquad \frac{1}{VS_{freq}} = \frac{1}{HS_{freq}} * V_{total}$$

To interface a video camera, the video timing concepts presented are now matched to the camera specifications and that data is entered into Camera Configurator®.

- The pixel clock frequency is critical for a 1:1 aspect ratio capture from analog cameras. But sub-sampling and over-sampling is easily achieved by changing the pixel clock frequency.

Overview of Video Bandwidth and System Limitations

Some high resolution/high frame rate cameras can output more data than can be transferred through the host computer's PCI bus. A successful imaging application must account for the camera data bandwidth and possibly control frame rate or image resolution to bring the bandwidth requirements to within the system's limitations.

Bandwidth is defined in two different ways. Peak bandwidth is the highest data rate occurring at any time during the data transfer. The average bandwidth is the amount of data per unit of time being transferred.

Each is calculated as follows:

- Peak Bandwidth (MBps) = Pixel Clock Frequency *Bpp *nb channels
- Average Bandwidth (MBps) = Frame Width *Frame Height *Frame Rate *Bpp
- where:
- MBps = MegaBytes per second

- Bpp = Bytes per pixel
- nb = number of …

When the bandwidth required by the frame grabber exceeds the capacity of the PCI 32-bit bus, the following techniques can reduce and optimize the average bandwidth.

Bandwidth Reduction Techniques

- A linear relationship exists between the average bandwidth required and the acquisition image height. For example, if four cameras of 1K x 1K, at some frame rate, need to transfer 160MB per/second of data, those four cameras at a 512 x 1K resolution will only need a bandwidth of 80MB per/second, which is now within the capability of the PCI-32 bus.
- For RGB cameras, pixel information is normally padded to 32-bits for the PC2-Vision. Using the Planar Transfer mode, where each color plane is sent to its own host buffer, can reduce PCI traffic by 25% 3-bytes to transfer (RGB) instead of 4 (0RGB).

Bandwidth Optimization Techniques

The following techniques are suggestions for applications that require all possible optimizations from the host system. Implementing these suggestions require a thorough understanding of your computer system setup and its BIOS controls.

- Allocate a separate IRQ for the frame grabber. BIOS settings can be used to manually assign the IRQ number to a particular PCI slot. As an alternative, the Window Device Manager can be used to force a specific IRQ to a specific PCI slot.
- Minimize the PCI latency timer in the BIOS setting; the value is given in CLK cycles.
- Use a high-performance AGP VGA board to decrease the image display system overhead when live acquisition is required.
- Avoid any hard drive write/read operations and network access through PCI LAN interfaces during intensive image transfers by the frame grabber.

Important: Some computer systems do not provide the BIOS controls described. Review your system manual.

PCVision IFC Parameter Comparison

Overview

The following tables compare IFC parameters between PCVision and PC2-Vision. They are intended to help someone familiar with PCVision to create config files for PC2-Vision. Parameters on the same line control equivalent functionality on their respective board. For a complete description of each parameter, please refer to the IFC-SDK™ Software manual.

Timing Parameters

PCVision Param	Values	PC2-Vision Param	Values
P_TIMING_SRC	IFC_PLL_STRIPPED_SYNC IFC_XTAL_SEPARATE_SYNC_OUT IFC_XTAL_COMPOSITE_SYNC_OUT IFC_VARIABLE_SCAN	P2V_SYNC_SOURCE	P2V_SYNC_COMPOSITE_VIDEO P2V_SYNC_COMPOSITE_SYNC P2V_SYNC_SEPARATE_SYNC P2V_SYNC_INTERNAL_SYNC P2V_SYNC_RED P2V_SYNC_GREEN P2V_SYNC_BLUE
Use XTAL mode on PCVision		P2V_MASTER_HSYNC	IFC_DISABLE IFC_ENABLE
Use XTAL mode on PCVision		P2V_VS_PULSE_ENABLE	P2V_VSYNC_DISABLE P2V_VSYNC_LINE_WIDTH P2V_VSYNC_TIME_WIDTH
P_PIXEL_CLK_FREQ	Range: 1.0 to 20.0MHz step size of 0.00001MHz	P_PIXEL_CLK_FREQ	Range: 1 to 40MHz steps size 0.00001MHz (10Hz)
P_PIXEL_CLK_POLARITY	IFC_FALLING_EDGE IFC_RISING_EDGE	P_PIXEL_CLK_POLARITY	IFC_RISING_EDGE
Use IFC_VARIABLE_SCAN		P_PIXEL_CLK_SIGNAL_TYPE	P2V_PIXEL_CLOCK_INTERNAL P2V_PIXEL_CLOCK_EXTERNAL
P_LEN_POLARITY	IFC_FALLING_EDGE IFC_RISING_EDGE	Use P_HSYNC_POLARITY	
P_FEN_POLARITY	IFC_FALLING_EDGE IFC_RISING_EDGE	Use P_VSYNC_POLARITY	
AMV_FIELD_SRC	AMV_VIDEO_STRIPPED_FLD AMV_LEN_AND_FEN_DETECTED_FLD	Use P2V_SYNC_SOURCE	
AMV_FIELD_SHIFT	AMV_CROP_HALFLINE AMV_FLDSHFT_NORM	*Use Cropper to remove halfline*	
P_HSYNC_FREQ	Range: 10.0 to 50.0KHz step size of 0.00001KHz.	P_HSYNC_FREQ	Range 7.0 to 50.0KHz in steps of 0.00001KHz (0.01Hz)
P_HSYNC_WIDTH	Range: 0.1 to 100.0 µs step size of 0.00001 µs	P_HSYNC_WIDTH	Range 1 to 400 pixels in steps of 1 pixel
P_HSYNC_POLARITY	IFC_ACTIVE_HIGH IFC_ACTIVE_LOW	P_HSYNC_POLARITY	IFC_ACTIVE_LOW IFC_ACTIVE_HIGH

