User's Manual

FASTCAM ultima SE

FASTCAM ultima SE

MOTION ANALYSIS SYSTEMS DIVISION
PHOTRON LTD.

Notes

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Chapter 1 - Introduction

Introduction

Warranty

How to Use This Manual

Precautions

Notes

Introduction

The PHOTRON FASTCAM ultima SE is designed to be a valuable addition to the engineer's or scientist's problem solving instrumentation kit. The simple hand held keypad, extraordinary framing rates, and instant video playback make evaluating difficult motion related problems routine.

The live setup feature allows the user to be sure that the image is exactly what is required to solve the problem. There is no guesswork about exposure levels or image composition. What the user sees on the video monitor is what will be captured in memory when the Record key is pressed.

The information in this manual will teach you how to operate the PHOTRON FASTCAM ultima SE.

Warranty

NEW EQUIPMENT WARRANTY

PHOTRON FASTCAM ultima SE Series

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

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

1. Repair service: If shipped to PHOTRON at any of the addresses shown below, repairs will be made at no charge.

2. Parts replacement: Replacement parts installed under warranty will be provided at no charge.

THIS WARRANTY DOES NOT APPLY UNDER THE FOLLOWING CONDITIONS:

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

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

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

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

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

Return the equipment that needs warranty service to:

How To Use This Manual

DEFINITION OF TERMS

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

NOTE

A note contains information that we wish to emphasize regarding the operation of your FASTCAM ultima SE.

CAUTION

A caution is intended to warn you that a certain operation or condition may cause harm to your FASTCAM ultima SE.

WARNING

A warning is important to the safety of anyone operating the FASTCAM ultima SE and should not be disregarded under any circumstances.

CHAPTER ONE, INTRODUCTION

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

CHAPTER TWO, CONTROLS AND CONNECTORS

An introduction to the components of your FASTCAM ultima SE. Explains the use of each connector and control on the Processor and the Imager.

CHAPTER THREE, KEYPAD OPERATION

Explains the use of each of the buttons and indicators on the keypad and the RS232 command set.

CHAPTER FOUR, GETTING STARTED

Details how to connect and operate the FASTCAM ultima SE. The step by step instructions in CHAPER FOUR organize your first recording session, from component connection to playback.

CHAPTER FIVE, DOWNLOADING IMAGES

This chapter discusses downloading images to a host personal computer. Using the ReadCam utility software included with your FASTCAM ultima SE and the definition of the TIFF files created by the Processor.

CHAPTER SIX, RECORDING STRATEGIES

Provides a model for understanding how a solid state recorder works and also provides the background information for selecting an appropriate record mode.

CHAPTER SEVEN, ROUTINE CARE

Contains information about caring for lenses, cleaning the air filters and how to get in touch with your service engineer should you need assistance with your FASTCAM ultima SE. Product specifications are the last items included in this chapter.

Precautions

VENTILATION

Holes at the front and rear of the Processor are provided for proper ventilation. To protect from overheating, do not block or cover the holes and do not operate the Processor in a space that does not have proper ventilation.

TEMPERATURE

The PHOTRON FASTCAM ultima SE, is designed to operate satisfactorily in an environment where the ambient temperature is between 0 and 45 degrees Celsius (32 and 113 degrees Fahrenheit), and there is no water condensation present.

STORAGE

Do not store the equipment in an area where the temperature will drop below -20 degrees or exceed 70 degrees Celsius (-4 to 158 degrees Fahrenheit). Ensure that moisture does not condense on the system.

SHIPPING

When shipping, use the shipping carton in which the unit was originally deli-vered. If you must frequently ship your FASTCAM ultima SE, you may wish to purchase an accessory carrying case that has been designed for this purpose.

Do not ship the equipment to an area where the temperature will drop below 20 degrees or exceed 70 degrees Celsius (-4 to 158 degrees Fahrenheit). Ensure that moisture does not condense on the system.

Precautions

FEDERAL COMMUNICATIONS COMMISSION STATEMENTS

WARNING: This equipment generates, uses and can radiate radio frequency energy and if it is 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 "A" computing device pursuant to Subpart B 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 device may not cause harmful interference, and (2) this device must accept any interference received including interference that may cause undesired operation.

WARNING

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

CAUTION

To avoid the risk of fire, use only the fuse specified for the equipment. The proper fuse is listed on the back panel of the equipment. To avoid the risk of an explosion, do not operate this product in an explosive atmosphere.

Chapter 2 - Controls and Connectors

PHOTRON FASTCAM ultima SE
Imager
Processor Front Panel
Processor Rear Panel

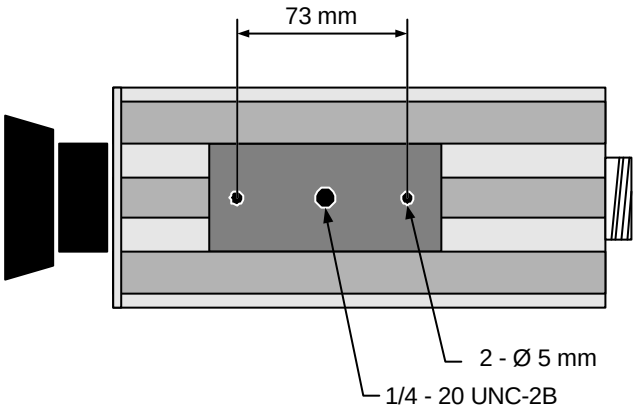
Notes

PHOTRON FASTCAM ultima SE

Imager

TRIPOD MOUNTING

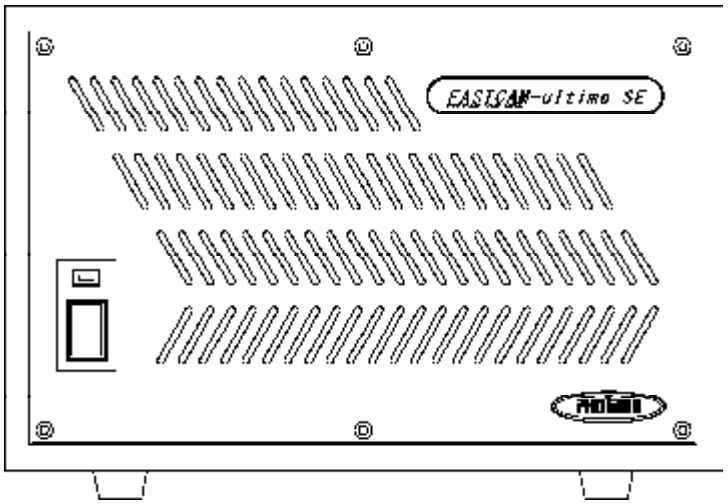
The tripod mounting hole is located near the center of balance of the Imager. There is a threaded hole, for a 1/4-20 screw, and two additional holes for a locating pin on the tripod.



IMAGER CABLE CONNECTOR

There is an Imager cable connector on the rear panel of the Imager.

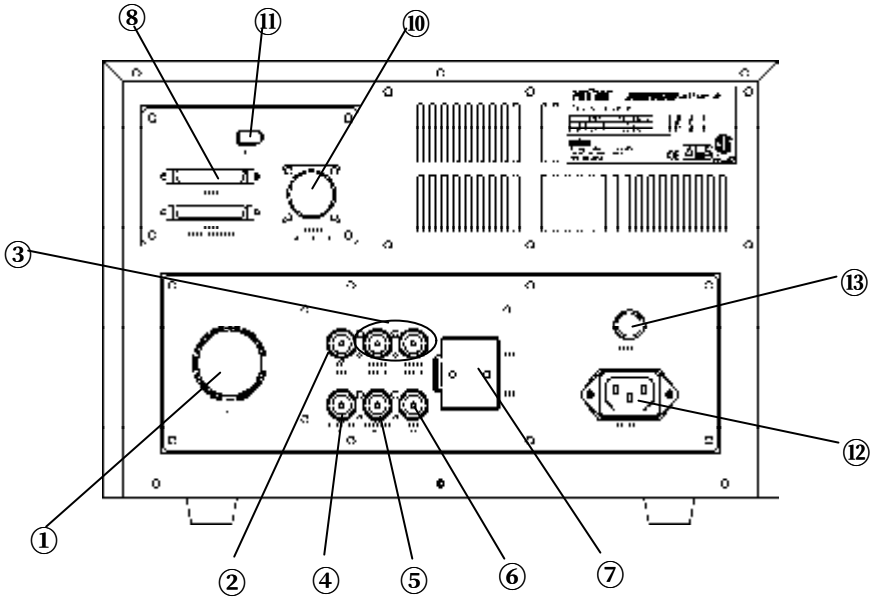
Processor Front Panel



FRONT PANEL

The processor front panel has the AC power switch and an air filter. The air filter should be changed periodically to prolong the life of your FASTCAM ultima SE. See chapter seven, page 7-2, for detailed instructions on how to change the air filter.

Processor Rear Panel

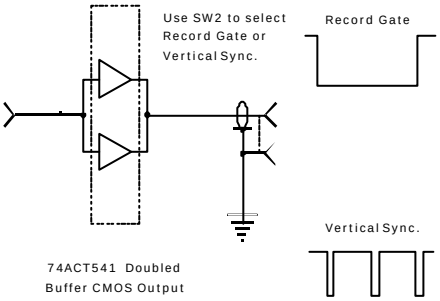


CN 1

The connector labeled CN 1 on the left side of the rear panel mates with the Imager cable.

