

FASTCAM-PCI Hardware Manual

Rev.2.2

*PHOTRON LIMITED
2001*

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Chapter 1 General Information

1.1.Introduction

1.2.Warranty

1.3.How to Use This Manual

1.4.Precautions



1.1. Introduction

The FASTCAM-PCI High-Speed Video Camera System has been developed to offer a powerful engineering solution in R and D, engineering, manufacturing, quality control in general industries and special applications in scientific, medical, biological, aerospace studies. Its extra-high-speed recording capability and easy-to-use remote control software provide a motion analysis environment that has been hard to obtain so far.

The live image setup function ensures that the image of the object on the screen is captured and recorded in the memory at a simple press on the recording button. You do not have to set the exposure and image layout on the screen by guessing: all you see on the monitor screen is what you get recorded at a press on the recording button. Use this cutting-edge recording technology to observe your fast moving object as a slow-motion playback image or to input the moving image data into your motion analysis system for processing.

This manual has been prepared for you to use the system in the most effective way for slow-motion observation and motion analysis of fast moving objects.

Remarks:

1. For the best use of the system, please read through this manual.
2. The content of this manual is based on the best knowledge of the manufacturer. However, in case any error or missed information is found in this manual, please inform the manufacturer of such shortcomings. Notwithstanding the above, the manufacturer is not responsible for any results of the use of this equipment.
3. Copying all or any part of this manual without permission is prohibited.
4. The content of this manual may be changed any time without prior notice.
5. The manufacturer assumes no responsibility for any direct or indirect damage or loss of profit resulting from the use of this equipment
6. The manufacturer assumes no responsibility for any result of the use of this equipment.
7. Copying all or any part of the software included in this system without prior written permission by the author is an infringement of copyright.

1.2. Warranty

New Equipment Warranty PHOTRON FASTCAM-PCI

PHOTRON LIMITED warrants this PHOTRON FASTCAM-PCI series and accessories manufactured by PHOTRON LIMITED, to function properly for one year from the date of shipment, if the warranty registration card was filled out and returned to PHOTRON USA, INC. or PHOTRON EUROPE LIMITED within thirty days of shipment.

PHOTRON LIMITED, in conjunction with PHOTRON USA,INC. or PHOTRON EUROPE LIMITED, agrees to perform the following equipment warranty services:

1. Repair service: If shipped to PHOTRON at any of the addresses shown below, repairs will be made at no charge.
2. Parts replacement: Replacement parts installed under warranty will be provided at no charge.

THIS WARRANTY DOES NOT APPLY UNDER THE FOLLOWING CONDITIONS:

Failure to operate the PHOTRON FASTCAM-PCI series in accordance with Photon's written instructions, including environmental specifications listed in the User's Manual.

If there is evidence of the PHOTRON FASTCAM-PCI series being subjected to accidental damage, misuse or abuse.

If the PHOTRON FASTCAM-PCI series has been repaired or tampered with by persons other than PHOTRON personnel, customer personnel trained by PHOTRON or without permission of PHOTRON.

Shipping damage is not covered by this warranty. The purchaser has the responsibility to place a claim of damage in shipment with the carrier.

PHOTRON LIMITED makes no other warranties, express or implied, including the implied warranties of merchantability and fitness for a particular purpose. If this PHOTRON FASTCAM-PCI series does not function properly during the warranty period, PHOTRON LIMITED will repair it without charge according to the terms stated above. Repair without charge is PHOTRON LIMITED's only obligation under this warranty. PHOTRON LIMITED, PHOTRON USA, INC.or PHOTRON EUROPE LIMITED will not be responsible for any consequential or incidental damages resulting from the sale, use or improper functioning of this equipment even if loss or damage is caused by the negligence or other fault of PHOTRON LIMITED, PHOTRON USA, INC.or PHOTRON EUROPE LIMITED.

Return the equipment that needs warranty service to:

In Americas
PHOTRON USA,INC.
9520 Padgett Street, Suite
110
San Diego,CA
92126-4446,USA
Phone: 858-684-3555
Fax: 858-684-3558
E-mail: image@photron.com

[In Europe:
**PHOTRON EUROPE
LIMITED**
Willowbank House
84 Station Road
Marlow, Bucks SL7, U.K
Phone:+44(0) 1628 89 4353
Fax: +44(0) 1628 89 4354
E-mail: image@photron.com

In other areas:
PHOTRON LIMITED
Shibuya 1-9-8,Shibuya-ku
Tokyo 150-0002,Japan
Phone:+81 3 3486 3471
Fax: +81 3 3486 8760
E-mail: image@photron.com

1.3. How to Use This Manual

DEFINITION OF TERMS

You will notice as you read this manual that some of the information is presented as a NOTE, CAUTION or WARNING. It is important that you understand the significance of these three terms.

NOTE

A note contains information that we wish to emphasize regarding the operation of your FASTCAM-PCI series.

CAUTION

A caution is intended to warn you that a certain operation or condition may cause harm to your FASTCAM-PCI series.

WARNING

A warning is important to the safety of everyone operating the FASTCAM-PCI series and should not be disregarded under any circumstances.

Chapter 1, general information

Contains the Warranty, precautions, introduction and how to use this manual.

Chapter 2, getting ready

An introduction to the components of your FASTCAM-PCI series. Explains the use of each connector and control on the Camera and the Processor.

Chapter 3, specifications

Contains specifications.

If you require additional information not included in this manual regarding the care, technical service and operation of your FASTCAM-PCI series please contact the service department in San Diego by calling:

800 - 585 - 2129

1.4. Precautions

AMBIENT Temperature

Photron FASTCAM-PCI has been designed to work properly in an ambient temperature range of 0 to 35 degrees Celsius (32 to 95 degrees Fahrenheit), no condensation.

STORAGE Temperature

FASTCAM-PCI must be stored in a place with an ambient temperature range of -20 to +70 degrees Celsius (-4 to +158 degrees Fahrenheit), no condensation.

TRANSPORTATION

Save the original carton the unit came in for future transportation. Or, if you transport the unit frequently, the use of a special carrying case is recommended. Please check with your dealer, Photron USA or Photron Europe. Do not send the unit to a place where the temperature can go below -20 degrees Celsius (-4 degrees Fahrenheit) or above 70 degrees Celsius (+158 degrees Fahrenheit).

