FASTCAM-ultima 512
Hardware Manual

IEEE1394 Interface Model
Rev.1.2

PHOTRON LIMITED
2015

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Chapter 1 Introduction

1.1. Preface
1.2. Warranty
1.3. How To Use This Manual
1.4. Precautions

1.1. Preface

The FASTCAM-ultima 512 High-Speed Video Camera System will prove itself a truly powerful visualization tool giving solution to engineers and scientists in such fields as general research and development, designing, manufacturing, quality assurance, scientific researches, medical and biological researches, space and aeronautics engineering. With its ultra-high sensitivity imaging sensor that enables framing under low level of light, the 512 offers a great basic feature of high-speed recording of up to 32,000 frames per second (fps). Another outstanding feature is that it promises an excellent user-friendliness of intuitive recording of subjects moving at a very high speed thanks to its real-time video output and easy-to-operate keypad-type remote control unit. Also, the hybrid-design scheme of the 512 makes it possible to seamlessly connect to a PC via a high-speed digital interface, combined with easy-to-use control software, to form an image recording and processing system that offers a much easier means for analyzing captured events immediately, which has been very difficult with conventional systems.

You will find this new recording technology most useful to capture the image of high-speed moving subjects for subsequent slow-motion observation and motion analysis, and image processing applications. This manual presents the technical details of the 512 system and how to operate it.

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 damages 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-ultima 512

PHOTRON LIMITED warrants this PHOTRON FASTCAM-ultima 512 (“512”) and accessories manufactured by PHOTRON LIMITED to function properly for one year from the date of shipment, provided 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 512 in accordance with Photon’s written instructions, including environmental specifications listed in the User’s Manual.

If there is evidence of the 512 being subjected to accidental damage, misuse or abuse.

If the 512 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 512 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 & Antipodes
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
www.photron.com

In Europe:
PHOTRON EUROPE LTD.
Willowbank House
84 Station Road
Marlow, Bucks SL7 1NX
U. K.
Phone:+44(0) 1628 89 4353
Fax: +44(0) 1628 89 4354
E-mail:image@photron.com
www.photron.com

In other areas:
PHOTRON LIMITED
Fujimi 1-1-8, Chiyoda-ku
Tokyo 102-0071
Japan

Phone:+81 3 3238 2170
Fax: +81 3 3238 2134
E-mail:image@photron.com
www.photron.co.jp

1.3. How To Use This Manual

DEFINITION OF TERMS

You will notice that some of the information in this manual is presented as a NOTE, CAUTION or WARNING. It is important that you understand the significance of these three terms. For safe operation of the system, please follow the safety instructions below:

“Note” includes information that should be emphasized regarding the operation of the 512.

“Caution” includes important information regarding operation. If it is neglected and the equipment is used in the wrong manner, damage may be caused to the content of recording, the equipment and related peripheral devices.

“Warning” presents very important information regarding safety of the operators. If it is neglected and the equipment is used in the wrong manner, a serious hazardous sequence involving human injury or death may result. It must not be disregarded.

Chapters

This manual is divided into six chapters each discussing subject matters related to its chapter title.

Chapter 1. Introduction

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

Chapter 2. Set Up

Introduces you to the components of the 512 and explains the use of each connector, keypad operation and parameter settings to make ready for recording.

Chapter 3. Recording

Explains the operation of the 512 for recording.

Chapter 4. Playback

Discusses playback of recorded images and filing image data.

Chapter 5. Connection to a PC

Shows how to connect and operate the 512 to a PC (Operation of the 512 from PC is discussed in the PFV Software Manual).

Chapter 6. Specifications

Provides detailed specifications of the 512 system.

1.4. Precautions

Ambient Temperature

Photron FASTCAM-ultima 512 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

The 512 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. Do not transport the unit under ambient temperature of 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 computing device pursuant to Subpart A of Part 15 of the FCC Rules and VDE 0871 Class B 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 equipment may cause harmful interference, and (2) this equipment must accept any interference received including interference that may cause undesired operation.

Memo

Chapter 2 Set Up

2.1. Unpacking
2.2. Names of Components
2.3. Connection of Equipment
2.4. System Setup

2.1. To Start

2.1.1. Unpacking

The 512 system consists of the following items. Make sure if all the components are found in the package.

1. Camera Head	1 ea.
2. Processor	1 ea.
3. Remote Control Keypad	1 ea.
4. AC Power Adapter/AC Cable	1 ea.
5. Camera Cable (5 meters long)	1 ea.
6. GENERAL IN Cable	1 ea.
7. GENERAL OUT Cable	1.ea.
8. Ferrite Core For Cable	1 ea.
9. CD-ROM For Driver/Application Setup	1 ea.
10. FASTCAM-ultima 512 Hardware Manual	1 ea.
11. FASTCAM Control Software Operation Manual	1 ea.
12. Warranty Registration Card	1 ea.

2.1.2. Optional Accessories

Following optional items are available for the 512:

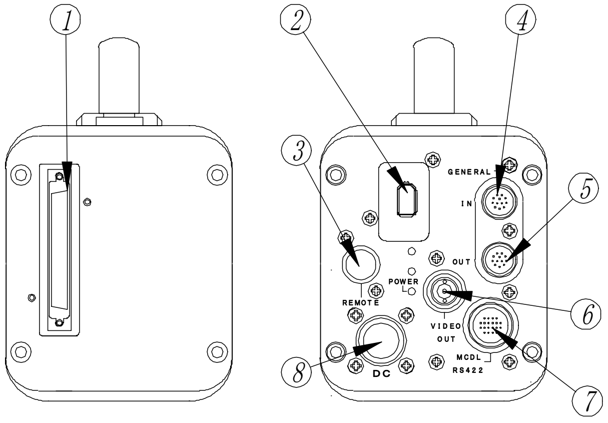
1. High-G Mount Kit for the 512 (High-G lens mount with High-G warranty)
2. IEEE1394 Optical Link
3. 4-Channel MCDL Analog Waveform Synchronized Recording Unit
4. 4-Output Trigger Box
5. MCDL/RS422 Cable

2.2. Names of Components

The 512 system consists of a processor, camera head, remote-control keypad and control software.

2.2.1. Processor

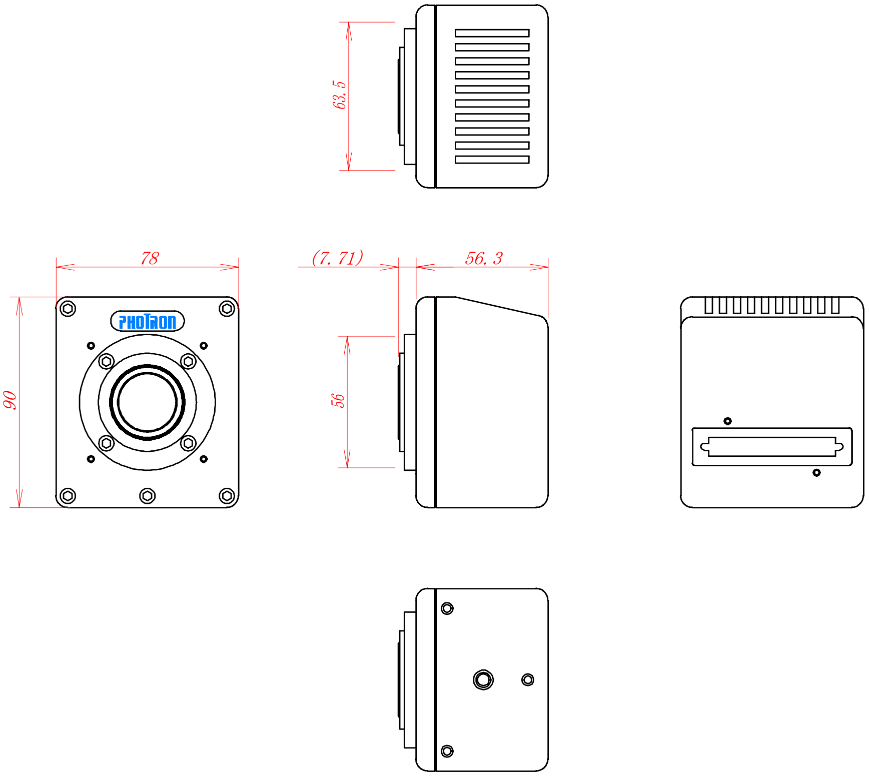
The 512 processor is designed to have a set of IC memory with a capacity of 670MB, standard, and a maximum of 2GB, to store non-compressed digital data of high-speed recorded images. The processor has a video output connector to display the recorded images on the video monitor, an IEEE1394 digital interface to control the camera from a PC and download recorded image data, input and output connectors for external sync and trigger signals, and a port to accept IRIG timecode and MCDL analog waveform signals (optional).



No.	Name	No.	Name
①	Camera Cable Connector	⑤	GENERAL OUT Connector
②	IEEE1394 Interface Connector	⑥	VIDEO OUT Connector
③	Remote Keypad Connector	⑦	MCDL/RS422 Connector
④	GENERAL IN Connector	⑧	DC IN Power Connector

2.2.2. Camera Head

The light-weight and compact-sized 512 camera head has been designed for ease of handling under various recording conditions and environments. The lens mount can be selected from C-type or Hi-G type to the user's application. The camera head has a tripod-mounting screw hole on its base plate.



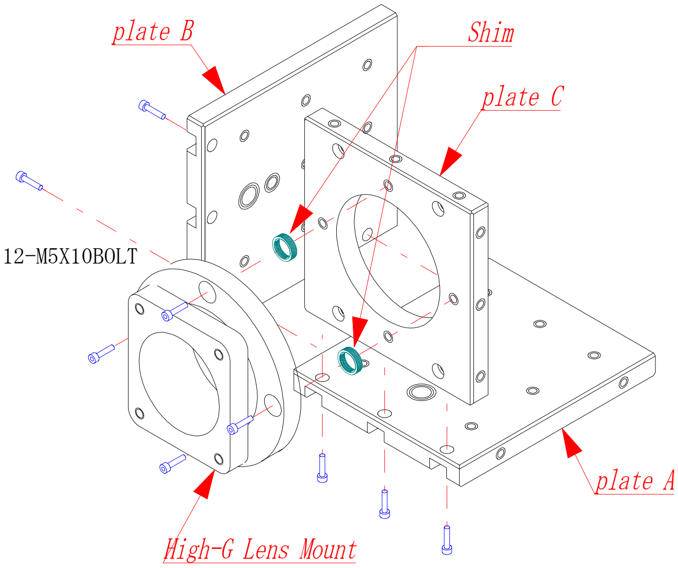
2.2.3. Changeable Lens Mount

The lens mount for the 512 can be changed to the particular needs of application. Two types of lens mounts are available to choose from: C-type mount and High-G lens mount (optional).

How To Change Lens Mounts (from C-type to High-G)

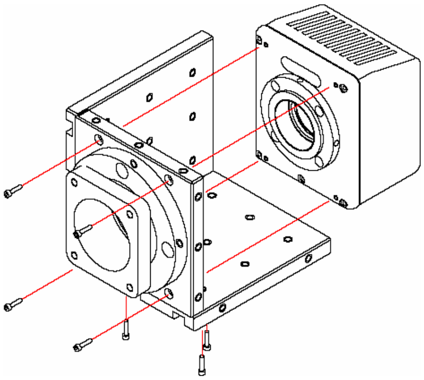
1. Assembling High-G Camera Mounting

The following figure shows an example of assembling High-G camera mounting. The metal plates A and B can be fitted to any edge of the plate C. You may place the plates A and B any of the four edges of plate C depending on the particular requirement of application. The figure on the next page shows an example of completed assembly of camera head and High-G camera mounting. The flange back length can be readjusted by increasing or decreasing the number of shims (4 stacks of 10 shims included). Fit the High-G Lens Mount in front of plate C as shown below.If your Hi-G lens has shims in its rear end, use them first to readjust the flange back length.



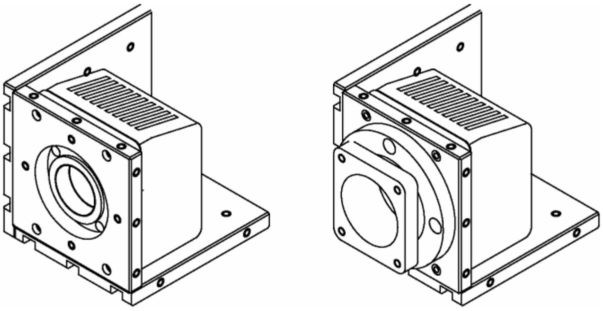
2. Fitting Camera on High-G Camera Mounting

Place the camera head on the High-G camera mounting and fasten with four screws as shown below.



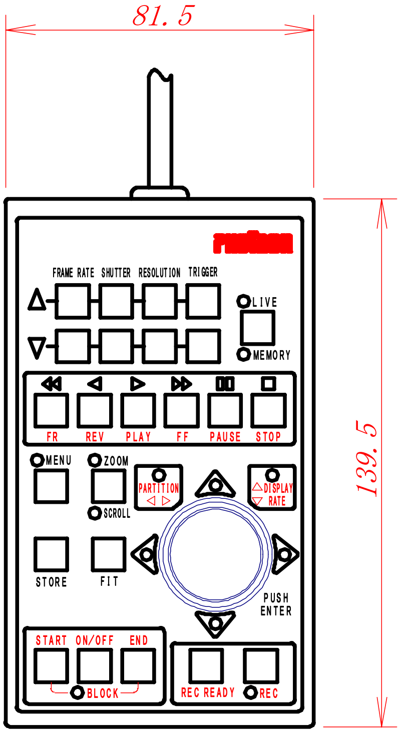
3. Using C-Type Lens on High-G Camera Mounting

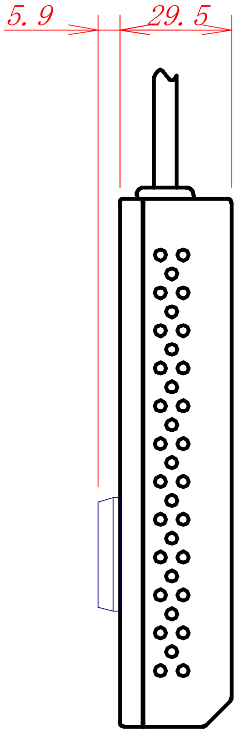
If you wish to use a C-type lens with the camera fitted on the High-G camera mounting, you can do so by removing the High-G lens mount block from the front of plate C.

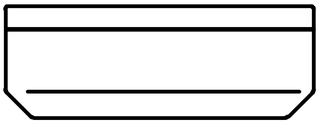


2.2.4. Remote Control Keypad

The 512 Remote Control Keypad connects to the processor and controls all the functions of the camera system. The keypad is of “hot-plug” type and can be connected or disconnected with power on.


81. 5
139. 5
FRAME RATE
SHUTTER
RESOLUTION
TRIGGER
LIVE
MEMORY
FR
REV
PLAY
FF
PAUSE
STOP
MENU
ZOOM
PARTITION
DISPLAY RATE
SCROLL
STORE
FIT
PUSH ENTER
START
ON/OFF
END
BLOCK
REC READY
REC

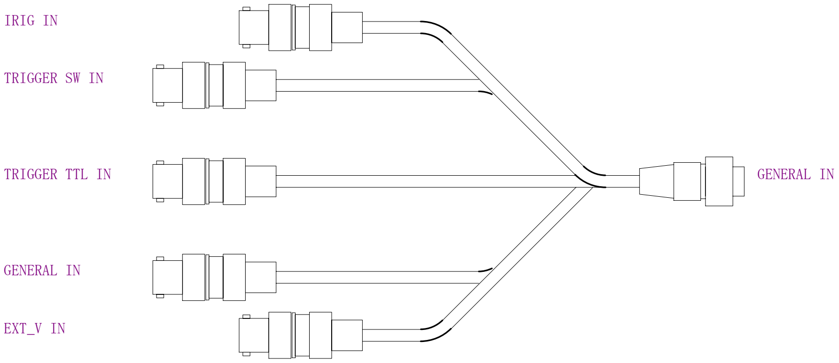




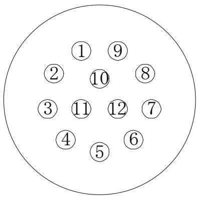
Connector on Processor	Signal	Connector Model (On Processor)	Connector Model (On Keypad)
REMOTE	Remote Keypad Signal	HR10A-10R-12SC (HIROSE)	HR10A-10P-12P (HIROSE)

2.2.5. GENERAL IN Cable

The 512 can be used as an integral part of a testing system by its capability to work in sync with external trigger and sync signals from other devices and equipment within the system. The processor has a GENERAL IN connector on its rear panel, which combines relevant input signal lines into one connector.


IRIG IN
TRIGGER SW IN
TRIGGER TTL IN
GENERAL IN
EXT_V IN
GENERAL IN

【GENERAL IN Pins】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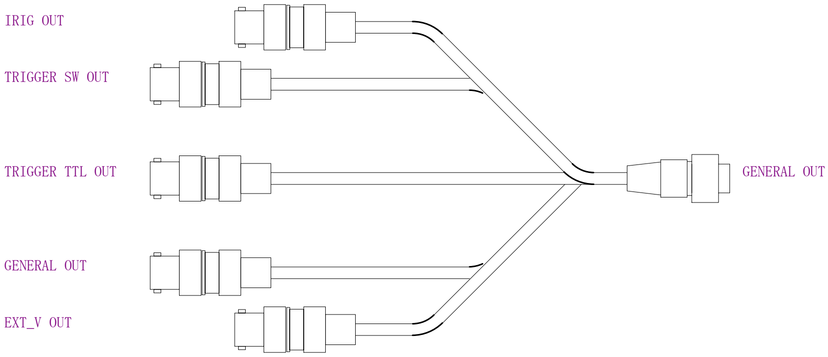
HR10A-10TR-12PB (HIROSE)

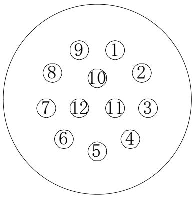
Connector Name	Signal Name	Pin No.	Connector on Processor Model (Manufacturer)	Connector on Cable Model (Manufacturer)	Input Connec-tor
GENERAL IN	Trigger SW IN	1	HR10A-10TR-12PB (HIROSE)	HR10A-10TPA-12S (HIROSE)	BNC
	GND	2			
	Trigger TTL IN	3			BNC
	GND	4			
	EXT_V IN	5			BNC
	GND	6			
	General IN	7			BNC
	GND	8			
	IRIG IN	9			BNC
	GND	10			

2.2.6. GENERAL OUT Cable

The 512 can be used as an integral part of a testing system by its capability to make other devices and equipment in the system work in sync with the 512's exposure timing and sync signals. The processor has a GENERAL OUT connector on its rear panel, which distributes 512's output signals to relevant devices and equipment.


IRIG OUT
TRIGGER SW OUT
TRIGGER TTL OUT
GENERAL OUT
EXT_V OUT
GENERAL OUT

【GENERAL OUT Pins】


⑨ ①
⑧ ⑩ ②
⑦ ⑫ ⑪ ③
⑥ ④
⑤

HR10A-10TR-12SB(HIROSE)

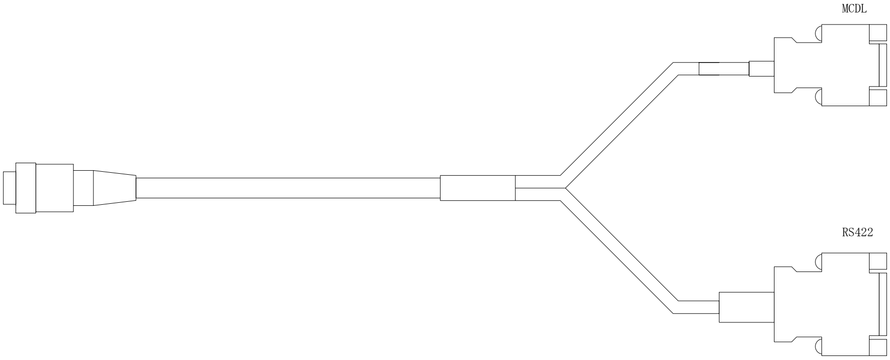
Connector Name	Signal Name	Pin No.	Connector on Processor Model (Manufacturer)	Connector on Cable Model Manufacturer)	Output Connectors
GENERAL OUT	Trigger SW OUT	1	HR10A-10TR-12SB (HIROSE)	HR10A-10TP-12P (HIROSE)	BNC
	GND	2			
	Trigger TTL OUT	9			BNC
	GND	10			
	EXT_V OUT	5			BNC
	GND	6			
	General OUT	7			BNC
	GND	8			
	IRIG OUT	3			BNC
	GND	4			

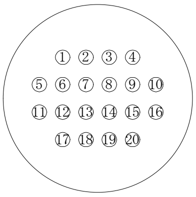
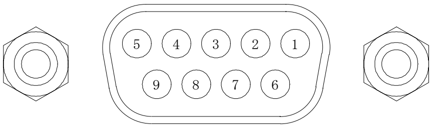
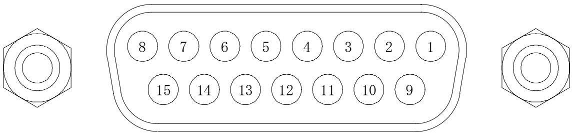
2.2.7. MCDL / RS422 Cable (Optional)

The 512 has connectivity with Photron MCDL (Multi-Channel Data Link) unit (optional). The waveform data output (up to 4 channels of analog data and up to 6 channels of digital data) from MCDL is sampled and recorded together with image data.

The RS422 port is an interface to control the 512 using RS422 communication protocol.

The MCDL and RS422 signal lines are combined into one composite cable, whose details are shown below:

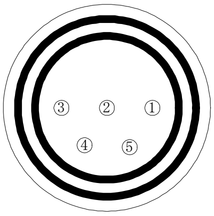


<table>
<tr><td>【MCDL/RS422 Connector Pins on Processor】</td><td>【MCDL Connector Pins】</td></tr>
<tr><td> HR10A-13TR-20SB (HIROSE)</td><td> 9-pin D-sub Connector (Female)</td></tr>
<tr><td colspan="2">【RS422 Connector Pins】</td></tr>
<tr><td colspan="2"> 15-pin D-sub Connector (Female)</td></tr>
</table>

Connector Name	Connector on Processor Model (Manufacturer)	Connector on Cable Model (Manufacturer)	Signal Name / Pin No.		Input Connector / Pin No.
MCDL RS422	HR10A-13TR-20SB (HIROSE)	HR10A-13TPD-20P (HIROSE)	MCDL		9-pin D-sub Connector (Female)
			SYNC－	13	1
			SYNC＋	12	2
			CLK＋	14	4
			CLK－	15	5
			DATA_B-	9	6
			DATA_A-	8	7
			DATA_A+	7	8
			DATA_B+	10	9
			N.C.	--	3
			RS422		15-pin D-sub Connector (Female)
			N.C.	--	1
			TXD+	18	2
			TXD-	17	3
			RXD+	19	4
			RXD-	20	5
			II_CAM_V/（Not supported）	5	6
			GND	6	7
			GND	4	8
			II_GATE（Not supported）	3	9
			GND	2	10
			II_RESET/（Not supported）	1	11
			N.C.	--	12
			N.C.	--	13
			GND	11	14
			GND	16	15

N.C.: Not Connected

2.2.8. DC Power IN Cable



【DC IN Pins】

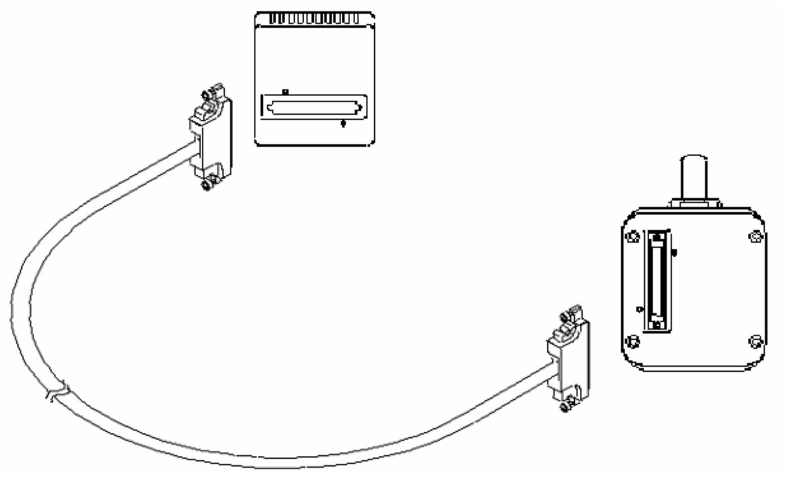
Connector Name	Signal Name	Pin No.	Connector on Processor Model (Manufacturer)	Connector on Cable Model (Manufacturer)
DC-IN	DC+12V	1	TRC01-A13R5FA （Tajimi）	TRC01-A13P5MA (Tajimi)
	DC+12V	2		
	N.C.	3		
	GND	4		
	GND	5		

2.3. System Connection

2.3.1. Connecting Camera Head

Follow the below procedure to connect between the camera head and processor..

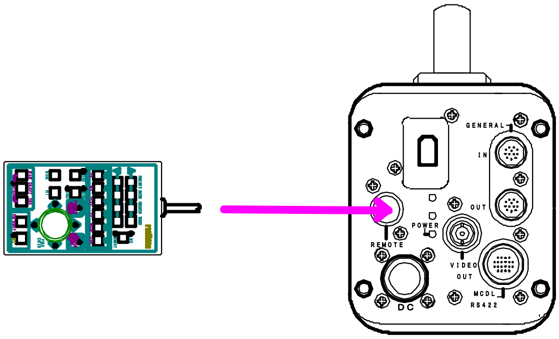
Be sure to turn the main power off on the processor.
Connect between the camera head and processor using the cables. Make sure the numbers on mating connectors match.