EXT OUT

A BNC type connector configured by SW2 to output a record gate or a vertical synchronizing pulse. Vertical sync pulse polarity and pulse width are also configured by SW2. The Record Gate is low during the time that the Processor is recording. The output circuit is as follows, and must be terminated by 50 ohms to ground:



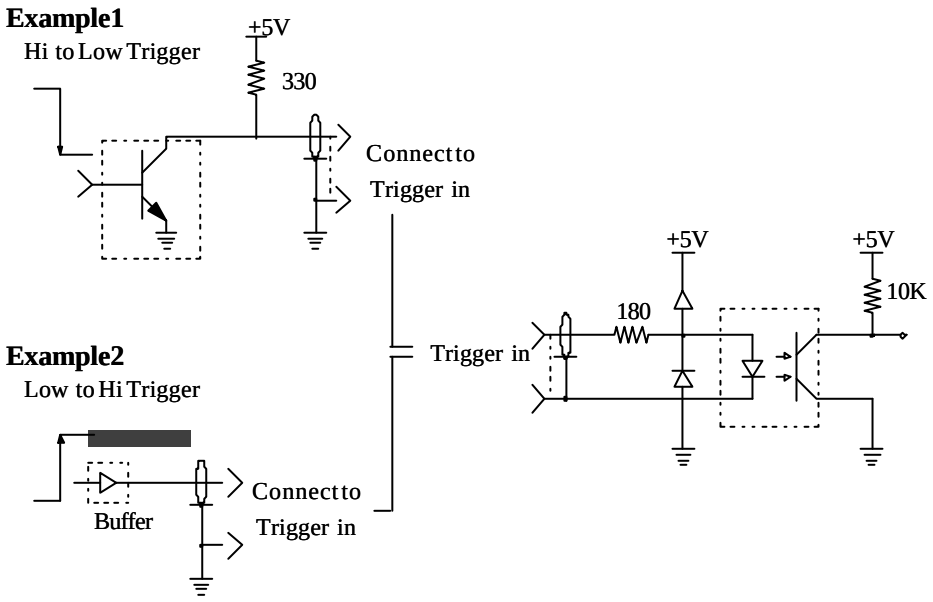
Processor Rear Panel

VIDEO OUT 1 AND VIDEO OUT 2

BNC type connectors that carry the video output signal from the FASTCAM ultima SE. Each output is designed to drive a 75 Ohm coaxial cable that can be connected to a video monitor, VCR or hard copy video printer.

TRIGGER IN

BNC-type connector, one of two trigger inputs. The input is connected to an opto-isolator requiring roughly 10 milliamps drive current from a 5 volt source. The Processor response to a trigger input is programmed by SW2. The Processor waits until the start of the next frame to trigger if SW2 is set to “trigger”. If SW2 is set to “reset & trigger” the Processor will start a new frame the instant the trigger is received and mark it as the trigger point. A simplified schematic for the input and a suggested driver are as follows:



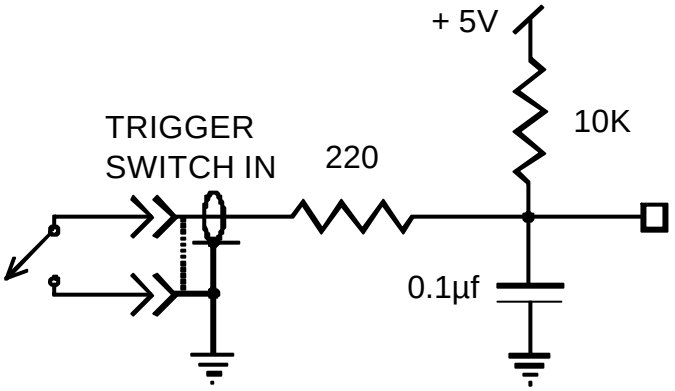
TRIGGER IN SCHEMATIC

Processor Rear Panel

TRIGGER SW IN

BNC type connector, one of two trigger inputs. This input requires a contact closure between the connector center conductor and shield in order to generate a trigger. The Processor response to a trigger input is programmed by SW2. The Processor waits until the start of the next frame to trigger if SW2 is set to "trigger". If SW2 is set to "reset & trigger" the Processor will start a new frame the instant the trigger is received, and mark it as the trigger point. A simplified schematic for the input is as follows:

TRIGGER SW IN CIRCUIT DIAGRAM



EXT IN

A BNC-type connector that accepts a synchronizing signal input from another FASTCAM ultima SE, allowing the user to synchronize two or more units. Use the menu's Sync Select function to enable this input, (See page 3- 14).

SYNCHRONIZING TWO OR MORE PROCESSORS TOGETHER

Connect the EXT OUT of one Processor to the EXT IN of the next Processor. The EXT OUT of the second Processor can then drive a third Processor, and so on. The EXT OUT must be set to V Sync with SW2. You may need to increase the V Sync pulse width as you increase cable length between Processors. Configure EXT IN to Reset & Trigger.

Processor Rear Panel

SW1 AND SW2

There are two DIP switches behind this panel. SW1 configures the processor's memory and the number of frames recorded in Random record mode. SW2 configures the external inputs and outputs. The switch positions not shown in the charts belows are factory presets and should remain undisturbed. User operated switch functions are as follows:

SW1

Function	1	2	3	4	5	6	7	8
512 Megabytes of memory							OFF	OFF
1024 Megabytes of memory							OFF	ON
1536 Megabytes of memory							ON	ON
Random Record 1 frmae	OFF	OFF	OFF					
Random Record 2 frmae	ON	OFF	OFF					
Random Record 3 frmae	OFF	ON	OFF					
Random Record 4 frmae	ON	ON	OFF					
Random Record 16 frmae	OFF	OFF	ON					
Random Record 64 frmae	ON	OFF	ON					
Random Record 128 frmae	OFF	ON	ON					
Random Record 256 frmae	ON	ON	ON					
Factory presets,DO NOT change						OFF		
KEYPAD TRIGGER(RECORD BUTTON)					OFF			
SOFTWARE TRIGGER(RS232 COMMAND FROM PC)					ON			
RS232C Baudrate 4800				OFF				
RS232C Baudrate 9600				ON				

CAUTION

DIP swithches should only be changed when the processor is off.

Processor Rear Panel

SW2

Function	1	2	3	4	5	6	7	8
EXT OUT Record Gate	OFF							
EXT OUT Vertical Sync	ON							
EXT OUT Negative		OFF						
EXT OUT Positive		ON						
EXT OUT V Sync width 1 μ sec			OFF	OFF				
EXT OUT V Sync width 5 μ sec			ON	OFF				
EXT OUT V Sync width 10 μ sec			OFF	ON				
EXT OUT V Sync width VBLK			ON	ON				
Trigger Inputs:Trigger					OFF			
Trigger Inputs:Reset & Trigger					ON			
SCSI ID 0						OFF	OFF	OFF
SCSI ID 1						ON	OFF	OFF
SCSI ID 2						OFF	ON	OFF
SCSI ID 3						ON	ON	OFF
SCSI ID 4						OFF	OFF	ON
SCSI ID 5						ON	OFF	ON
SCSI ID 6						OFF	ON	ON
SCSI ID 7						ON	ON	ON

VBLK

30～4,500FPS	17.95μ sec
9,000 fps	10.10μ sec
13,500FPS	14.10μ sec
18,000FPS	6.17μ sec
27,000FPS	8.17μ sec
40,500FPS	6.09μ sec

Processor Rear Panel

SCSI

This is the Small Computer System Interface (SCSI) input connector. This connector accepts SCSI protocol commands from a computer and provides a data path for digital video downloads. The connector type is a high density 50-pin female SCSI-2.

SCSI LOOP THROUGH

A SCSI connection to the next device on the SCSI bus, or if the Processor is the last device on the SCSI bus, an active termination plug should be inserted in this connector. The connector type is an active high density 50-pin female SCSI-2.

REMOTE CONTROLLER

This connection is used for the keypad that is shipped with the FASTCAM ultima SE, and also with the supplied RS-232 serial adapter that allows the user to remotely control the imager from a host PC using the RS-232 command set. (See page 3-16 for the command set)

AC IN CONNECTOR

Standard IEC/CEE plug connector. Please refer to the data label just below the connector for the correct voltage input and fuse ratings.

FUSE BOX

5A

Notes

CHAPTER 3 - KEYPAD OPERATION

Introduction

Live

Recording Rate

Recording Operation

Playback Controls

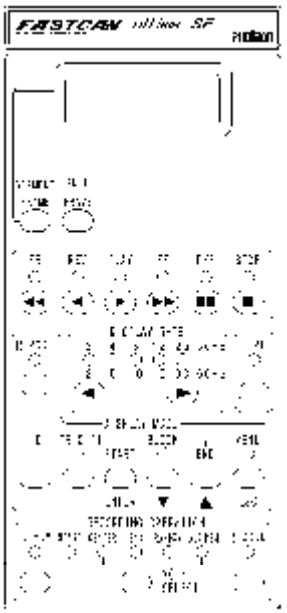
Display Rate

Display Mode

RS232 Protocol and Commands

Notes

Introduction



FULL FRAME BUTTON

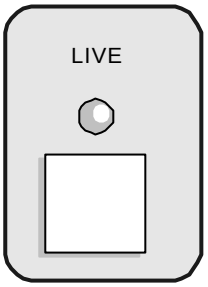
LIVE BUTTON

The keypad for the PHOTRON FASTCAM ultima SE is organized into six sections relating to the various tasks associated with capturing high speed events. We will discuss the use of every keypad function in this chapter. There are two possible approaches to explain keypad operation. The first method is a straight forward top to bottom explanation. We will use the second method of explanation that is structured by the way the keypad is used in a typical motion analysis session.