P_VSYNC_FREQ	Range: 10.0 to 100.0Hz step size of 0.00001Hz	P_VSYNC_FREQ	Range: 2.0 to 1,000.0Hz in steps of 0.00001Hz
P_VSYNC_WIDTH	Range 1.0 to 20.0ms step size of 0.5ms	P_VSYNC_WIDTH	Range 1 to 20 lines in steps of 1 line
P_VSYNC_POLARITY	IFC_ACTIVE_HIGH IFC_ACTIVE_LOW	P_VSYNC_POLARITY	IFC_ACTIVE_LOW IFC_ACTIVE_HIGH
P_NUM_EQ_PULSES_FPORCH	Range: 0 to 10 step size of 1	P_NUM_EQ_PULSES_FPORCH	Range 0 to 100 lines in steps of 1 line
P_NUM_EQ_PULSES_BPORCH	Range: 0 to 10 step size of 1	P_NUM_EQ_PULSES_BPORCH	Range 0 to 100 lines in steps of 1 line
P_EQ_PULSE_WIDTH	Range: 0.1 to 50.0 us in 0.00001 µs steps	*No equivalent on PC2-Vision*	
P_SERR_PULSE_WIDTH	Range: 0.1 to 50.0 us in 0.00001 µs steps	*No equivalent on PC2-Vision*	
No equivalent on PCVision		P2V_VS_PULSE_OFFSET	Range: 0 to 65535000 µs step size of 1 µs
No equivalent on PCVision		P2V_VS_PULSE_DURATION	Range: 1 to 65535000 µs step size of 1 µs
Always enabled on PCVision		P2V_VSYNC_ALIGN_ON_HS	IFC_DISABLE IFC_ENABLE
No equivalent on PCVision		P2V_ADD_VSYNC_TO_FRAME_RESET	IFC_DISABLE IFC_ENABLE
AMV_PTG_VSYNC_OUT_EN	IFC_DISABLE IFC_ENABLE	P2V_VSYNC_OUT_ENABLE	IFC_DISABLE IFC_ENABLE
Always enabled on PCVision		P2V_VSYNC_OUT_ALL_CONN	IFC_DISABLE IFC_ENABLE
No equivalent on PCVision		P_WEN_ENABLE	IFC_DISABLE IFC_ENABLE
No equivalent on PCVision		P_WEN_POLARITY	IFC_ACTIVE_LOW IFC_ACTIVE_HIGH
No equivalent on PCVision		P_WEN_VERTICAL_OFFSET	Range: 0 to 256 lines step size 1 line

General Parameters

PCVision Param	Values	PC2-Vision Param	Values
P_PIXEL_SIZE	8-bits per pixel	P_PIXEL_SIZE	Range: 1 to 32-bits
P_FIRST_FIELD_STAT	IFC_EVEN_FIELD IFC_ODD_FIELD	*No equivalent on PC2-Vision*	
P_FIRST_FIELD_CMD	IFC_NEXT_FIELD IFC_EVEN_FIELD IFC_ODD_FIELD	P_FIRST_FIELD_CMD	IFC_NEXT_FIELD IFC_EVEN_FIELD IFC_ODD_FIELD
P_SCAN_MODE_STAT	IFC_NILACED IFC_ILACED	P_SCAN_MODE_STAT	IFC_NILACED IFC_ILACED
P_PIXEL_COLOR	IFC_MONO	P_PIXEL_COLOR	IFC_MONO IFC_RGB IFC_RGB_PLANAR