3. Fasten the retaining screws tightly on all connectors.

2.3.2. Connecting Remote Control Keypad

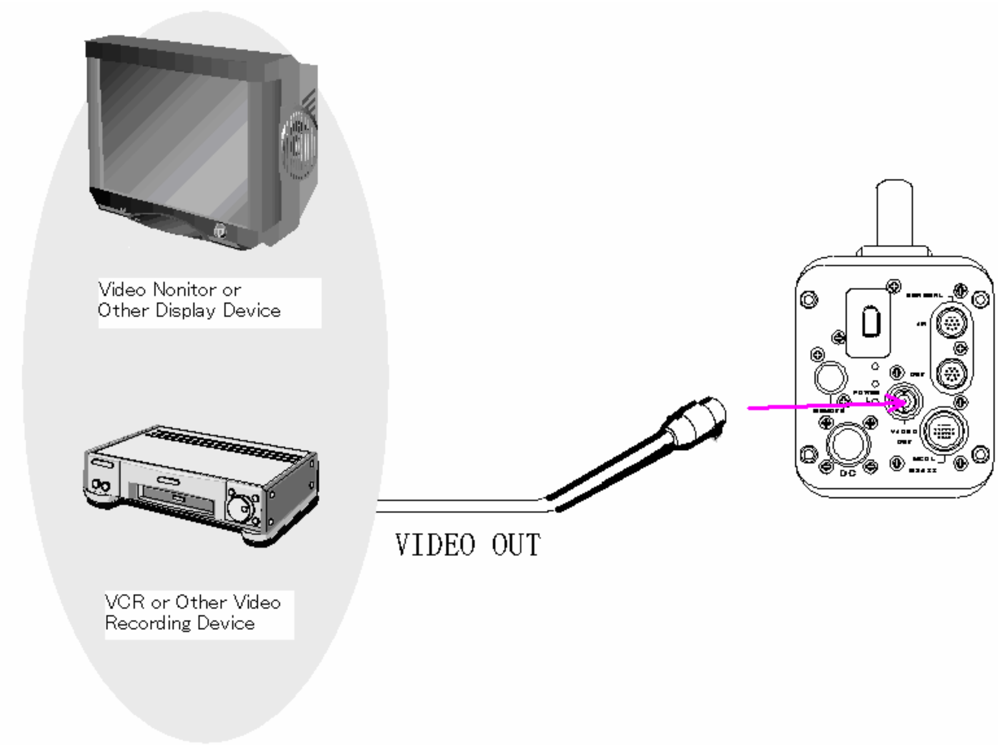
1. Connect the keypad cable connector to the REMOTE connector on the processor rear panel.


GENERAL
IN
OUT
POWER
REMOTE
VIDEO OUT
DC
MCDL
RS422

Note: The keypad is “hot-plug” compatible and allows for connecting and disconnecting while main power is on.

2.3.3. Connecting Video Monitor

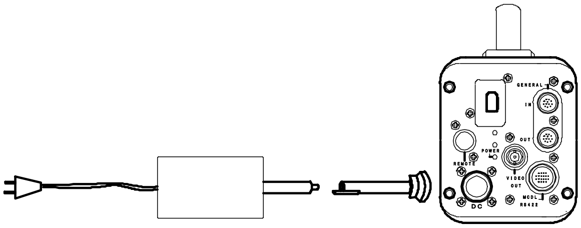
Connect a video monitor to the processor to monitor live image from the 512. Connect between the VIDEO OUT connector on the processor and the video in connector of a video monitor with a coax cable.


Video Nonitor or
Other Display Device
VCR or Other Video
Recording Device
VIDEO OUT
DC

2.3.4. Power Connection

The 512 is powered by DC power fed from the attached AC power adapter that connects to a power line of 100 to 240 VAC.

Connect the DC output cable from the AC power adapter unit to the DC IN connector on the 512 rear panel.


GENERAL
IN
OUT
POWER
REMOTE
VIDEO
OUT
MCDL
RS422
DC

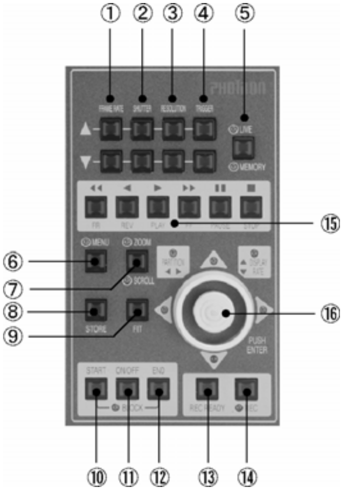
2. Connect the AC power cord to the AC IN connector on the AC power adapter unit.
3. Plug the power cord into an AC outlet.

2.4. Basics of Remote Control Keypad Operation

The 512 remote control keypad has been so designed that most of “frequently-used” functions are operated by one touch on the keypad as much as possible. Also, the menu has been so organized that parameter settings can be effectively carried out from the joystick.

This section discusses the basics of joystick operation that is necessary to use the menu in the most effective manner.

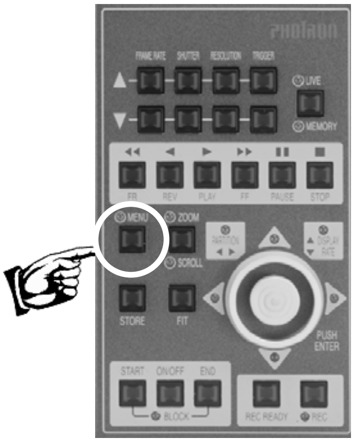
2.4.1. Details of Controls on Keypad

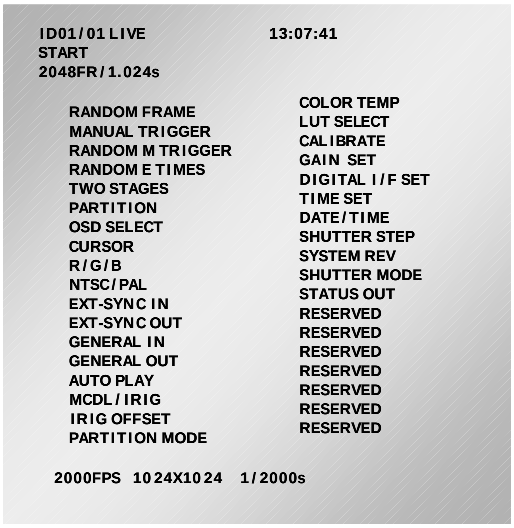

①
②
③
④
⑤
PHOTRON
FRAME RATE
SHUTTER
RESOLUTION
TRIGGER
LIVE
MEMORY
FR
REV
PLAY
FF
PAUSE
STOP
⑮
MENU
ZOOM
SCROLL
⑥
⑦
⑧
⑨
STORE
FIT
DISPLAY RATE
PUSH ENTER
⑯
START
ON/OFF
END
BLOCK
REC READY
REC
⑩
⑪
⑫
⑬
⑭

No.	Name of Key	Function	No.	Name of Key	Function
①	FRAME RATE	Sets frame rate.	⑨	FIT	Fits video image to frame size.
②	SHUTTER	Sets shutter speed.	⑩	START/BLOCK	Sets start frame of block playback.
③	RESOLUTION	Sets resolution.	⑪	BLOCK ON/OFF	Switches ON / OFF of block playback.
④	TRIGGER	Sets trigger mode.	⑫	END/BLOCK	Sets end frame of block playback.
⑤	LIVE / MEMORY	Switches LIVE / Playback from memory.	⑬	REC READY	Make ready for recording.
⑥	MENU	Displays menu.	⑭	REC	Starts recording.
⑦	ZOOM / SCROLL	Switches Zoom / Scroll	⑮	PLAYBACK	Playback buttons.
⑧	STORE	Stores settings and markers.	⑯	JOYSTICK	Steers selection.

2.4.2. Menu List Display

Press the MENU button on the keypad to display the menu list on the video monitor.


FRAME RATE
SHUTTER
RESOLUTION
TRIGGER
LIVE
MEMORY
FR
REV
PLAY
FF
PAUSE
STOP
MENU
ZOOM
PARTITION
DISPLAY RATE
SCROLL
STORE
FIT
PUSH ENTER
START
ON/OFF
END
BLOCK
REC READY
REC



ID01/01 LIVE 13:07:41
START
2048FR/1.024s

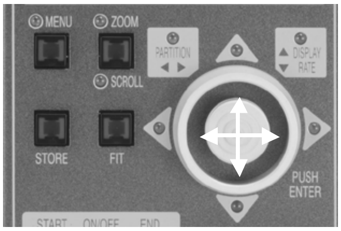
RANDOM FRAME
MANUAL TRIGGER
RANDOM M TRIGGER
RANDOM E TIMES
TWO STAGES
PARTITION
OSD SELECT
CURSOR
R/G/B
NTSC/PAL
EXT-SYNC IN
EXT-SYNC OUT
GENERAL IN
GENERAL OUT
AUTO PLAY
MCDL/IRIG
IRIG OFFSET
PARTITION MODE

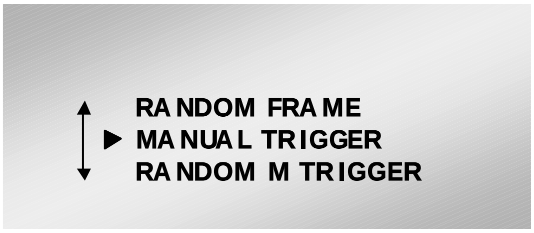
COLOR TEMP
LUT SELECT
CALIBRATE
GAIN SET
DIGITAL I/F SET
TIME SET
DATE/TIME
SHUTTER STEP
SYSTEM REV
SHUTTER MODE
STATUS OUT
RESERVED
RESERVED
RESERVED
RESERVED
RESERVED
RESERVED
RESERVED

2000FPS 1024X1024 1/2000s

2.4.3. Menu Selection

Move the joystick up, down, left or right to steer the cursor [>]. Bring the cursor to the top of a menu item that you wish to pick and press the joystick handle down firmly, and the menu item is selected.


MENU
ZOOM
PARTITION
DISPLAY RATE
SCROLL
STORE
FIT
PUSH ENTER
START
ON/OFF
END


RANDOM FRAME
▶ MANUAL TRIGGER
RANDOM M TRIGGER

2.4.4. Canceling Menu Selection

While the menu list is being displayed, press the MENU button to cancel a selected menu item.

2.4.5. Menu / Manual Reference

The following table is a quick index that directs your question about any of the menu items to a relevant page of the manual where in-depth explanation is given.

Menu Command Name	Page to See	Menu Command Name	Page to See
RANDOM FRAME	50	COLOR TEMP	64
MANUAL TRIGGER	48	LUT SELECT	69
RANDOM M TRIGGER	58	CALIBRATE	38
RANDOM E TIMES	56	GAIN SET	73
TWO STAGES	61	DIGITAL I/F SET	114
PARTITION	66	TIME SET	33
OSD SELECT	98	DATE/TIME	34
CURSOR	99	SHUTTER STEP	43
R/G/B	100	SYSTEM REV	35
NTSC/PAL	101	SHUTTER MODE	43
EXT-SYNC IN	77	STATUS OUT	129
EXT-SYNC OUT	78	RESERVED	
GENERAL IN	85	RESERVED	
GENERAL OUT	86	RESERVED	
AUTO PLAY	102	RESERVED	
MCDL/IRIG	88	RESERVED	
IRIG OFFSET	89	RESERVED	
PAR0TITION MODE	68	RESERVED	

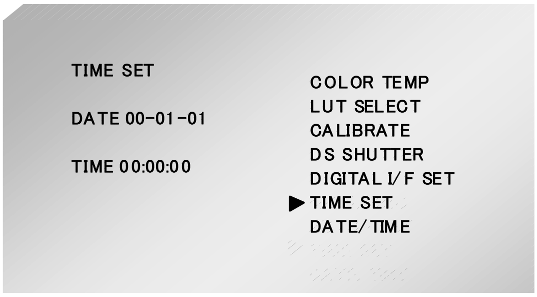
2.5. Setting Up System (Date, Time and Revision)

This section discusses how to set up the internal clock of the 512 system. Data and time are correctly set up and are store as a part of recorded image data. Once the clock is set up, it is supported by an internal battery and the date and time are retained correctly even when the main power is turned off.

2.5.1. Setting Date and Time

Follow the below procedure to set up date and time of the clock.

1. Press the MENU button to display the menu list.
2. Select [TIME SET] menu using the joystick on the keypad.
3. The TIME SET menu is shown as follows:



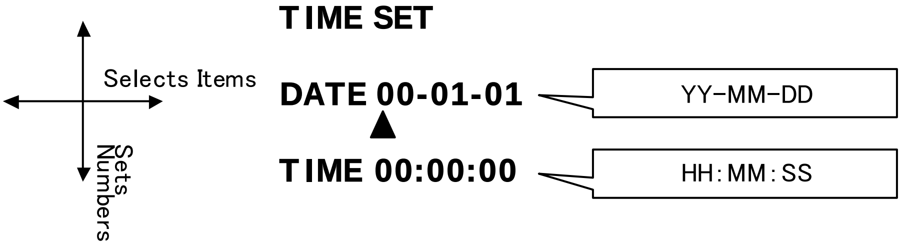
TIME SET

DATE 00-01-01

TIME 00:00:00

COLOR TEMP
LUT SELECT
CALIBRATE
DS SHUTTER
DIGITAL I/F SET
▶ TIME SET
DATE/TIME

4. Left-Right movement of the joystick selects menu items, and up-down movement sets numbers.



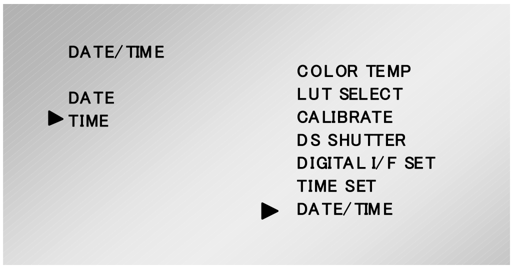
Selects Items
Sets Numbers
TIME SET
DATE 00-01-01
TIME 00:00:00
YY-MM-DD
HH:MM:SS

5. When all is done, press the joystick down firmly to enter the setting.

2.5.2. Switching Date / Time

For display in the image frame, either date or time can be chosen. Follow the below procedure to make choice:

1. Press the MENU button to display the menu list.
2. Select the [DATE/TIME] menu by the joystick.
3. The DATE/TIME menu is displayed as follows:

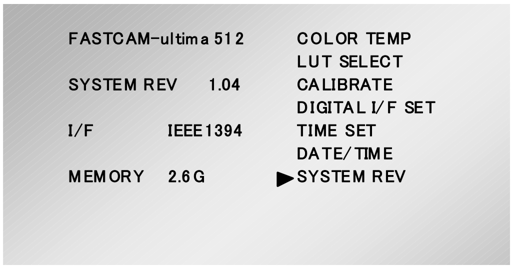

DATE/TIME
DATE
▶TIME
COLOR TEMP
LUT SELECT
CALIBRATE
DS SHUTTER
DIGITAL I/F SET
TIME SET
▶ DATE/TIME

4. Move the cursor up or down to select either DATE or TIME. The selected item, DATE or TIME is now displayed.
5. When selection is done, press the joystick down firmly to set as default.
6. Check to see if the time indication is shown as it was intended.

2.5.3. Displaying System Revision

The current system version number is shown on the display.

1. Press the MENU button to display the menu list.
2. Select [SYSTEM REV] by the joystick on the keypad.



```
FASTCAM-ultima 512          COLOR TEMP
                            LUT SELECT
SYSTEM REV     1.04         CALIBRATE
                            DIGITAL I/F SET
I/F          IEEE1394       TIME SET
                            DATE/TIME
MEMORY     2.6G           ▶SYSTEM REV
```

3. The current system revision number is displayed.

Memo

Chapter 3 Recording

3.1. Initialization (Shading Correction)
3.2. Selecting Frame Rate
3.3. Selecting Resolution
3.4. Selecting Shutter Speed
3.5. Selecting Trigger Mode
3.6. Adjusting White Balance (Color Model)
3.7. Partitioning Memory
3.8. Look-Up Table Operation
3.9. Setting Gain
3.10. External Trigger Input
3.11. External Sync Input
3.12. Setting Input and Output Signals
3.13. Event Marker Function
3.14. MCDL - Multi Channel Data Link
3.15. IRIG Timecode

3.1. Initialization (Calibration)

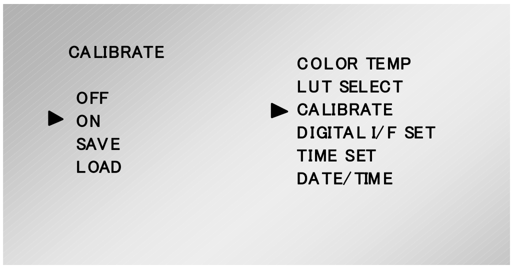
To take advantage of the high image quality of the 512 system, it is important to correct the non-uniformity in sensitivity of each pixel of the imaging sensor. The 512 has a calibration (shading correction) function that corrects the non-uniformity in output of each pixel based on black level. This function uses a uniform black image as reference to null the output of each pixel against black, making it possible to obtain uniform output from each of pixels in proportion to the level of incoming light.

Calibration is carried out automatically when the system is switched on. For the best result of recording, however, it is strongly recommended that whenever you change framing parameters such as gain, frame rate, shutter speed, etc., you carry out calibration of the camera before starting a recording.

The following procedure shows how to initialize the system.

3.1.1. Start Calibration

1. Set up framing parameters such as frame rate and shutter speed.
2. Place a cap on the lens completely cover it. The black image at this time is used as reference black. Make sure the lens is covered and there is no light falling on the imaging sensor.
3. Press the MENU button on the keypad to display the menu.
4. Use the joystick on the menu to go to [CALIBRATE] and press the joystick down to select.

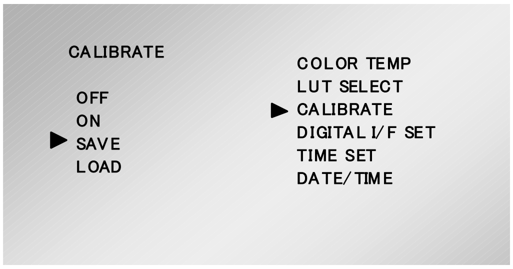


5. Use the joystick to go to [ON]. Double check if the lens is completely covered and press the joystick down to execute [CALIBRATE].
6. Remove the lens cap and make sure corrected image is displayed.

3.1.2. Saving Calibrated Setting

The 512 can save one pattern of black image data obtained through the execution of calibration. Follow the below procedure to save a correction pattern.

1. Press the MENU button on the keypad to display the menu.
2. Use the joystick to go to [CALIBRATE] and press the joystick down to select.
3. Use again the joystick to go to [SAVE] and press the joystick down to execute [SELECT].

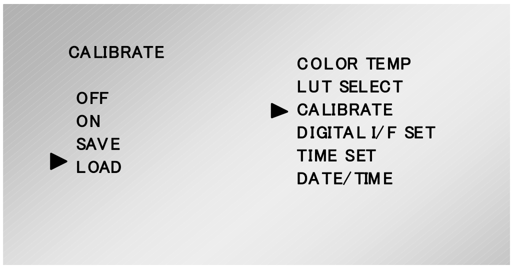

CALIBRATE
OFF
ON
▶ SAVE
LOAD
COLOR TEMP
LUT SELECT
▶ CALIBRATE
DIGITAL I/F SET
TIME SET
DATE/TIME

Note: It may take tens of seconds to several minutes to save data of a black image.

3.1.3. Loading Calibrated Setting

The black image data saved in the 512 system may be loaded for subsequent use in the following manner.

1. Press the MENU button on the keypad to display the menu.
2. Use the joystick to go to [CALIBRATE] and press the joystick down to select.
3. Use the joystick to go to [LOAD] and press the joystick down to execute [LOAD].

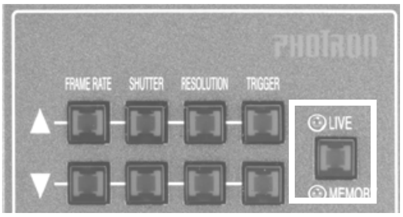

CALIBRATE
OFF
ON
SAVE
▶ LOAD
COLOR TEMP
LUT SELECT
▶ CALIBRATE
DIGITAL I/F SET
TIME SET
DATE/TIME

3.2. Selecting Frame Rate

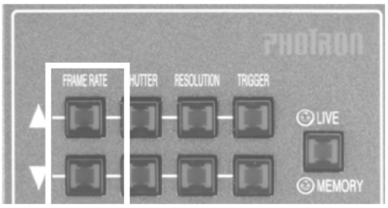
The 512 can set a frame rate of from 60 Frames Per Second (FPS) up to 32,000 FPS depending on the particular need of a recording. With the 512, frame rates from 60 FPS to 2,000 FPS allows for recording of image using the full resolution of 512 x 512 pixels of the imaging sensor. For framing at frame rates higher than 2,000 FPS, high-speed recording is attained by limiting the read-out area (resolution) of the sensor.

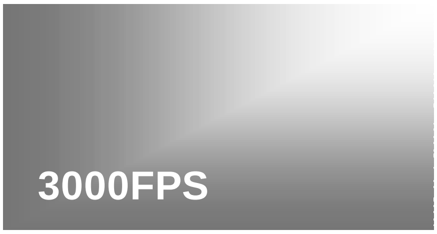
The following discusses how to select a frame rate (FPS):

1. Make sure the camera is in the LIVE mode.



2. Press the FRAME RATE up or down button on the keypad. The frame rate increases as the up button is pressed and decreases as the down button is pressed.





3. Make sure the frame rate indication in the lower left corner of the video image changes as either button is pressed.

Note: At a frame rate higher than 2,000 FPS, the maximum resolution of those allowable under the currently selected frame rate is automatically selected. Please see the Frame Rate / Resolution reference table in section 6.1.5.

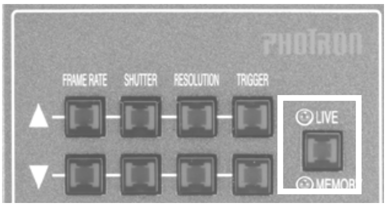
Note: When the camera is set to a lower frame rate (60fps or 125fps), several bright points (pixels) may appear in image. This is because the exposure time to the sensor is too long. The brightness of such points can be reduced by setting a faster shutter speed.

3.3. Selecting Resolution

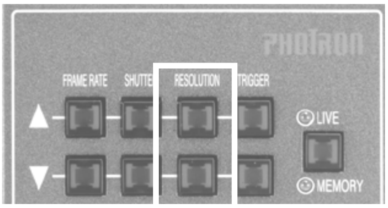
The 512 has a high-speed mega-pixel imaging sensor with a full resolution of 512 x 512 pixels in its imager. It can produce a high-density image of 260,000 pixels in full resolution operation. Also, depending on the needs from each recording application, it can record at higher speeds by limiting the image resolution, or can record for a longer duration by reducing the amount of data of each of captured frames.

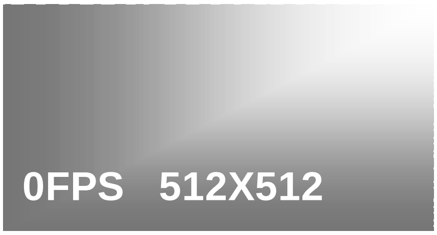
This section discusses how to select a resolution as follows:

1. Make sure the camera system is in the LIVE mode.


PHOTRON
FRAME RATE
SHUTTER
RESOLUTION
TRIGGER
LIVE
MEMORY

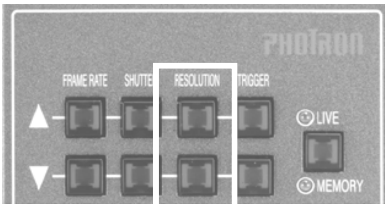
2. Use the RESOLUTION buttons on the keypad to select a desired resolution. Press the UP[△] button to make resolution increased, and the DOWN [▽] button decreased.

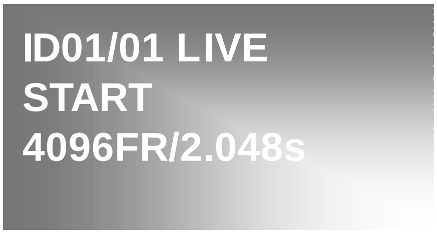

PHOTRON
FRAME RATE
SHUTTER
RESOLUTION
TRIGGER
LIVE
MEMORY



0FPS 512X512

3. Make sure the resolution indication in the lower left corner of the video frame changes as either of the RESOLUTION buttons is pressed. The maximum available record duration is also updated together with resolution.


PHOTRON
FRAME RATE
SHUTTER
RESOLUTION
TRIGGER
LIVE
MEMORY



ID01/01 LIVE
START
4096FR/2.048s

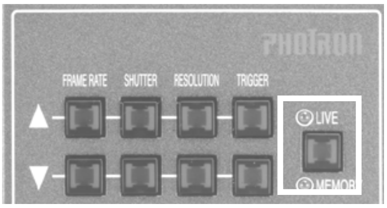
Note: Please see the Frame Rate/Resolution Reference Table (Section 6.1.5.)

3.4. Selecting Shutter Speed

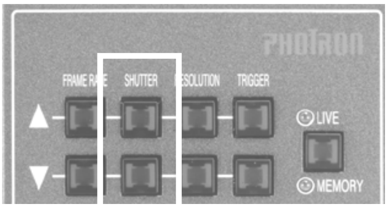
The 512's electronic shuttering system makes it possible to control the exposure time within a frame regardless of the current frame rate. By using an exposure time that is shorter than the frame time determined by the frame rate (i.e. 1/frame rate sec.), you can capture events taking place at an extremely high speed as a still image without blurring effect.
The shutter speed can be changed from the basic speed of 1/frame rate sec. up to 1/272,000 sec. (3.7 micro seconds) at an increment of 1/1,000 sec.

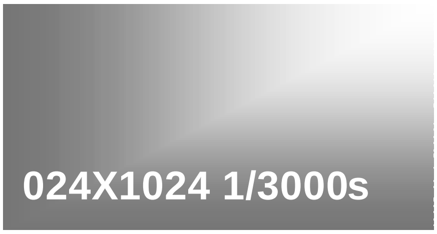
This section discusses how to select a shutter speed from the keypad.

1. Make sure the camera Is in the LIVE mode.


PHOTRON
FRAME RATE
SHUTTER
RESOLUTION
TRIGGER
LIVE
MEMORY

2. Use the SHUTTER buttons on the keypad to select a shutter speed. Press the UP [△] button to have the shutter speed made higher, the DOWN [▽] button lower.


PHOTRON
FRAME RATE
SHUTTER
RESOLUTION
TRIGGER
LIVE
MEMORY


024X1024 1/3000s

3. Make sure the shutter speed indication in the lower left corner of the video frame changes as either of the SHUTTER buttons is pressed.

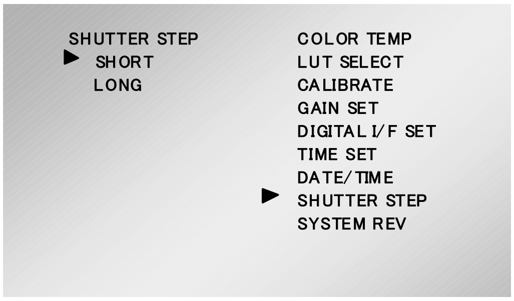
Note: See the Shutter Speed Table, Section 6.1.6.