FEDERAL COMMUNICATIONS COMMISSION

STATEMENTS

WARNING: This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class 鄭 · computing device pursuant to Subpart B of Part 15 of the FCC Rules and VDE 0871 Class 釘 · which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

This device complies with Part 15 of the FCC Rules and VDE 0871. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received including interference that may cause undesired operation.

WARNING

This product is grounded through the power cord. This protective ground connection is essential for safe operation of the equipment. Avoid electrical shock by plugging the power cord into a properly wired receptacle. A loss of the protective ground, for any reason, could result in electrical shock. Use the proper power cord and insure that it is in good condition.

Chapter 2 Getting Ready

2.1. Introductions

2.2. About the FASTCAM-PCI set

2.3. Installation of hardware

2.1. Introductions

2.1.1. About the packing

This product consists of the following items. Unpack and make sure if all the items are included.

1. Camera head (with a 6-meter cable)	1 ea.
2. PCI board	1 ea.
3. Lens mount cap	1 ea.
4. Internal sync/trigger signal cable	
With IL connector 2Pin- 2Pin, 50 mm	1 ea.
5. Board driver /Application set-up disk CD-ROM	1 ea.
6. Hardware manual	1 ea.
7. FASTCAM Control Software Operation Manual	1 ea.
8. Warranty card	1 ea.

2.1.2. Accessories and optional items

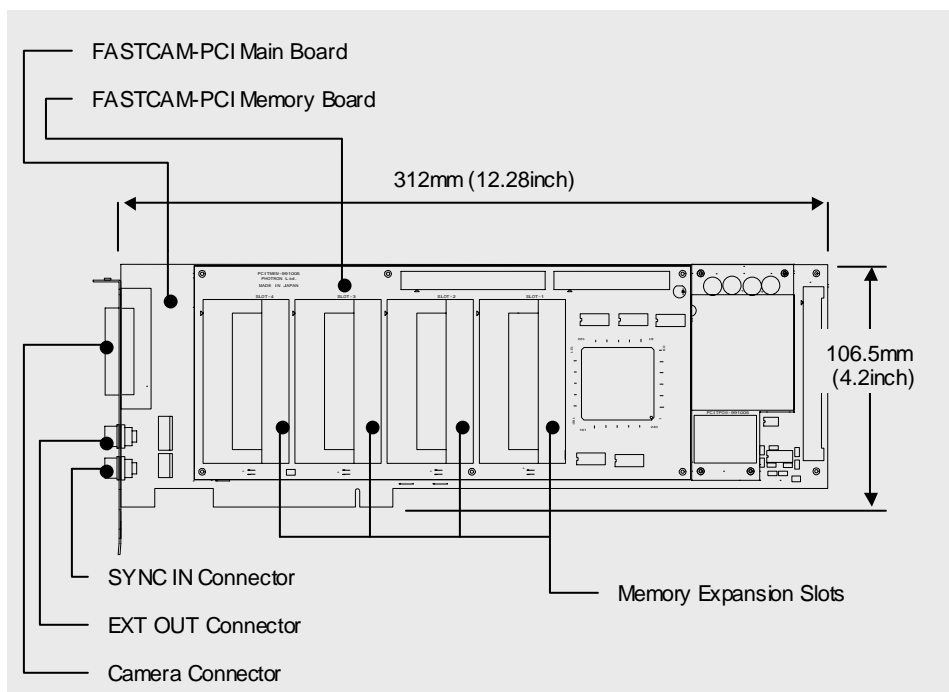
The FASTCAM-PCI offers the following optional items:

- 543-frame expansion memory module**
- 16m Imager cable option**

2.2. About the FASTCAM-PCI Set

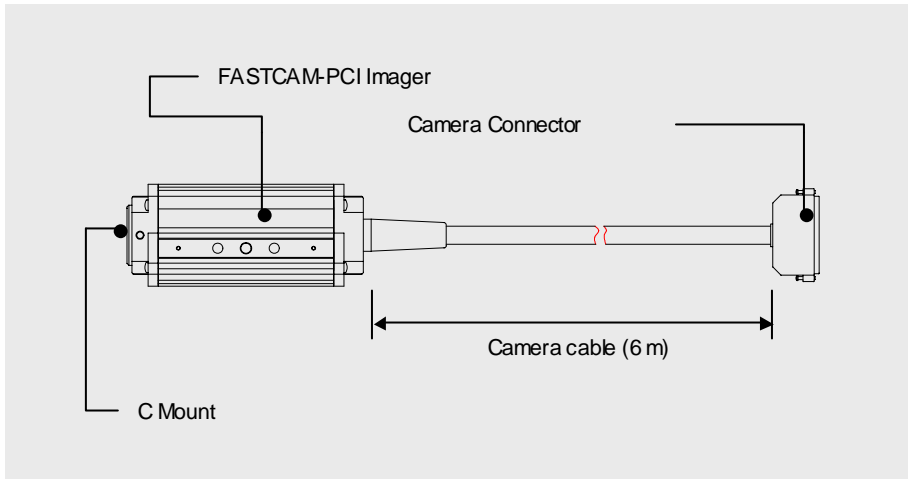
The FASTCAM-PCI consists of a processor board, camera head and a set of control software. Up to four processor boards, complying with the ATX standard can be installed in the PC.