No equivalent on PCVision		P2V_MULTITAP_MODE	P2V_SINGLE_TAP P2V_2TAP_ILACE_FIXED
No equivalent on PCVision		P2V_PLANAR_MODE	P2V_PLANAR_DISABLED P2V_PLANAR_HORZ P2V_PLANAR_VERT
P_INPUT_LUT1_FILE	filename	P_INPUT_LUT1_FILE	filename
AMV_INPORT_POLARITY	IFC_FALLING_EDGE IFC_RISING_EDGE	Use CICapMod ::InportInterruptPolarity	
AMV_INPORT	IFC_LEVEL_HIGH IFC_LEVEL_LOW	Use CICapMod::InportVal	
AMV_OUTPORT	IFC_LEVEL_HIGH IFC_LEVEL_LOW	Use CICapMod::OutportVal	
AMV_YCRCB_MONO_ACQ	IFC_DISABLE IFC_ENABLE	Use IfxCreateImgConn with IFC_YCRCB_SINK	
P_HORZ_OFF	Range: 1 to 1024 pixels step size of 1	P2V_HORZ_BACK_PORCH + P_HORZ_OFF	Range 0 to 400 pixels in steps of 1 pixel Range: 0 to 2044 pixels step size 1 pixel
No equivalent on PCVision		P2V_HORZ_FRONT_PORCH	Range 0 to 400 pixels in steps of 1 pixel
P_WIDTH_PIXELS	Range: 8 to 16384 pixels step size of 8 pixels	P_WIDTH_PIXELS	Range: 4 to 2048 pixels step size 4 pixels
P_VERT_OFF	Range: 1 to 1024 lines step size of 1 line	P_VERT_OFF	Range: 0 to 2047 lines step size 1 line
P_HEIGHT_PIXELS	Range: 1 to 4096 lines step size of 1 line	P_HEIGHT_PIXELS	Range: 1 to 2048 lines step size 1 line
No equivalent on PCVision		P_VIDEO_STANDARD	IFC_VIDEO_STD_NTSC IFC_VIDEO_STD_PAL IFC_VIDEO_STD_NONE
No equivalent on PCVision		P2V_FIELD_PROCESS	P2V_FIELD_PROCESS_ALL P2V_FIELD_PROCESS_ODD_ONLY P2V_FIELD_PROCESS_EVEN_ONLY
No equivalent on PCVision		P2V_SELECT_UART_PORT	P2V_UART_PORT_AUTO P2V_UART_PORT_CON1 P2V_UART_PORT_CON2

Analog Parameters

PCVision Param	Values	PC2-Vision Param	Values
P_ANALOG_GAIN	Valid gain settings are: 1.0 and 1.5	*No analog gain on PC2-Vision, use brightness/contrast*	
AMV_LOW_PASS_FILTER_EN	IFC_DISABLE IFC_ENABLE	P2V_LOW_PASS_FILTER	P2V_LPF_6_5_MHZ P2V_LPF_12_MHZ P2V_LPF_BYPASS
AMV_NREF_CONTROL + AMV_PREF_CONTROL	Range: 0 to 1.2 volts step size of 0.01875 Range: 0 to 2 volts step size of 0.03125	P_BRIGHTNESS + P_CONTRAST	Range: 0 to 100 in steps of 0.1 Range: 0 to 100 in steps of 0.1
AMV_EDONPISHA_MODE	IFC_DISABLE IFC_ENABLE	*Use frame reset and VSync pulse*	
P_CLAMP_HSYNC_EDGE	IFC_FALLING_EDGE IFC_RISING_EDGE	*Clamping always defined on the active edge of HSync for PC2-Vision*	
P_CLAMP_OFFSET_TIME	Range: 0 to 50 µs step size of 0.00001 µs	P2V_CLAMP_START + P2V_CLAMP_END	Range: 0.1 µs to 51.1 µs step size of 0.025 µs (25ns) Range: 0.1 µs to 51.1 us step size of 0.025 µs (25ns)
AMV_CLAMP_SOURCE	AMV_AUTOCLAMP AMV_PROGCLAMP	P_CLAMP_MODE	IFC_ENABLE