3.4.1. Switching Shutter Speed Steps

The 512 system offers two sets of shutter speed steps – fine and coarse steps – to choose from. With either set of steps, the lowest shutter speed is 1/60 second and then the speed is doubled at each step for the next five steps, up to 1/2000. After that, with the coarse steps, the speed further doubles, almost jumps, for the next several steps. With the fine steps, on the other hand, the shutter speed gradually increases with much finer steps. See the Shutter Speed Table, Section 6.1.6. for details of steps.

You can choose one of the two sets of shutter speed steps by the following procedure:

1. Press the MENU button on the keypad to display the menu list.
2. Move the cursor to [SHUTTER STEP] and press the joystick down to select the menu.
3. The SHUTTER STEP menu is displayed as follows:



FINE	All 61 finely stepped shutter speeds are available to choose from
COARSE	17 selected shutter speeds are available to choose from

4. Move the cursor to [FINE] or [COARSE].
5. Press the joystick down to set the selection.

Note: See Shutter Speed Table, Section 6.1.6.

3.4.2. Switching Shutter Modes

By switching between MODE 1 and MODE 2 in the [SHUTTER MODE], you can change the mode of shutter speed setting as follows:

MODE 1: The shutter speed is automatically set to 1/(frame rate) sec when the frame rate is changed.

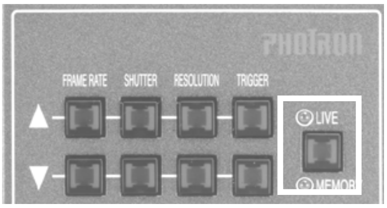
MODE 2: The shutter speed remains the same after the frame rate has been changed.

3.5. Selecting Trigger Mode

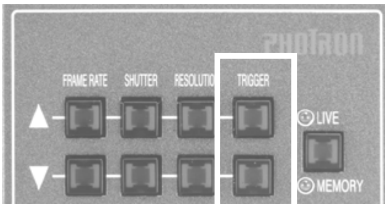
The 512 has several different modes of triggering to meet the particular needs of capturing varied, instantaneous events. This section discusses how each of the trigger modes works.

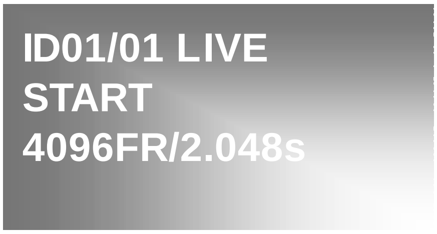
First, the procedure to select a trigger mode is shown, and then how each trigger mode works is discussed.

1. Make sure that the camera is in the LIVE mode.


PHOTRON
FRAME RATE
SHUTTER
RESOLUTION
TRIGGER
LIVE
MEMORY

2. Press the TRIGGER △ or ▽ button on the keypad to select a trigger mode.

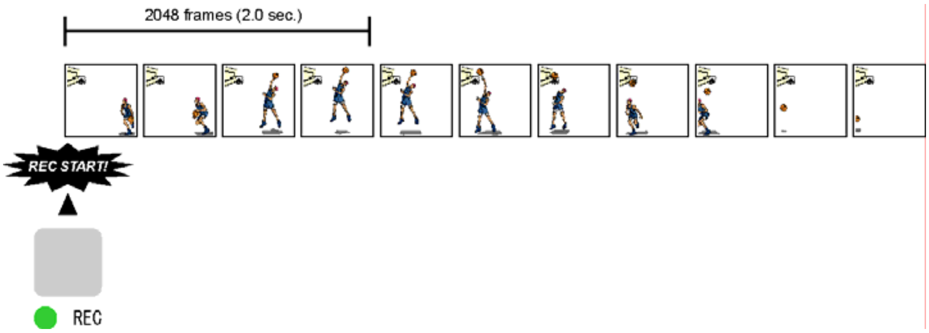

PHOTRON
FRAME RATE
SHUTTER
RESOLUTION
TRIGGER
LIVE
MEMORY


ID01/01 LIVE
START
4096FR/2.048s

3. The selected trigger mode is displayed on the screen immediately. Make sure that the trigger mode indication changes as you press the △ or ▽ button.

3.5.1. START Mode

In the START trigger mode, the camera starts recording at the moment the REC button is pressed and continues recording until the memory is full, and automatically stops recording. This mode is useful when you know for sure when the anticipated event will occur. If your camera has a recording capacity of 2 seconds, for example, the camera records the high-speed event for two seconds after the REC button is pressed, as shown below.

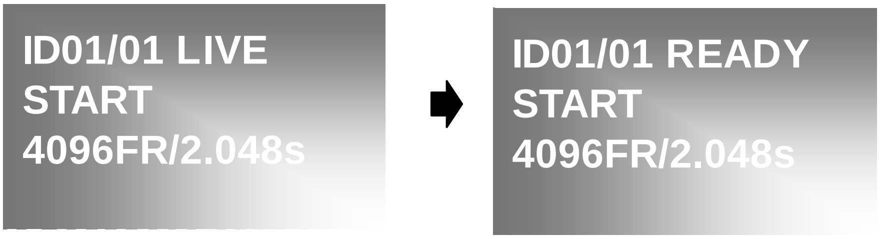


Recording in START Mode

Here is how to record in the START mode:

As discussed in Section 3.5, make sure that the camera is in the LIVE mode, and select the START trigger mode.

1. Press the REC READY button on the keypad. The camera is now in the READY mode. Make sure that the [LIVE] indication on the screen has changed to [READY].



ID01/01 LIVE
START
4096FR/2.048s

ID01/01 READY
START
4096FR/2.048s

2. At the moment your interested event is coming up, press the REC button on the keypad. Note that the [READY] indication changes to [REC], indicating the camera is recording, and then it turns to [LIVE] when recording ends.

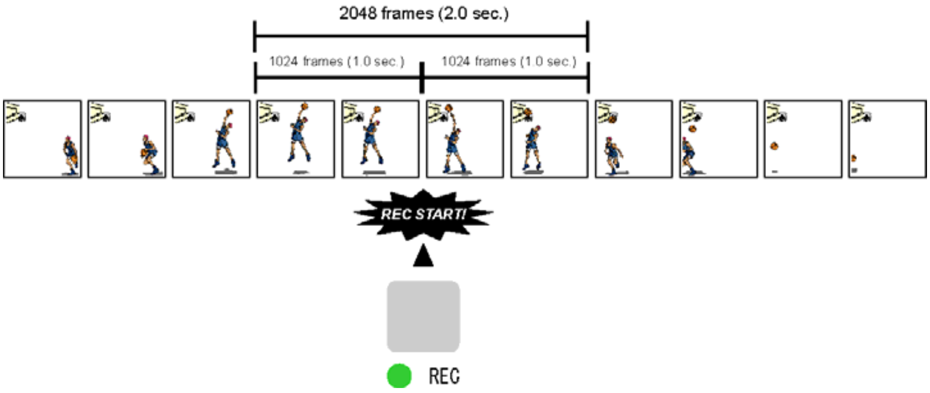
ID01/01 REC
START
4096FR/2.048s

➡

ID01/01 LIVE
START
4096FR/2.048s

3.5.2. CENTER Mode

In the CENTER trigger mode, the camera records the target event in the same number of frames before and after the trigger. It is useful when you are interested in the scenes of before and after a particular event. If your camera has a recording capacity of two seconds, the camera records the scenes in the same number of frames (1024 frames – one second each) before and after the trigger as shown below.



Recording in CENTER Mode

Follow the below procedure to record in the CENTER mode.

Following Section 3.5, make sure that the camera is in the LIVE mode, and select the CENTER trigger mode.

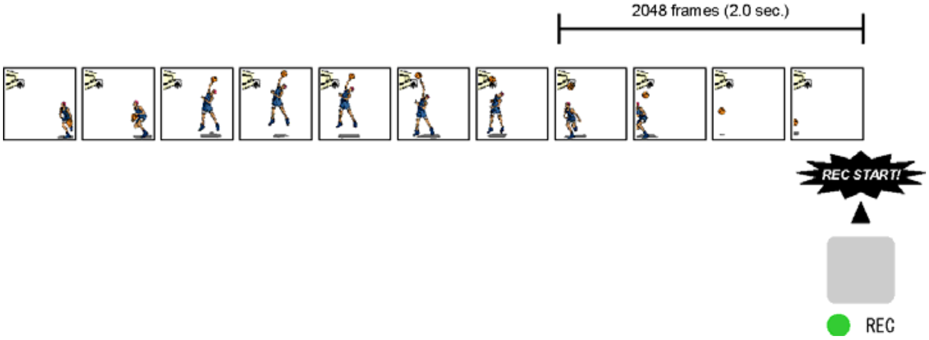
1. Press the REC READY button on the keypad. The camera is now in the READY mode. Make sure that the [LIVE] indication on the screen has changed to [READY].

2. Press the REC button on the keypad when your target event is expected to take place very soon. Note the indication on the screen has turned to [ENDLESS] showing that the camera is now recording the image of the target subject in the memory going around from end to end repeatedly.

3. At the moment you have seen your interested event has taken place, press the REC button again. The camera stops, having recorded the scenes before and after the event in the same number of frames. Note that the indication on the screen has turned from [ENDLESS] to [REC] to [LIVE].

3.5.3. END Mode

The END trigger mode records the images of a target event right before the REC button is pressed. This mode is useful when it is hard to know when your target event will take place. For example, if your camera has a recording capacity of two seconds, it records images of the event in the memory for two seconds before the REC button is pressed as shown below.



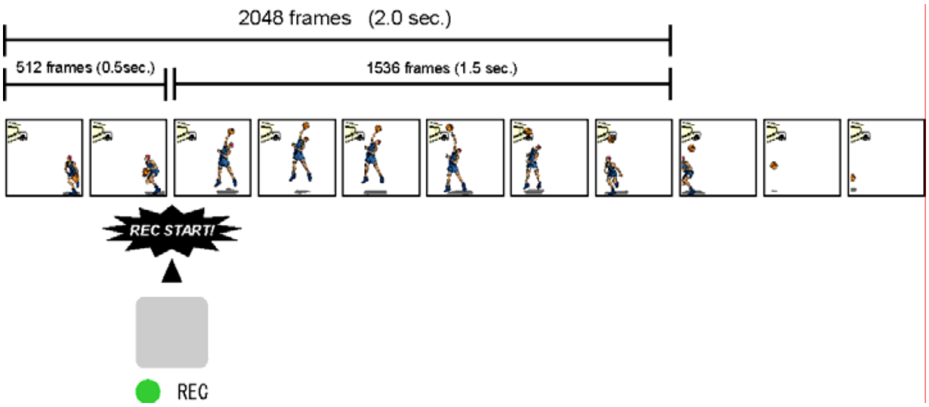
Recording in END Mode

Follow the below procedure to record in the END trigger mode:

1. As discussed in Section 3.5, make sure that the camera is in the LIVE mode, and select the END trigger mode.
2. Press the REC READY button on the keypad. The camera is now in the READY mode. Note that the indication on the screen has turned from [LIVE] to [READY].
3. Press the REC button on the keypad, and the indication on the screen turns to [ENDLESS]. The camera is now recording the image of the target subject in the memory going around from end to end repeatedly.
4. At the moment the event of your interest has taken place, press the REC button on the keypad again. The camera stops recording. The camera has recorded the event together with the scene right before it. Note the indication on the screen has turned from [ENDLESS] to [LIVE].

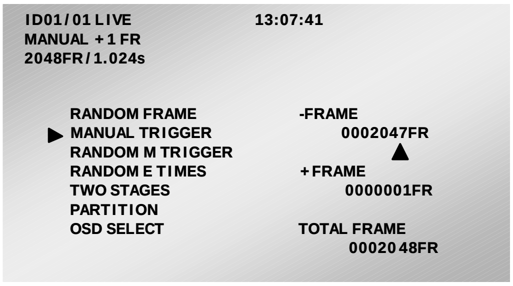
3.5.4. MANUAL Mode

In the MANUAL trigger mode, the camera records scenes before and after the REC button is pressed. Unlike the CENTER mode, however, the numbers of frames to record before and after a trigger can be preset differently. For a camera with a recording capacity of two seconds, for example, record durations of 0.5 seconds before and 1.5 seconds after the trigger can be set as shown in the below figure.



Setting MANUAL Mode

To use your camera in the MANUAL mode, you need to divide the memory into two parts – one part for scenes before and another for scenes after – a trigger. Here is how to divide the memory
Press the MENU button on the keypad to display the menu list.
Move the cursor to MANUAL TRIGGER and press the joystick down to select it.
The MANUAL TRIGGER menu comes up as shown below. The right hand portion of the menu is for presetting the numbers of frames before and after a trigger.

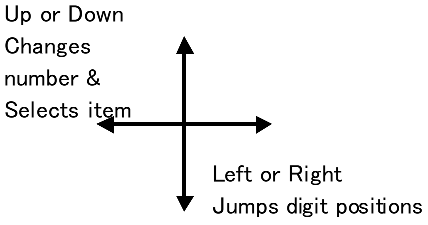


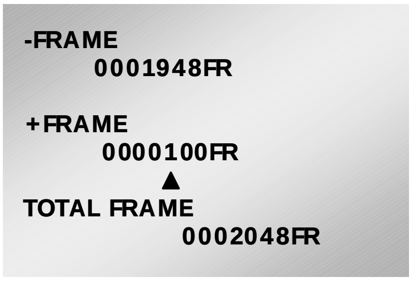
```
ID01/01 LIVE                 13:07:41
MANUAL +1 FR
2048FR/1.024s

      RANDOM FRAME            -FRAME
    ▶ MANUAL TRIGGER               0002047FR
      RANDOM M TRIGGER                 ▲
      RANDOM E TIMES          +FRAME
      TWO STAGES                   0000001FR
      PARTITION
      OSD SELECT              TOTAL FRAME
                                   0002048FR
```

The meaning of each item is as follows:

-FRAME	Number of frames to record BEFORE a trigger.
+FRAME	Number of frames to record AFTER a trigger.
TOTAL FRAME	Total number of frames available in memory.

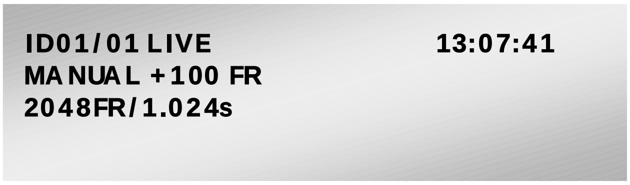
Now set the numbers of frames before and after a trigger. Using the joystick, up or down for increase or decrease the number, and left or right to jump the digit position, set a number. If you set the number for [–FRAME] as shown below, for example, the number for [+FRAME] is automatically set depending on the total number of frames available for recording.





```
-FRAME
      0001948FR

+FRAME
       0000100FR
              ▲
TOTAL FRAME
              0002048FR
```

When you are done, press the joystick down to enter the settings. Now you should see the trigger mode setup indication of [MANUAL +100 FR] in the upper left corner of the screen as shown below, where the number of frames to record after a trigger is 100.
Now the camera is ready to record 1948 frames before and 100 frames after a trigger.



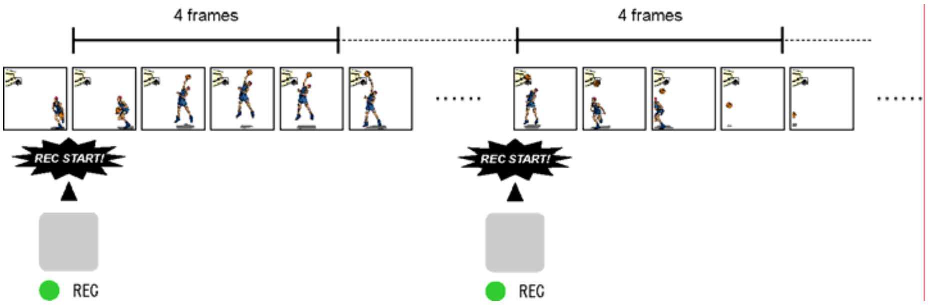
```
ID01/01 LIVE                    13:07:41
MANUAL +100 FR
2048FR/1.024s
```

Recording in MANUAL Mode

After presetting the numbers of frames to record before and after a trigger as shown in the above example, follow the below procedure to record in the MANUAL trigger mode:
Following Section 3.5, make sure the camera is in the LIVE mode, and select the MANUAL trigger mode.
Press the REC READY button on the keypad. The camera is now in the READY mode. Make sure that the [LIVE] indication has turned to [READY].
Press the REC button on the keypad when your target event is expected to take place very soon. Note the indication on the screen has turned to [ENDLESS] showing that the camera is now recording the images of the subject in the memory going around from end to end repeatedly.
At the moment you have seen the event of your interest taking place, press the REC button again. The camera stops. It has recorded in its memory1948 frames before and 100 frames after the trigger, respectively, as preset in the above example. Make sure that the indication on the screen has turned from [REC] to [LIVE].

3.5.5. RANDOM Mode

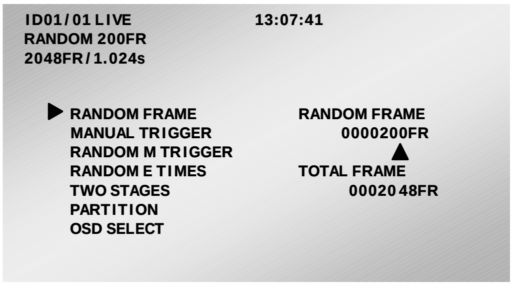
In the RANDOM trigger mode, the camera records in its memory a preset number of frames of images every time a trigger is given. This mode is useful to record images of events that take place at an unpredictable timing with output of a trigger signal. The number of frames to record at each trigger can be set any number from 1 (one) up to the total number of available frames in the memory.



Setting Number of Frames for RANDOM Mode Recording

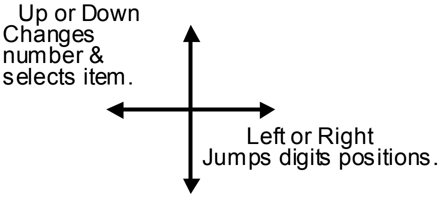
To operate the camera in the RANDOM trigger mode, you need to preset the number of frames to record at each trigger. Follow the procedure below:

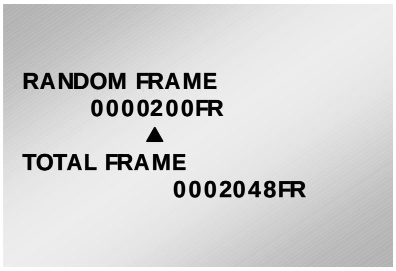
1. Press the MENU button on the keypad to display the menu list.
2. Use the joystick on the keypad to move the cursor to [RANDOM TRIGGER]. Press the joystick down to select the menu.
3. The RANDOM TRIGGER menu appears as shown below. The number of frames to record at each trigger is shown in the lower right area.



```
ID01/01 LIVE                  13:07:41
RANDOM 200FR
2048FR/1.024s

  ▶ RANDOM FRAME              RANDOM FRAME
    MANUAL TRIGGER                0000200FR
    RANDOM M TRIGGER                      ▲
    RANDOM E TIMES            TOTAL FRAME
    TWO STAGES                     0002048FR
    PARTITION
    OSD SELECT
```

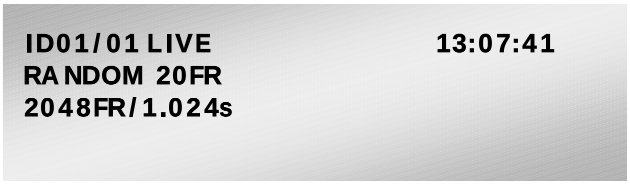
4. Now you can set the number of frames to record at each trigger by moving the cursor with the joystick as shown in the following figure on the next page. Move the joystick, left or right, to select a digit, and, up or down, to increase or decrease the number in each digit as necessary.


Up or Down
Changes number & selects item.
Left or Right
Jumps digits positions.



RANDOM FRAME
0000200FR
▲
TOTAL FRAME
0002048FR

5. When you are done, press the joystick down to enter the settings. Now you should see the number of frames to record at each trigger as [RANDOM 20 FR] in the upper left area of the screen as shown below, where the number of frames to record at each trigger is 20.



ID01/01 LIVE 13:07:41
RANDOM 20FR
2048FR/1.024s

Recording in RANDOM Mode

Follow the below procedure to record in the RANDOM mode.

Following Section 3.5, make sure the camera is in the LIVE mode and the RANDOM trigger mode has been selected.

1. Press the REC READY button on the keypad. The camera is now in the READY mode. Make sure that the indication on the screen has turned from [LIVE] to [READY].

2. Press the REC button on the keypad for the first time. Note the indication on the screen has turned from [READY] to [REC]. The camera is now recording images in the memory going around from end to end repeatedly.

3. Press the REC button again when you know events of your interest are coming up very soon. The camera records in the memory the preset number of frames of images and stands by for a next trigger. In addition to the REC button on the keypad, contact or TTL signals from external trigger input terminals can be used to trigger the camera in the RANDOM mode (see Section 3.10 External Trigger Input).

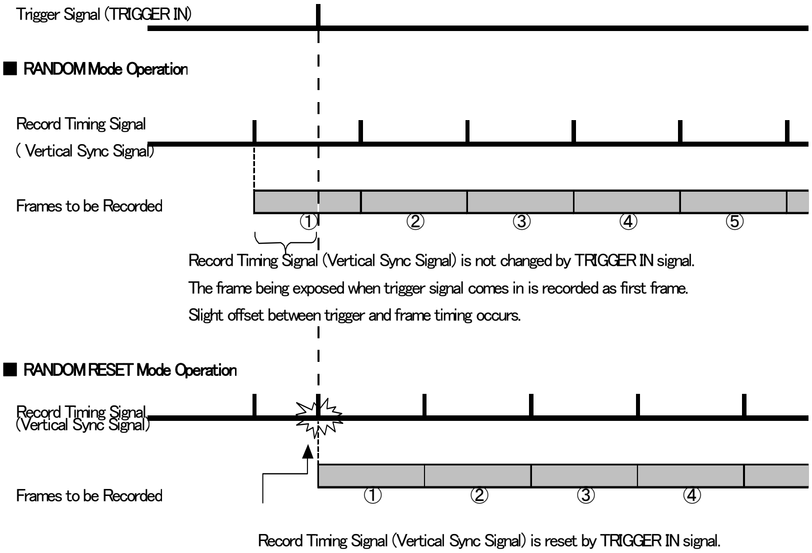
4. The camera automatically stops recording when the memory is full (*). Make sure the indication on the screen has turned from [REC] to [LIVE].

*Note: You can stop recording by pressing the REC READY button at any time during recording.

3.5.6. RANDOM RESET Mode

This section describes the principle of operation of the RANDOM RESET mode in comparison with the RANDOM and START mode. To simply put it, the RANDOM RESET mode is a mode of recording operation that has been devised to improve the accuracy of temporal relationship between the timing of trigger input and that of start of recording by resetting the recording timing, i.e. vertical sync, at the input of a trigger.

The following figure is a visual presentation of the basic idea of the RANDOM RESET mode.


Trigger Signal (TRIGGER IN)
■ RANDOM Mode Operation
Record Timing Signal
(Vertical Sync Signal)
Frames to be Recorded
①
②
③
④
⑤
■ RANDOM RESET Mode Operation
Record Timing Signal
(Vertical Sync Signal)
Frames to be Recorded
①
②
③
④

Record Timing Signal (Vertical Sync Signal) is not changed by TRIGGER IN signal.
The frame being exposed when trigger signal comes in is recorded as first frame.
Slight offset between trigger and frame timing occurs.

Record Timing Signal (Vertical Sync Signal) is reset by TRIGGER IN signal.

The above figure shows the difference in timing of trigger input and start of recording between the RANDOM (or START) mode and RANDOM RESET mode.

In the RANDOM or START mode, the record timing signal (vertical sync) advances regardless of the timing of trigger input as shown in the above. Because of this fact, the recording start time of the first frame may be slightly brought forward, up to about 3/4 of a framing cycle, depending on when the trigger is given, and there is no knowing how much the offset may be.

In the RANDOM RESET mode, on the other hand, the record timing signal (vertical sync) is reset by the trigger input and restarts working from that point. By resetting the vertical sync at the trigger, we now know exactly the temporal relationship between the trigger input and start of recording of the first frame. It is a known fact that it takes 100 ns from the input of a trigger signal to reset of the vertical sync signal, i.e. start of recording.

Note: Technically, there is a slight time lag between the record timing (vertical sync) and start of exposure, which is dependant on the framing rate being used (7.4 us at 2,000 fps).

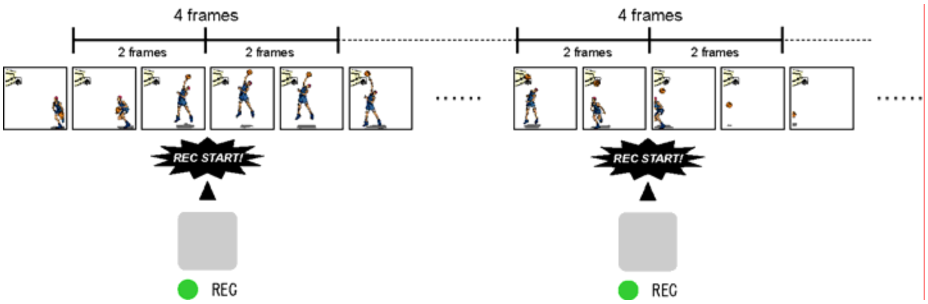
Note: The RANDOM RESET mode cannot be used in conjunction with the Sync Operation (frame rate synchronization) with External Equipment (Section 3.11.4.)

Note: When you wish to operate multiple 512 cameras in the RANDOM RESET mode, use [GENERAL IN] for trigger input. Do not use [TRIGGER TTL IN] or [TRIGGER SW IN] because it is likely that proper recording cannot be attained due to delay of trigger signals.

Note: The enforced reset of timing signal may cause an image brightness difference of up to 3 percent between the first frame and subsequent frames of a recording.

3.5.7. RANDOM CENTER Mode

In the RANDOM CENTER trigger mode, the camera records in the memory a preset number of frames of images at each trigger, as in the case with the RANDOM mode. The difference is that the RANDOM CENTER mode records the preset number of frames before and after a trigger, while the RANDOM mode only records after a trigger. This mode is useful to record images of events that take place at an unpredictable timing with output of a trigger signal and that you wish to observe together with scenes preceding the it. The number of frames to record at each trigger can be set any number from 1 (one) up to the total number of available frames in the memory.