2.2.1. Processor board



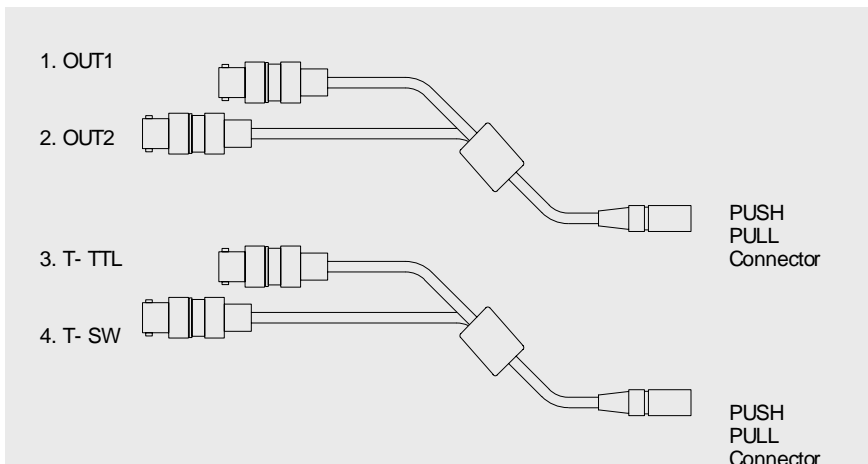
2.2.2. Camera head

Imager



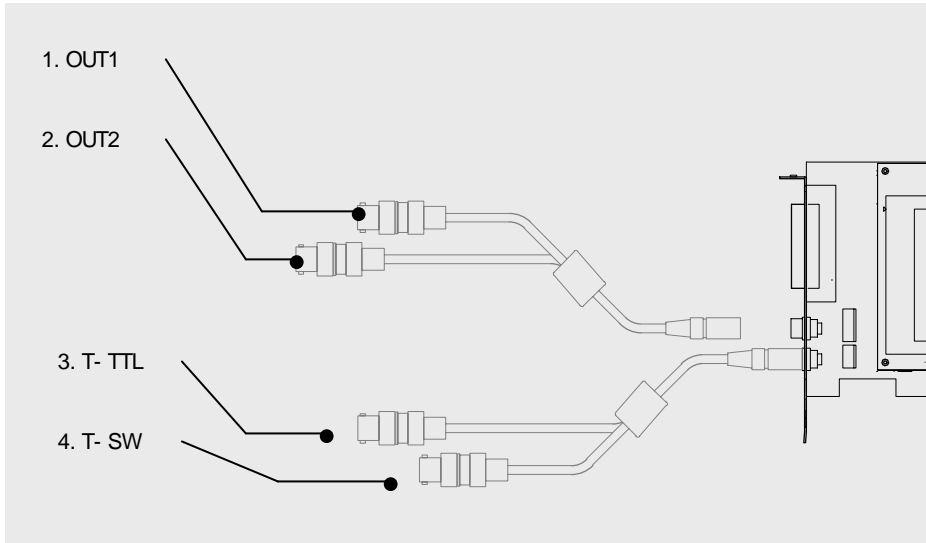
2.2.3. Accessories

EXT OUT/ SYNC IN Cables



2.2.4. Connectors Specifications

The FASTCAM-PCI supports the following input and output signals.



1 EXTOUT1 Output connector

A BNC connector for an output signal that specifies the first frame when a non-sync reset trigger signal is used.

2 EXTOUT2 Output connector

A BNC connector for an output vertical sync signal for sync operation with strobe and/or pulsed laser units.

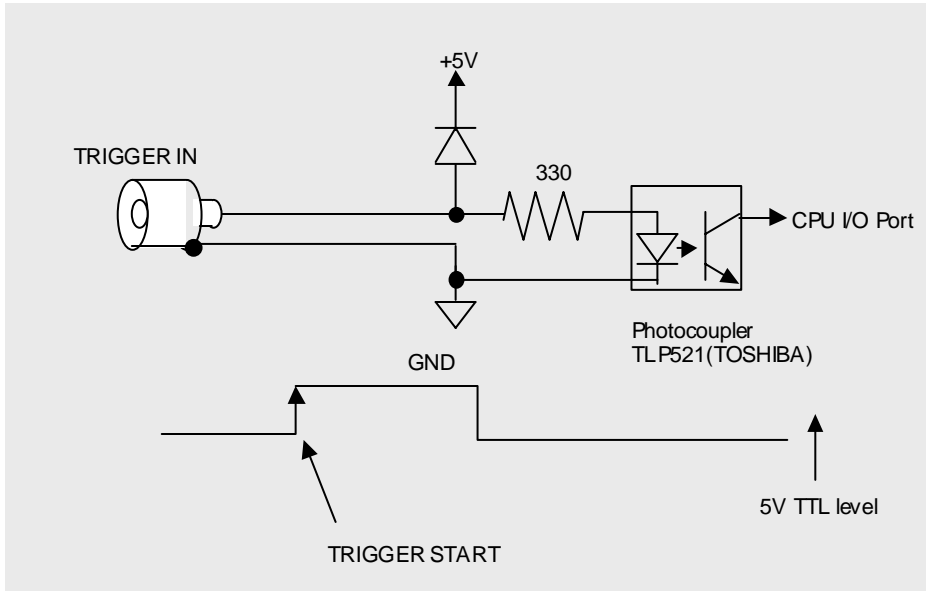
3 TRIGGER TTL IN Input connector

A BNC connector for TTL compatible signal that controls start and end of recording in a selected recording mode. The input signal is +5 volt positive and the pulse width should be over 50 microseconds.