Some keypad buttons turn functions on or off. For example, press the Live button once to switch the processor to live mode and press it again to turn live mode off. Notice that the green LED above the Live button illuminates to indicate that the processor is in live mode.

The Full Frame button on the other hand selects one of several possible frame rates. Pressing the Full Frame button selects the next lower frame rate. One of the LEDs will illuminate to indicate the frame rate. When you reach a frame rate of 30 the next button press will wrap the frame rate back to 4500 and you can step down the range of frame rates again.

Live



Press the Live button to place the FASTCAM ultima SE in live mode. The LED above the button will illuminate to indicate that the processor is in live mode. Press the Live button again to take the processor out of live mode. The last image taken by the Imager will remain on the video monitor after live is turned off.

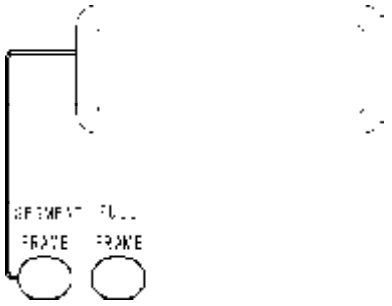
When the FASTCAM ultima SE is in live mode, pictures from the Imager are displayed on the video monitor so that you can adjust the imager lens, tripod, and the lighting for best results. The picture on the monitor is accurate as far as composition, focus and exposure are concerned. The images recorded by your FASTCAM ultima SE will be as they appear on the monitor in live mode.

NOTE

The Playback controls are disabled as long as the processor is in live mode. Verify that the Live LED is not illuminated before trying to use the Playback controls.

Recording Rate

To set the framing rate, use the Recording Rate section of the control keypad. In the Live mode, too, the camera operates at the selected framing rate.



At every press on the Full Frame button, the framing rate advances a step to the next lower rate, from 4500 fps down to 30 fps. After the framing rate has hit 30 fps, the next press on the Full Frame button brings the framing rate back to 4500 fps.
The selected framing rate is shown on the LCD display. Also, the LED below the selected rate lights on. For example, when the camera is framing at 4500 fps, the LED below [4500] lights on.

Regardless of the current framing rate setting, a press on the Segment Frame button will instantly turn the framing rate to 9000 fps. At every press on the Segment Frame button afterward, the framing rate advances a step to a higher number until it hits 40500 fps, the highest number. Then, the next press will bring the framing rate back to 9000 fps.

NOTE

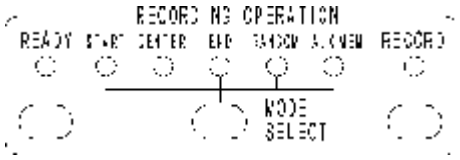
When the FASTCAM-ultima SE is powered on, it is set to the default framing rate of 4500 fps.

Shutter Speed

The shutter speed is a reciprocal of the framing rate, that is, the shutter speed is obtained by dividing 1 by the framing rate. For example, the shutter speed at 4500 fps framing rate is 1/4500 seconds (222 micro sec.) Because of the this fact, the lens iris must be widened as the framing rate is set to a higher number so that more light is let in onto the sensor within a shorter period of time.

Recording Operation

Use the Recording Operation section of the keypad to select a record mode and to start a recording.



Press the MODE SEL(mode select) button to step through the various record modes from left to right. The LED under the operative record mode will be illuminated.

AUX MEM

Aux Mem is a special record mode that is used to calibrate the FASTCAM ultima SE before making a recording of your event. The electronics, starting with the sensor in the Imager, may cause fixed pattern noise and shading errors in the pictures seen on the monitor. These unwanted artifacts can be corrected by the proper use of the Aux Mem record mode.

With the lens capped, an Aux Mem recording is made of the artifacts. The processor then inverts the recorded artifacts and sums the result with the output video canceling out the unwanted artifacts.

NOTE

The imager frame rate must be set to 4,500 fps when performing an Aux Mem recording.

Recording Operation

NOTE

An Aux Mem recording should be made under the following conditions:

(1) First Time The Imager Is Turned On.

(2) Switching Between 1.0 And 0.6 Gamma.

(3) Switching Between 0dB And 6dB Gain.

(4) When System Has Been On For An Extended Period Of Time.

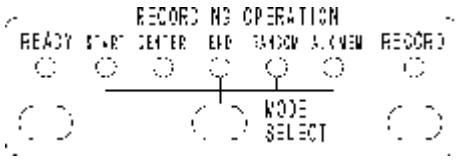
To correct for fixed pattern noise in the picture follow this procedure:

1. Use the Menu button on the keypad to check gamma and gain settings.
2. Verify that gamma is set to 1.
3. Verify that the gain is at the setting you will be using.
4. Set the record rate to 4500 fps.
5. Cover the front of the lens so that no light falls on the sensor. Use the Mode Sel button to select Aux Mem.
6. Press the Ready button.
7. Press the Record button, the FASTCAM ultima SE will record for less than a second.
8. Uncover the lens and the FASTCAM ultima SE is ready for normal operation.

NOTE

If your picture is noisy after performing an Aux Mem calibration make sure that you have the frame rate set to 4500 fps and then do the Aux Mem procedure again.

Recording Operation



START

Press the Mode Sel button as many times as needed to illuminate the Start LED. Press the Ready button and then the Record button to start a recording. The processor will record until every frame in memory has an image stored in it. The processor stops recording when the memory is full.

A trigger signal input through either the Trigger In or the Trigger SW In connector on the rear panel of the processor has the same effect as pressing the Record button. To make a Start mode recording using an external trigger signal, select the Start mode as above, press the Ready button and then supply a trigger signal input either to Trigger In or to Trigger SW In. Remember Trigger In requires a positive 10 ma TTL level signal to drive the opto-isolator or Trigger SW In requires a simple contact closure, with no voltage present, across its connector.

START MODE FRAME NUMBERING

Memory / Frames	First Frame	Trigger Point	Last Frame
512 megabytes / 8192	1	1	8,192
1 gigabyte / 16384	1	1	16,384
1.5 gigabytes / 24576	1	1	24,576

Recording Operation

CENTER

Press the Mode Sel button as many times as needed to illuminate the LED above Center. To begin recording first press the Ready button and then the Record button. The processor will record images until a trigger signal is received, either through Trigger In, Trigger SW In or by pressing the Record button.

The Center mode records an equal number of frames before and after the trigger signal input. A trigger signal causes the processor to mark the frame that was being recorded at the time the trigger was received as the trigger point. The processor records a number of frames equal to half the number of frames available in memory after the trigger point and then stops recording.

CENTER MODE FRAME NUMBERING

Memory / Frames	First Frame	Trigger Point	Last Frame
512 megabytes / 8192	-4,096	1	4,096
1 gigabyte / 16384	-8,192	1	8,192
1.5 gigabytes / 24576	-12,288	1	12,288

NOTE:

Allow Sufficient Time To Fill First Half Of Memory Before Trigger Is Received.

END

Press the Mode Sel button as many times as needed to illuminate the LED above End. To begin recording first press the Ready button and then the Record button. The processor will record images until you press the Record button again, or a trigger signal is received through Trigger In or Trigger SW In. The processor stops recording the instant the trigger signal is received. The video stored in memory will contain images covering events up to the time when the trigger signal was received.

END MODE FRAME NUMBERING

Memory / Frames	First Frame	Trigger Point	Last Frame
512 megabytes / 8192	-8,192	1	1
1 gigabyte / 16384	-16,383	1	1
1.5 gigabytes / 24576	-24,575	1	1

NOTE

Allow Sufficient Time To Fill Memory Before Trigger Is Received.

RANDOM

Press the Mode Sel button as many times as needed to illuminate the LED under Random. To begin recording first press the Ready button and then the Record button. The processor will record up to 256 pictures, each time the Record button is pressed, or when a trigger signal is received through the Trigger In or Trigger SW In connectors. The number of pictures recorded is set by the DIP switch, SW1, on the rear panel of the processor. See page 2.7 of this manual for SW1 settings.

Random mode frame numbering is the same as Start mode.

NOTE

If you wish to exit Random record mode before memory has been fully loaded press the Mode Sel button.

Playback Controls

Use the Playback Control section to view the recorded images in memory.

NOTE

When the FASTCAM ultima SE is in live mode the Playback controls are disabled by the processor. If the Live LED is illuminated press the Live button to exit live mode and enable the Playback controls.

▶PLAY

Press the Play button to playback the recording in memory starting with the frame currently displayed on the video monitor. Playback will begin at the rate selected within the Display Rate section of the keypad. If the processor is in Pause/Stop (P/S) mode, the image display will advance one frame each time you press the play button.

NOTE

Scrambled pictures in playback are caused by a Recording Rate mismatch. The recording rate indicated on the keypad must match the recording rate of the images in memory that you are trying to Play.