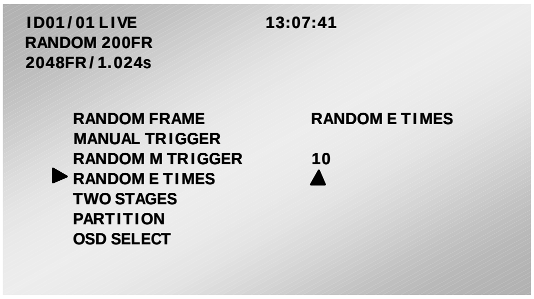


Setting Number of Frames and Triggers for RANDOM CENTER Mode Recording
The procedures for presetting the number of frames to record at each trigger and the number of triggers to be given during a recording session are the same as the ones used in the RANDOM trigger mode. See the previous Section 3.5.5 RANDOM Mode.

Setting Number of Recording for RANDOM CENTER Mode Recording

The maximum number of trigger accepted in RANDOM CENTER mode operation is ten (10) times. It is possible to end a series of recordings when a preset number of input triggers finished. This subsection describes how to preset a number of trigger inputs.

1. Press the MENU button on the keypad to display the menu list.
2. Move the cursor to [RANDOM E TIMES] and press the joystick down to set the selection.
3. The RANDOM E TIMES menu is displayed as shown below. The number of trigger acceptance is preset in the right-hand side area of the screen

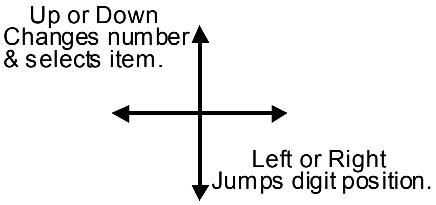


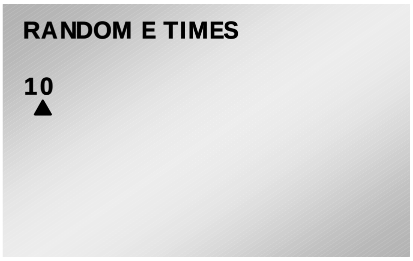
ID01/01 LIVE 13:07:41
RANDOM 200FR
2048FR/1.024s

RANDOM FRAME
MANUAL TRIGGER
RANDOM M TRIGGER
▶ RANDOM E TIMES
TWO STAGES
PARTITION
OSD SELECT

RANDOM E TIMES
10
▲

4. Set a number of trigger acceptance using the joystick on the keypad.





RANDOM E TIMES

10
▲

Recording in RANDOM CENTER Mode

Here is how to record in the RANDOM CENTER mode:

Following Section 3.5, make sure that the camera is in the LIVE mode, and select the RANDOM CENTER mode.

1. Press the REC READY button on the keypad. The camera is now ready to record. Make sure that the indication [LIVE] has turned [READY].

2. Press the REC button on the keypad for the first time, which will turn the camera into ENDLESS recording mode. Note the indication on the screen has turned from [READY] to [ENDLESS]. The camera is now recording images in the memory going around from end to end repeatedly.

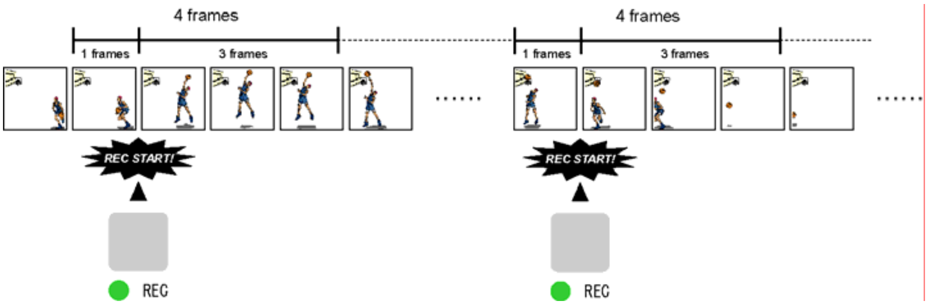
3. Press the REC button again when you know events of your interest are coming very soon. The camera records in the memory the preset number of frames of images before and after the event, and stands by for a next trigger. In addition to the REC button on the keypad, contact or TTL signals from external trigger input terminals can be used to trigger the camera in the RANDOM mode (see Section 3.10 External Trigger Input).

4. The camera automatically stops recording when the memory is full (*). Make sure the indication on the screen has turned from [ENDLESS] to [LIVE].

*Note: You can stop recording by pressing the REC READY button at any time during a recording session.

3.5.8. RANDOM MANUAL Mode

In the RANDOM MANUAL trigger mode, the camera records in the memory a preset number of frames of images at each trigger, as in the case with the RANDOM CENTER mode. The difference is that the RANDOM MANUAL allows for any number of frames to be recorded before and after a trigger, while the RANDOM SENTER mode records the same number of frames before and after a trigger. This mode is useful to record images of events that take place at an unpredictable timing with output of a trigger signal and that you wish to observe together with scenes preceding the it. The number of frames to record at each trigger can be set any number from 1 (one) up to the total number of available frames in the memory.



Setting Number of Frames and Triggers for RANDOM MANUAL Mode

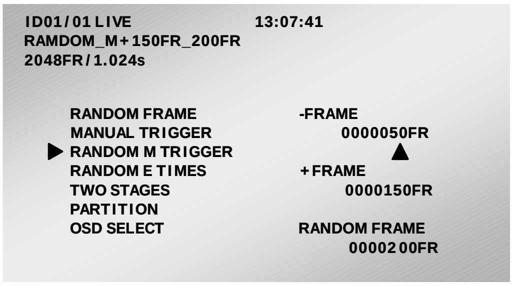
The procedures for presetting the number of frames to record at each trigger and the number of triggers to be given during a recording session are the same as the ones used in the RANDOM CENTER trigger mode. See the previous Section 3.5.5 RANDOM CENTER Mode. After presetting these numbers, go to the following procedure for RANDOM MANUAL mode setting.

Setting RANDOM MANUAL Mode Recording

To use your camera in the RANDOM MANUAL mode, you need to preset numbers of frames to record before and after each trigger. Here is how to preset these numbers:

1. Press the MENU button on the keypad to display the menu list.
2. Move the cursor by the joystick to [RANDOM TRIGGER] and press the joystick down to select the menu.

3. The RANDOM M TRIGGER menu is displayed as shown below. The numbers of frames to record before and after a trigger are shown in the right hand area.

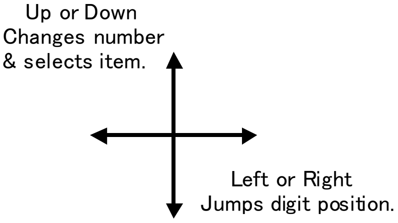


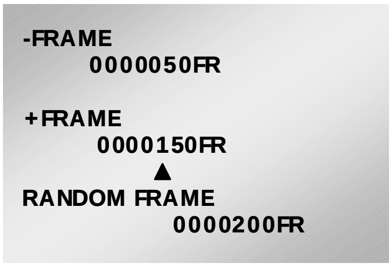
```
ID01/01 LIVE                 13:07:41
RAMDOM_M+150FR_200FR
2048FR/1.024s

    RANDOM FRAME            -FRAME
    MANUAL TRIGGER              0000050FR
  ▶ RANDOM M TRIGGER                  ▲
    RANDOM E TIMES          +FRAME
    TWO STAGES                  0000150FR
    PARTITION
    OSD SELECT              RANDOM FRAME
                                 0000200FR
```

The meaning of each item is as follows:

-FRAME	Number of frames to record BEFORE a trigger.
+FRAME	Number of frames to record AFTER a trigger.
TOTAL FRAME	Total number of frames to record at a trigger.

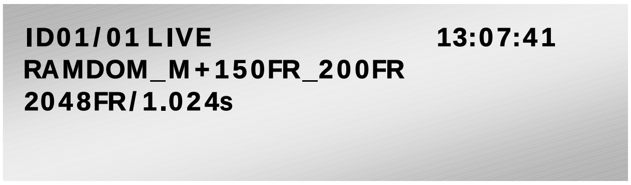
4. Now set the numbers of frames to record before and after a trigger. Using the joystick, up or down to increase or decrease the number, and left or right to jump the digit position, set a number. If you set the number for [–FRAME] as shown below, for example, the number for [+FRAME] is automatically set depending on the total number of frames to record at each trigger.





```
-FRAME
     0000050FR

+FRAME
      0000150FR
          ▲
RANDOM FRAME
            0000200FR
```

5. When you are done, press the joystick down to enter the settings. Now you should see the trigger mode setup indication of [RANDOM_M+150FR_200FR] in the upper left corner of the screen as shown below, where the number of frames to record after a trigger is 150 and the total number of frames to record at each trigger 200. Now the camera is ready to record 50 frames before and 150 frames after each trigger.



```
ID01/01 LIVE                 13:07:41
RAMDOM_M+150FR_200FR
2048FR/1.024s
```

Recording in RANDOM MANUAL Mode

Follow the below procedure to make a recording in the RANDOM MANUAL mode:

1. Following Section 3.5, make sure the camera is in the LIVE mode, and select the RANDOM MANUAL mode.

2. Press the REC READY button on the keypad. The camera is now in the READY mode. Make sure the indication [LIVE] on the screen has turned to [READY].

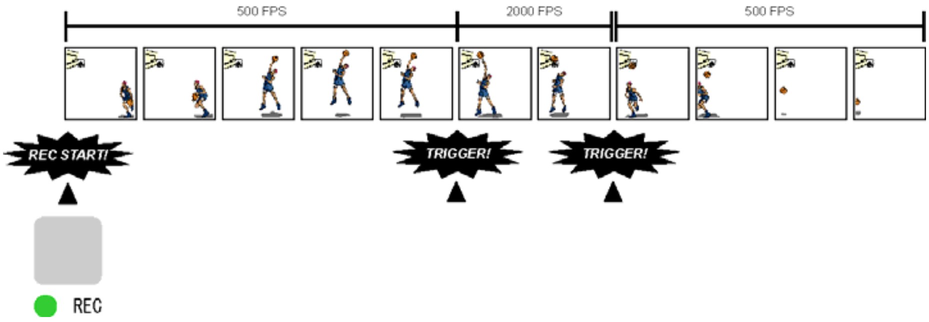
3. Press the REC button on the keypad for the first time, which will turn the camera into ENDLESS recording mode. Note the indication on the screen has turned from [READY] to [ENDLESS]. The camera is now recording images in the memory going around from end to end repeatedly.

4. Press the REC button again when you know events of your interest are coming up very soon. The camera records in the memory the preset number of frames of images before and after the event, and stands by for a next trigger. In addition to the REC button on the keypad, contact or TTL signals from external trigger input terminals can be used to trigger the camera in the RANDOM MANUAL mode (see Section 3.10 External Trigger Input).

5. The camera automatically stops recording when the memory is full (*). Make sure the indication on the screen has turned from [ENDLESS] to [LIVE].

*Note: You can stop recording by pressing the REC READY button at any time during a recording.

3.5.9. DUAL FRAMING RATE Mode



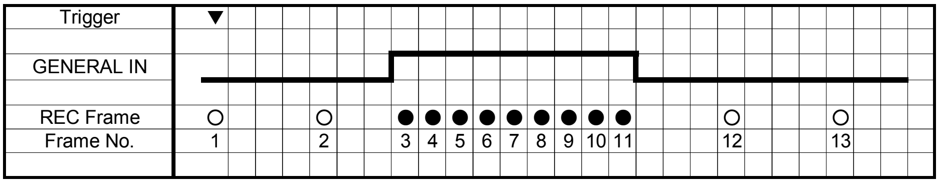
The DUAL FRAMING RATE Mode has been devised to use two preset framing rates alternately. It allows for changing the framing rate during a recording to capture faster or more interesting events for slower playback. For example, while shooting, at a slower framing rate, a basketball player nearing the goal, you can record the instance the basketball player stuffing the ball into the basket in a higher temporal resolution for subsequent motion analysis. This section describes how the Dual Framing Rate Mode works.

Concept of Dual Framing Rate Mode and External Control Signal Input

To use the Dual Frame Rate mode, you first set a higher framing rate with which you wish to capture the instance of important event. Then, you set a slower framing rate as 1/2, 1/4 or 1/8 of the higher framing rate.

The change of the frame rate during recording is effected by an external TTL signal input using the GENERAL IN cable connector.

The following figure is a visual presentation of the temporal relationship between the trigger signals and corresponding recorded to be recorded in an example of 1:4 rate setting.



Trigger		▼																										
GENERAL IN																												
REC Frame		○				○			●	●	●	●	●	●	●	●	●				○				○			
Frame No.		1				2			3	4	5	6	7	8	9	10	11				12				13			

Where the white circle denotes frames recorded at the lower rate and the black at higher rate.

The START mode is the mode of recording used in the Dual Framing Rate mode.

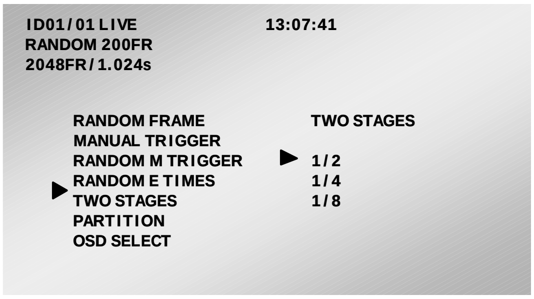
TTL change over signals to be fed to the GENERAL IN connector are defined as follows (e.g. for positive signal setting):

GENERAL_IN Input “H”	Change to higher rate from the next frame
GENERAL_IN Input “L”	Change to lower rate from the next frame

Parameter Setting for Dual Framing Rate Mode Operation

The following shows how to set parameters for a higher and lower framing rates.

1. Referring to Section 3.2. [Selecting Frame Rate], select a framing rate for the higher rate, for example 2000 fps.
2. Press the MENU button on the keyboard to display the menu list.
3. Move the cursor by the joystick to [TWO STAGES] and press the joystick down to select the item.
4. The TWO STAGE menu appears on the screen. In the right-hand area, framing rate ratios of 1/2, 1/4 and 1/8 are shown to choose from.



ID01/01 LIVE 13:07:41
RANDOM 200FR
2048FR/1.024s

RANDOM FRAME
MANUAL TRIGGER
RANDOM M TRIGGER
RANDOM E TIMES
▶ TWO STAGES
PARTITION
OSD SELECT

TWO STAGES

▶ 1/2
1/4
1/8

5. Move the cursor to one of the ratios, for example 1/4, and press the joystick down to select it.
6. Now the system has been set to record at 2,000 fps for the higher rate and 500 fps for the lower rate.
7. Press the MENU button to exit and go back to the LIVE screen.

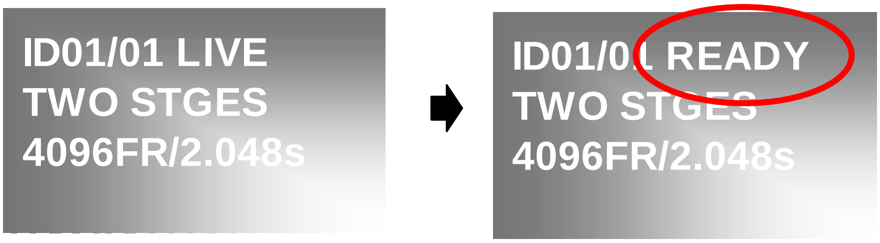
Recording in Dual Framing Rate Mode

Follow the below procedure to record in the Dual Framing Rate mode.

1. Referring to Section 3.5. Selecting Trigger Mode, make sure the camera is in the LIVE mode and the trigger mode is TWO STAGES.
2. Connect a TTL trigger input to the GENERAL IN connector. See the table below for TTL signal and recording frame rate (e.g. for positive signal setting):

GENERAL_IN Input “H”	Change to higher rate from the next frame
GENERAL_IN Input “L”	Change to lower rate from the next frame

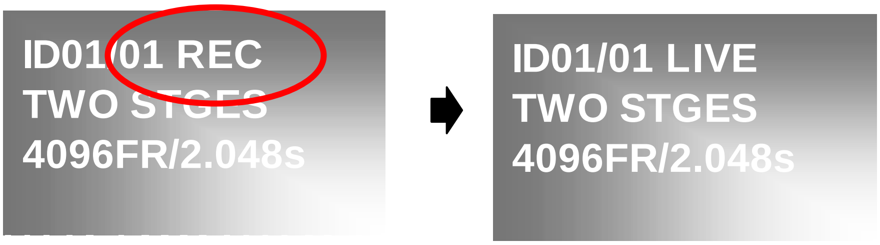
3. Press the REC READY button on the keypad to turn the system into the READY mode. Make sure the indication on the screen has turned from [LIVE] to [READY].



ID01/01 LIVE
TWO STGES
4096FR/2.048s

ID01/01 READY
TWO STGES
4096FR/2.048s

4. At the moment you wish to start recording, press the REC button. The system starts recording and the indication turns to [REC]. When the recording is done, i.e. the memory is full, the system automatically stops recording. The indication turns to [LIVE].



ID01/01 REC
TWO STGES
4096FR/2.048s

ID01/01 LIVE
TWO STGES
4096FR/2.048s

3.6. Adjusting White Balance (for Color Model only)

A digital camera must have a proper white balance that renders a white target as a “pure white” image in both live and playback modes. In order to make accurate color reproduction with a color model of the 512, color balance must be correctly set under the color temperature of lighting. The 512 has re-adjustable R, G and B color channels so that proper white balance can be attained by tweaking the balance of them depending on the characteristics of lighting.
Two different methods - Fixed (preset) and Manual (one touch balancing) - of color balance readjustment are offered with the 512.

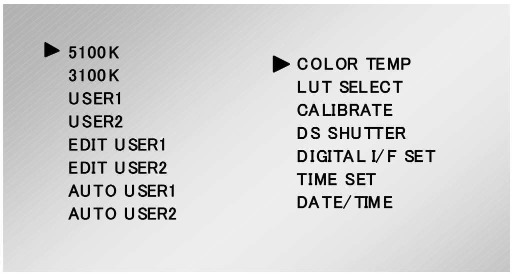
This section describes these readjustment methods.

3.6.1. Fixed (Preset) White Balance

The 512 has two sets of preset (fixed) white balance values to cover typical color temperatures of 5100K and 3100K, each representing the following light:

5100K:	Bright daylight, outdoor
3100K:	Hologen lamps

Press the MENU button to display the menu and select the COLOR TEMP command.
Then select 5100K, or 3100K, depending on the current lighting setup.

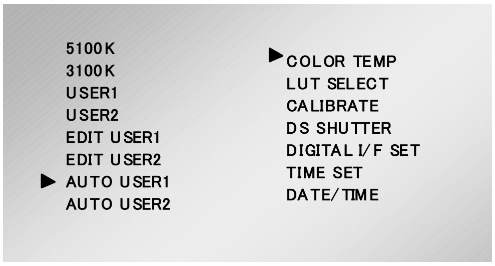

▶ 5100K
3100K
USER1
USER2
EDIT USER1
EDIT USER2
AUTO USER1
AUTO USER2
▶ COLOR TEMP
LUT SELECT
CALIBRATE
DS SHUTTER
DIGITAL I/F SET
TIME SET
DATE/TIME

Make sure that white balance has been updated.

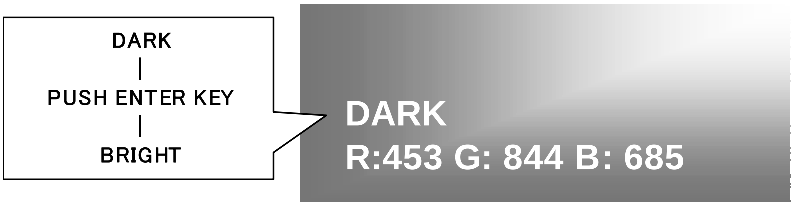
3.6.2. Manual (One Touch) White Balance

To obtain a better white balance, the 512 has a means for setting up white balance semi-automatically. Two patterns of setting can be saved in memory as preset parameters. Follow the below procedure:

1. Set up parameters for an upcoming recording – frame rate, shutter speed and resolution.
2. Press the MENU button on the keypad to display the menu list.
3. Move the cursor to the [COLOR TEMP] command using the joystick.
4. Press the joystick down and the COLOR TEMP menu appears as shown below.



5. Move the cursor by the joystick to AUTO USER1 （or AUTO USER2）and press the joystick down to enter the white balance readjustment mode.
6. Make sure that the value of each of R, G and B channels and indication of DARK or GRIGHT are shown in the lower left corner of the screen.



DARK
R:453 G: 844 B: 685

7. Turn the light on and shoot a piece of white paper or something that is a reference white target, and place it in the center of the picture frame.
8. Control the lens iris to readjust the amount of incoming light onto the imaging sensor. While doing this, make sure that the indicator changes from [DARK] to [PUSH ENTER] to [BRIGHT], or other way around, as the incoming light amount varies. If the indication does not change even when the overall brightness of the image frame is changing, check if the white target is in the center part of the view field. If the target is not in the center, replace it until the indicator changes to the movement of the iris.
9. Control the iris until the indicator shows PUSH ENTER.
10. Press the joystick down to enter the current setting of white balance while PUSH ENTER is displayed.
11. Now the 512 system has obtained a set of R, G and B values for a proper white balance. Make sure that the displayed image has been updated.
12. The set of R, G and B values are saved in the USER 1 (or USER 2) window.

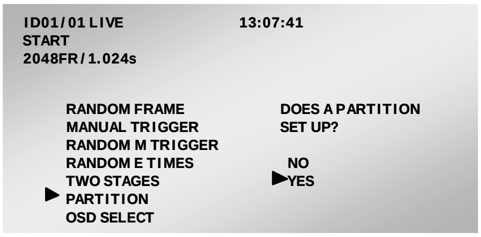
3.7. Partitioning Memory

The 512 has a large capacity memory of 670 GB, standard, or up to 2GB with optional additional memory units. The memory can be partitioned into several sections and each section is used for a recording session. The memory can be divided into up to 64 sections of equal capacity. Each section is given its own ID number for recording management purposes. Each of the divided sections can have its own recording parameter settings, which is a useful feature when an event is recorded repeatedly under several different shooting conditions.

3.7.1. Prepare for Memory Partitioning (Set Number of Sections)

To take advantage of the memory-partitioning feature, it is necessary to decide on how to divide the memory and set it up accordingly. This section discusses how to set up memory partitioning.

1. Press the MENU button on the keypad to display the MENU.
2. Select [PARTITION] with the joystick.
3. The PARTITION menu is now displayed on the screen.
4. A dialog window is displayed asking if you wish to set up partitions.
   Note: If you partition the memory or change the current partitions, all the image data currently stored in the memory is erased.

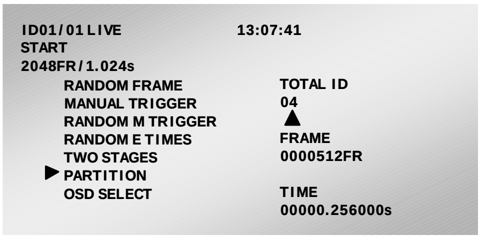

ID01/01 LIVE 13:07:41
START
2048FR/1.024s

DOES A PARTITION SET UP?

NO
▶YES

RANDOM FRAME
MANUAL TRIGGER
RANDOM M TRIGGER
RANDOM E TIMES
TWO STAGES
▶ PARTITION
OSD SELECT

5. If you wish to partition the memory, select YES. A setup menu is displayed.


ID01/01 LIVE 13:07:41
START
2048FR/1.024s

TOTAL ID
04
▲
FRAME
0000512FR

TIME
00000.256000s

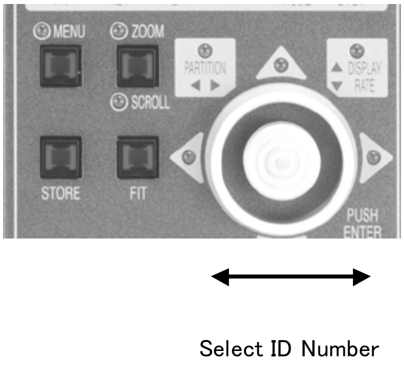
RANDOM FRAME
MANUAL TRIGGER
RANDOM M TRIGGER
RANDOM E TIMES
TWO STAGES
▶ PARTITION
OSD SELECT

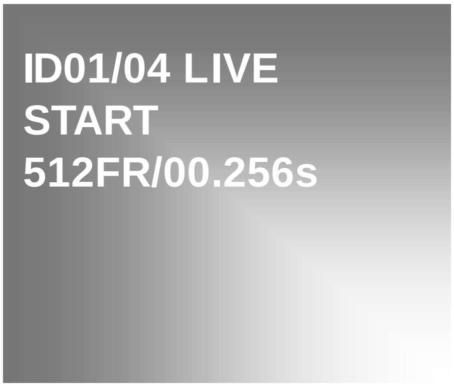
6. Move the joystick up or down to select the desired number for divided sections.
7. Once the selection is done, press the joystick down to enter the setting.
8. Make sure the ID indication is in fractional number mode now.

3.7.2. Recording into Divided Sections

This section describes how to record in the PARTITIONED MEMORY mode.

1. Make sure that the camera is in the LIVE mode.
2. Move the joystick left or right to select the ID number of the section that you wish to record. Make sure if the ID number displayed in the screen is correct.





ID01/04 LIVE
START
512FR/00.256s

3. Once the ID number has been selected, start a recording in the usual manner.

3.7.3. Playback of Recorded Sections

Recorded image in any of the sections can be played by selecting the ID of the particular section of interest as follows:

1. Make sure that the camera is in the MEMORY mode.
2. Move the joystick on the keypad, left or right, to select a section that you wish to play. Make sure if the displayed ID number is correct.
3. Once the section that you wish to play back has been selected, play it in the usual manner.

3.7.4. PARTITION MODE

The previous section 3.7.2. Recording into Divided Sections shows how to record when PARTITION MODE 1 is selected.
When PARTITION MODE 2 is selected, manual selection of ID is not needed. The following describes how to record in PARTITION MODE 2 with the number of partitions set to 10, for example:

1. In partition ID01, set the camera in READY status.
2. Send a trigger pulse to start recording.
3. Recording ends.
4. ID is automatically increased to 02 and the camera is set in the status waiting for a REC trigger. The camera is in the READY mode if it is in the START recording mode and in the ENDLESS recording mode if in the CENTER, END or MANUAL mode.
5. Send a REC trigger to start recording.
6. Recording ends.
7. ID is automatically increased to 03 and the camera is set in the status waiting for a REC trigger.
8. The camera automatically repeats the above until it ends recording at ID10, and the camera returns to LIVE.

This operation saves the trouble of manually changing the ID and setting the camera in the status waiting for a REC trigger, and is useful to record events in series changing ID numbers.

Note: The above MODE 2 operation can only be used in the START, CENTER, END or MANUAL recording mode.