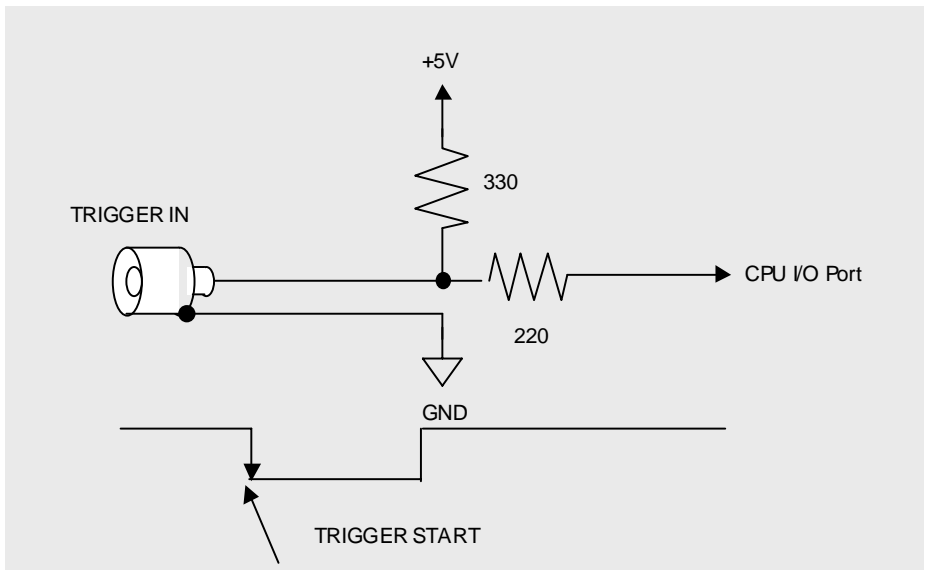
4 TRIGGER SW IN Input connector

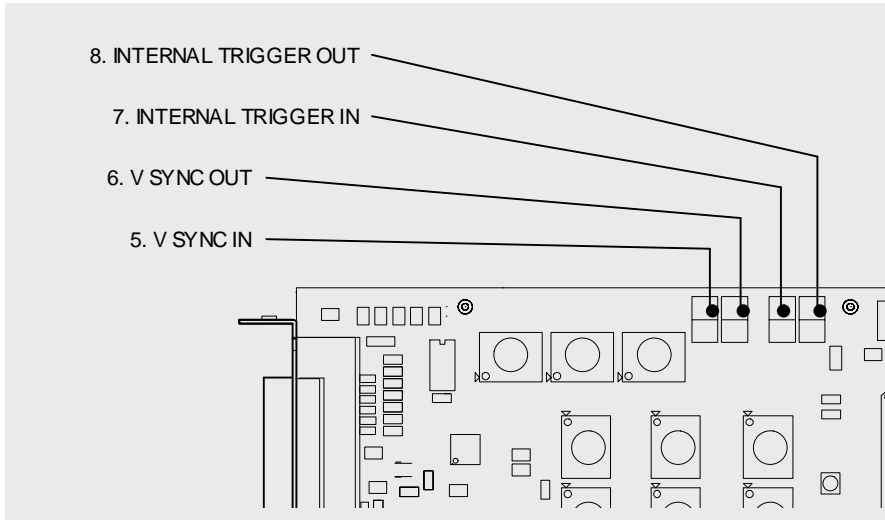
Switch contact between the shield and the center conductors of the BNC connector controls start and end of a recording in a selected recording mode.

TRIGGER TTL IN Input connector



TRIGGER SW IN Input connector





5. V SYNC INPUT Connector (VSI Connector)

When multiple FASTCAM-PCIs are set on one single PC, sync signal between cameras is input via this connector. It does not support external connection or synchronization. The sync signal is +3.3 volt TTL level, negative.

6. V SYNC OUTPUT Connector (VSO Connector)

When multiple FASTCAM-PCIs are set on one single PC, sync signal between cameras is sent out via this connector. It does not support external connection or synchronization. The sync signal is +3.3 volt TTL level, negative.

7. INTERNAL TRIGGER INPUT Connector (TRI Connector)

In multi-camera recording operation, the trigger signal from the master camera is fed to slave camera(s) via this connector for sync recording with the master camera.

8 INTERNAL TRIGGER OUTPUT Connector

In multi-camera recording operation, the trigger signal from the software is fed to slave camera(s) via this connector for software-controlled sync recording with the master camera.

8. INTERNAL TRIGGER OUTPUT Connector (TRO Connector)

In multi-camera recording operation, the trigger signal from the software is fed to slave camera(s) via this connector for software-controlled sync recording with the master camera.

2.3. Installation of hardware

Caution

Shut down the computer when you connect the camera head and PCI board. Also, shut down the computer when you install a PCI board into a computer slot. If you do not shut down the computer when installing the PCI board or camera, it may cause defect or damage on them. Please see if there is no excessive twist of cables.

2.3.1. Installing the main PCI board

2.3.2. Installing the camera head

2.3.3. Adding Memory

2.3.4. Setting for multi-camera sync

2.3.1. Installing the main PCI board

Follow the procedure below to install the PCI board.

1. Be sure to shut down the computer and unplug from the power outlet.
2. Remove the top cover of the computer following the instructions given in the computer's manual.
3. Make sure there is an empty slot for a PCI board.
4. Remove the cover plate on the back of the computer housing corresponding to the slot where you are going to insert the PCI board.
5. Insert the PCI board into the slot. Press the board firmly until it completely sits in the slot. Fasten the retaining screws on the back of the computer housing.
6. Connect the camera cable to the PCI board. Make sure if the connector's orientation is correct, and fasten the retaining screws firmly. Double check if the connectors are firmly engaged and retained.
7. Replace the top cover of the computer and fasten retaining screws following the instructions of the computer manual.

2.3.2. Installing the camera head

8. Connect the connector on the camera cable to the camera connector of the PCI board.

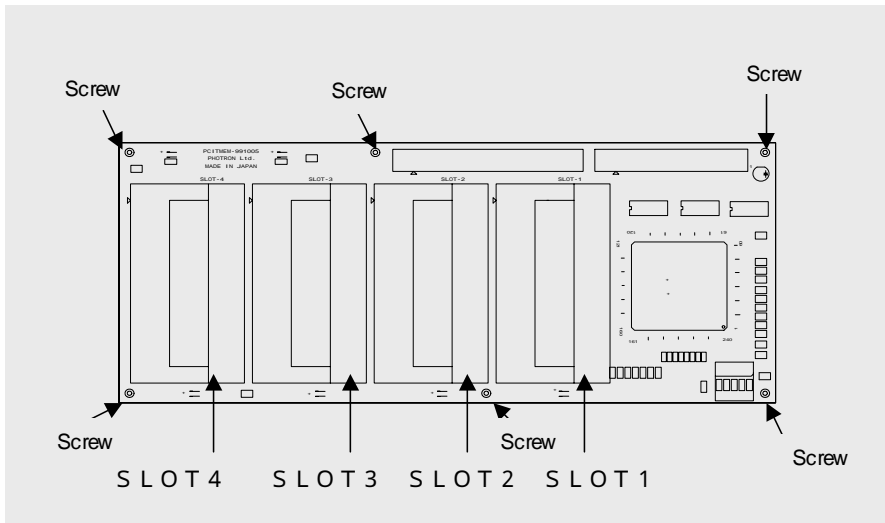
Warning:

Please be sure to unplug the power connector from the power outlet before installing the PCI board in the PC.