If you did not fill the video memory with your last recording, images from a previous recording can still be seen in playback.

◀REV

Press the Rev button to playback in the reverse direction, starting with the frame currently displayed on the video monitor. Playback will begin at the rate selected within the Display Rate section of the keypad. If the processor is in P/S mode, the image display will step backwards one frame each time you press the Rev button.

Playback Controls

▶▶FF

Fast forward advances the pictures on the monitor by a multiple of 10 or 100 frames at a time, depending on the menu setting. The rate of play is adjusted by the Display Rate buttons. A rate of two equates to twenty pictures per second and a rate of thirty equates to three hundred pictures per second. See page 3-14 for menu operation.

◀◀FR

Fast reverse moves the pictures on the monitor by a multiple of 10 or 100 frames at a time, depending on the menu setting, in the reverse direction. The rate of play is adjusted by the Display Rate buttons. A rate of two equates to twenty pictures per second and a rate of thirty equates to three hundred pictures per second.

▮▮P/S

Press the P/S (Pause/Stop) button to halt playback on the current frame. P/S works the same for all play modes; forward, reverse, normal speed and fast speeds. To resume video motion in the same direction and speed, press the P/S button a second time.

■STOP

Press the Stop button to halt at the current frame. You must push the appropriate playback button to resume viewing or searching.

Display Rate

The Display Rate controls the rate at which the recorded information is displayed on the video monitor.

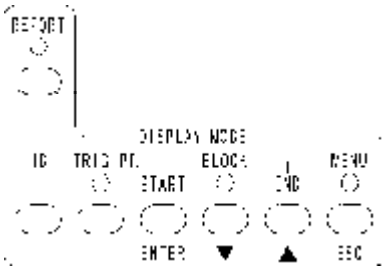
One of five possible playback speeds in use is indicated by the illuminated LED. Press the button under the 2 to decrease the display rate. Press the button under the 30 to increase the display rate.

In Play or Rev playback modes the numbers below the LEDs are in frames per second for NTSC imagers. The numbers above the LEDs are in frames per second for DAL imagers.

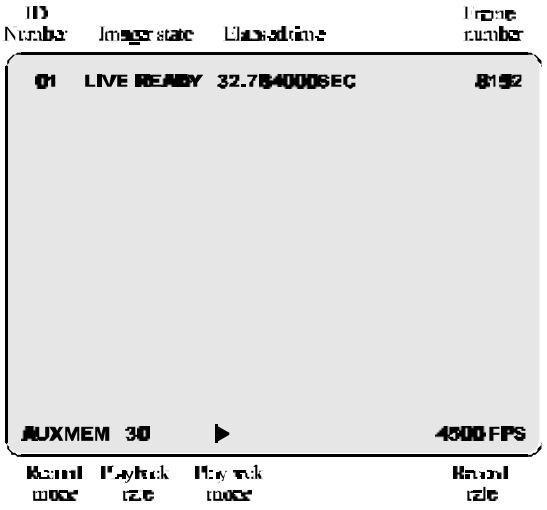
In FF and FR search modes the numbers below the LEDs are in frames per second multiplied by ten or 100 depending on the menu setting. The processor would be scanning through memory and displaying pictures at 50 pictures per second if the LED above the 5 were illuminated while the processor was in FF (fast forward).

Display Mode

REPORT



The Report function overlays the top and bottom of the image on the video monitor with text information. Press the Report button to toggle the display on or off. The information displayed is as follows:



Display Mode

ID

There is a number displayed within the Report text on the video monitor in the upper left corner of the image. The number showing on the monitor can be used to identify recordings as you download images to a VCR for archiving purposes. The ID number is recorded in memory with your pictures and is embedded in the TIFF Header when pictures are digitally downloaded. You must manually set the ID to the value you wish. Press the ID button to increment the ID number by one.

TRIG PT.

Press the TRIG PT button to jump the playback to the frame marked as the trigger point in memory. The processor goes immediately to the trigger point frame and enters Pause/Stop mode. To resume playback from the trigger point press the P/S button.

BLOCK

The BLOCK display mode plays back a section of a recording. Play through the segment of your recording that you wish to set up as a block playback. Press the Start button to mark a frame as the beginning of the block and press the End button to mark the end of the block you wish to view. After selecting a start and an end point, press the BLOCK button to enable Block mode. Press the play button to playback the section of the recording you have marked and then keep playing it repeatedly. The playback controls function normally within the boundaries of the block. You can press the BLOCK button to stop the playback repetition and move on to other sections of your recording. The letter B appears next to the playback mode icon on the video monitor to indicate block mode playback and the LED below block will be illuminated.

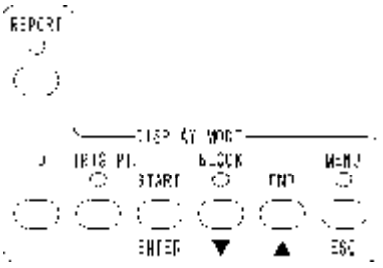
Display Mode

MENU

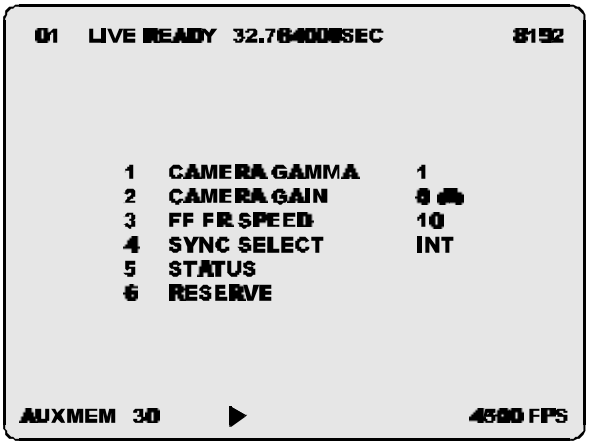
Press the Menu button and a list of operating parameters will appear on the video monitor as shown below:

NOTE

If the menu does not appear turn on the report data by pressing the Report button. The Report button controls all text overlay information.



When the menu appears, the number "**1**" next to camera gamma will be flashing. Move up or down the list by pressing the ▲▼ buttons. The flashing nmber indicates where you are in the list. If you wanted to change the sync selection for instance, use the ▲▼ buttons to move to number 4 on the list. The number four will start to flash. Press the ENTER button, and the word "INT" will start to flash. Use the ▲▼ buttons to change the selection to EXT. Press the ESC button to register the new selection. Press the ESC button again to exit the menu function.



Display Mode

1. GAMMA CORRECTION

A gamma value of 1.0 applies no black stretch to the video and a value of 0.6 applies black stretch to the video sufficient for most video monitors.

2. CAMERA GAIN

There are two settings for camera gain “0 dB” and “6 dB.” Setting the camera gain to “6 dB” increases the camera sensitivity one f-stop with a slight increase in video noise.

3. FF FR SPEED

Set the speed multiplier for fast forward and fast reverse play modes. The multiplier can be set to “10” or “100.” For example, if the display rate indicates 30 fps, with the multiplier set to “10,” the FF rate will be 300 fps

4. SYNC SELECT

Selects the frame synchronizing source to be internal “Int” or external “Ext.” When “Ext” is selected the processor uses the signal received via the EXT IN BNC connector to start each frame of the recording.

5. STATUS

Opens another page with information about the FASTCAM ultima SE DIP switch settings that includes; memory, Ext Out settings, Trigger, and SCSI ID number.

6. RESERVE

Has no function at this time.

RS232 Protocol and Commands

RS232 COMMUNICATIONS PROTOCOL

The Processor uses a full duplex UART type asynchronous system, with standard nonreturn-to-zero (NRZ) format (eight data bits, two stop bits and no parity). The baud rate is 4800. The command codes given below are ASCII. You may use a terminal emulation program (hyper terminal) to communicate the imager and control it from the PC keyboard.

RECORDING RATE

The Processor is sent a code to increase the record frame rate. The Processor then responds with a code that specifies its new frame rate. If you are at 4500 fps the next increase frame rate command will wrap back to 30 fps.

Command Code 61h

Function

Forces the Processor to full frame mode, and decreases the full frame record rate one step. The processor responds with the current full frame record rate.

Response

27h = 30 fps	2Ch = 750 fps
28h = 60 fps	2Dh = 1125 fps
29h = 125 fps	2Eh = 2250 fps
2Ah = 250 fps	20h = 4500 fps
2B h= 500 fps	

Command Code 62h

Function

Forces the Processor to segmented frame mode, and increases the segmented frame record rate one step. The processor responds with the segmented frame record rate. If you are at 40500 fps the next increase frame rate command will wrap back to 9000 fps.

Response

21h = 9000 fps
22h = 13500 fps
23h = 18000 fps
24h = 27000 fps
25h = 40500 fps

PLAYBACK COMMANDS

Send the Processor a code to specify a playback mode and the Processor responds with a code for that mode.

Command Code	Function	Response code
63h	Fast reverse	31h
64h	Reverse	32h
65h	Play	33h
66h	Fast forward	34h
67h	Pause / Stop on	35h
67h	Pause / Stop off	36h
68h	Stop	37h

PLAYBACK FRAME RATES

The code you send the Processor commands an increase or a decrease in playback frame rate. The Processor responds with a code indicating its current frame rate.