3.8. Look-Up Table (LUT) Operation

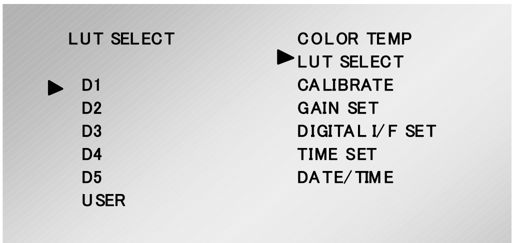
The look-up table is a reference table that defines the mutual relationship between the grayscale values of the recorded image data and that of the displayed image on the computer monitor or video display screen.

The 512 has a built-in hardware LUT that offers a means to enhance the contrast of image to make the subject look more clearly, or to enhance a particular range of gray level within a frame to make the subject outstand in the scene. This gray level manipulation is effective only on the displayed image and the original recorded image data is not altered in any way.

This section discusses the relationship between the LUT, video output and PC software of the 512 system.

The following is a description of the relationship between the LUT, output image and PC software:

1. Press the MENU button on the keypad to display the menu list.
2. Move the cursor to [LUT SELECT] and press the joystick down to set the selection.
3. The LUT SELECT menu is displayed as follows:



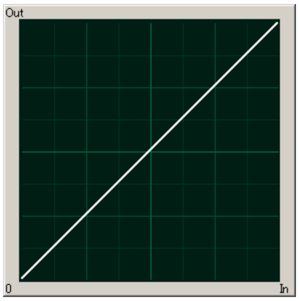
4. Select an LUT from D1 to D5, or USER
5. Press the joystick down to set the selection.

3.8.1. Operating Preset LUT

The 512 has five (5) preset LUT patterns. All the five patterns are shown here:

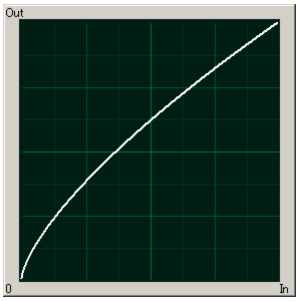
D1

This is an LUT pattern whose output is always linear to the input. It is the standard LUT that is used in usual applications.



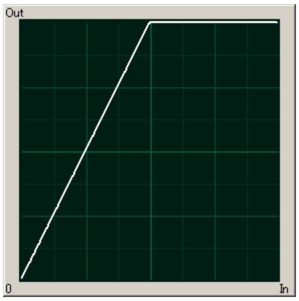
D2

This is an LUT pattern with a 0.6 gamma.



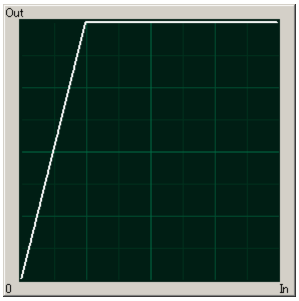
D3

This is an LUT pattern that allocates the lower 512 of the 1024 total steps to output. It expands the darker portion of an original recorded image.



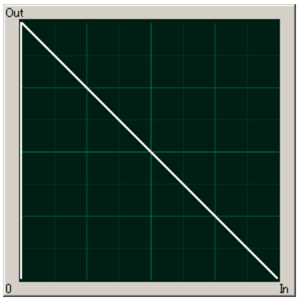
D4

This is an LUT pattern that allocates the lower 256 of the 1024 total steps to output. It expands the darker portion of an image, more than D3 LUT.



D5

This is an LUT pattern that inverts the input image data.



3.8.2. Customizing LUT Patterns

LUT patterns can be created from the PFV (Photron FASTCAM Viewer) Control Software. See the PFV Software Manual for details of LUT pattern creation.

USER

This mode uses a custom LUT created from the PFV Control Software.

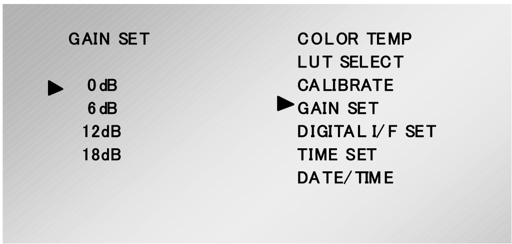
3.9. Setting Gain

Gain is a setting of voltage applied to the amplifier in sensor. By raising the setting number, i.e. the voltage, a greater magnitude of amplification is made on the output image signal from pixels when the incoming light level is low. Beware, however, the higher the amplification the greater the noise, resulting in degradation of image quality.

There are four settings of different gain factor to choose from depending on the subject and lighting.

How to Set Gain

1. Press the MENU button on the keypad to display the menu list.
2. Move the cursor to [GAIN SET] and press the joystick down to set the selection.



3. The menu is displayed as shown in the above.

Gain Setting	Description	Sensor Sensitivity (Amplification)	Image Quality
0dB	Minimum gain	Lowest	Low noise
6dB	Low gain	↑	↑
12dB	Medium gain	↓	↓
18dB	Maximum gain	Highest	High noise

4. Move the joystick up or down to select a gain setting.
5. Press the joystick down to set the selection.

Note: As the gain setting gets higher, the zero level of the sensor output (sensor output level when the lens is fully covered) rises. For zero level correction, see Section 3.1. Calibration.

Note: It is highly advisable to carry out calibration whenever you changed gain setting, from low to high or other way around.

3.10. External Trigger Input

The 512 can operate in response to external triggers that are provided depending on the needs of each application. This section discusses the different kinds of external triggers and how to set up the system for each of them.

3.10.1. Input of External Trigger Signals

The trigger signals that are used on the 512 and the corresponding input connectors are shown below.

Connectors (Input)	Menu Setting	Signals
TRIGGER SW IN	None	Contact signal Trigger on CLOSURE
TRIGGER TTL IN	None	Optical isolator input Positive logic, 5V, 15mA(recommended) 7V, 23mA(maximum)
GENERAL IN	TRIGGER POS	TTL level, Positive logic 5V(maximum)
	TRIGGER NEG	TTL level, Negative logic 5V(maximum) Contact signal, Trigger on CLOSURE

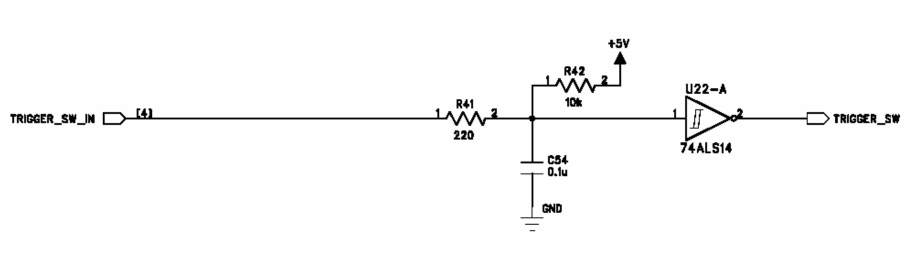
Note: For input trigger signals for GENERAL IN, the GENERAL IN circuit must be set up for the type of the input signal from the menu in advance. Please see the GENERAL IN section elsewhere in this manual for details.

Note: When GENERAL IN is set [TRIGGER POS/NEG], TRIGGER SW IN and TRIGGER TTL IN inputs become void.

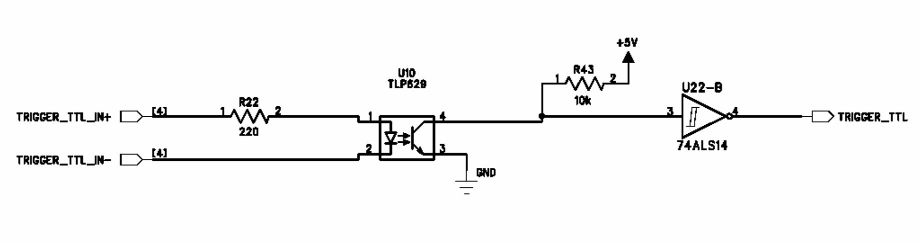
Note: Do not input any trigger signals other than contact signals to TRIGGER SW IN, otherwise the camera may be seriously damaged.

Note: Do not apply trigger signals of excessive voltage or current to TRIGGER SW IN or GENERAL IN, otherwise the camera may be seriously damaged.

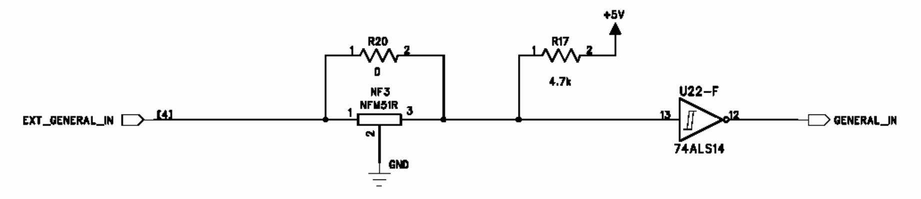
TRIGGER SW IN Circuit


TRIGGER_SW_IN
[4]
R41
220
+5V
R42
10k
C54
0.1u
GND
U22-A
74ALS14
TRIGGER_SW

TRIGGER TTL IN Circuit


TRIGGER_TTL_IN+
TRIGGER_TTL_IN-
[4]
R22
220
U10
TLP629
GND
+5V
R43
10k
U22-B
74ALS14
TRIGGER_TTL

GENERAL IN Circuit


EXT_GENERAL_IN
[4]
R20
0
NF3
NFM51R
GND
+5V
R17
4.7k
U22-F
74ALS14
GENERAL_IN

3.10.2. Output of Trigger Signals to External Equipment

The 512 can output trigger signals to external equipment and devices. The output signals are provided from the TRIGGER SW OUT and TRIGGER TTL OUT connectors. In addition, other trigger output is available from the GENERAL OUT connector by setting up the circuit as necessary.

The following table shows the output connectors and the relevant output signals.

Connectors (Output)	Menu Setting	Signals	Delay (Approx.)
TRIGGER SW OUT	None	Contact signal	5 nsec
TRIGGER TTL OUT	None	CMOS (74ACT541 buf'fd) Output, Positive logic	2.7 μsec
GENERAL OUT	TRIGGER POS	CMOS (74ACT541 buff'd) Output, Positive logi	55 nsec
	TRIGGER NEG	CMOS (74ACT541 buff'd) Output, Negative logic	70 nsec

Note: For output trigger signals from GENERAL IN, the GENERAL IN circuit must be set up for the type of the input signal from the menu in advance. See Section 3.11.2. GENERAL OUT for details.

3.11. Input of External Sync Signals

The 512 has an operation mode for recording in sync with external sync signal. By using sync signals fed from outside, synchronized multiple-camera recording or single- or multiple-camera recording in sync with external instrumentation and lighting equipment is possible.
This section describes how to set up the 512 system in external sync environment giving some tips and precautions.

3.11.1. Input of External Sync Signals

The table below shows external signals that can be input to the 512 system. Follow the below procedure to set up the system.

1. Connect an external sync signal to the processor.
2. The green LED (POWER LED) on the rear panel blinks.
3. Press the MENU button to display the menu list.
4. Use the joystick on the keypad to select [EXT-SYNC IN] menu.
5. The menu is shown. Details of the menu is as follows:

Menu Display	Description	Signal
OFF	Switches External Sync off.	None
ON POS CAM	Operates in sync with 512.	TTL level, Pos. logic
ON NEG CAM	Operates in sync with 512.	TTL level, Neg. logic
ON POS OTHERS	Operates in sync with external equipment.	TTL level, Pos. logic
ON NEG OTHERS	Operates in sync with external equipment.	TTL level, Neg. logic

6. Move the joystick up or down to select a menu item.
7. Once the selection is done, press the joystick down to set.

Note: A use of a terminating resistor is strongly recommended to avoid any disturbance of sync signal that may cause the camera to malfunction depending on the environment.

3.11.2. Output of External Sync Signals

The 512 can output sync signals to outside equipment and devices. The following table shows the output signals from the 512. Set up sync signal output in the following procedure.

1. Press the MENU button on the keypad to display the menu list.
2. Move the joystick on the keypad to select the [EXT-SYNC OUT] menu.
3. The menu is displayed. Details are shown below:

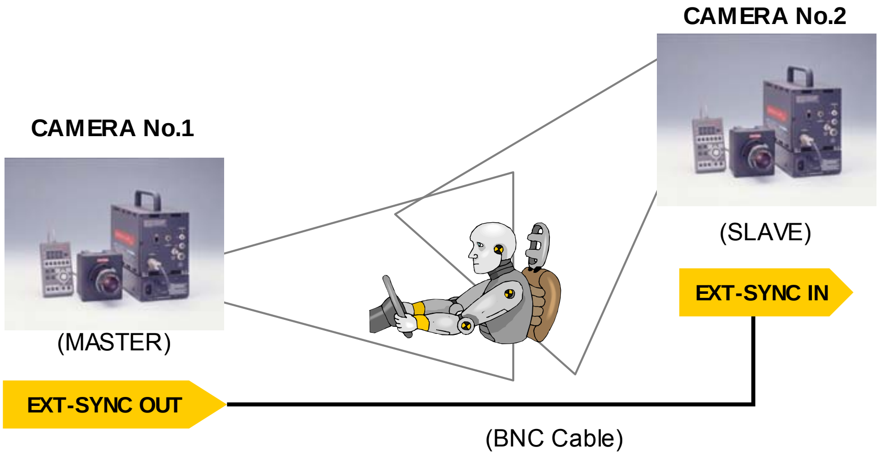
Menu Display	Description	Signal	Remarks (Input delay, approx.)	
VSYNC POS	Outputs positive logic VSYNC signal.	CMOS(74ACT541 buffered) output, Positive logic	EXT-V IN is set in positive logic.	50 nsec
			EXT-V IN is set in negative logic	80 nsec
VSYNC NEG	Outputs negative logic SYNC signal.	CMOS(74ACT541 buffered) output, Negative logic	EXT-V IN is set in positive logic.	50 nsec
			EXT-V IN is set in negative logic.	80 nsec

4. Move the joystick up or down to select an output signal.
5. Once selection is done, press the joystick down to complete the setting.

3.11.3. Sync Operation of Multiple 512 Systems

Multiple 512 systems can be synchronized, using the external input and output features of the system, for synchronized recording.

Concept of Sync Operation


CAMERA No.2
(SLAVE)
EXT-SYNC IN
CAMERA No.1
(MASTER)
EXT-SYNC OUT
(BNC Cable)

This section describes how to set up external sync signals necessary for sync operation of two cameras.

Setting up Master Camera (That Outputs Sync Signal)

First decide the master camera that provides sync signal to the other camera, and make necessary setting on it in the following manner:

1. Press the MENU button on the keypad to display the menu list.
2. Move the cursor by the joystick to [EXT-SYNC OUT] menu and press the joystick down to enter the selection.
3. Move the joystick up or down to select an output signal, **VSYNC POS** in this example, and press the joystick down.
4. Now the system has been set in a way that a sync signal (positive going) is output from EXT-SYNC OUT connector.

Setting up Slave Camera (That Receives Sync Signal)

Next, set up input sync signal on the slave camera.

5. Connect between the EXT-SYNC OUT of the master camera and the EXT-SYNC IN of the slave camera with a BNC cable to feed the sync signal from the master camera to the slave.
6. Make sure that the green LED (POWER LED) on the rear panel of the slave camera blinks.
7. To set up the type of sync signal that the slave receives, press the MENU button on the keypad to display the menu list.
8. Move the cursor by the joystick to select the [EXT-SYNC IN] menu.
9. Move the cursor by the joystick to select the type of output signal. Because the master camera has been set to positive (VSYNC POS), **ON POS CAM** should be selected here.
10. Once the selection is done, press the joystick down to set it.

Note: If the steps 3 to 6 are done without input sync signal from the master, the slave camera operates at the frame rate that is currently set and no EXT-SYNC OUT is output from the slave camera.

Note: Blinking of green LED indicates that input sync signal is present. If the sync signal stops or is lost, the LED stops blinking.

Note: When you wish to operate multiple 512 cameras in the RANDOM RESET mode, use [GENERAL IN] for trigger input. Do not use [TRIGGER TTL IN] or [TRIGGER SW IN] because it is likely that proper recording cannot be attained due to delay of trigger signals.

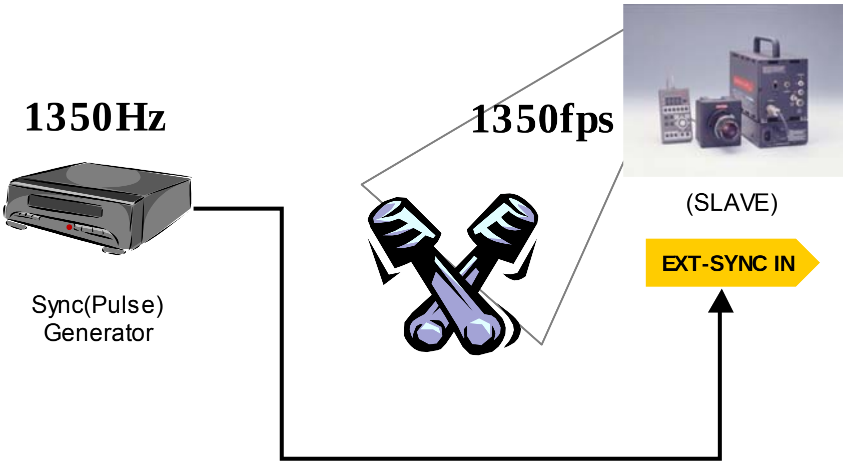
Note: The internal circuit of the APX inevitably causes a slight frequency error of up to ±22.98 nsec against the input sync signal cycle.

Example: When an external sync signal of 10,000 Hz is input from external equipment, the sync cycle within the internal circuit will be 100 usec ± 22.98 nsec, which will result in a frame rate of between 9,998fps and 10,002fps.

3.11.4. Sync Operation with External Equipment

In addition to its original framing rates, the 512 has a feature of setting up a frame rate locked to the frequency of a sync signal from external source. With this feature, it has considerably expanded its range of application. For example, it can work in sync with a manufacturing machine running at 1350 rpm, to record the machine’s behavior at 1350 FPS.

Concept of External Sync Recording



This section describes the function that makes the 512 work in sync with external equipment.

Requirement on Input Signals

For the 512 to work in sync with external equipment, the basic requirement on the input signal is as follows:

TTL level, Positive or Negative logic
60 Hz to 32,000 Hz

Camera Setup

Feed a sync signal to the 512 processor.

1. Connect between the sync signal generator and the EXT-SYNC IN on the 512 rear panel with a BNC cable.
2. Make sure that the green LED (POWER LED) on the 512 processor rear panel blinks when a sync signal from the generator is present.
3. Press the MENU button to display the menu list.
4. Move the cursor by the joystick to the [EXT-SYNC IN] and press the joystick down to select it.
5. Move the cursor by the joystick, up or down, to select a type of sync signal, **ON POS OTHERS** (positive) or **ON NEG OTHERS** (negative)**.**
6. Once the selection is done, press the joystick down to set it.
7. Start the external signal source sending sync signal to the camera. Make sure that the camera recognizes the signal frequency and the frame rate is in sync with the input signal. The current frame rate recognized by the 512 system is displayed in the lower left corner of the screen.

Note: The frequency of the sync signal from the external source should not be changed when the camera is in the LIVE mode or recording (malfunctioning may result).

Note: Every time the frequency of the external sync source is changed for any reason, do the steps 1 through 7 again to set up the system to the new frequency.

Note: If steps 3 to 7 are done without input sync signal, the camera operates at 60 FPS. In this case, the camera indicates 1 FPS in text, which means there is no sync signal input.

Note: Blinking of the green LED on the rear panel indicates the presence of a sync signal. It stops blinking when the input sync signal is lost.

Note: Frame rate sync operation with external equipment cannot be carried out in the RANDOM RESET mode.

3.11.5. Sync Operation of 512 and Other Models of Cameras

(Sync Operation of Mixed Models of Cameras)

Using the 512 camera's feature of setting up a frame rate locked to the frequency of a sync signal from external sources described in the previous Section 3.11.4., the model allows for sync operation with other models of FASTCAM cameras, such as the Ultima APX and 1024R2 models.

Synchronizing the 512 to the APX

To make the 512 camera synchronized to the APX, the APX is the master camera and the 512 slave.

Setting up the APX (Master Camera That Feeds Sync Signal to the Slave)

The APX has rear panel connectors of the same specifications as the 512. Also, its control software GUI and remote keypad menu are of the same specifications as the 512. Because of these common specifications, setting up the APX camera is carried out as if both cameras are of one same model, the 512 or APX.

1. Press the MENU button on the keypad to display the menu list.
2. Move the cursor by the joystick to [EXT-SYNC OUT] menu and press the joystick down to enter the selection.
3. Move the joystick up or down to select an output signal, **VSYNC POS** in this example, and press the joystick down.
4. Now the system has been set in a way that a sync signal (positive going) is output from EXT-SYNC OUT connector.

Setting up the 512 (Slave Camera That Receives Sync Signal from the Master)

Next, set up input sync signal on the slave camera.

5. Connect between the EXT-SYNC OUT of the master camera and the EXT-SYNC IN of the slave camera with a BNC cable to feed the sync signal from the master camera to the slave.
6. Make sure that the green LED (POWER LED) on the rear panel of the slave camera blinks.
7. To set up the type of sync signal that the slave receives, press the MENU button on the keypad to display the menu list.
8. Move the cursor by the joystick to select the [EXT-SYNC IN] menu.
9. Move the cursor by the joystick to select the type of output signal. Because the master camera has been set to positive (VSYNC POS), **ON POS CAM** should be selected here.
10. Once the selection is done, press the joystick down to set it.

Note: When you wish to make the APX camera synchronized to the 512, the 512 is the master camera and the APX slave, follow the above procedure swapping the place of the two cameras.

Synchronizing the 512 to FASTCAM-Ultima 1024R2

To make the 512 camera synchronized to an Ultima 1024R2, the 1024R2 is the master camera and the 512 slave.

Setting up the 1024R2 (Master Camera Feeding Sync Signal to the Slave)

1. Press the MENU button on the keypad to display the menu list.
2. Move the cursor by the joystick to [EXT OUT] menu and press the ENTER key to enter the selection.
3. Move the joystick up or down to select an output signal from the EXT OUT connector. Select [**VSYNC POS]** in this example, and press the ENTER key.
4. Now the system has been set in a way that a sync signal (positive going) is output from EXT OUT connector.

Setting up the 512 (Slave Camera Receiving Sync Signal from the Master)

Next, set up input sync signal on the slave camera.

5. Connect between the EXT OUT of the master camera and the EXT-SYNC IN of the slave camera with a BNC cable to feed the sync signal from the master camera to the slave.
6. Make sure that the green LED (POWER LED) on the rear panel of the slave camera blinks.
7. To set up the type of sync signal that the slave receives, press the MENU button on the keypad to display the menu list.
8. Move the cursor by the joystick to select the [EXT-SYNC IN] menu.
9. Move the cursor by the joystick to select the type of output signal. Because the master camera has been set to positive (VSYNC POS), ON POS CAM should be selected here.
10. Once the selection is done, press the joystick down to set it.

Note: It is not possible to make the 1024R2 synchronized to the 512 because the 1024R2 does not have the function to follow sync signal from another source.

3.12. Setting GENERAL IN / OUT Signals

With the previous Photron high-speed camera systems, all the external input and output signal lines were connected to individual connectors on the rear panel of the processor. With the 512, however, all these signal lines are combined into compound input and output cables and are connected to the GENERAL IN and GENERAL OUT connector, respectively (See Sections 2.2.5. and 2.2.6.)

3.12.1. Setting GENERAL IN Signals

This section describes how to set up input signals connected to the GENERAL IN connector.

1. Press the MENU button on the keypad to display the menu list.
2. Move the joystick to select the [GENERAL IN] menu.
3. The GENERAL IN menu is now displayed. The items are as follows:

Menu Items	Description	Signal
EVENT POS	Inputs event signals (Positive logic)	TTL level, Positive logic
EVENT NEG	Inputs event signals (Negative logic)	TTL level, Negative logic
TRIGGER POS	Inputs trigger signals (Positive logic)	TTL level, Positive logic
TRIGGER NEG	Inputs trigger signals (Negative logic)	TTL level, Negative logic Contact signals, Trigger on CLOSURE
READY POS	Inputs Ready signals (Positive logic)	TTL level, Positive logic
READY NEG	Inputs Ready signals (Negative logic)	TTL level, Negative logic Contact signals, Trigger on CLOSURE

READY POS/NEG

When READY POS or NEG is selected, the camera can be turned Ready by sending a pulse to it. When PARTITION MODE 2 has been selected in this case, a pulse will turn the camera into the status waiting for a REC trigger – into READY if the camera is in the START mode, and into ENDLESS recording status if the camera is in CENTER, END or MANUAL mode.

Note: When you use external signals to drive the whole system, be sure to check the nature of the incoming signals.

Note: See Section 3.13 (Event Marker Function) for detailed tips on how to set up EVENT POS or NEG.

Note: When TRIGGER POS or NEG is selected, external trigger to [TRIGGER TTL IN] and [TRIGGER SW IN] become void.

3.12.2. Setting GENERAL OUT Signals

This section describes how to set up signals output from the GENERAL OUT connector.

1. Press the MENU button on the keypad to display the menu list.
2. Move the joystick to select the [GENERAL OUT] menu.
3. The GENERAL OUT menu is now displayed. The items are as follows:

Menu Display	Description	Signal
EXPOSE POS	Outputs sensor's exposure duration in HIGH level.	TTL level, Positive logic
EXPOSE NEG	Outputs sensor's exposure duration in LOW level.	TTL level, Negative logic
REC POS	Outputs recording duration in HIGH level.	TTL level, Positive logic
REC NEG	Outputs recording duration in LOW level.	TTL level, Negative logic
TRIGGER POS	Transfers received external trigger signal in HIGH level.	TTL level, Positive logic
TRIGGER NEG	Transfers received external trigger signal in LOW level.	TTL level, Negative logic
READY POS	Outputs pulse of specified level when camera is waiting for REC trigger. See note below	TTL level, Positive logic
READY NEG	Outputs pulse of specified level when camera is waiting for REC trigger. See note below	TTL level, Negative logic

READY POS/NEG
When READY POS or NEG has been selected, a pulse of the specified level is output if the camera is waiting for a REC trigger – a trigger that will turn the camera into READY if it is in START mode, and ENDLESS in CENTER, END or MANUAL. This feature is valid only in the START, CENTER, END or MANUAL mode.

Note: When you use these signals to drive the whole system, be sure to check the nature of the signals.