2.3.3. Adding Memory

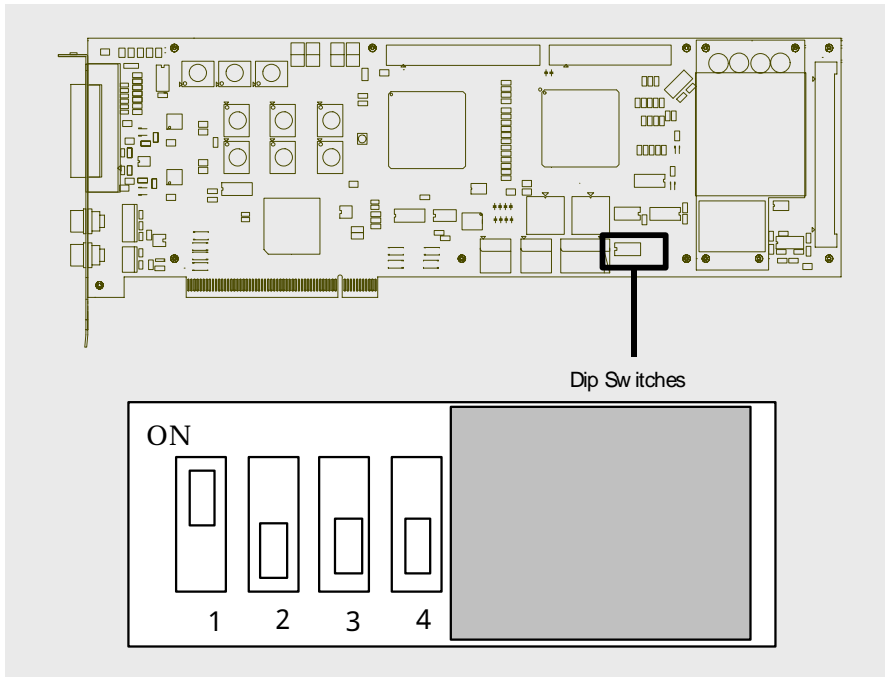
Up to four memory modules of 128MB capacity can be added to a PCI board.

1. Shut down the computer and unplugs the power cord from the power outlet. Open up the PC enclosure and remove the PCI board from the PC.
2. Remove the retaining screws that fasten the PCI Memory board to the PCI Main board. Be careful when removing the connectors.



3. Install SO-DIMM memory module(s) onto the PCI Memory board. Use SLOT 1 first and then other slots in the order as numbered. DO NOT skip any slot between additional memory modules. Align the memory modules in the same orientation and see if they are firmly inserted in the slot.

4. Setting dip switches on PCI main board



Dipswitches 1 to 4 are for activating the additional memory modules. Reset the dipswitches to match the number of added memory modules looking at the table below.

Note: Dipswitches 5 to 8 are factory set. Please do not disturb them, or they may cause malfunctioning of the camera.

Setting

Number of memory Modules	Dipswitch setting			
	1	2	3	4
1 (128 M Byte)	ON	OFF	OFF	OFF
2 (256 M Byte)	ON	ON	OFF	OFF
3 (384 M Byte)	ON	ON	ON	OFF
4 (512 M Byte)	ON	ON	ON	ON

ON: Move SW upward OFF: Move SW downward

Match the number of added memory modules and dipswitch setting correctly, or the system may fail to capture and record images properly.

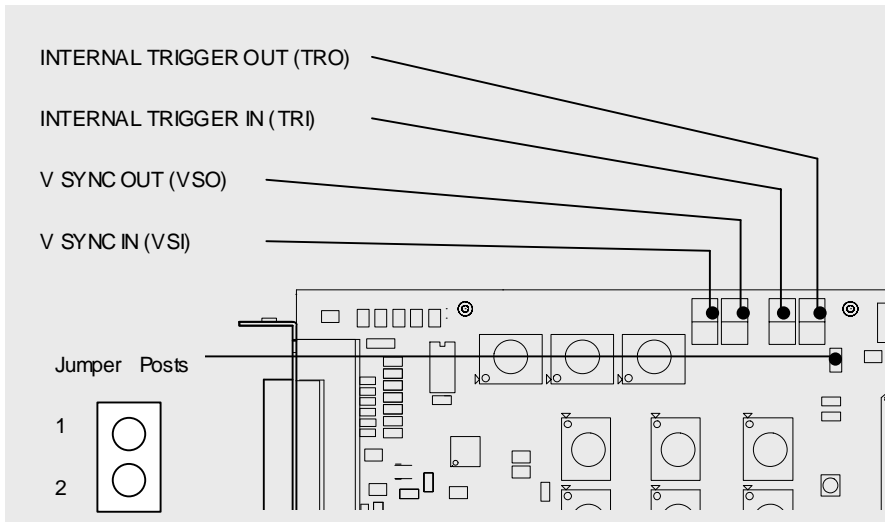
5. Connecting between PCI main board and memory modules

Make sure the connectors are firmly engaged to their entire depth. Redo the retaining screws to fasten the board firmly.

6. Install the PCI board in the PC following the instructions given in section 2.3.1.

2.3.4. Setting for multi-camera sync

By setting the PCI main board for external sync mode, multi-camera operation can be performed. In the multi-camera operation mode, two, three or four cameras are hooked up to one computer and run in synchronization with each other to record the image of a common object from different view points along one single time line. This is a useful feature for an application where behavior of a single, or two or more objects, is observed from different perspectives. To activate this mode, resetting of jumpers on the PCI main board is necessary. First, remove the PCI main board from the computer, then remove the PCITMEM (memory) board from the PCI main board to expose the jumpers. Follow the instructions given in section 2.3.3. (Adding Memory Board) to carry out this resting of jumpers.