Command Code	Function
69h	Decreases the playback frame rate to the next lower value.
6Ah	Increases the playback frame rate to the next higher value.

Response

38h = 2 fps
39h = 5 fps
3Ah = 10 fps
3Bh = 15 fps
3Ch = 30 fps

DISPLAY MODE

These commands are for changing the appearance of the on screen data and controlling the block playback function.

Command Code	**Function**
6Bh	Toggles the block playback mode on and off.
	Response code
	3Eh = Block on, 3Fh = Block off
6Ch	Marks the start frame for block playback.
6Dh	Marks the end frame for block playback.

Command Code	**Function**
6Eh	Toggles the on-screen menu on and off.
	Response code
	42h = Menu on, 43h = Menu off

Command Code	**Function**
6Fh	Toggles the image data overlay on and off.
	Response code
	44h = Report on, 45h = Report off

Command Code	**Function**
70h	Jumps the playback to the trigger point, frame one.
	Response
	46h = Trig. Pt. on, 47h = Trig. Pt. off

Command Code	**Function**
71h	Toggles live mode on and off.
	Response code
	48h = Live on, 49h = Live off

RECORDING MODE SELECT

The Processor is sent a code to change the record mode. The Processor then responds with a code that specifies its new record mode.

Command Code	Function
72h	Steps through the various record modes. The Processor responds with the current record mode.

Response

4Ah = Start 4Ch = End
4Bh = Center 4Dh = Random
4Eh = Aux Mem

Command Code	Function
73h	Toggles Record mode on and off. The Processor responds with its current state.

Response

52h = Ready on, 53h = Ready off

Command Code	Function
74h	Toggles Record mode on and off. The Processor responds with its current state.

Response

52h = Record on, 53h = Record off

NOTE

SW1-5 must be set to ON, or the processor will not respond to the record command, 74h, entered through the serial port.

Command Code	Function
75h	Increments the session ID by one.

Notes

Chapter 4 - Getting Started

Connecting the System

Power On

Making Your First Recording

Summary

Notes

Connecting the System

INTRODUCTION

In this chapter you will learn how to connect your FASTCAM ultima SE components to a video monitor and VCR.

MOUNTING THE IMAGER

The tripod mounting hole is located near the center of balance of the Imager. There is a threaded hole, for a 1/4-20 screw, and two additional holes for a locating pin on the tripod. You should mount the Imager on the tripod before attaching a lens to the Imager.

ATTACHING THE LENS

The Imager is equipped with a C-mount lens adapter, screw the lens clockwise into the adapter until you are no longer able to turn the lens with light pressure. Do not over tighten the lens. Leave the lens cap in place for the moment.

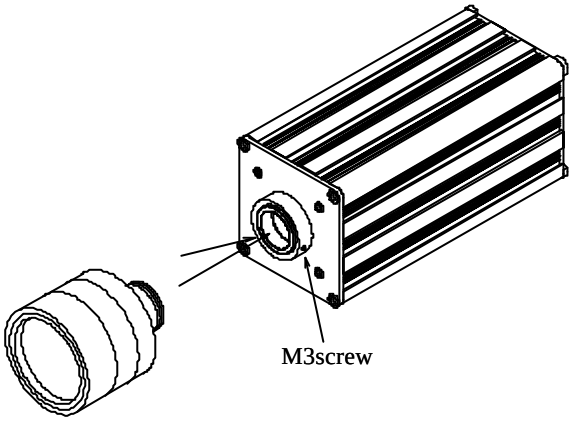
Adjustment of Flange Back

1)Fit the lens on the C-mount, and tighten the M3 screws (2 ea. of).

Be careful not to really fix the screws at this stage.

2)Set the lens focus to 'infinite' and try to find the point, as you adjust the lens focus, which will have an infinite object in focus.

3)If the object came in focus, tighten and fix the screws.



Connecting the System

CONNECTING THE PROCESSOR

CAUTION

Make sure that the AC power cord is not connected to the Processor while you are connecting the components of your FASTCAM ultima SE. Refer to the connection diagram on page 4-3 to assist you.

First, mate the imager cable to the Imager.

Connect the keypad cable to the remote controller connector on the rear of the Processor. The video output on the rear of the Processor should then be connected by a 75 Ohm coaxial cable to the video input on the back of your VCR. Wire the VCR's video out connector to your monitor's video input using another coaxial cable.

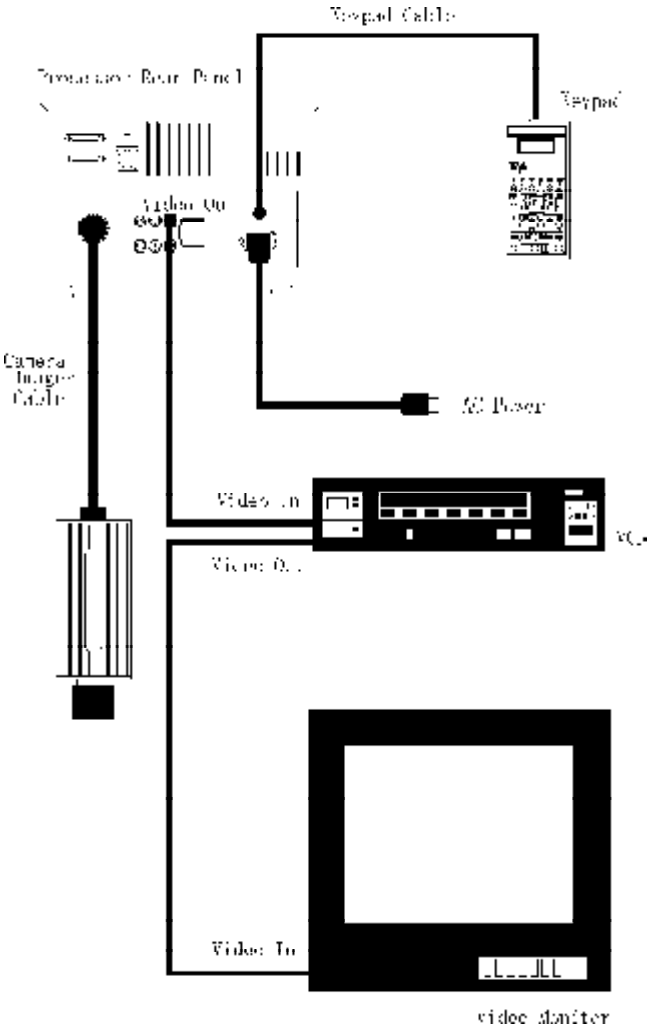
CONNECTING THE AC POWER

CAUTION

Check the voltage of the AC power source that you intend to use. Check that the Processor has been configured to operate at that voltage by reading the label on the rear of the Processor below the power connector. Check that the proper fuses are installed in the power connector assembly before attempting to connect this equipment to the AC mains.

Make sure that the power switch on the front panel of the Processor is turned off and then connect the AC power cord to the rear of the Processor.

Connecting the System



FASTCAM ULTIMA SE CONNECTION DIAGRAM

Power On

APPLYING POWER TO THE PROCESSOR

Turn the front panel power switch on. The Processor configures itself, when power is applied, to the following conditions:

1. Live - Off
2. Rec Rate - 4500
3. Rec Mode - START
4. ID No - 01
5. Report - On
6. Playback rate - 30 fps

The picture on the video monitor will appear as follows:

NOTE

You should always perform an Aux Mem recording before using the FASTCAM ultima SE. The electronics, starting with the sensor in the Imager, may cause fixed pattern noise and shading errors in the pictures seen on the monitor. These unwanted artifacts can be corrected by making an Aux Mem recording following the procedure on the next page.

Power On

MAKING AN AUX MEM RECORDING

A short automated procedure to optimize Imager performance is as follows:

1. Use the Menu button on the keypad to check gamma and gain settings.
2. Verify that gamma is set to 1.
3. Verify that the gain is at the setting you will be using.
4. Set the record rate to 4500 fps.
5. Cover the front of the lens so that no light falls on the sensor. Use the Mode Sel button to select Aux Mem.
6. Press the Ready button.
7. Press the Record button. The FASTCAM ultima SE will record for less than a second.
8. Uncover the lens and the FASTCAM ultima SE is ready for normal operation.

NOTE

If your picture is noisy after performing an Aux Mem calibration, make sure that you have the frame rate set to 4500 fps, and then make another Aux Mem recording.

You may need to repeat this Imager setup procedure if you change between 0 dB and 6 dB gain, the imager has been on for an extended period of time, changing between 1.0 and 0.6 gamma or if the Imager changes temperature significantly.

You must press the Live button on the keypad and uncap the lens to see a picture from the Imager. After you press the Live button, adjust the imager lens and the scene lighting to get a picture on the video monitor.

MAKING YOUR FIRST RECORDING

Point the Imager at something that you wish to record. Place the FASTCAM ultima SE in Live mode, and then select a frame rate using the Recording Rate section of the keypad. Adjust the lens and scene lighting until you are satisfied with the picture on the monitor. Use the Mode Sel button to select the Start record mode. Press the Ready button, and then press the Record button. The FASTCAM ultima SE will record until memory is full. Press the Live button to exit live mode and enable the playback controls. Press the Play button and your recording will playback on the monitor beginning with the first frame that wasrecorded.