3.13. Event Marker Function

The 512's Event Marker function makes it possible to record a frame number, on the fly, at each external marking signal so that you can jump to the marked frame (event frame) when playing recorded images. In addition to triggering points, these event marks given at any moments of interesting event will let you play back such interesting events quickly. Up to ten event frames can be marked in each partitioned section.
Marking is done at an edge of the incoming marker pulse. The immediately subsequent frame after receipt of a marker pulse is recorded as an event frame. The following describes how to place event marks:

1. Press the MENU button on the keypad to display the menu list. Move the joystick to select the GENERAL IN menu. Using the joystick in the GENERAL IN menu, select [EVENT POS] or [EVENT NEG]. EVENT POS marks an event at the rising edge of the marking signal and EVENT NEG at the falling edge.
2. Send pulses into the GENERAL IN connector each moment you see an interesting event during a recording session.
3. Up to ten marking pulses are accepted in a session.
4. Recording comes to an end.
5. Press the LIVE/MEMORY button to switch to the MEMORY mode.
6. Press the △ or ▽ FRAME RATE button to jump to the first marked event. At each press on either button, playback jumps to previous or subsequent event frames.
7. While an event frame is displayed on the screen, the text shows [EVENT FRAME x] where the x is a number between 1 and 10 each representing the serial number of an event frame.

Note: This function is not available in the DUAL FRAME RATE mode.

3.14. MCDL – Multi-Channel Data Link (Analog Data Acquisition)

The 512 has connectivity with the Photron MCDL (Multi-Channel Data Link – optional), which makes it possible for the 512 to record sampled waveform data (up to 4 channels of analog and 6 channels of digital signals) along with image date. The original waveform data from the MCDL is sampled at the frequency of ten times the current frame rate and the sapling tales place at a timing of every tenth of each frame period.

The recorded data is played as a waveform on the PFV. Also, it is added to the header when the image data is stored in the TIFF format. I may also be viewed on video monitor.

The following describes how to operate the 512 together with an MCDL unit.

1. Connect the MCDL output cable to the MCDL connector (9-pin D-sub) on the 512 rear panel.
2. Press the MENU button on the keypad to display the menu list. Move the joystick to select the [MCDL/IRIG] menu. Further select the [MCDL ON] and press the joystick down to set it on.
3. The waveform of the input signal is displayed in the text portion of the screen.
4. The waveform is now recorded superimposed on and in sync with the image.
5. To play a recorded waveform, press the LIVE/MEMORY button to get in the MEMORY mode. Press the PLAY button and the recorded waveform is shown superimposed on each corresponding image.

Note: When you use both MCDL and IRIG, select [MCDL IRIG ON].

Multi Channel Data Link
PHOTRON

3.15. IRIG Timecode(optional)

The 512 is compatible with the IRIG-B signal input and can add an IRIG code to each recorded frame. The sampling of IRIG code is once every frame.

The IRIG code recorded on each frame is displayed on video screen or PFV screen. It is added to the header when the recorded image data is stored in the TIFF format.

The required specification of IRIG code is as follows:

Connector: BNC
Code Format: IRIG－B (122), Analog
Amplitude: 1.2 Vp-p Minimum; 8.0 Vp-p Maximum
Modulation Ratio: 2:1 to 4:1

1. The following describes how to use the MCDL:
2. Connect the IRIG generator output cable to the IRIG IN connector (BNC) on the 512 rear panel.
3. Press the MENU button on the keypad to display the menu list. Move the joystick to select the [MCDL/IRIG] menu. Further select the [IRIG ON] and press the joystick down to set it on.
4. IRIG code is displayed in the text portion of the screen.
5. The IRIG code is now recorded on the image.
6. To play a recorded IRIG code, press the LIVE/MEMORY button to get in the MEMORY mode. Press the PLAY button and the recorded IRIG code is shown superimposed on each corresponding image.

Note: When you use both MCDL and IRIG, select [MCDL IRIG ON].

To add an offset to a sampled IRIG code:

1. Select the [IRIG OFFSET] menu.
2. Specify an offset within the range of +0.999999 sec to –0.999999 sec.
3. The specified offset is added to all sampled IRIG codes.

Chapter 4 Playback

4.1. Playing Recorded Images
4.2. Search Images of Interest (Fast Forward/Rewind Play)
4.3. Slow Playback (Jog)
4.4. Zooming (Zoom / Fit / Scroll)
4.5. Block Playback (Playback of Clips of Interesting Scene)
4.6. Text Display – Hide / Unhide
4.7. Displaying Crosshair Cursor
4.8. Display R / G / B Planes (Color Model Only)
4.9. Switching NTSC / PAL Video Output
4.10. Automatic Playback
4.11. Playback Event Markers

4.1. Playing Recorded Images

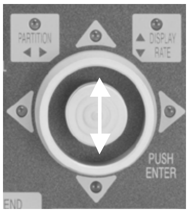
The 512 can play back images recorded in the memory on the video monitor instantly. The following describes how to play recorded images.

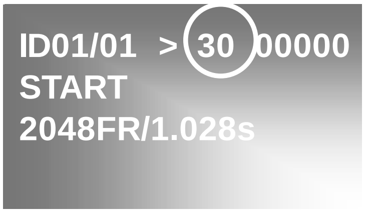
1. If the camera is in the LIVE mode, press the LIVE/MEMORY button on the keypad to change to the MEMORY mode. Make sure the LED right next to the mode indication [MEMORY] is on now and that the video screen shows an image frame from memory.
2. Press the PLAY button on the keypad to play back the recorded images. The functions of playback buttons are shown in the below table.

FR
REV
PLAY
FF
PAUSE
STOP

Name	Function	Description
FR	Rewind and Play	Rewinds and plays recorded images at x10, x100 or x1000 the currently set playback speed. Each press on FR button changes playback speed.
REV	Reverse Play	Plays recorded images in reverse direction at 2 to 30 FPS in NTSC or 2 to 25 FPS in PAL
PLAY	Play	Plays recorded images in normal direction at 2 to 30 FPS in NTSC and 2 to 25 FPS in PAL.
FF	Fast Forward	Plays recorded images at x10, x100 or x1000 the currently set playback speed. Each press on the FF button changes speed.
PAUSE	Temporary Stop	Stops playback temporarily. A [||] mark is displayed on video screen. With this mark in the screen, you can jog frames by pressing the PLAY/REV button.
STOP	Stop	Stops playback and returns to the trigger frame.

3. Move the joystick up or down on the keypad to change playback speed. The current playback speed is displayed in the upper portion of the video screen.




ID01/01 > 30 00000
START
2048FR/1.028s

PAL Playback Rates	2; 4; 8; 12; 25 FPS
NTSC Playback Rates	2; 5; 10; 15; 30 FPS

4.2. Searching Images of Interest (Fast Forward/Rewind Play)

1. Make sure that the system is in the MEMORY mode.
2. Press the [＞] (PLAY) button to start playback.

FR
REV
PLAY
FF
PAUSE
STOP
MENU
ZOOM

3. Press the [＞＞] (FF) or [＜＜] (FR) button to search your desired images on the fly.

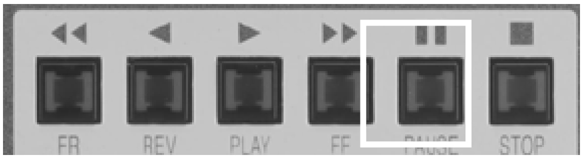
Note: At each press on the button, speed changes to x10 to x100 to x1000.

As soon as you see your desired or interesting image, press the [＞] (PLAY) button to go back to normal playback, or the [II] (PAUSE) button to stop playback temporarily.

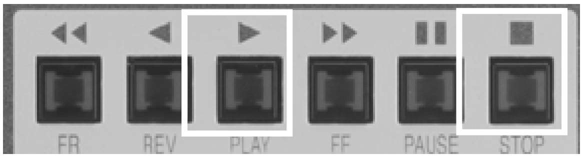
4.3. Slow Playback (Jog)

1. Make sure the system is in the MEMORY mode.

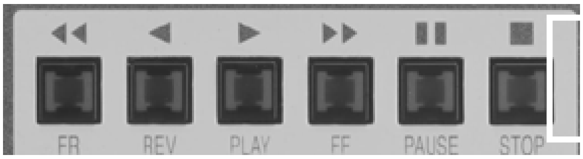
2. Press the [＞] (PLAY) button to start playback.


FR
REV
PLAY
FF
PAUSE
STOP

3. Press the [＞＞] (FF) or [＜＜] (FR) button to search your desired image.


FR
REV
PLAY
FF
PAUSE
STOP

4. When your desired image is coming up, press the [II] (PAUSE) button to stop playback temporarily.


FR
REV
PLAY
FF
PAUSE
STOP

5. Make sure a [II] mark is displayed in the video screen.

6. Press the [＞] (PLAY) button to play in the single-frame jog mode, or the FF or FR button to play in the ten-frame jog mode.

4.4. Zooming (Zoom / Fit / Scroll)

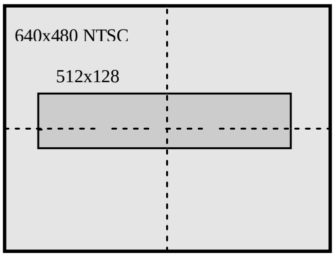
When recording at a frame rate of 4,000 FPS or higher, the 512 records images in lower resolution, for example 512 x 128 pixels, which is displayed in a smaller space within the monitor screen. In such a case the recorded image can be displayed to fill the monitor screen using the 512's Zoom/Fit feature. This section describes how to use the digital zoom, fit and scroll functions of the 512 in the following subsections.

4.4.1. Fitting Image Frame to Video Screen

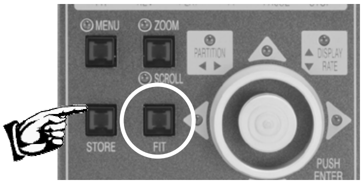
The Fit function of the 512 system readjusts the size of each framing resolution to maximize the playback image fitting the video screen format. This section describes how a recorded image of 256 x 256 pixel resolution is readjusted to fit the video format screen by the Fit function.

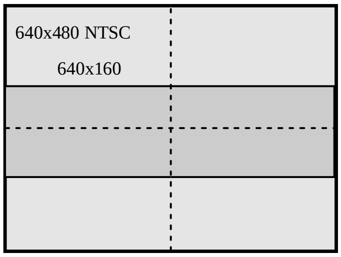
Press the FIT button on the keypad once.

MENU
ZOOM
PARTITION
DISPLAY RATE
SCROLL
STORE
FIT
PUSH ENTER

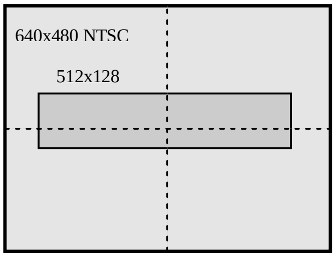

640x480 NTSC
512x128

The displayed image size has changed so that the recorded image area has been maximized within the video monitor screen.


MENU
ZOOM
PARTITION
DISPLAY RATE
SCROLL
STORE
FIT
PUSH ENTER


640x480 NTSC
640x160

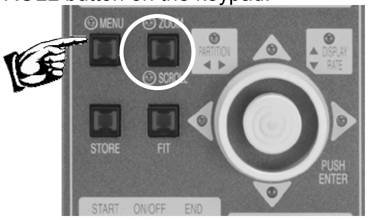
Give another press on the FIT button to revert to the original size of the recorded image.


640x480 NTSC
512x128

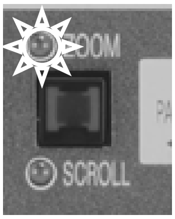
4.4.2. Zooming Playback Image Frame

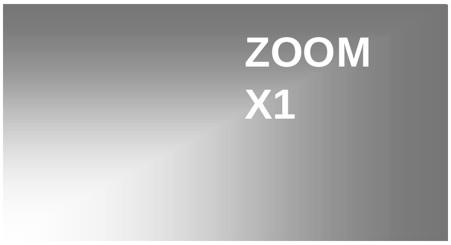
The 512's Zoom function magnifies the original recorded image at steps of x1, x2, x4 and x8 to display on the video screen. The following describes how to zoom the recorded image.

1. Press the ZOOM/SCROLL button on the keypad.

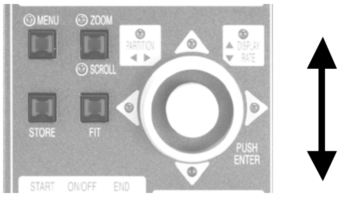

MENU
ZOOM
SCROLL
PARTITION
DISPLAY RATE
STORE
FIT
PUSH ENTER
START ON/OFF END

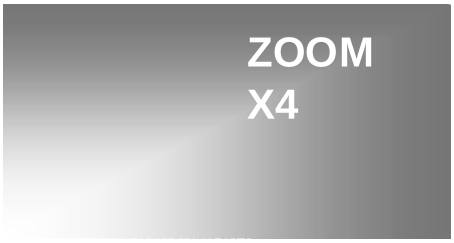
2. The ZOOM indication LED lights up. At the same time, the indication of ZOOM and the current magnification appear on the video monitor screen.


ZOOM
SCROLL



3. Move the joystick up or down to attain a desired magnification, x1, x2, x4 or x8. The image is zoomed with its center retained in the center of the video display.

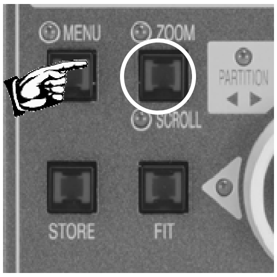

MENU
ZOOM
SCROLL
PARTITION
DISPLAY RATE
STORE
FIT
PUSH ENTER
START ON/OFF END



4.4.3. Scrolling Playback Image Frame

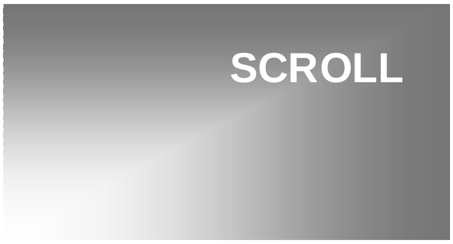
The 512's Scroll function moves a magnified, oversized image over the video monitor screen to display any portion of the bigger-than-the-screen image.

1. Press the ZOOM/SCROLL button on the keypad. This button switches the mode between ZOOM and SCROLL. Press it twice if necessary. Make sure the SCROLL indication LED lights up.



2. An indication of SCROLL has appeared on the video screen.

ZOOM
SCROLL



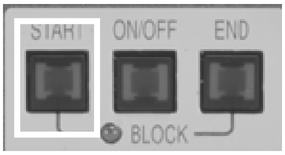
3. Move the joystick up or down, left or right to scroll the magnified image until your interested portion comes up in the screen. When the entire image is already displayed in the screen, the image does not scroll.

4.5. Block Playback (Playback of Clips of Interesting Scenes)

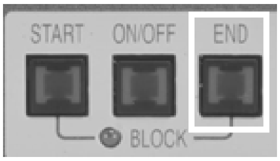
Playing a high-speed recording footage is time-consuming. For example, a footage recorded at 2,000 FPS for one second takes 66 seconds to play back at 30 FPS: it takes over one minute to see a strip of recorded 2,000 frames from end to end. In many cases, however, the frames of real interest to you are only a few or several tens of the entire footage.
The 512's Block Play function lets you see only a portion of special interest to you out of the entire recorded frames. All you have to do is pick first and last frames of a clip you want to play.

The following describes how to use this function.

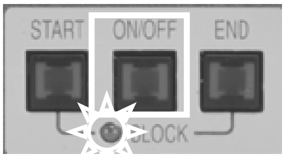
1. Press the LIVE/MEMORY button on the keypad to turn the system into the MEMORY (Playback) mode.
2. Press the PLAY button to play the footage in the usual manner.
3. Press the START button on the keypad at a frame that you wish to make the first frame of a clip.



4. Press the END button on the keypad at a frame that you wish to make the last frame of a clip. Now the clip of your interested frames has been defined.
5.



6. Press the BLOCK ON/OFF button on the keypad and make sure the LED has lighted up. Now the system is in the Block Play mode.

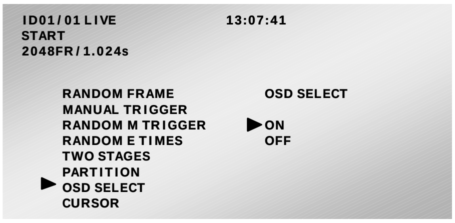


7. Now the system plays back the defined clip only. Start playing the clip in the Block Play mode as many times as necessary. You can use all playback buttons - FR, REV, PLAY, FF, PAUSE and STOP.
8. When you are done, press the BLOCK ON/OFF button to exit the Block Play mode. The clip setting is cancelled.

4.6. Text Display – Hide / Unhide

The text display on the screen can be hidden or unhidden as necessary. Here is how to handle it.

1. Press the MENU button on the keypad to display the menu list.
2. Move the joystick up or down, left or right, to select the OSD SELECT menu.
3. The OSD SLELCT menu is displayed as shown below.



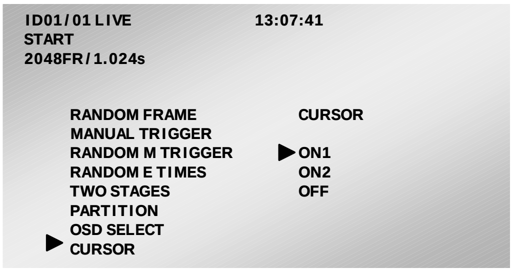
```
ID01/01 LIVE                 13:07:41
START
2048FR/1.024s

     RANDOM FRAME                 OSD SELECT
     MANUAL TRIGGER
     RANDOM M TRIGGER           ► ON
     RANDOM E TIMES               OFF
     TWO STAGES
     PARTITION
   ► OSD SELECT
     CURSOR
```

4. Move the joystick again up or down, left or right, to select the OFF indication.
5. Press the joystick down to set the selection.
6. Make sure the text display has been hidden.
7. Press the MENU button on the keypad to exit the menu.
8. To have the text displayed on the screen again, select ON in step 4 above.

4.7. Displaying Crosshair Cursor

The 512 has a crosshair cursor display function. This function is useful to pinpoint certain points of interest within the image displayed on the video screen at recording and playback. The following shows how to use the crosshair function.

1. Press the MENU button on the keypad to display the menu list.
2. Move the joystick to select the [CURSOR] menu.
3. Now the CURSOR menu is displayed on the screen as shown below.

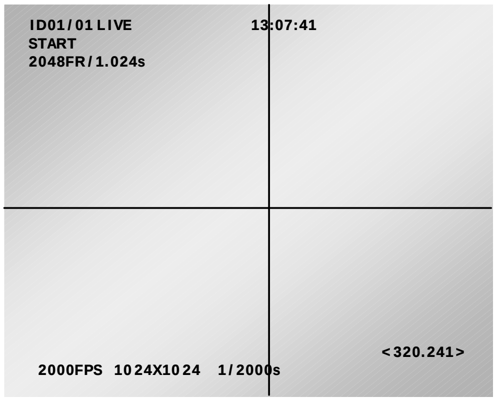


ID01/01 LIVE 13:07:41
START
2048FR/1.024s

RANDOM FRAME
MANUAL TRIGGER
RANDOM M TRIGGER
RANDOM E TIMES
TWO STAGES
PARTITION
OSD SELECT
▶ CURSOR

CURSOR
▶ ON1
ON2
OFF

4. Two types of cursor lines are available – White (ON 1) and Black (ON 2) to choose from depending on the brightness of the image.
5. Move the joystick up or down to select ON 1, ON 2 or OFF. Press the joystick down to set the selection.
6. Press the MENU button to exit the menu.
7. If you have selected ON 1 or ON 2 in step 5 above, you will see a crosshair displayed in the video screen and the corresponding coordinates of the cross are shown in the lower right corner of the screen.
8. Move the joystick up or down and left or right to steer the crosshair over the screen.



ID01/01 LIVE 13:07:41
START
2048FR/1.024s

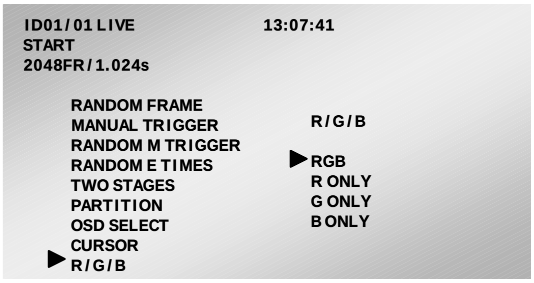
<320.241>
2000FPS 1024X1024 1/2000s

9. When you are done and you no longer need the crosshair cursor, repeat steps 1 to 6 selecting OFF in step 5 to make the cursor disappear.

4.8. Displaying RGB Planes (Color Model Only)

The 512's R/G/B Display function lets you have image of R, G or B channel, or RGB combined (color) image displayed on the screen. The following describes how to make a selection.

1. Press the MENU button on the keypad to display the menu list.
2. Move the joystick to select the R/G/B menu.
3. The R/G/B menu is now displayed on the screen.



```
ID01/01 LIVE                 13:07:41
START
2048FR/1.024s

        RANDOM FRAME
        MANUAL TRIGGER            R/G/B
        RANDOM M TRIGGER
        RANDOM E TIMES          ▶ RGB
        TWO STAGES                R ONLY
        PARTITION                 G ONLY
        OSD SELECT                B ONLY
        CURSOR
      ▶ R/G/B
```

4. Move the joystick up or down to select one of R, G, B or RGB. Press the joystick down to set the selection.
5. Press the MENU button to exit the menu.

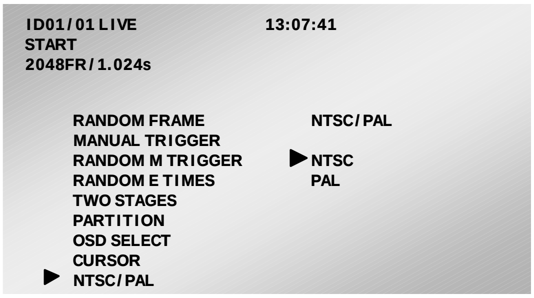
4.9. Switching NTSC / PAL Video Output

The 512 has a function that lets you switch the video display format between NTSC and PAL to display images on the video screen.

Caution: You must have appropriate NTSC and PAL video monitors properly connected in the system to change the video format from NTSC to PAL, or other way around, using this function. When you are currently operating in an NTSC setup, for example, and if you inadvertently switch from NTSC to PAL without an appropriate PAL video monitor connected in the system, you will not only lose image display on the current NTSC video monitor, but also you will lose the ability to revert to NTSC operation by simple keypad operation. In such a case, you must reset the whole system from the PC control software.

The following describes how to switch the video format between NTSC and PAL.

1. Press the MENU button on the keypad to display the menu list.
2. Move the joystick to select the NTSC/PAL menu.
3. The NTSC/PAL menu is now displayed on the video monitor screen.



ID01/01 LIVE 13:07:41
START
2048FR/1.024s

RANDOM FRAME
MANUAL TRIGGER
RANDOM M TRIGGER
RANDOM E TIMES
TWO STAGES
PARTITION
OSD SELECT
CURSOR
▶ NTSC/PAL

NTSC/PAL
▶ NTSC
PAL

4. Move the joystick up or down to select the NTSC or PAL menu. Press the joystick down to set the selection.
5. Press the MENU button to exit the menu.
6. Turn the 512 system off, and then turn the system on again.
7. Make sure that the video format has been changed on the relevant monitor screen.

4.10. Automatic Playback

The 512 has a function that makes the system automatically change from the LIVE mode to MEMORY mode as soon as a recording is done. The trigger frame of the recorded images is displayed on the monitor screen and the system is just ready to play back. This feature is useful when you wish to view the recorded images right after recording an event.

The following describes how to use this feature.

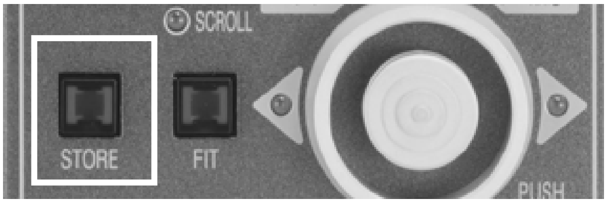
1. Press the MENU button on the keypad to display the menu list.
2. Move the joystick to select the AUTO PLAY menu.
3. The AUTO PLAY menu is displayed on the screen.
4. Move the joystick again to select ON or OFF. Press the joystick down to set the selection.
5. Press the MENU button to exit the menu.
6. Perform a test recording and make sure if the system automatically turns into the MEMORY mode when a recording finishes.

4.11. Playback Event Markers

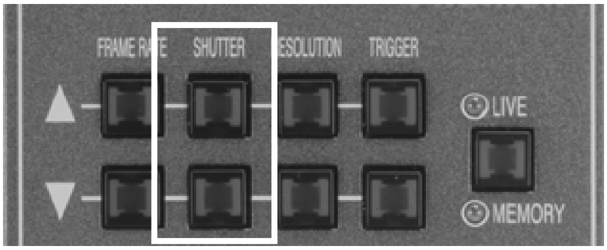
The 512 has a function to set event markers, on the fly, to any frame of interest during playback. Up to ten event marks can be set within each partitioned recording. Once event markers are set, you can jump to any of the marked frames in subsequent playbacks.

The following shows how to set event markers.

1. Press the LIVE/MEMORY button on the keypad to turn the system into the MEMOEY mode.
2. Play a recorded footage in the usual manner.
3. When an interesting frame is being displayed on the screen, press the STORE button on the keypad.



4. Repeat steps 2 and 3 as necessary and until ten event marks have been set.
   Note: If the number of event marks exceeds ten, the eleventh and subsequent marks overwrite previous marks starting from the first mark.
5. Press the SHUTTER △ or ▽ button on the keypad to jump to previous or subsequent marked frames.



6. When a marked frame is being displayed on the screen, a text of [MARKER FRAME x] is shown, x being a number 1 to 10 representing the serial number of each marked frame within the currently played recording.

Note: If you try to set more than ten marker frames, the eleventh frame and thereafter will overwrite the first frame and thereafter in the order they have been set.

Chapter 5 Connecting 512 to a PC

5.1. Connecting 512 to a PC
5.2. Connecting Multiple 512s to a PC
5.3. Connecting Mixed Models of FASTACM Cameras to a PC

5.1. Connecting 512 to a PC

The 512 has connectivity with PC by a digital interface and can be controlled by special control software installed in the computer. This section discusses connecting the 512 to a PC using IEEE1394 interface.

For details of control software (PFV – Photron FASTCAM Viewer) operation, see the FASTCAM Control Software Operation Manual.

5.1.1. Connection to a PC

Physical connection between the 512 system and a PC requires an IEEE1394 connecting cable that is commercially available. The connector on the 512 side is a 6-pin type. The connector on the PC side may be 4-pin or 6-pin type depending on the particular PC model that you are going to use. Use a cable with an appropriate connector on each end.

The IEEE1394 interface in the 512 allows for plugging and unplugging while the system is active with power on, as is the case with other peripheral devices.