Trigger and Strobe Parameters

PCVision Param	Values	PC2-Vision Param	Values
P_TRIGGER_ENABLE	IFC_DISABLE IFC_ENABLE	P_TRIGGER_ENABLE	IFC_DISABLE IFC_ENABLE
P_TRIGGER_SRC	IFC_EXT0_TRIG IFC_SOFT_TRIG	P_TRIGGER_SRC	IFC_SOFT_TRIG IFC_EXT0_TRIG IFC_EXT1_TRIG IFC_EXT_AUTO_TRIG
P_TRIGGER_POLARITY	IFC_ACTIVE_HIGH IFC_ACTIVE_LOW	P_TRIGGER_POLARITY	IFC_FALLING_EDGE IFC_RISING_EDGE
P_TRIGGER_STATE	AMV_TRGCYC_IDLE AMV_TRGCYC_ACTIVE	*No equivalent on PC2-Vision*	
P_GEN_SW_TRIGGER	Range: 0 to 1 step size of 1	P_GEN_SW_TRIGGER	range 0 to 1 step size 1
No equivalent on PCVision		P_FRAMES_PER_TRIGGER	Range: 1 to 1000 frames step size of 1 frame
No equivalent on PCVision		P_TRIGGER_DEBOUNCE	Range: 1 to 255 µs step size 0.1 µs
No equivalent on PCVision		P2V_VSYNC_WAIT_COUNT	Range: 0 to 255 step size 1
AMV_SKIP_FIELD_MODE	IFC_DISABLE IFC_ENABLE	*No equivalent on PC2-Vision*	
P_FRAME_RESET_MODE	IFC_DISABLE IFC_ENABLE	P_FRAME_RESET_MODE	IFC_DISABLE IFC_ENABLE

P_FRAME_RESET_POLARITY	IFC_ACTIVE_HIGH IFC_ACTIVE_LOW	P_FRAME_RESET_POLARITY	IFC_ACTIVE_LOW IFC_ACTIVE_HIGH
P_FRAME_RESET_OFFSET	Range: 1 to 256 lines step size of 1 line	P_FRAME_RESET_OFFSET	Range: 0 to 65535000 µs step size of 1 µs
P_FRAME_RESET_SIZE	IFC_FRAME_RESET_OFFSET_PERIOD IFC_FRAME_RESET_ONE_LINE	P_FRAME_RESET_SIZE	Range: 1 µs to 65535000 µs step size of 1 µs
Always enabled on PCVision		P2V_FRAME_RESET_ALIGN_ON_HS	IFC_DISABLE IFC_ENABLE
AMV_FRAME_RESET_ON_VSYNC_OUTPUT	IFC_DISABLE IFC_ENABLE	P2V_ADD_FRAME_RESET_TO_VSYNC	IFC_DISABLE IFC_ENABLE
P_STROBE_MODE	IFC_FAST_STROBE IFC_SLOW_STROBE	P_STROBE_MODE	IFC_FAST_STROBE IFC_SLOW_STROBE
P_STROBE_POLARITY	IFC_ACTIVE_HIGH IFC_ACTIVE_LOW	P_STROBE_POLARITY	IFC_ACTIVE_HIGH IFC_ACTIVE_LOW
P_STROBE_DELAY	Range: 1 to 64 lines step size of 1 line	P_STROBE_DELAY	Range: 0 µs to 65535000 µs step size of 1 µs
P_STROBE_ENABLE	IFC_DISABLE IFC_ENABLE	P_STROBE_ENABLE	IFC_DISABLE IFC_ENABLE
No equivalent on PCVision		P_STROBE_DURATION	Range 10 µs to 65535000 µs step size 1 µs
Always enabled on PCVision		P2V_STROBE_ALIGN_ON_HS	IFC_DISABLE IFC_ENABLE

Troubleshooting

Overview

This section provides suggestions for resolving installation or usage problems that may be encountered with the PC2-Vision due to the constant changing nature of computer equipment and operating systems. Note that information provided within this section will be updated with the latest information DALSA can provide for each manual version released.

If you require help and need to contact DALSA Technical Support, make detailed notes on your installation and/or test results for our technical support to review. See "Technical Support" on page 170 for contact information.

Tools

Windows Event Viewer

Windows Event Viewer (**Computer Management • System Tools • Event Viewer**) lists various events that have taken place during the OS boot sequence. If a driver generates an error it will normally log an entry in the event list. The Computer Management utility is available by right-clicking **My Computer** in the Explorer window (or desktop icon) and selecting **Manage** in the pop-up menu.

DALSA Device Manager Program

The DALSA Device Manager program provides a convenient method of collecting information about the installed PC2-Vision. System information, such as operating system, computer CPU, system memory, PCI configuration space, as well as PC2-Vision firmware information can be written to a text file (default file name: **BoardInfo.txt**).

Execute the program using the Windows Start Menu shortcut **Start • All Programs • DALSA • PC2-Vision Device Driver • Device Manager**. If the DALSA Device Manager program does not run, it will exit with a message that the board was not found. Since the PC2-Vision board must have been in the system to install the board driver, possible reasons for an error are:

- Board was removed
- Board driver did not start or was terminated
- PCI conflict after some other device was installed

Sapera comes with the following tools to help resolve PC2-Vision problems:

DALSA Log Viewer (**Start•Program•DALSA•Sapera LT•Tools•DALSA Log Viewer**): Lists various information and warning and error messages reported by DALSA boards (including the PC2-Vision driver).

PCI Diagnostics (**Start•Program•DALSA•Sapera LT•Tools•PCI Diagnostics**): Lists all PCI configuration space registers of the computer.