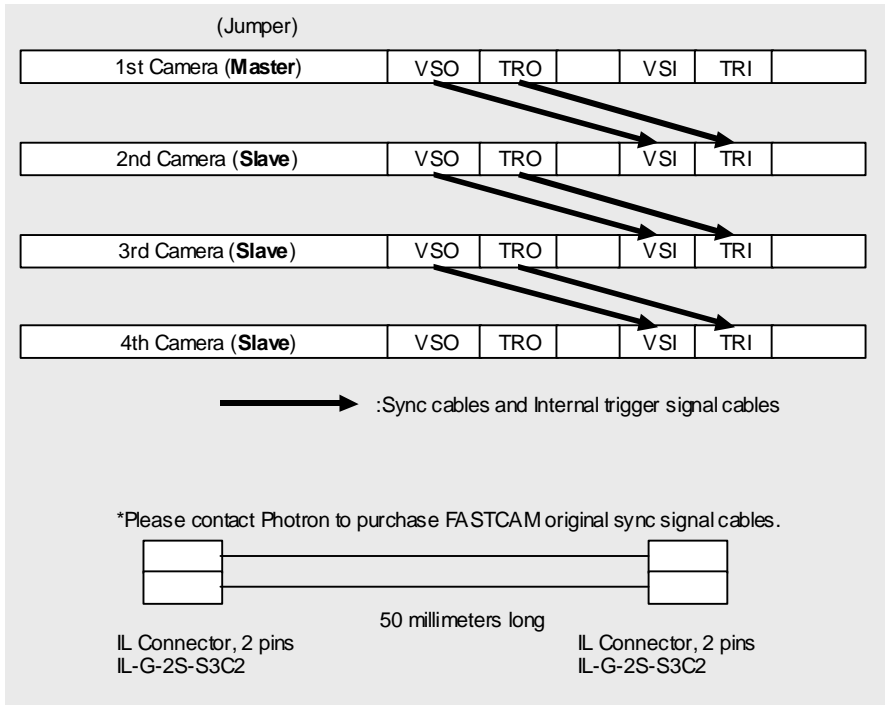


- **TRI Connector**
Imports internal trigger signals from TRO connector of other boards.
- **TRO Connector**
Outputs trigger signals internally generated in the board.
- **VSI Connector**
Imports external sync signals from VSO connector of other boards.
- **VSO Connector**
Outputs external sync signals
- **Jumper posts for external sync signal setting**
These jumper posts are used to set for sync operation mode.

Master Mode	The PCI board that is set as the Master board outputs internally generated sync signals from the VSO connector. It also outputs the trigger signals given by the software from the TRO connector.
Jumper setting	Open
Slave Mode	Once the PCI main board is set in the slave mode, the camera operates in sync with the sync signal imported via the VSI connector. Recording starts at the trigger signal input via the TRI connector.
Jumper setting:	Short

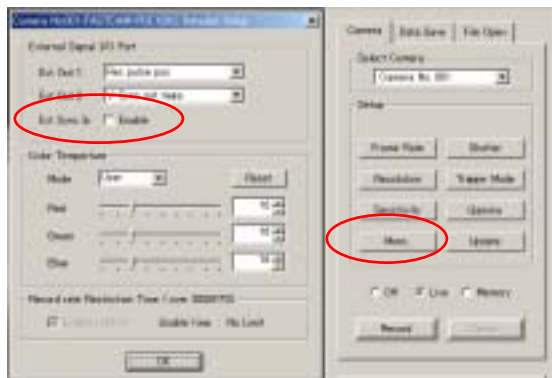
Cable connection for 4-cameras sync operation

***Hardware setting:**



***Application Software Setting**

Software must be properly reset for the cameras to operate in sync mode. In the sync operation mode, one of the cameras must be set to master mode while others are set to slave mode. For the cameras that are to follow the master, check the “Ext sync In” box in the camera setup menu from the “More” button. Do not check the “Ext sync In” box for the camera that is the master, or the cameras will not work.



***Triggering for sync recording**

Note:

Triggering from software:

All cameras are triggered without delay by a trigger signal distributed via the internal harness.

Triggering from external source:

A common externally generated trigger signal must be input to each PCI board via EXT SYNC IN connector. A trigger signal input to one PCI board only will not be passed on to other PCI boards.

Chapter 3 Specifications

3.1. Hardware Specifications

3.2. Dimensions

3.3. Care of Lenses

3.1. Hardware Specifications

Table1: Overall Functions Specification

Lens mount	C mount	
Imaging sensor	Progressive scan 1/3-inch CCD, square pixels	
Recording media	IC memory (SD-RAM)	
Recording capacity	128MB: 543 full frames, 2.2 seconds 256MB: 1,087 full frames, 4.3 seconds 384MB: 1,631 full frames, 6.5 seconds 512MB: 2,175 full frames, 8.7 seconds	
Framing rates	Full frame:	30, 60, 125, 250 fps
	Partial frame:	500, 1000, 2000, 3000, 5000, 10000 fps
	Frame rate availability dependant on model	
Pixel resolution	Full frame:	512 x 480 pixels
	Partial frame:	512 x 240; 256 x 240; 256 x 120 pixels 128 x 120; 128 x 80; 128 x 34 pixels
	Note: Pixel resolution depends on framing rate (see Table 3).	
Grayscale	Monochrome: 8 bits (256 steps) Color: R, G, B 8 bits each (24 bits color, 256 steps)	
Playback rates	1, 2, 4, 8, 15, 30 fps	
Electronic shutter	1/frame rate; 1/500; 1/1000; 1/2000; 1/3000; 1/5000;1/10000; 1/20000; 1/40000; 1/65000; 1/80000;1/100000; 1/120000 second Note: Shutter speed availability depends on framing rate (see Table 4).	
Trigger input (TTL) Trigger input	TTL +5 V positive going (Contact) Switch contact Sync output	
Sync Output	Vertical sync signal (master) to drive other FASTCAM-PCI slaves boards (Negative 3.3 Vp-p)	
Sync input	Vertical sync signal (negative 3.3 Vp-p)	
Output signal 1	Vertical sync output+5V TTL, negative	
Output signal 2	Asynchronous random reset timing signal +5V TTL, positive	
Power	From the PCI bus (+3.3V; +5.0V; -12V)	
Ambient temperature	0 to 35 degrees Celsius (32 to 95 F), no condensation	
Power consumption	+3.3 V: 2 A; +5.0 V: 2 A; -12 V: 0.5 A (32.6 watts)	
Dimensions	Camera head: 160(6.3") W x 330(13")D x 180(7.1")H mm	
	PCI board: 312(12.6") W x 106(4.2")H x 16(0.6")T mm (PCI full size standard)	
Weight	Camera head:	1.1 kg (2.4 lbs) (including 6-meter camera cable)

Table 2: Framing Rate/Model

Framing Rate FPS	Model			
	FASTCAM-PCI 500	FASTCAM-PCI 1k	FASTCAM-PCI 2k	FASTCAM-PCI 10k
30	O	O	O	O
60	O	O	O	O
125	O	O	O	O
250	O	O	O	O
500	O	O	O	O
1000	O	NA	O	O
2000	O	NA	NA	O
3000	NA	NA	NA	O
5000	NA	NA	NA	O
10000	NA	NA	NA	O