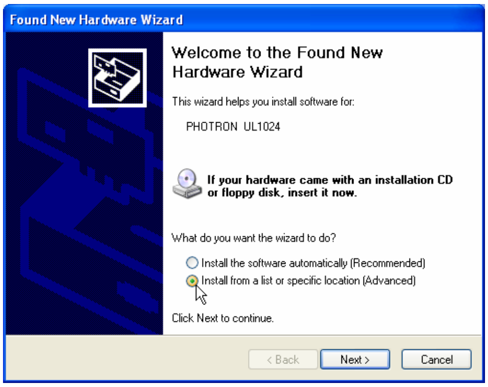
5.1.2. Installing Hardware Driver

Once physical connection between the 512 and PC is established, the PC must be set up to operate the software to control the 512 system via the IEEE1394 interface. This section describes how to set up the PC.

Follow the below procedure. The Windows XP Professional is used in the following example.

Note: Make sure that IEEE1394 interface is properly installed in the PC. If necessary, refer to the user's manual of each hardware.

After connecting between the 512 and PC with an IEEE1394 cable, turn the PC on to start up the OS. Login and the following screen is displayed. Click the Next button to proceed to the next screen.



Welcome to the Found New Hardware Wizard

This wizard helps you install software for:

PHOTRON UL1024

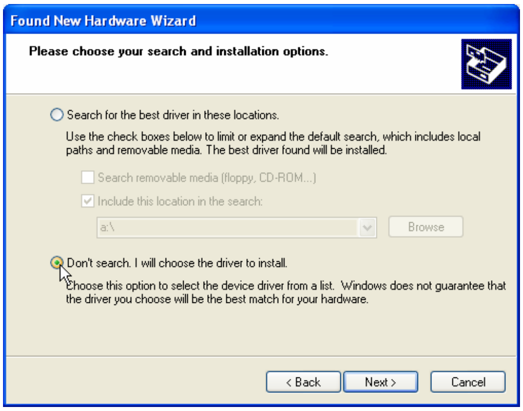
If your hardware came with an installation CD or floppy disk, insert it now.

What do you want the wizard to do?

○ Install the software automatically (Recommended)
● Install from a list or specific location (Advanced)

Click Next to continue.

Make sure that the camera name is recognized on the install screen.
Note: The name displayed here differs by the model of the camera being connected.
Check the "Select from list of drivers for this device" option in the driver detection check box.



Please choose your search and installation options.

○ Search for the best driver in these locations.

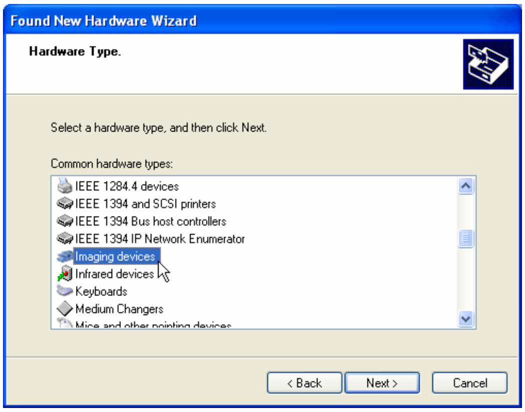
Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.

☐ Search removable media (floppy, CD-ROM...)
☑ Include this location in the search:
a:\

● Don't search. I will choose the driver to install.

Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.

3. Select a hardware type from the list. Select “Other devices” and click the Next button.

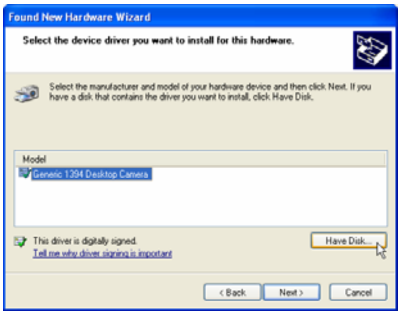

Found New Hardware Wizard
Hardware Type.

Select a hardware type, and then click Next.

Common hardware types:

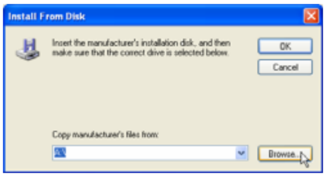
IEEE 1284.4 devices
IEEE 1394 and SCSI printers
IEEE 1394 Bus host controllers
IEEE 1394 IP Network Enumerator
Imaging devices
Infrared devices
Keyboards
Medium Changers
Mice and other pointing devices
< Back
Next >
Cancel

The device driver selection screen is displayed. Click “Use disk”. A file reference dialog box is displayed.


Found New Hardware Wizard
Select the device driver you want to install for this hardware.

Select the manufacturer and model of your hardware device and then click Next. If you have a disk that contains the driver you want to install, click Have Disk.

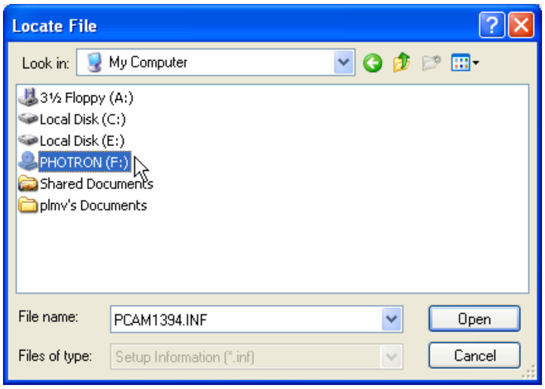
Model
Generic 1394 Desktop Camera
This driver is digitally signed.
Tell me why driver signing is important
Have Disk...
< Back
Next >
Cancel


Install From Disk

Insert the manufacturer's installation disk, and then make sure that the correct drive is selected below.

OK
Cancel
Copy manufacturer's files from:
Browse...

Insert the attached CD-ROM in the CD drive and pick the place.

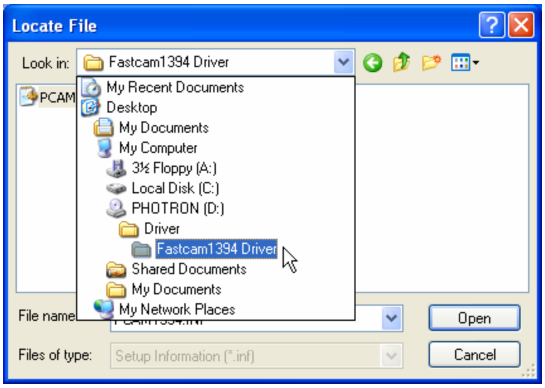

Locate File
Look in:
My Computer
3½ Floppy (A:)
Local Disk (C:)
Local Disk (E:)
PHOTRON (F:)
Shared Documents
plmv's Documents

File name: PCAM1394.INF

Files of type: Setup Information (*.inf)

Open
Cancel

The CD-ROM is laid out as shown below. Pick “Fastcam1394 Driver” under the Driver folder.

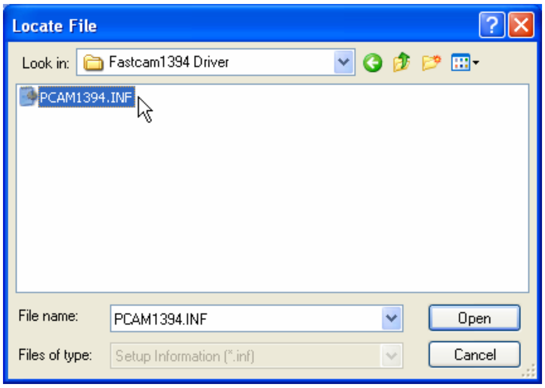

Locate File
Look in:
My Recent Documents
Desktop
My Documents
My Computer
3½ Floppy (A:)
Local Disk (C:)
PHOTRON (D:)
Driver
Fastcam1394 Driver
Shared Documents
My Documents
My Network Places
PCAM
Open
Cancel

Look in: Fastcam1394 Driver

File name:

Files of type: Setup Information (*.inf)

7. Select the [PCAM1394.INF] file and click the Open button.

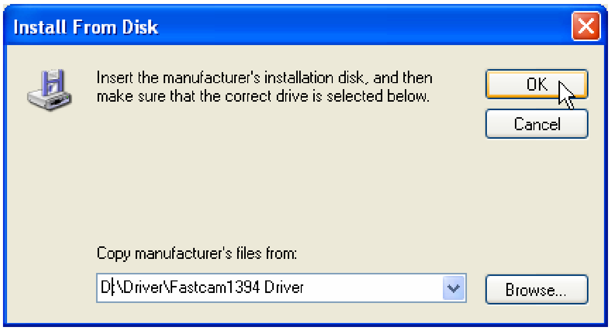

Locate File
PCAM1394.INF
Open
Cancel

Look in: Fastcam1394 Driver

File name: PCAM1394.INF

Files of type: Setup Information (*.inf)

8. After making sure the directory of file copy is correct, click the OK button.

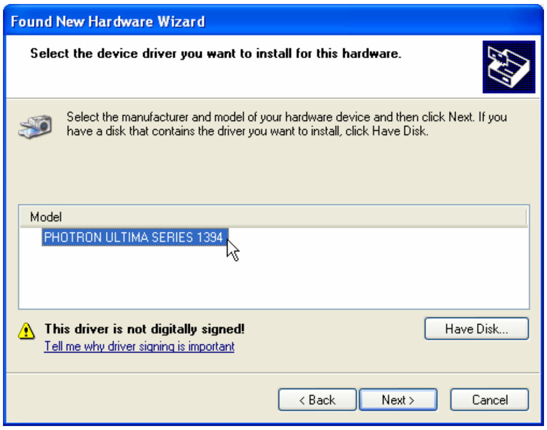

Install From Disk
OK
Cancel
Browse...

Insert the manufacturer's installation disk, and then make sure that the correct drive is selected below.

Copy manufacturer's files from:

D:\Driver\Fastcam1394 Driver

9. Select [PHOTRON FASTCAM-APX/512] on the model selection screen and click the Next button.


Found New Hardware Wizard
Model
Have Disk...
< Back
Next >
Cancel

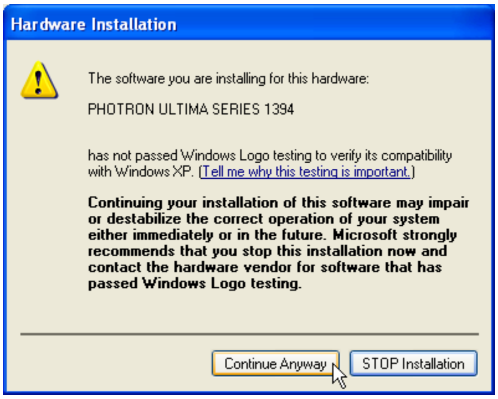
Select the device driver you want to install for this hardware.

Select the manufacturer and model of your hardware device and then click Next. If you have a disk that contains the driver you want to install, click Have Disk.

PHOTRON ULTIMA SERIES 1394

This driver is not digitally signed!
Tell me why driver signing is important

10. The following warning screen is displayed. Click YES and go ahead.


Hardware Installation
Continue Anyway
STOP Installation

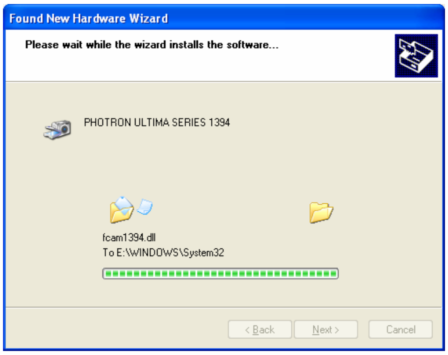
The software you are installing for this hardware:

PHOTRON ULTIMA SERIES 1394

has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.)

Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the hardware vendor for software that has passed Windows Logo testing.

11. The start installation screen is displayed. Click the Next button to go on.

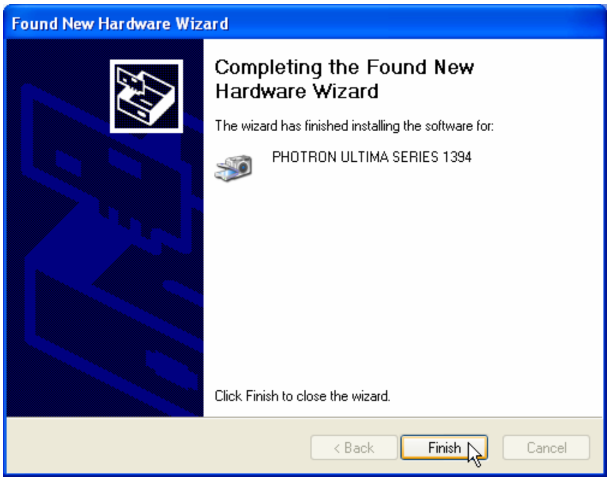

Found New Hardware Wizard
< Back
Next >
Cancel

Please wait while the wizard installs the software...

PHOTRON ULTIMA SERIES 1394

fcam1394.dll
To E:\WINDOWS\System32

12. After loading necessary files, the Installation Complete dialog box is displayed. Click the Completed button to finish installation.


Found New Hardware Wizard
< Back
Finish
Cancel

Completing the Found New Hardware Wizard

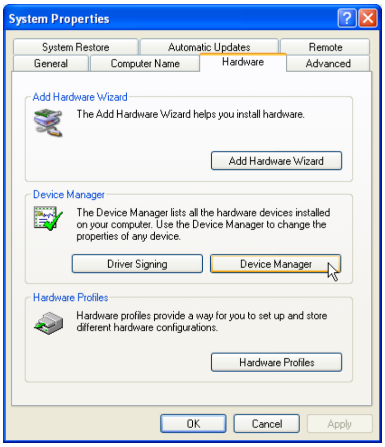
The wizard has finished installing the software for:

PHOTRON ULTIMA SERIES 1394

Click Finish to close the wizard.

13. Make sure that the driver has been correctly installed in the following manner:
Click Start -> Setup -> Control Panel -> then click the System icon, then pick the Hardware tag and click Device Manager button on it.

Look at the Device Manager to see if the 512 camera is correctly working as an imaging device.


System Properties
System Restore
Automatic Updates
Remote
General
Computer Name
Hardware
Advanced
Add Hardware Wizard
Device Manager
Driver Signing
Hardware Profiles
OK
Cancel
Apply

Add Hardware Wizard

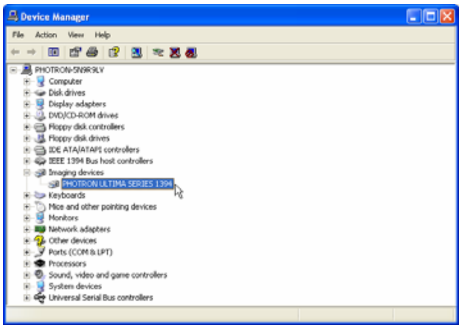
The Add Hardware Wizard helps you install hardware.

Device Manager

The Device Manager lists all the hardware devices installed on your computer. Use the Device Manager to change the properties of any device.

Hardware Profiles

Hardware profiles provide a way for you to set up and store different hardware configurations.


Device Manager
File
Action
View
Help
PHOTRON-5N9R9LV
Computer
Disk drives
Display adapters
DVD/CD-ROM drives
Floppy disk controllers
Floppy disk drives
IDE ATA/ATAPI controllers
IEEE 1394 Bus host controllers
Imaging devices
PHOTRON ULTIMA SERIES 1394
Keyboards
Mice and other pointing devices
Monitors
Network adapters
Other devices
Ports (COM & LPT)
Processors
Sound, video and game controllers
System devices
Universal Serial Bus controllers

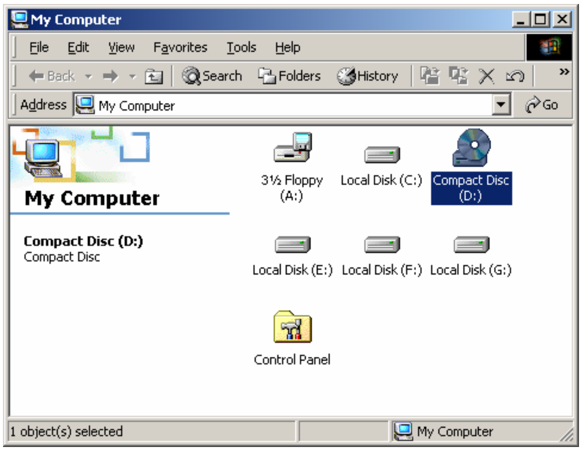
The above has completed hardware driver installation. Install software next.

5.1.3. Installing PFV Control Software

Once the hardware driver is installed, the PFV (Photron FASTCAM Viewer) Software must be installed in the PC to control the 512 camera system. This section describes how to install the software.

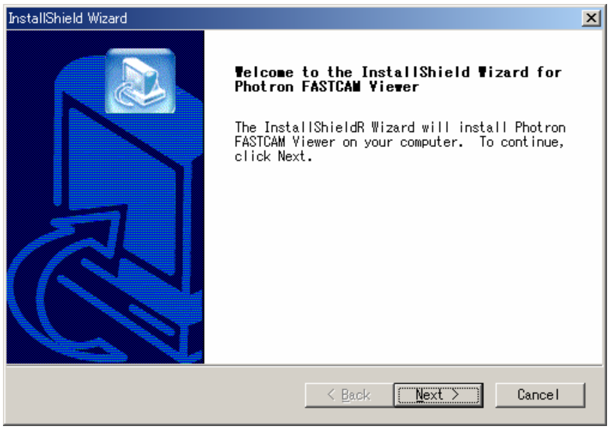
Follow the below procedure to install the software. The Windows 2000 Professional is used in the following example.

1. Insert the attached CD-ROM in the CD drive of the PC and go the My Computer screen.


My Computer
File
Edit
View
Favorites
Tools
Help
Back
Search
Folders
History
Address
My Computer
Go
My Computer
Compact Disc (D:)
Compact Disc
3½ Floppy (A:)
Local Disk (C:)
Compact Disc (D:)
Local Disk (E:)
Local Disk (F:)
Local Disk (G:)
Control Panel
1 object(s) selected
My Computer

2. Open the [PFV setup] folder in the CD-ROM and double-click [Setup.exe].

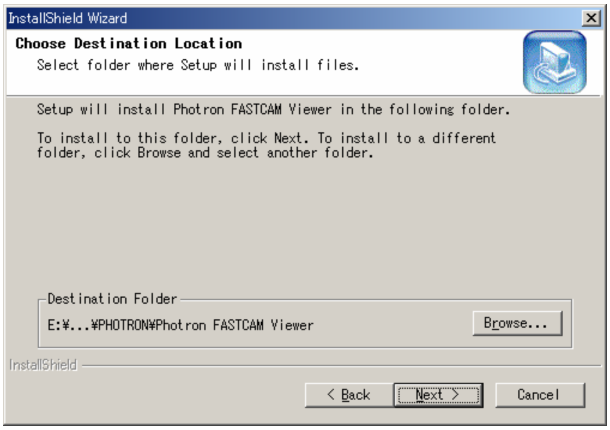
The setup program starts up and reads the installation programs. The following screen is displayed when reading is done. Click the Next button and go on.


InstallShield Wizard
< Back
Next >
Cancel

Welcome to the InstallShield Wizard for Photron FASTCAM Viewer

The InstallShieldR Wizard will install Photron FASTCAM Viewer on your computer. To continue, click Next.

3. A dialog box for directory selection appears.Click the Browse button, as necessary, to select a directory. When selection is done, click the Next button to go on.


InstallShield Wizard
InstallShield
< Back
Next >
Cancel
Browse...

Choose Destination Location

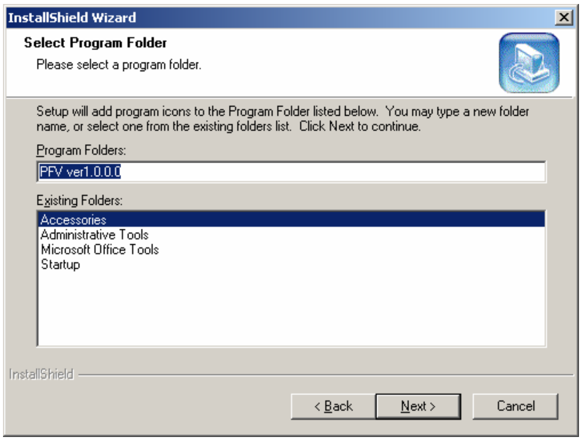
Select folder where Setup will install files.

Setup will install Photron FASTCAM Viewer in the following folder.

To install to this folder, click Next. To install to a different folder, click Browse and select another folder.

Destination Folder: E:¥...¥PHOTRON¥Photron FASTCAM Viewer

4. A dialog box for selecting folder to register the programs is displayed. Disregard it and click the Next button to go to the next screen.


InstallShield Wizard
InstallShield
< Back
Next >
Cancel

Select Program Folder

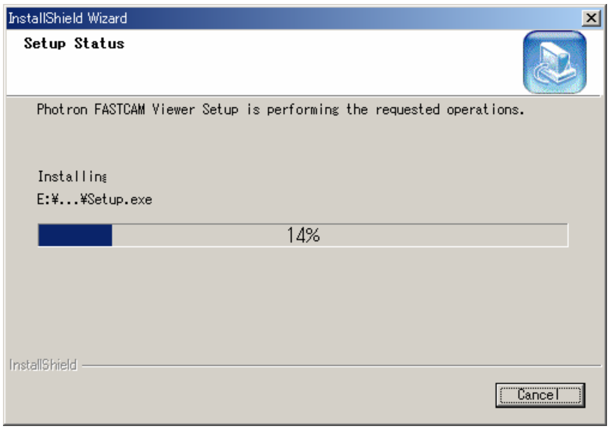
Please select a program folder.

Setup will add program icons to the Program Folder listed below. You may type a new folder name, or select one from the existing folders list. Click Next to continue.

Program Folders: PFV ver1.0.0.0

Existing Folders:
Accessories
Administrative Tools
Microsoft Office Tools
Startup

5. The setup program copies necessary files in the PC.



InstallShield Wizard

Setup Status

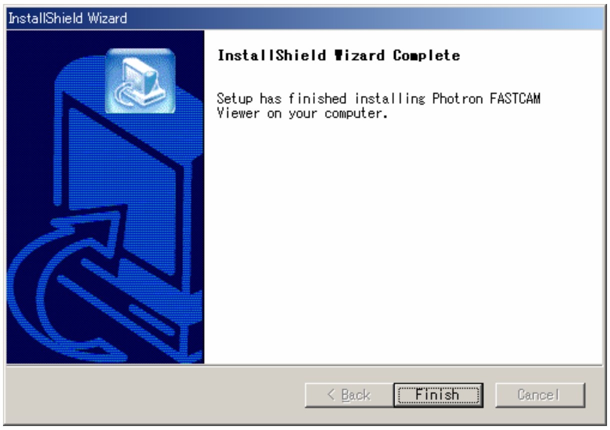
Photron FASTCAM Viewer Setup is performing the requested operations.

Installing

E:¥...¥Setup.exe

14%

6. When copying is done, the following dialog box is displayed. Click the Finish button to complete installation.



InstallShield Wizard

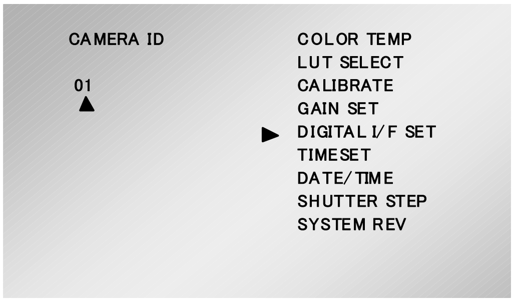
InstallShield Wizard Complete

Setup has finished installing Photron FASTCAM Viewer on your computer.

5.2. Connecting Multiple 512's to a PC

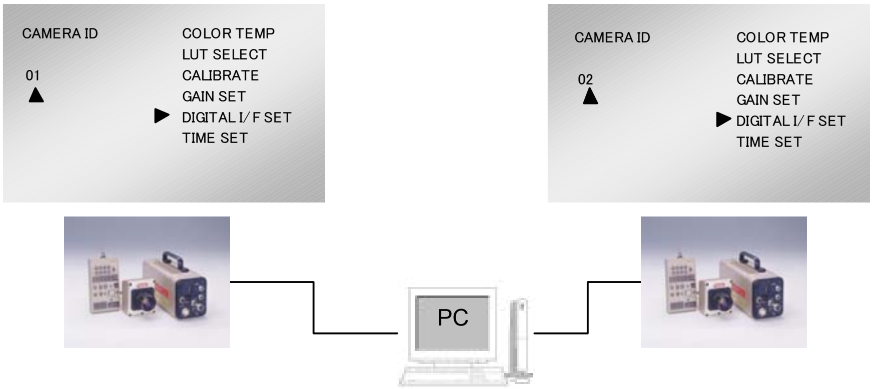
Multiple 512 cameras can be connected to a PC for integrated, synchronized control. When hook up cameras to a PC, be sure not to duplicate ID numbers: each camera must have a unique ID.

1. Press MENU button on the keypad to display the menu list.
2. Move the cursor to [DIGITAL I/F SET] and press the joystick down to set the selection.
3. The CAMERA ID menu is displayed as shown below.


CAMERA ID
01
▲
COLOR TEMP
LUT SELECT
CALIBRATE
GAIN SET
▶ DIGITAL I/F SET
TIMESET
DATE/TIME
SHUTTER STEP
SYSTEM REV

4. Move the joystick up or down to select an ID and press the joystick down to set the selection.
5. Press the MENU button to exit the menu list.
6. When the camera is connected to a PC, the above setting is reflected.

Example


CAMERA ID
01
▲
COLOR TEMP
LUT SELECT
CALIBRATE
GAIN SET
▶ DIGITAL I/F SET
TIME SET
CAMERA ID
02
▲
COLOR TEMP
LUT SELECT
CALIBRATE
GAIN SET
▶ DIGITAL I/F SET
TIME SET
PC

Note: For synchronized recording with multiple cameras, see Section 3.11.3. of this manual.

5.3. Connecting Mixed Models to a PC

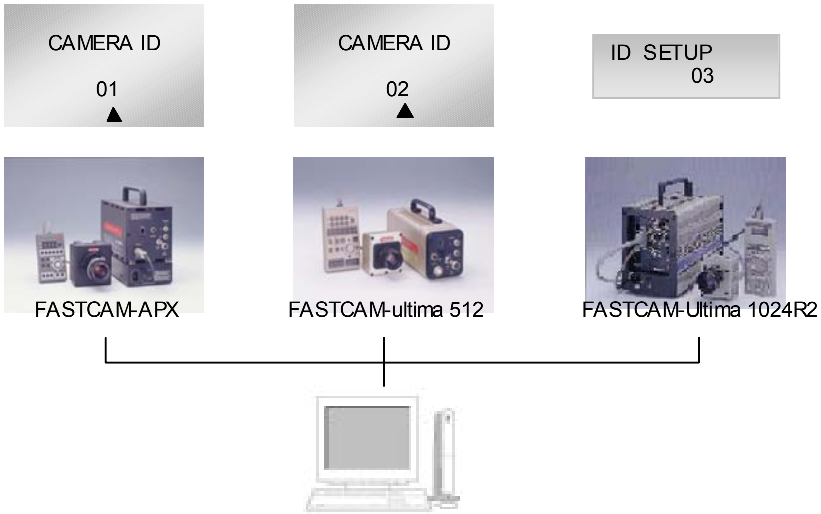
The 512 is capable of working in synchronization with other IEEE1394 compatible FASTCAM series cameras such as the APX and Ultima 1024R2 in a multiple camera system with mixed models under control from a PC. When connecting cameras to the PC, be sure the ID numbers do not duplicate: each camera must have a unique ID.