IFC comes with the following tools to help resolve PC2-Vision problems:

DALSA Log Viewer (**Start•Programs•IFC Version 5.8•Tools•DALSA Log Viewer**): Lists various information and warning and error messages reported by DALSA boards (including the PC2-Vision driver).

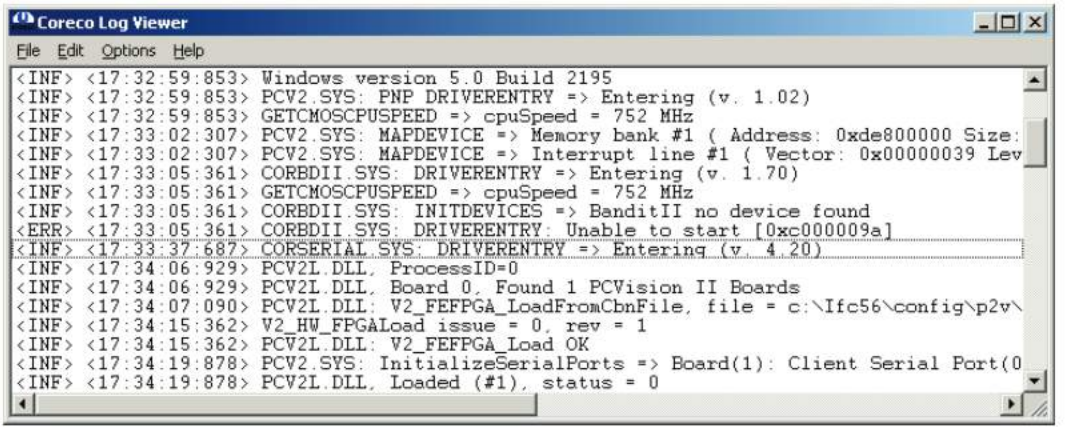
PCI Diagnostics (**Start•Programs•IFC Version 5.8•Tools•PCI Diagnostics**): Lists all PCI configuration space registers of the computer.

When you contact DALSA Technical Support by e-mail, make certain that you attached two pieces of information (the log file and the pci dump file). They provide valuable information about your PC2-Vision to rapidly find the root cause of the problem.

Saving the Log

1. Start DALSA Log Viewer
2. Select menu "File / Save Messages…"
3. Select a filename (for example, **log.txt**)
4. Send log to DALSA Technical support

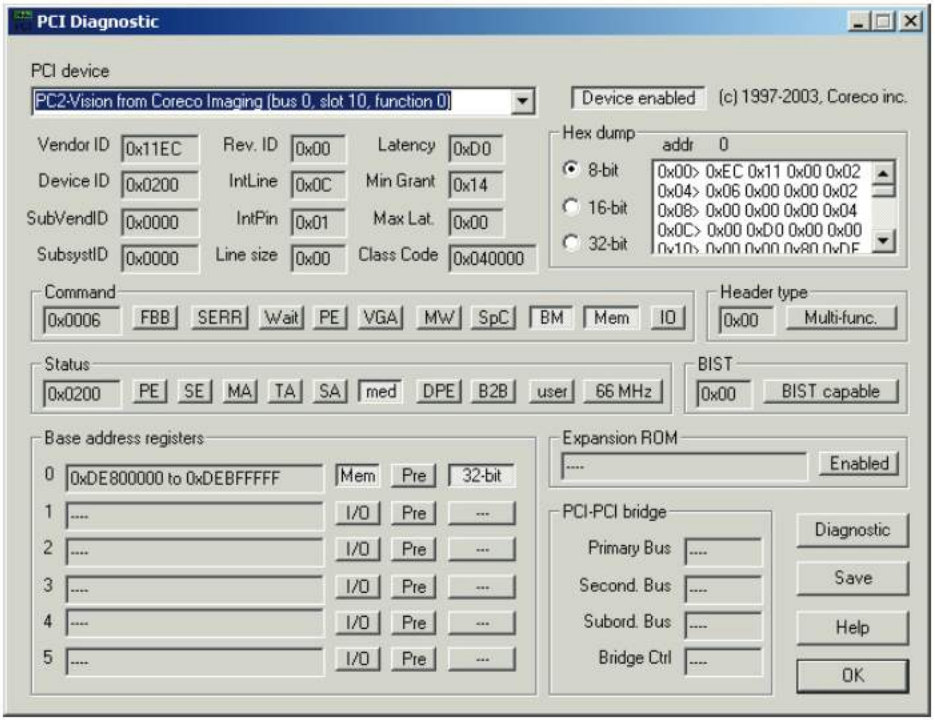
Below is a typical log:



Saving the PCI Diagnostics

1. Start PCI Diagnostics
2. Click the **Save** button. The dump of PCI configuration file is saved under **PCIDUMP.TXT**
3. Send **PCIDUMP.TXT** to DALSA Technical Support
4. Note DALSA PCI Vendor ID is 0x11EC. The PC2-Vision board PCI Device ID is 0x0200.