Table 3: Frame Rate/Frame Size

Framing Rate (FPS)	Image size						
	512x480	512x240	256x240	256x120	128x120	128x80	128x34
30	O	O	O	O	O	O	O
60	O	O	O	O	O	O	O
125	O	O	O	O	O	O	O
250	O	O	O	O	O	O	O
500		O	O	O	O	O	O
1000			O	O	O	O	O
2000				O	O	O	O
3000					O	O	O
5000						O	O
10000							O

Table 4 Shutter Speed/Frame Rate

30 FPS	60 FPS	125 FPS	250 FPS	500 FPS	1000 FPS	2000 FPS	3000 FPS	5000 FPS	10,000 FPS
1/30									
1/60	1/60								
1/125	1/125	1/125							
1/250	1/250	1/250	1/250						
1/500	1/500	1/500	1/500	1/500					
1/1000	1/1000	1/1000	1/1000	1/1000	1/1000				
1/2000	1/2000	1/2000	1/2000	1/2000	1/2000	1/2000			
1/3000	1/3000	1/3000	1/3000	1/3000	1/3000	1/3000	1/3000		
1/5000	1/5000	1/5000	1/5000	1/5000	1/5000	1/5000	1/5000	1/5000	
1/10000	1/10000	1/10000	1/10000	1/10000	1/10000	1/10000	1/10000	1/10000	1/10000
1/20000	1/20000	1/20000	1/20000	1/20000	1/20000	1/20000	1/20000	1/20000	1/20000
1/40000	1/40000	1/40000	1/30000	1/30000	1/40000	1/40000	1/40000	1/40000	1/40000
			1/60000	1/60000	1/60000	1/60000	1/65000	1/60000	1/60000
							1/100000	1/80000	1/80000
								1/120000	1/120000

Table5: Number of Frames/Recording Time

Recording Time and Number of Recorded Frames (30FPS)

(FPS)	Resolution	Memory/Recording Time and Number of Recorded Frames							
		128MByte		256MByte		384MByte		512MByte	
		Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)
30	512x480	543	18.1	1087	36.2	1631	54.4	2175	72.5
	512x240	1091	36.4	2183	72.8	3275	109.2	4367	145.6
	256x240	2183	72.8	4367	145.6	6551	218.4	8735	291.2
	256x120	4367	145.6	8735	291.2	13103	436.8	17471	582.4
	128x120	8735	291.2	17471	582.4	26207	873.6	34943	1164.8
	128x 80	13103	436.8	26207	873.6	39311	1310.4	52415	1747.2
	128x 34	30839	1028.0	61679	2056.0	92519	3084.0	123359	4112.0

Recording Time and Number of Recorded Frames (60FPS)

(FPS)	Resolutions	Memory/Recording Time and Number of Recorded Frames							
		128MByte		256MByte		384MByte		512MByte	
		Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)
60	512x480	543	9.1	1087	18.1	1631	27.2	2175	36.3
	512x240	1091	18.2	2183	36.4	3275	54.6	4367	72.8
	256x240	2183	36.4	4367	72.8	6551	109.2	8735	145.6
	256x120	4367	72.8	8735	145.6	13103	218.4	17471	291.2
	128x120	8735	145.6	17471	291.2	26207	436.8	34943	582.4
	128x 80	13103	218.4	26207	436.8	39311	655.2	52415	873.6
	128x 34	30839	514.0	61679	1028.0	92519	1542.0	123359	2056.0

Recording Time and Number of Recorded Frames (125FPS)

(FPS)	Resolutions	Memory/Recording Time and Number of Recorded Frames							
		128MByte		256MByte		384MByte		512MByte	
		Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)
125	512x480	543	4.4	1087	8.7	1631	13.0	2175	17.4
	512x240	1091	8.7	2183	17.5	3275	26.2	4367	34.9
	256x240	2183	17.5	4367	34.9	6551	52.4	8735	69.9
	256x120	4367	34.9	8735	69.9	13103	104.8	17471	139.8
	128x120	8735	69.9	17471	139.8	26207	209.7	34943	279.5
	128x 80	13103	104.8	26207	209.7	39311	314.5	52415	419.3
	128x 34	30839	246.7	61679	493.4	92519	740.2	123359	986.9

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Recording Time and Number of Recorded Frames (250FPS)

(FPS)	Resolutions	Memory/Recording Time and Number of Recorded Frames							
		128MByte		256MByte		384MByte		512MByte	
		Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)
250	512x480	543	2.2	1087	4.3	1631	6.5	2175	8.7
	512x240	1091	4.4	2183	8.7	3275	13.1	4367	17.5
	256x240	2183	8.7	4367	17.5	6551	26.2	8735	34.9
	256x120	4367	17.5	8735	34.9	13103	52.4	17471	69.9
	128x120	8735	34.9	17471	69.9	26207	104.8	34943	139.8
	128x 80	13103	52.4	26207	104.8	39311	157.2	52415	209.7
	128x 34	30839	123.4	61679	246.7	92519	370.1	123359	493.4

Recording Time and Number of Recorded Frames (500FPS)

(FPS)	Resolutions	Memory/Recording Time and Number of Recorded Frames							
		128MByte		256MByte		384MByte		512MByte	
		Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)
500	512x240	1091	2.2	2183	4.4	3275	6.6	4367	8.7
	256x240	2183	4.4	4367	8.7	6551	13.1	8735	17.5
	256x120	4367	8.7	8735	17.5	13103	26.2	17471	34.9
	128x120	8735	17.5	17471	34.9	26207	52.4	34943	69.9
	128x 80	13103	26.2	26207	52.4	39311	78.6	52415	104.8
	128x 34	30839	61.7	61679	123.4	92519	185.0	123359	246.7

Recording Time and Number of Recorded Frames (1000FPS)

(FPS)	Resolutions	Memory/Recording Time and Number of Recorded Frames							
		128MByte		256MByte		384MByte		512MByte	
		Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)
1000	256x240	2183	2.2	4367	4.4	6551	6.6	8735	8.7
	256x120	4367	4.4	8735	8.7	13103	13.1	17471	17.5
	128x120	8735	8.7	17471	17.5	26207	26.2	34943	34.9
	128x 80	13103	13.1	26207	26.2	39311	39.3	52415	52.4
	128x 34	30839	30.8	61679	61.7	92519	92.5	123359	123.4

Recording Time and Number of Recorded Frames (2000FPS)