Power On

SUMMARY

The following is a summary procedure for making a recording of an event you wish to study:

1. SelectLivemode.
2. Select a frame rate.
3. Adjust the imager lens and the lighting for the best picture on the monitor.
4. Choose a record mode: Start, Center, End or Random
5. PressReady
6. PressRecord
7. DeselectLivemode.
8. Use playback controls to review your recording.

Chapter 5 - Downloading Images

Moving Images to Your

Computer

Image Download Utility

TIFF Image File Structure

Notes

Moving Images to Your Computer

FASTCAM Series SCSI Download Utility (READCAM.EXE)

This software program is an assisting tool to be used when downloading the image data recorded in the processor memory via the SCSI interface after recording.

NOTE:

1. The operating systems that have been successfully tested to date are Windows95/98/Me/NT4.0/ 2000. READCAM.EXE requires Adaptec's ASPI manager installed in the system.

2. Execute image data transfer only after you have stored the recorded image.

*Windows 2000 has been tested with ASPI manager for NT4.0

Accessories

Item	Description	Q'ty
1	Floppy disk containing software set	1
2	SCSI cable with 50-pin high-density connectors (1 m)	1
3	SCSI terminator	1

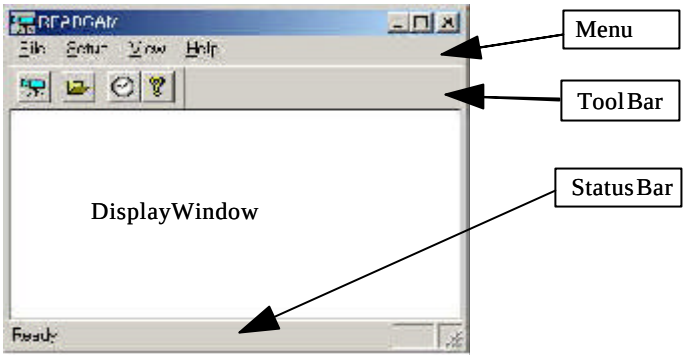
How to install

Set the floppy disk in floppy drive and double click "SETUP.EXE", and "READCAM.3.0 Setup" starts up. Follow the installation menu to install the software.

How to Use Camera Utility

1. Interface Window

The following window is displayed when READCAM program is started.



Menu: Commands are selected here.
Tool bar: Icon shortcuts appear here.

Readcamera

Set up folder

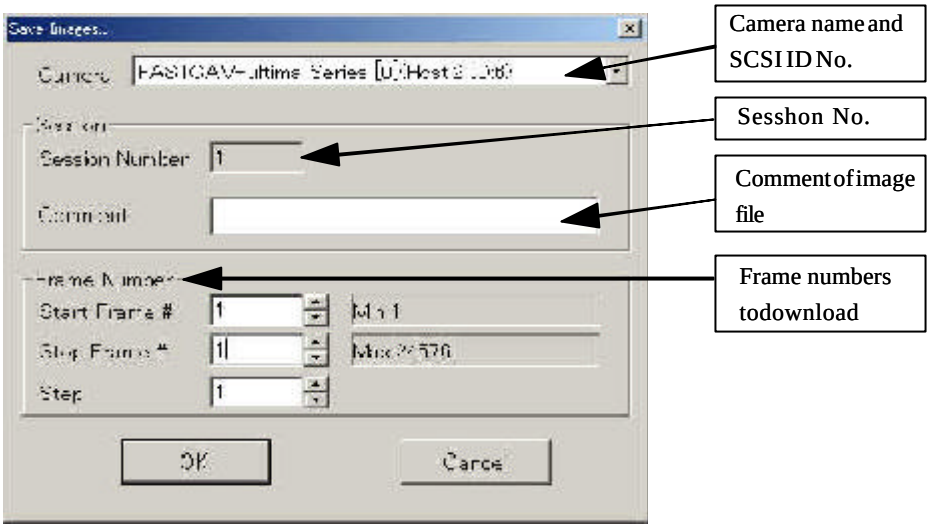
Display history

About READCAM

Display window: Displays the results.
Status bar: Explanation of commands is shown here.

2. File Menu: Read Camera

Reads image data from the camera and records it in output folder that has bee n preset.
The following dialog appears when this command starts up.



Camera: The current camera is shown. When multiple cameras are available, they are shown in the right hand side of the text box with a click on the down arrow. Click on the camera you like to use.

Session Number: Show the session number from 0 to 255 that has been set on the remote control pad. The session number input here is used as part of the folder name to record image data.

Framing Comment: Inputs a brief comment on events. This comment is recorded in the recording log file.

Start Frmae: Assigns the starting frame number. Frame one is marked when the trigger is received. Frame number before the trigger is a negative number. All the frames after the trigger are assigned a positive number, starting frame "1" being

the frame at the moment the trigger was received. Note there is no • gframe 0• h. The frame immediately before frame "1" is "-1".

Stop Frame: Assigns the ending frame. Click OK to record all the frames between the Start and Stop frames. OK Button begins download of specified frame. Cancel Button exits this window and returns you to the Interface window.

Step: Assigns the number of frames to skip to record. Recording takes place at every frame skipping the number of frames selected here. When the number is "1", no skipping is done, i.e., all the frames are recorded.

Note: When an output folder has not been set, the following dialog is displayed.

To set up an output folder, see the output folder setup section.

3. File Menu: Exit

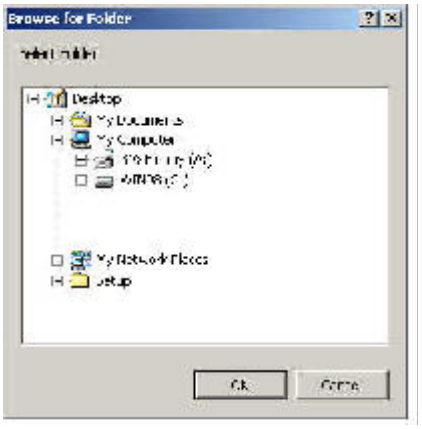
Exit: Ends and exits this Utility Program.

4. Setup Menu: Setfolder

Sets the folder and the format to record the image data. When this command is selected, the following dialog box appears:

Output folder:

Selects the folder in which to save the image data. Click the browse button to select tan existing folder. The image data is saved in a sub folder within the output folder, with its name containing the session number of the data being downloaded.



File Formats

BMP Format (Windows Bitmap)

The standard Windows format

TIFF Format (Tagged Image Format File)

A standard format mainly used in UNIX systems

JPEG Format (Joint Photographic Coding Experts Group)

A standard format of compressed images. Unreversible compression only supported in this software. Ten compression rates are available to choose from.

PNM Format (Portable Pixel/Gray Map)

A format mainly use in UNIX systems.
The data portion can be in binary or ASCII format.

AVI Format (Audio, Video, still Images)

A Windows standard format of motion images. Saves image data in either compressed or uncompressed form (to be selected at saving).

Note: In formats other than BMP and AVI, relevant application software may be needed for playing the images.

Serial-numbered File Name Format:

Selects the option of using the MovieRuler-based format (Photron• fs motion analysis software package) for output of folder and file names to save image data.

5. Setup Menu: History Setup

HistorySetup

Selects the directory of files to record the execution history of READCAM. Select the command and the following dialog will be displayed.

HistoryDisplay

Displays the content of execution history of READCAM. Select this command and the following dialog will be displayed.

6. Display Menu

Set Font: Selects the font to use in display window.
Tool Bar: Switches Show/Hide for tool bar display.
Status Bar: Switches Show/Hide for status bar display.

7. Destination Folder

For example, when a destination folder is set as [C:\DATA], a "subfolder that describes the session" is generated under the destination folder and the image data is saved in it.

The name of "subfolder that describes the session" is automatically generated under the following rule.

Sxxxyz.n

S	The name begins with a capital S.
xxx	The session number is shown by 3 decimal digits.
y	Indicates the file format (see the examples shown below).
z	A "C" indicates color image and a "M" indicates monochrome.
n	Where "n" is incremented by one, starting from "1" for the first folder to be saved, for folders with the same session number and same file format.

Examples of format indication:

S001WC.1	->BMP
S001TC.1	->TIFF
S001PC.1	->PNM
S001JC.1	->JPEG
S001AC.1	->AVI
S001RC.1	->RAW

8. File Names for Recorded Image Data

READCAM Standard Format

File names are automatically generated in the following format:

TYPEsdddddd.eee

TYPE

f	Used for RGB color saving, and for monochrome cameras.
gry	Used for transformation from color to greyscale.
r	Used for plane-by-plane saving of R channel image data.
g	Used for plane-by-plane saving of G channel image data.
b	Used for plane-by-plane saving of B channel image data.
s	A minus sign "-" is attached to negative frame numbers before the trigger. An underscore "_" is attached to positive frame numbers after the trigger.

dddddd A decimal number that indicates the frame number.

eee Fileextensions
BMP -> .bmp
TIFF -> .tif
PNM -> .ppm (color)/.pgm (monochrome)
JPEG -> .jpg
AVI -> .avi
RAW -> .raw

※ 保存できるタイプはカラー／モノクロ機種により変わります。(???????意味不明です。大里英夫)

MovieRuler-Compatible Format

When MoviewRuler-compatible format is selected, the following Saving Name entry is additionally displayed in the saving dialog. Enter the title of the saved image data.