Below is a typical PCI configuration for a PC2-Vision:



Symptoms

PC2-Vision board not detected

The board is not seen when an application is started. This is due to a module creation error under IFC or because the Sapera Server is not present under Sapera.

Note: PC2-Vision is supported by two different APIs: Sapera LT and IFC. You must install one or the other. It is not possible for PC2-Vision to work under both APIs on the same machine. PC2-Vision will only work correctly with the last API installed on the machine. This ensures that the PC2-Vision driver matches the version of the API you are currently using.

This could stem from a hardware failure, a PCI problem, a plug and play problem, a kernel driver problem, or a software installation problem. You need to have 'administrator' privileges to install PC2-Vision software and to follow the troubleshooting guidelines given in this section.

Potential Hardware or PCI Failure

- Make certain that the PC2-Vision board is properly seated in the PCI slot. It is preferable to screw in the board securely to the computer chassis at the PCI bracket (some computer chassis use a clip mechanism instead of a screw). This ensures that the board remains stable when you connect/disconnect cables.
- Make certain that the 3.3V (LED1) or 5V (LED3) LED is lit at the back of the board (below the floppy power connector). If not, this indicates a problem with the PCI interface controller. Try a different PCI slot. This could also indicate a problem with the power supply provided by the PCI bus to the board.
- Make certain that the PC2-Vision is visible on the PCI bus. To do this, you can use the PCI diagnostic tools described above. Make certain that the PC2-Vision is displayed within the PCI device list. The DALSA PCI vendor ID is 0x11EC. The PC2-Vision PCI device ID is 0x0200. Ensure that a Base address register is assigned to PC2-Vision (lower left section of PCI Diagnostics). Ensure that the **Device Enable** button is activated (in the upper right section of PCI Diagnostics). If the board is not correctly mapped or activated, this may indicate a problem with the BIOS settings. You can go to your BIOS settings and check for PCI settings. The PCI slot number for PC2-Vision is reported by PCI Diagnostics. You can also try moving the board to a different PCI slot.

Potential Plug and Play or Driver Related Failure

After you have checked all the items in the preceding section you can proceed by validating that the board is correctly registered in Windows and that the associated kernel driver has started. Note that Windows NT® does not support plug and play.

- Start the DALSA Log Viewer tool. Check for '1 PC2-Vision device found' in the list of messages, as shown in bold below. If you do not see this, look for error messages (identified by <ERR> at the start of the line). Make certain that the memory is mapped successfully and that an interrupt line is assigned to the board. Ensure that the "VE_FEFPGA_Load OK" message is present. PC2-Vision driver related messages have the "**pcv2.sys**" string inserted before the actual message. If the DALSA Log indicates that the device is found, proceed to next section.

```
PCV2.SYS: DRIVERENTRY => Windows version 5.0 Build 2195 : M:\pc2\dev\pcv2\Driver\Kernel\Winnt
PCV2.SYS: DRIVERENTRY => Entering (v. 1.32) : M:\pc2\dev\pcv2\Driver\Kernel\Winnt\ms\board.c
GETCMOSCPUSPEED => cpuSpeed = 1752 MHz : M:\pc2\dev\pcv2\Driver\Kernel\Winnt\ms\cortime.c (85)
PCV2.SYS: DRIVERENTRY =>: Last installation is for Sapera: M:\pc2\dev\pcv2\Driver\Ke
PCV2.SYS: BOARDFINDDEVICE => Looking for PC2-Vision : M:\pc2\dev\pcv2\Driver\Kernel\Winnt\ms\
PCV2.SYS: INITBOARDEXTENSION => bus 0 slot 10  : M:\pc2\dev\pcv2\Driver\Kernel\Winnt\ms\board
PCV2.SYS: BOARDPARSERESOURCES => Memory bank #1 ( Address: 0xde000000 Size: 0x00400000) : M:\
PCV2.SYS: BOARDPARSERESOURCES => Interrupt line #1 ( Vector: 0x00000009 Level: 0x00000009) :
PCV2.SYS: BOARDPARSERESOURCES => Memory mapped successfully : M:\pc2\dev\pcv2\Driver\Kernel\W
PCV2.SYS: INITDEVICES => 1 PC2-Vision device found : M:\pc2\dev\pcv2\Driver\Kernel\Winnt\ms\b
PCV2L.DLL, ProcessID=0 : D:\pc2\dev\pcv2\Driver\User\pcv2api.c (367)
PCV2L.DLL, Board 0, Found 1 PC2-Vision Boards  : D:\pc2\dev\pcv2\Driver\User\pcv2api.c (453)
PCV2L.DLL: V2_FEFPGA_LoadFromCbnFile, file = C:\Ifc58\config\p2v\exo\pcv2.cbn : D:\pc2\dev\pc
V2_HW_FPGALoad issue = 0, rev = 2 : M:\pc2\dev\pcv2\Driver\Kernel\Winnt\ms\pcv2hw.c (152)
PCV2L.DLL: V2_FEFPGA_Load OK : D:\pc2\dev\pcv2\Driver\User\FEfpga.c (692)
PCV2.SYS: CorSerialAddDevice => CorSerial Interface Version: Board Driver:3, CorSerial:3 : M:
PCV2.SYS: CorSerialCreatePorts => Board(1): Client Serial Port(0) Created : M:\pc2\dev\pcv2\D
PCV2L.DLL: Power is OK on Power Connector (J6) : D:\pc2\dev\pcv2\Driver\User\FEfpga.c (711)
PCV2L.DLL, Loaded (#1), status = 0 : D:\pc2\dev\pcv2\Driver\User\pcv2api.c (981)
PCV2L.DLL, Unloaded (#1) : D:\pc2\dev\pcv2\Driver\User\pcv2api.c (986)
PCV2L.DLL, ProcessID=0 : D:\pc2\dev\pcv2\Driver\User\pcv2api.c (367)
PCV2L.DLL, Board 0, Found 1 PC2-Vision Boards  : D:\pc2\dev\pcv2\Driver\User\pcv2api.c (453)
PCV2L.DLL, Loaded (#1), status = 0 : D:\pc2\dev\pcv2\Driver\User\pcv2api.c (981)
```