See the previous section for setting up camera ID on each of the cameras. For the Ultima 1024R2, refer to its user's manual.

Note: The Ultima 1024R2 has two IEEE1304 ports, one of which outputs +12 VDC (see the Ultima 1024R2 Manual for details). When you wish to use this port with DC voltage output, and if the PC's 1394 connector is a 6-pin type having a DC voltage output, be sure to kill the DC voltage from the PC to avoid short circuit.

Example

As described in the previous Section 5.2., Connecting Multiple 512's to a PC, set camera ID on each of the cameras as shown below (duplication of ID is prohibited). See the Ultima 1024R2 User's Manual for details of the 1024R2 setup.



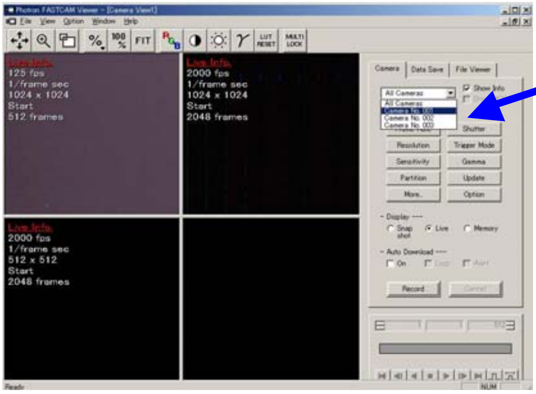
Setting Up Mixed Cameras

Because of the difference in the specifications of each model, each camera must be set up separately, one at a time.

For details of camera setup, see FASTCAM Control Software Operation Manual, Section 3.6. (Subsections 3.6.1. and 3.6.2.)

Setup Method 1

From the camera selection tab select the model name of a camera you have in the multi-camera system and set it up following the instruction in Section 3.6. (Page 67) of Control Software Operation Manual. The below figure shows the PFV (Photron FASTACM Viewer) operation screen.


Photron FASTCAM Viewer - [Camera View1]
File View Option Window Help
FIT
LUT RESET
MULTI LOCK
Camera
Data Save
File Viewer
All Cameras
Show Info
All Cameras
Camera No. 001
Camera No. 002
Camera No. 003
Shutter
Resolution
Trigger Mode
Sensitivity
Gamma
Partition
Update
More..
Option
Display
Snap shot
Live
Memory
Auto Download
On
Record
Cancel
Ready
NUM

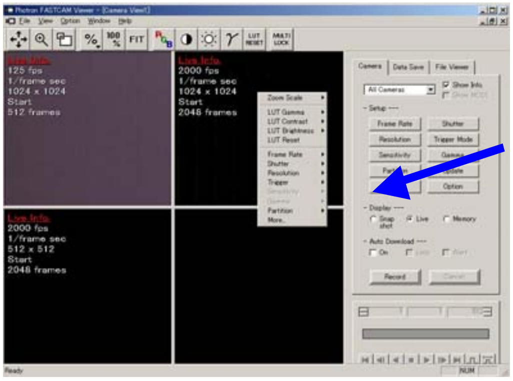
```
125 fps
1/frame sec
1024 x 1024
Start
512 frames
```

```
Live Info.
2000 fps
1/frame sec
1024 x 1024
Start
2048 frames
```

```
Live Info.
2000 fps
1/frame sec
512 x 512
Start
2048 frames
```

Setup Method 2

Right-click on the screen, with the mouse cursor on the LIVE image screen, to display the camera selection tab. You can set up the camera whose LIVE image is being displayed on the monitor screen. The below figure shows the PFV (Photron FASTACM Viewer) operation screen.


Photron FASTCAM Viewer - [Camera View1]
File View Option Window Help
FIT
LUT RESET
MULTI LOCK
Zoom Scale
LUT Gamma
LUT Contrast
LUT Brightness
LUT Reset
Frame Rate
Shutter
Resolution
Trigger
Partition
More..
Camera
Data Save
File Viewer
All Cameras
Show Info
Setup
Frame Rate
Shutter
Resolution
Trigger Mode
Sensitivity
Option
Display
Snap shot
Live
Memory
Auto Download
On
Record
Ready
NUM

```
125 fps
1/frame sec
1024 x 1024
Start
512 frames
```

```
Live Info.
2000 fps
1/frame sec
1024 x 1024
Start
2048 frames
```

```
Live Info.
2000 fps
1/frame sec
512 x 512
Start
2048 frames
```

Note: For synchronized recording with mixed, multiple cameras, see Section 3.11.5. of this manual

Chapter 6 Specifications

6.1. Specifications
6.2. Mechanical Data
6.3. How to Care Lenses

6.1. Specifications

6.1.1. Product Specifications

Imaging Sensor	C-MOS Imaging Sensor	
Sensor Resolution	512 x 512 Pixels	
Frame Rates	Up to 2,000 FPS, full resolution	
Lens Mount	C Mount; Hi-G Mount (optional) Changeable	
Recording Grayscale	Monochrome	10 bits
	Color	10 bits each on RGB (Bayer color filter array)
Shutter	Electronic Shutter	
Recording Media	IC Memory	
Memory Capacity	670MB Standard, 2GB Maximum	
Partitioned Recording	Partitioning of up to 64 sections	
Image Output Customization	Built-in Customizable LUT for Grayscale customization	
External Sync Input	5Vp-p, Pos/Neg Switchable; Synchronized with other systems sync	
External Sync Output	5Vp-p, Pos/Neg Switchable	
Trigger Signal Input	TTL, Contact	
Other Output Signals	Trigger, Exposure timing, In-Recording signals	
External Controls	Remote Keypad, RS422 External control interface	
Video Output Signal	RS170(NTSC/PAL), Real-time digital zoom function	
Digital Interface	IEEE1394 Interface (1 port)	

6.1.2. Miscellaneous

Operating Conditions	
Ambient Temperature	0 to 40 degrees Celsius (32 to 104 degrees Fahrenheit), No Condensation
Mechanical Data	
Camera Head	90(H) x 78(W) x 56(D) mm, 3.5(H) x 3.2(W) x 2.2(D) inches
Processor	109(H) x 90(W) x 235(D) mm, 4.3(H) x 3.5(W) x 9.3(D) inches
Remote Keypad	38(H) x 82(W) x 140(D) mm, 1.5(H) x 3.2(W) x 5.5(D) inches
Camera Cable	5 meters, 16 feet
Power	
AC Power	100 to 240 VAC 1.3 to 0.7 A, 50-60 Hz
DC Power	12 VDC, 3.5 A
Weight	
Camera Head	0.5 kg, 1.1 lbs. (without Camera Cable)
Processor	1.76 kg, 3.9 lbs. (without Cables or Carrying Handle)
Remote Keypad	0.8 kg, 1.8 lbs. (without Keypad Cable)

6.1.3. Accessories and Optional Items

Accessories	Quantity
C-mount adapter	1
Hex wrench for changing lens mounts	1
Lens mount cap	1
GENERAL IN cable	1
GENERAL OUT cable	1
Spare power connector (for custom cable)	1
Ferrite core for power cable	3
Driver/Application setup CD-ROM	1
FASTCAM-512 Hardware Manual	1
FASTCAM Control Software operation manual	1
Warranty registration card	1

Optional Items – User-set
IEEE1394 optical extension unit (OpticalLink TE/RE)
4ch MCDL Waveform data input box
4ch Trigger box
Hi-G Lens kit for 512 (Hi-G warranteed)
MCDL/RS422 cable

6.1.4. Frame Rates and Resolutions

Resolution	Framing Rate (FPS)									
	60	125	250	500	1000	2000	4000	8000	16000	32000
512×512	√	√	√	√	√	√				
512×256	√	√	√	√	√	√	√			
512×128	√	√	√	√	√	√	√	√		
512×64	√	√	√	√	√	√	√	√	√	
512×32	√	√	√	√	√	√	√	√	√	√
256×512	√	√	√	√	√	√				
256×256	√	√	√	√	√	√	√			
256×128	√	√	√	√	√	√	√	√		
256×64	√	√	√	√	√	√	√	√	√	
256×32	√	√	√	√	√	√	√	√	√	√
128×512	√	√	√	√	√	√				
128×256	√	√	√	√	√	√	√			
128×128	√	√	√	√	√	√	√	√		
128×64	√	√	√	√	√	√	√	√	√	
128×32	√	√	√	√	√	√	√	√	√	√
64×512	√	√	√	√	√	√				
64×256	√	√	√	√	√	√	√			
64×128	√	√	√	√	√	√	√	√		
64×64	√	√	√	√	√	√	√	√	√	
64×32	√	√	√	√	√	√	√	√	√	√

6.1.5. Number of Recorded Images vs. Resolution

-1 Model (670MB Memory)
-2 Model (2GB Memory)

Resolution (Pixels)	No. of Recorded Images -1 Model (670MB Memory)	No. of Recorded Imaged -2 Model (2GB Memory)
512×512	2,048	6,144
512×256	4,096	12,288
512×128	8,192	24,576
512×64	16,384	49,152
512×32	32,768	98,304
256×512	4,096	12,288
256×256	8,192	24,576
256×128	16,384	49,152
256×64	32,768	98,304
256×32	65,536	196,608
128×512	8,192	24,576
128×256	16,384	49,152
128×128	32,768	98,304
128×64	65,536	196,608
128×32	131,072	393,216
64×512	16,384	49,152
64×256	32,768	98,304
64×128	65,536	196,608
64×64	131,072	393,216
64×32	262,144	786,432

Record duration = Number of Images x (1/frame rate (FPS))

6.1.6. Shutter Speed

FINE Step Mode
COARSE Step Mode

Shutter Speed (Seconds)	FINE	COARSE
1/60	√	√
1/125	√	√
1/250	√	√
1/500	√	√
1/1000	√	√
1/2000	√	√
1/2500	√	
1/3000	√	
1/3500	√	
1/4000	√	√
1/4500	√	
1/5000	√	
1/5500	√	
1/6000	√	
1/6500	√	
1/7000	√	
1/7500	√	
1/8000	√	√
1/8500	√	
1/9000	√	
1/9500	√	
1/10000	√	
1/11000	√	
1/12000	√	
1/13000	√	
1/14000	√	
1/15000	√	
1/16000	√	√
1/17000	√	
1/18000	√	
1/19500	√	
1/21000	√	
1/22000	√	
1/23500	√	
1/25500	√	
1/27000	√	
1/29500	√	
1/32000	√	√
1/34000	√	
1/36500	√	
1/39000	√	
1/42000	√	
1/45500	√	
1/49500	√	
1/54500	√	
1/57500	√	
1/60500	√	
1/64000	√	√
1/68000	√	
1/72500	√	
1/77500	√	
1/83500	√	
1/90500	√	
1/99000	√	√
1/109000	√	
1/121000	√	√
1/136000	√	
1/155500	√	√
1/181500	√	√
1/217500	√	√
1/272000	√	√

6.1.7. RS422 Serial Control Commands

RS422 Communication Protocol

The 512 processor has a UART-type asynchronous system with its NRZ (Nonreturn-To-Zero) format comprising 8 data bits, 2 stop bits, non-parity. The baud rate is 4800.

Camera Setup Command

All camera parameters are set up by the camera setup commands. Each command works in the manner corresponding to the indication of the keypad button.

Camera Setup Commands	
FRAME RATE ↑	0x60
FRAME RATE ↓	0x61
RESORUTION ↑	0x62
RESORUTION ↓	0x63
SHUTTER ↑	0x64
SHUTTER ↓	0x65
TRIGGER ↑	0x66
TRIGGER ↓	0x67
LIVE/MEMO	0x68
PLAY＜＜	0x69
PLAY＜	0x6A
PLAY＞	0x6B
PLAY＞＞	0x6C
PLAY｜｜	0x6D
PLAY STOP	0x6E
BLOCK S	0x6F
BLOCK E	0x70
BLOCK ON/OFF	0x71
REC READY	0x72
REC	0x73
STORE	0x74
MENU ON/OFF	0x75
ENTER	0x76
ZOOM	0x77
FIT	0x78
CROSSHAIR KEY ↑	0x79
CROSSHAIR KEY ↓	0x7A
CROSSHAIR KEY ←	0x7B
CROSSHAIR KEY →	0x7C

Camera Information Requirement Command

Camera setup information can be obtained. Camera information corresponding to each command can be obtained.

Camera Information Requirement Commands	
FRAME RATE	0xA0
RESORUTION	0xA1
SHUTTER	0xA2
TRIGGER	0xA3
LIVE/MEMO	0xA4
ID	0xA5
RANDOM FRAME	0xB0
MANUAL TRIGGRE	0xB1
RAMNDOM M TRIGGER	0xB2
RANDOM E TIMES	0xB3
TWO STAGES	0xB4
OSD SELECT	0xB5
R/G/B	0xB6
EXT-SYNC IN	0xB7
EXT-SYNC OUT	0xB8
GENERAL IN	0xB9
GENERAL OUT	0xBA
COLOR TEMP	0xBB
LUT SELECT	0xBC
DS SHUTTER	0xBD
MCDL/IRIG	0xBE
AUTO PLAY	0xBF
DATE/TIME	0xC0
MAX ID	0xC1

Camera Information Response Commands

The 512 camera system returns the camera information to the requiring command. The returned information includes a camera information command indicating the kind of camera information followed by setup response command that shows the setup details. The setup response command has numeric meaning in it and has 8 bytes or 16 bytes (when the data bit portion only is converted) of information sent back in a row.

Note: A 16-byte transfer of data is available only when returning setup details on resolution information.

Example: Request frame rate information when the camera is set 2,000 FPS.

Send a camera information request command [0xA0].
An information command [0xd0] is returned by the camera.
Then, a setup response command consisting of 8 bytes of is returned in a row like [0x30], [0x30], [0x30], [0x30], [0x30], [0x30], [0x30], [0x30].

Camera Information Commands		Setup Response Commands (8 or 16bytes)
FRAME RATE	0xD0	00000060
		～
		00120000
RESORUTION	0xD1	00000128 00000016
		～
		00001024 00001024
SHUTTER	0xD2	00000060
		～
		00250000
TRIGGER	0xD3	00000000 : START
		00000001 : CENTER
		00000002 : END
		00000003 : MANUAL
		00000004 : RANDOM
		00000005 : RANDOM RESET
		00000006 : RANDOM CENTER
		00000007 : RANDOM MANUAL
		00000008 : TWO STAGES
LIVE/MEMO	0xD4	00000000 : LIVE
		00000001 : MEMO
		00000002 : READY
		00000003 : REC
		00000004 : ENDLESS
ID	0xD5	00000001
		～
		00000064

RANDOM FRAME	0xE0	00000001
		～
		0xxxxxxx
MANUAL TRIGGRE	0xE1	00000001
		～
		0xxxxxxx
RAMNDOM M TRIGGER	0xE2	00000001
		～
		0xxxxxxx
RANDOM E TIMES	0xE3	00000001
		～
		00000010
TWO STAGES	0xE4	00000002 : 1/2
		00000003 : 1/4
		00000004 : 1/8
OSD SELECT	0xE5	00000001 : ON
		00000002 : OFF
R/G/B	0xE6	00000001 : ALL
		00000002 : R
		00000003 : G
		00000004 : B
EXT-SYNC IN	0xE7	00000001 : OFF
		00000002 : ON POS CAM
		00000003 : ON NEG CAM
		00000004 : ON POS OTHERS
		00000005 : ON NEG OTHERS
EXT-SYNC OUT	0xE8	00000001 : VSYNC POS
		00000002 : VSYNC NEG
GENERAL IN	0xE9	00000001 : EVENT POS
		00000002 : EVENT NEG
		00000003 : TRIGGER POS
		00000004 : TRIGGER NEG
GENERAL OUT	0xEA	00000001 : EXPOSE POS
		00000002 : EXPOSE NEG
		00000003 : REC POS
		00000004 : REC NEG
		00000005 : TRIGGER POS
		00000006 : TRIGGER NEG
COLOR TEMP	0xEB	00000001 : 5100K
		00000002 : 3100K
		00000003 : USER１
		00000004 : USER2
LUT SELECT	0xEC	00000001 : D1

		00000002 : D2
		00000003 : D3
		00000004 : D4
		00000005 : D5
		00000006 : USER
DS SHUTTER	0xED	00000001 : OFF
		00000002 : ON MODE１
		00000003 : ON MODE2
		00000004 : ON MODE3
MCDL/IRIG	0xEE	00000001 : OFF
		00000002 : MCDL ON
		00000003 : IRIG ON
		00000004 : MCDL IRIG ON
AUTO PLAY	0xEF	00000001 : OFF
		00000002 : ON
DATE/TIME	0xF0	00000001 : DATE
		00000002 : TIME
TOTAL ID	0xF1	00000001
		～
		00000064

Digits of Setup Response Commands	
0	0x30
1	0x31
2	0x32
3	0x33
4	0x34
5	0x35
6	0x36
7	0x37
8	0x38
9	0x39

6.1.8. STATUS OUT

By turning the STATUS OUT on in the menu, you can set the camera in the status where it always outputs image data in the serial format. The camera statuses where serial output can be made are LIVE, MEMORY, READY, REC and ENDLESS. As soon as the camera's status turns into one of them, the camera begins serial output of image data.
With the above setting, you can know the camera status without the need to issue a camera status request command.

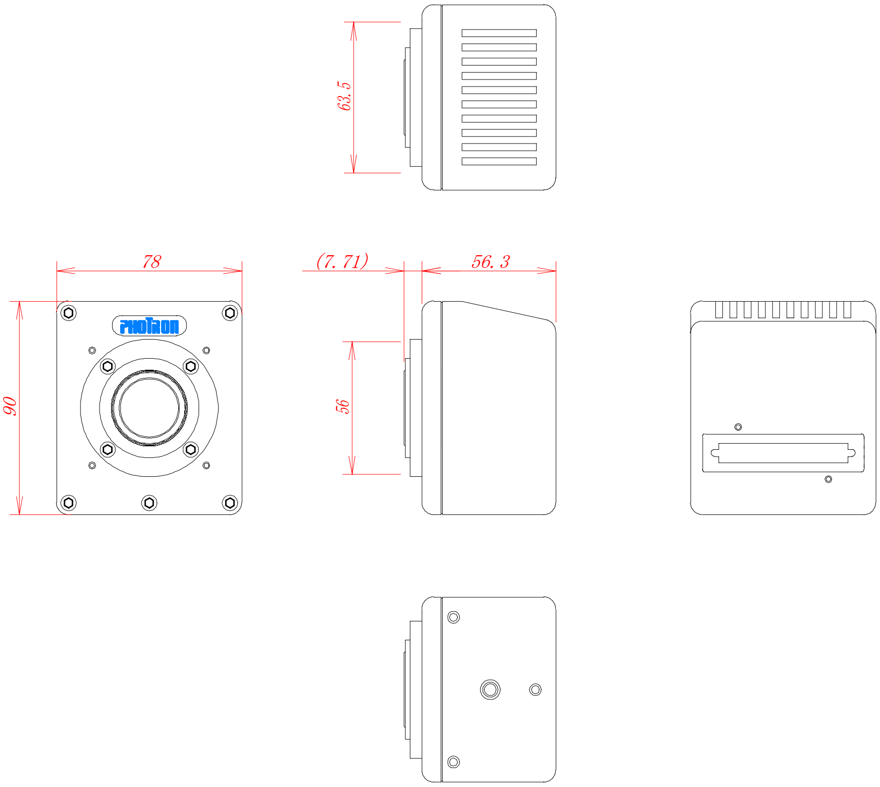
The serial commands for camera status are shown below:

LIVE	0x53, 0x30
MEMORY	0x53, 0x31
READY	0x53, 0x32
REC	0x54, 0x33
ENDLESS	0x53, 0x34

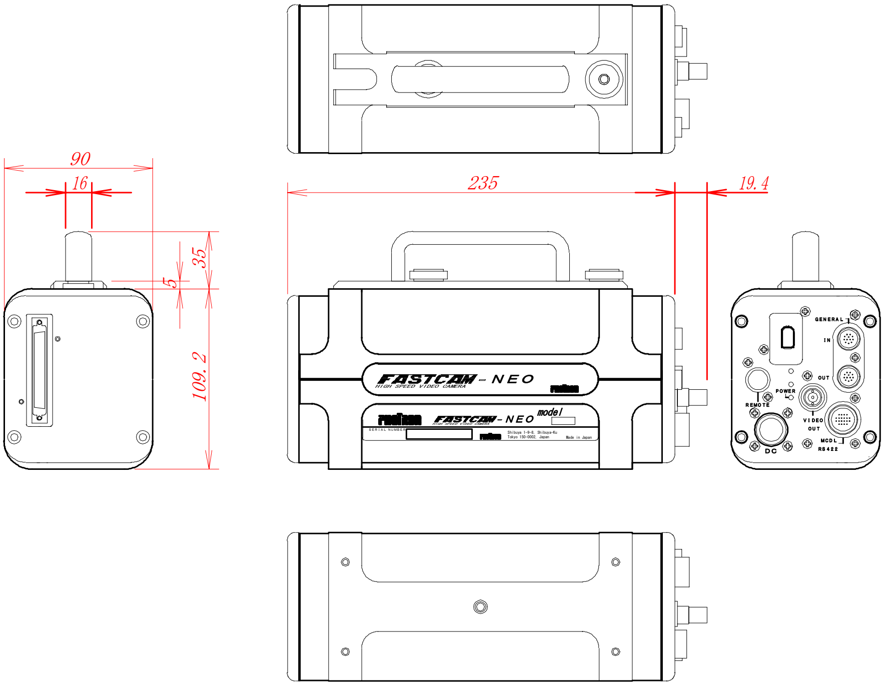
For example, the camera issues 0x53 and then 0x30 to change its status from MEMORY to LIVE.

6.2. Mechanical Data

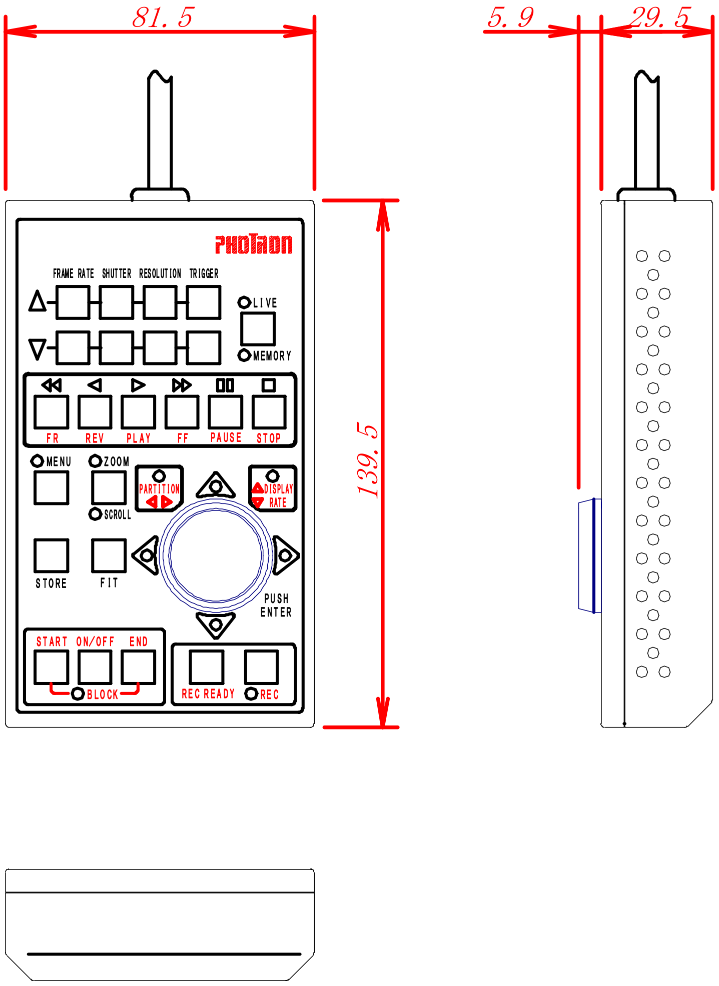
6.2.1. Camera Head (millimeters)


63.5
78
(7.71)
56.3
PHOTRON
90
56

6.2.2. Processor (millimeters)


90
16
235
19.4
35
5
109.2
FASTCAM-NEO
HIGH SPEED VIDEO CAMERA
model
GENERAL
IN
OUT
POWER
REMOTE
VIDEO
OUT
DC
MCDL
RS422

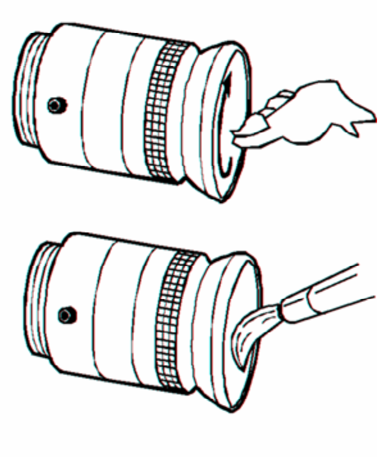
6.2.3. Keypad (millimeters)


81. 5
5. 9
29. 5
139. 5
PHOTRON
FRAME RATE
SHUTTER
RESOLUTION
TRIGGER
LIVE
MEMORY
FR
REV
PLAY
FF
PAUSE
STOP
MENU
ZOOM
SCROLL
PARTITION
DISPLAY
RATE
STORE
FIT
PUSH
ENTER
START
ON/OFF
END
BLOCK
REC READY
REC

6.3. Care of Lenses

The surface of photographic lenses has thin coatings that reduce unwanted reflections. Extra care must be taken to protect these fragile coatings.

Protect the lens by installing a lens cap when you are not using the camera. Brush the lens gently with a camel hairbrush 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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9520 Padgett Street, Suite 110
San Diego, CA 92126-4446, USA
Phone: 858-684-3555
Fax: 858-684-3558
E-mail: image@photron.com

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FASTCAM-ultima 512 User’s Manual
English Version
2015
Rev.1.2