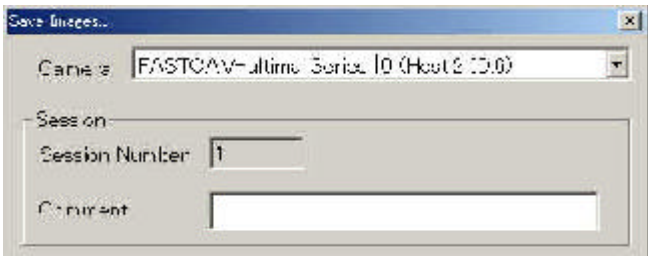


Image file names are generated in serial number format with six digits.

TITLE_TYPEdddddd.eee

TITLE The title entered in the image saving dialog is given here.

TYPE The type of the saved image data is shown here.
f Used for RGC color saving or for monochrome cameras.
gry Used for transformation from color to greyscale.

r Used for plane-by-plane saving of R channel image data.
g Used for plane-by-plane saving of G channel image data.
b Used for plane-by-plane saving of B channel image data.

dddddd A serial number with six digits begins with 000001 regardless of the frame number of the imagedata.
eee BMP -> .bmp
TIFF -> .tif
PNM -> .ppm (color)/.pgm (monochrome)
JPEG -> .jpg
AVI -> .avi
RAW -> .raw

9. Camera Information File

Image data files saved in MovieRuler-compatible format does not contain relevant data such as the frame count. The camera information file describes such missing information and generates files in the same folder.

File Name of Camera Information Files

TITLE_TYPE.cih

TITLE	The title entered in the image saving dialog is given here.
TYPE	The type of the saved image data is shown here.
f	Used for RGC color saving or for monochrome cameras.
gry	Used for transformation from color to greyscale.
r	Used for plane-by-plane saving of R channel image data file.
g	Used for plane-by-plane saving of G channel image data file.
b	Used for plane-by-plane saving of B channel image data file.

The Content of Camera Information Files

#CameraInformationHeader	Headercomment
CameraType:****	Cameramodelname
SessionNumber:****	Sessionnumber
RecordRate(fps):****	Framingrate(framespersecond)
ShutterSpeed(s):****	Shutterspeed(seconds)
TriggerMode:****	Triggermode
Total Frame : ****	Total number of frames (*1)
Start Frame : ****	Start frame (*2)
Save Step : ****	Skip interval (*3)
Color Bit : ****	Number of bits per pixel (color: 24, monochrome: 8)
File Format : ****	Extension indicating the file format

*1 The total number of frames saved
*2 The first frame of the saved data
*3 “1” indicates NO step saving.

Examples are given as follows:

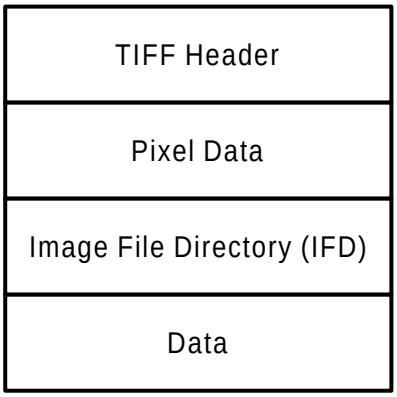
#CameraInformationHeader
Camera Type : FASTCAM-ultima SE [0](Host:2 ID:5)
Session Number : 1
Record Rate(fps) : 125
Shutter Speed(s) : 1/250
TriggerMode : End
Total Frame : 51
Start Frame : -50
Save Step : 1
Color Bit : 24
File Format : bmp

TIFF IMAGE FILE STRUCTURE

*This description is given for TIFF files saved using READCAM SCSI download software.

The TIFF file format for the PHOTRON FASTCAM ultima SE supports one video frame per file. The file format is described, followed by descriptions of each component, including a description of each tag. We are assuming that the reader has a working knowledge of the TIFF specification revision 5.0 published by the Aldus Corporation.
We have requested from Aldus, who controls the TIFF image standard, the proprietary use of 5 tags. Tag numbers 32000 (8000 hex) and above have been set aside by Aldus for company specific use. Roper Scientific MASD has been granted tags 34071 through 34075 (8517 through 851B hex). Tag 8517 will point to the location of the image frame data specific to each Roper Scientific MASD product supported.

FASTCAM-ultima SE TIFF File Format



TIFF header

The header is a sequence of 8 bytes that describe the TIFF file. Each box below represents 2 bytes. An offset is defined as the number of bytes from beginning of file to a specific data set. All offsets are four bytes long.

The offset to the Image File Directory is from the beginning of the file, and includes the 8 bit Tiff Header, and the image pixel data. The 40 bytes of image frame data such as, frame number, session number, elapsed time, and so on follows the IFD. There can also be other data following the IFD.

0	4949	Byte Order
2	002A	Version
4	xxxx	Byte Offset
6	xxxx	to IFD

Image file directory (IFD)

An IFD is a series of TIFF tags that provide a TIFF reader with instructions on how to interpret the data contained in the file. The IFD points to the location and amount of pixel data. The IFD also points to the location and amount of frame data. An IFD must always begin on an even address. The first two bytes of an IFD indicate the number of entries it contains. Each entry in an IFD is a 12 byte structure as illustrated below:

A	Entry Count = 00 12h
A + 2	New Subfile Type
A + 14	ImageWidth
A + 26	ImageLength
A + 38	BitsPerSample
A + 50	Compression
A + 62	PhotometricInterpretation
A + 74	FillOrder
A + 86	StripOffsets
A + 98	Orientation
A + 110	SamplesPerPixel
A + 122	RowsPerStrip
A + 134	StripByteCounts
A + 146	XResolution
A + 158	YResolution
A + 170	PlanarConfiguration
A + 182	ResolutionUnit
A + 194	Software
A + 206	PHOTRON FrameData

TIFF IMAGE FILE STRUCTURE

The 18 directory entries in the IFD for the FASTCAM ultima 40K are asfollows:
All the following directory entry values are in hex.

NewSubfileType
- 00FE
- 0004
- 00000001
- 00000000

ImageWidth
- 0100
- 0003
- 00000001
- 000000FF

ImageLength
- 0101
- 0003
- 00000001
- 000000FF

BitsPerSample
- 0102
- 0003
- 00000001
- 00000008

Compression
- 0103
- 0003
- 00000001
- 00000001

PhotometricInterpretation

0106
0003
00000001
00000001

FillOrder

010A
0003
00000001
00000001

StripOffsets

0111
0004
00000001
00000008 (points to the location of the first image pixel)

Orientation

0112
0003
00000001
00000001

SamplesPerPixel

0115
0003
00000001
00000001

RowsPerStrip

0116
0003
00000001
00000100

StripByteCounts

0117
0004
00000001
00010000

XResolution

011A
0005
00000001
000100E6

YResolution

011B
0005
00000001
000100EE

PlanarConfiguration

011C
0003
00000001
00000001

ResolutionUnit

0128
0003
00000001
00000002

Software

0131
0002
00000001
00000010

PHOTRONFrameData

8517
0001

00000028 (40 bytes of frame data)

xxxxxxxx (points to location of frame data)

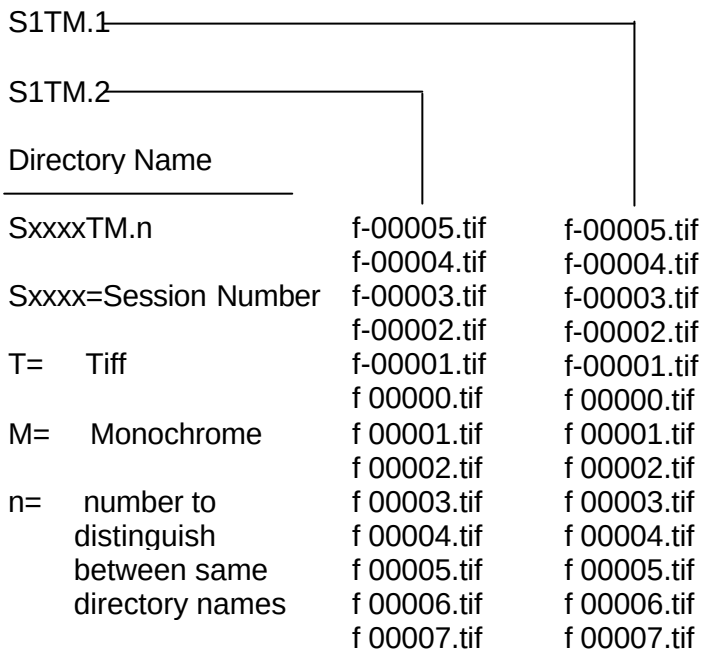
photron frame data

The forty bytes of frame data are as follows:

Data	Description
05	Model code for FASTCAM ultima SE
ss	Session Number
00	
pp	Picture rate MSB
pp	Picture rate LSB
00	
00	
ee	Exposure time MSB
ee	Exposure time LSB
00	
00	
ff	Frame number MSB of 32 bit no.
ff	Frame number
ff	Frame number
ff	Frame number LSB
ll	Elapsed time (10^{-5} sec) MSB of signed 32 bit no.
ll	Elapsed time
ll	Elapsed time
ll	Elapsed time LSB
00	
00	
00	
00	
00	
00	
00	
00	
00	
00	
00	
00	
gg	Image Intensifier gain MSB integer (future use)
gg	Image Intensifier gain
gg	Image Intensifier gain
gg	Image Intensifier gain LSB
tt	Image Intensifier gate MSB signed 32 bit no. preceded (future use)
tt	Image Intensifier gate
tt	Image Intensifier gate
tt	Image Intensifier gate LSB

Directory and file naming

The naming structure of TIFF files recorded onto a hard disk is shown below.
The disk format is compatible with DOS 5.0 or higher. A recording is stored into a directory. The name for the directory is given as the session ID number with an extension that signifies different occurrences of this directory name.
Therefore a directory with SxxxxTM.n can be defined as Session Number[Sxxxx] with a designator "T" indicating TIFF,a designator "M" indicating Monochrome , and a numeric value [.n] as a number that can distinguish between two directories with the same name.
Individual frames are stored under the directory as fixed length files.
The name of each file corresponds to that of an individual Frame Number.