- Open Windows Explorer to ensure that the **pcv2.sys** file is copied to your **Winnt\system32\drivers or Win\system32\drivers** folder. If it is not, this points to a software installation problem. You may try to uninstall and reinstall the software. Make certain that you have 'administrator' privileges when you perform installation. Follow all directives given by the installation program.
- Open the Registry editor. Click on Windows **Start** button and select 'Run…'. In the Run dialog box, type '`regedit`' (without the quotes) and click **OK**. This will start the registry editor. Go to the HKEY_LOCAL_MACHINE•SYSTEM•CurrentControlSet•Service•Pcv2 folder. You should see the following key:

  - Start
  - REG_DWORD
  - 0x00000002

- If the Pcv2 folder is absent, this indicates a problem with the installation process. Make certain that you have 'administrator' privileges when you perform installation.
- If the log does not show any indication that the PC2-Vision driver had started, you may have a plug and play problem. If you have Windows® 2000 or Windows® XP, go to **ControlPanel•System•Hardware•Device Manager**. Look for PC2-Vision under 'Imaging Devices'. Double-click and look at the device status. You should see: "This device is working properly". If this indication is not present, you may try to manually install the **.INF** file.

The **PCV2.INF** file is located in your PC2-Vision folder:

…**\DALSA\pc2-vision\win2000\inf\pc2c.inf**

The **PC2Vision.INF** file is located in:

…**\Ifc58\bin\win2000\pcvision.inf**

Open Windows Explorer and go to the **.INF** folder. Right-click on the **.INF** file and select **Install**. Note that this does not apply to Windows NT® .

Board does not grab

You are able to start Sapera CamExpert or IFC Camera Configurator®, but you do not see an image and the frame rate displayed is 0.

- If your camera is powered through a camera cable, make certain that J6 on the PC2-Vision is connected to a floppy power cable. Otherwise, the camera must be powered using an external power supply.
- Make certain that you provide an external trigger if the camera config file requires one. You can try generating a software trigger if you do not have a trigger source.
- Does your camera provide a WEN signal that you need to use? Adapt your config file and camera cable accordingly.
- Make certain that the pinout of your camera cable matches your camera and that the camera is properly connected to the cable.
- Make certain that the camera cable is plugged into J1 (upper MDR-36) for camera 1, 2 and 3, or in J2 (lower MDR-36) for camera 4, 5 and 6.
- Make certain that the camera is configured for the proper mode of operation (Composite Video, Separate Sync, Master Mode). This must match the camera config file. Refer to your camera datasheet.
- Try using a standard camera (RS-170 or CCIR) and select P2V_DEF_RS512x480P for RS-170 or P2V_DEF_CC512x512P for CCIR. This validates that PC2-Vision is able to grab and may point to a problem with your camera config file.
- In config file, make certain that you have the proper source of synchronization (Source of input sync parameter in Configurator®) for your camera.
- In the Configurator®, crop the image to 320 x 200 to make certain that enough pixels are sent by the camera to fill each line.
- Try creating a XTAL config file for your camera. This ensures that PC2-Vision boards see synchronization signals.
- Try to snap one frame from the Configurator® instead of continuous grab.
- Try using the SeqSnap demo to grab.
- Make certain an interrupt is assigned to the board in PCI Diagnostics. "IntLine" field holds a value different from 0.