(FPS)	Resolutions	Memory/Recording Time and Number of Recorded Frames							
		128MByte		256MByte		384MByte		512MByte	
		Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)
2000	256x120	4367	2.2	8735	4.4	13103	6.6	17471	8.7
	128x120	8735	4.4	17471	8.7	26207	13.1	34943	17.5
	128x 80	13103	6.6	26207	13.1	39311	19.7	52415	26.2
	128x 34	30839	15.4	61679	30.8	92519	46.3	123359	61.7

Recording Time and Number of Recorded Frames (3000FPS)

(FPS)	Resolutions	Memory/Recording Time and Number of Recorded Frames							
		128MByte		256MByte		384MByte		512MByte	
		Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)
3000	128x120	8735	2.9	17471	5.8	26207	8.7	34943	11.6
	128x 80	13103	4.4	26207	8.7	39311	13.1	52415	17.5
	128x 34	30839	10.3	61679	20.6	92519	30.8	123359	41.1

Recording Time and Number of Recorded Frames (5000FPS)

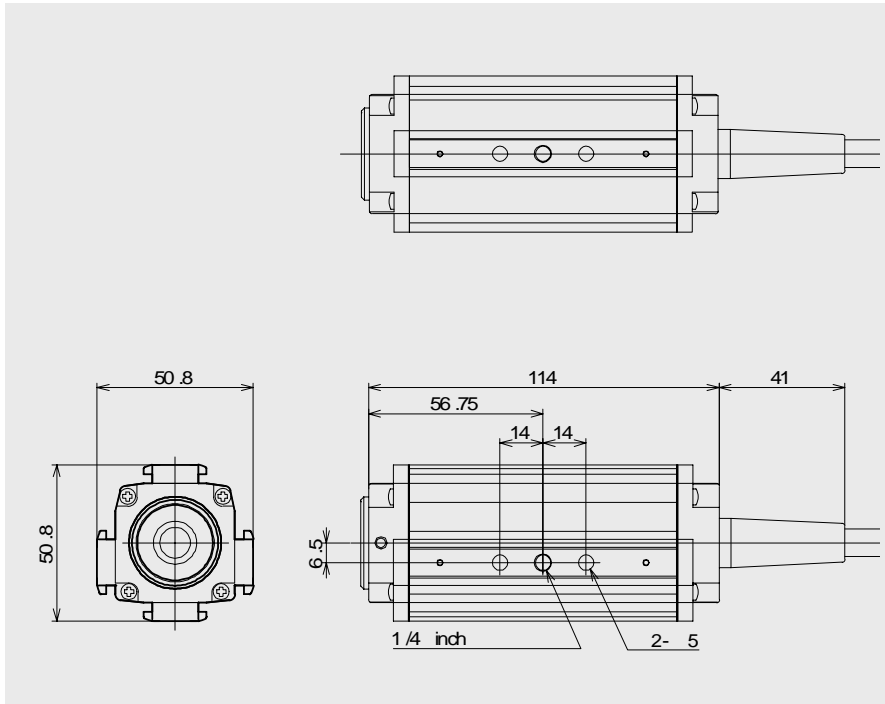
(FPS)	Resolutions	Memory/Recording Time and Number of Recorded Frames							
		128MByte		256MByte		384MByte		512MByte	
		Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)
5000	128x 80	13103	2.6	26207	5.2	39311	7.9	52415	10.5
	128x 34	30839	6.2	61679	12.3	92519	18.5	123359	24.7

Recording Time and Number of Recorded Frames (10,000FPS)

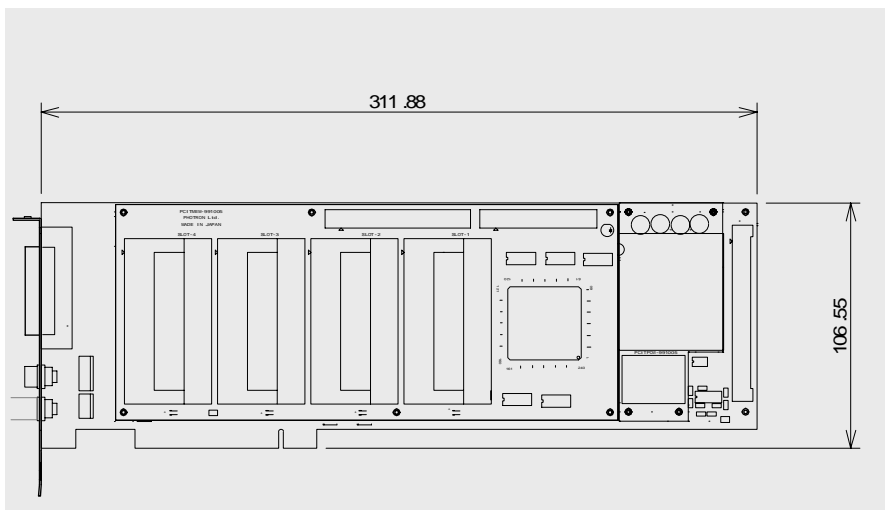
(FPS)	Resolutions	Memory/Recording Time and Number of Recorded Frames							
		128MByte		256MByte		384MByte		512MByte	
		Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)	Number of Recorded Frames	Recording time (sec)
10000	128x 34	30839	3.1	61679	6.2	92519	9.3	123359	12.3

3.2. Dimensions

3.2.1. Imager: (mm)

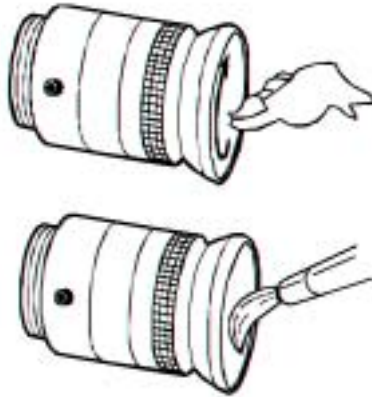


3.2.2. Main board: (mm)



3.3. Care of Lenses

The surface of photographic lenses have thin coatings that reduce chromatic aberration, unwanted reflections, and other distortions. Extra care should be taken to protect this fragile coating. Protect the lens by installing a lens cap when you are not using the camera. Brush the lens gently with a camel hair brush or loosely folded piece of lens paper to remove dust particles. For stubborn dirt use photographic lens cleaning solution and lens wipes. Never rub the lens with direct pressure or drop cleaning solution directly on the lens surface.



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