Board grabs black

You are able to use Sapera CamExpert or IFC Camera Configurator®; the frame rate is as expected, but the display stays black.

- Try changing anti-aliasing filter selection (6MHz, 12MHz or bypass).
- Try changing Contrast/Brightness settings.
- Try changing the clamping setting (DC restoration).
- Make certain that the input LUT is not filled with '0's.
- Make certain that the iris of the lens on your camera is opened.
- This problem is sometimes caused by a PCI transfer issue. No PCI transfer takes place, so the frame rate is above 0 but nevertheless no image is displayed in Camera Configurator®. Under IFC, use IntrEx demo to see if you receive a P2V_INTR_BMDONE interrupt. Camera must be connected to port 0 and you need to have an appropriate **P2VTEST.TXT** file from Configurator®.
- Make certain that BUS MASTER bit in the PCI configuration space is activated. Look in PCI Diagnostics for **BM** button under "Command" group. Make certain that the **BM** button is activated.

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Technical Support

Technical support requests for imaging product installations and help with imaging applications can be made at:

Any support question or request can be submitted via our web site:	http://www.dalsa.com/mv/support

Glossary of Terms

Bandwidth

Describes the measure of data transfer capacity. A computer system's PCI expansion bus is rated for a maximum peak data bandwidth of 132 MB/s. PCI devices must share the maximum PCI bus bandwidth when transferring data to and from system memory or other devices.

Bus

A common pathway, or channel, between multiple devices. Besides the computer's internal bus to memory and system components, peripheral buses such as PCI and AGP, allow adding or changing devices that make up the computer system.

Composite sync

Synchronization signals that combines the vertical component (video field or frame sync) with the horizontal component (video line sync). Often RGB cameras, besides the three color signals, have a fourth composite sync (CS) signal.

Composite Video

A video signal that is composed of the luminance and color information plus the synchronization signals together. Common composite video formats are NTSC and PAL.

Driver

Also called a device driver, a program routine that links a peripheral device to the operating system. Specific to the Bandit-II, its VGA driver is required for its display adapter functionality and a device driver is required for its frame grabber capabilities.

Frame

One complete image data set or its equivalent storage space.

Frame buffer

An area of memory used to hold a frame of image data. A frame buffer may exist on the acquisition hardware or be allocated by the acquisition hardware device driver in host system memory.

Grab

Acquiring an image frame by means of a frame grabber.

Grayscale

In image processing, the range of available brightness levels, displayed in shades of gray. In an 8-bit system, the gray scale contains values from 0 to 255.

Host

Refers to the computer system that supports the installed frame grabber.

Interlaced

Describing the standard television method of raster scanning in which the image is the product of two fields, each of which is made up of the image's alternate lines (that is, one field is comprised of lines 1, 3, 5, etc., and the other is comprised of lines 2, 4, 6, etc.)

Low-Pass Filter

A filter that blocks high frequencies and allows lower frequencies to pass through. Used to limit undesirable analog information (such as high frequency video noise) before converting to digital data.

MDR

Mini Delta Ribbon cable.

NTSC

National Television Systems Committee. Color TV standard used in North America and other countries. The interlaced video signal is composed of a total of 525 video lines at a frame rate of 30 Hz.

PAL

Phase Alteration by Line. Color TV standard used in most of Europe and other countries. The interlaced video signal is composed of a total of 625 video lines at a frame rate of 25 Hz.

PCI

Peripheral Component Interconnect. The PCI local bus is a 32-bit high performance expansion bus intended for interconnecting add-in boards, controllers, and processor/memory systems.

Pixel

A contraction of "picture element". The number of pixels describes the number of digital samples taken of the analog video signal. The number of pixels per video line by the number of active video lines describes the acquisition image resolution. The binary size of each pixel (for example, 8-bits, 15-bits, 24-bits) defines the number of gray levels or colors possible for each pixel.

RGB

A representation of color using the three primary colors (red, green, blue) as components. Video signals in RGB format are typically a non-composite video standard. A digital true color image can be represented by 8-bits per color (24-bits/pixel). Often image data is stored or transferred in 32-bits/pixel where the upper 8-bits of each pixel are unused.

Scatter-Gather

Host system memory allocated for frame buffers is virtually contiguous but physically scattered throughout all available memory.

TTL

Transistor-Transistor Logic. Acceptable TTL gate input signal voltage levels are:

LOW: lower than 0.8V

HIGH: higher than 2.0V

Any voltage between 0.8V and 2.0V is uncertain and will not be reliably interpreted by the TTL device.

Trigger

A mechanism that initiates an action when an event occurs such as synchronizing an image acquisition to an external event. A trigger generally causes a program routine to be executed such as the resetting of camera exposure and/or the firing of a strobe light.

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