Notes

Chapter 6 - Recording Strategies

Introduction

How the Processor Stores Images

Choosing a Record Mode

Notes

Introduction

The first section of this chapter is devoted to a brief description of how the PHOTRON FASTCAM ultima SE moves images in and out of memory. We feel this will assist you to decide which record mode is best suited to a particular application.

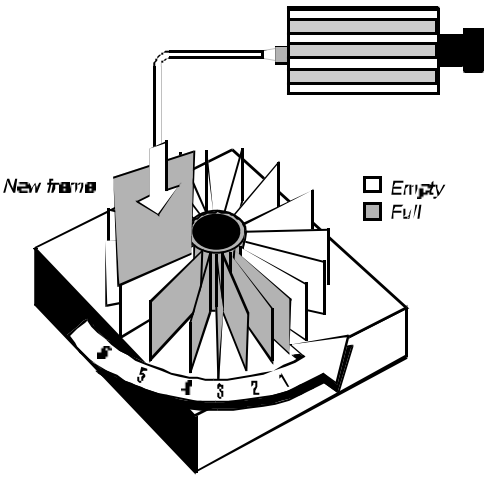
The Processor stores its images in random access memory (RAM) rather than on film or magnetic tape. The major advantage of storing pictures in RAM is speed. There are no moving mechanical parts involved in the recording process. A mechanical part takes time to stabilize at a particular speed. A mechanical tape or film transport is the major source of delay between pressing the record key and when recording begins. How then, does the Processor manage the picture storage process?

How the Processor Stores Images

An analogy for the recording and playback process would be a Carousel slide projector and a Carousel slide tray. Think of the Processor as the Carousel slide projector and the Random Access Memory (RAM) as the Carousel slide tray. For our discussion, the RAM is divided into small sections or frames that are just large enough to hold a single video image. These frames can be thought of as the pockets in a slide tray that hold the slides or images.

Slide trays are loaded with slides starting at location number one and continuing on around the tray in sequence until the last location is loaded. When the slide tray is full, a slide must be removed before another slide can be put in. The processor memory is loaded with images in a similar way. The first image is placed in the first frame of processor memory. The second image is placed in the next frame and so on until the last image is placed in the last location. When the processor memory is full, the Processor will erase the image in the first frame and insert a new picture in its place. This process continues frame by frame around the circle. The result is that the processor memory always holds the most recent images.

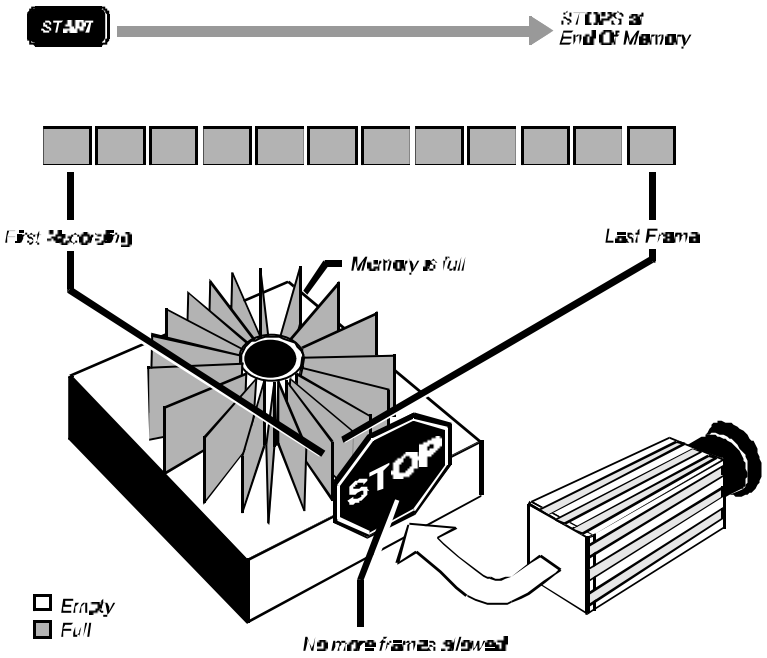
The Mode Sel button specifies how frames are stored in memory during a recording. The four record modes are: Start, Center, End and Random.



How the Processor Stores Images

START

The Start mode fills memory only once and then stops recording. Use the Start mode when you wish to start a recording session manually. This mode is used when the experiment has an observable start and you are interested in the action immediately after the recording is started.

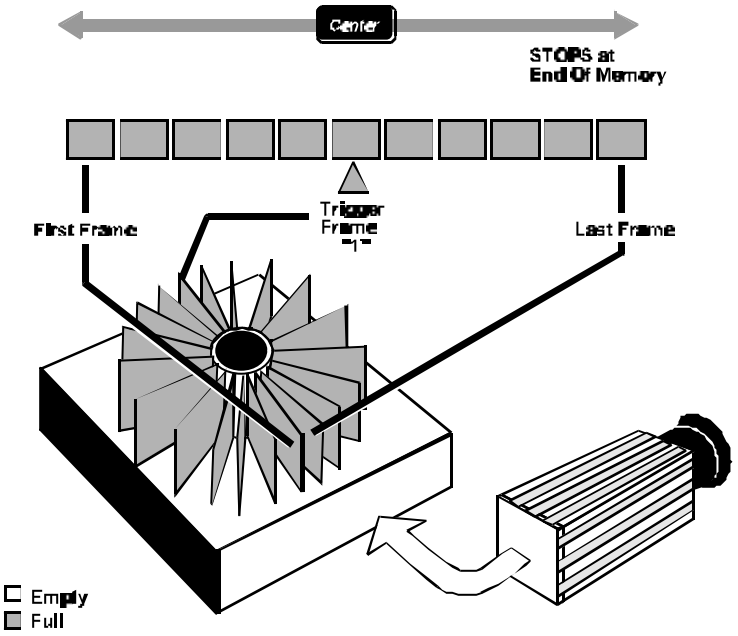


How the Processor Stores Images

CENTER

The Processor treats memory as a circular buffer when using the Center mode. Pictures are stored in sequence with the current picture replacing the oldest picture in memory so that you always have the 8,192 most recent frames. The trigger input signal causes the Processor to mark the next frame as frame one. The Processor records an additional 4,096 frames or half of the total number of frames available and then stops recording.

Center is a good way to operate the FASTCAM ultima SE if the event you are trying to study is controlled by an electrical signal, or if the condition you are trying to study generates an electrical signal . The electrical signal can be used as a trigger to control the recording.

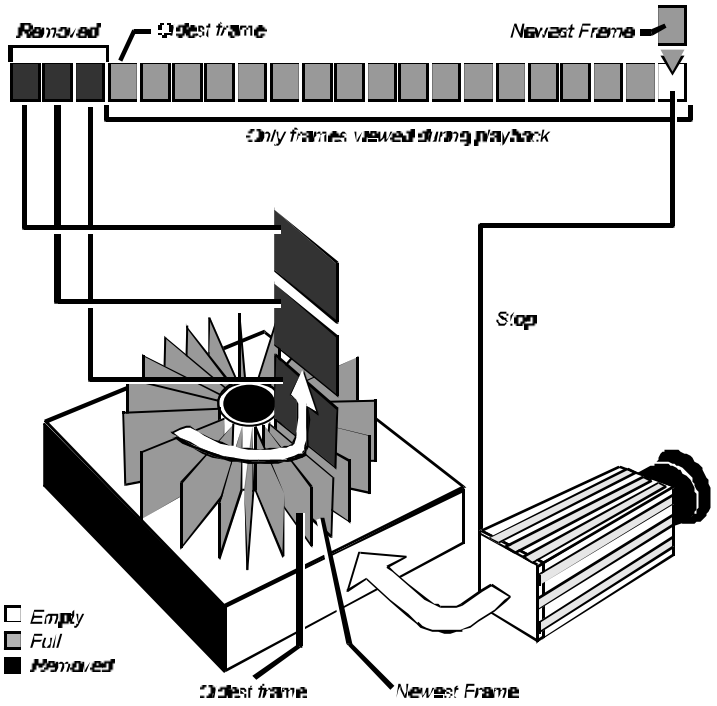


How the Processor Stores Images

END

The Processor treats memory as a circular buffer when using the End mode. Pictures are stored in sequence with the current picture replacing the oldest picture in memory until you press the Record button again or a trigger signal is received through Trigger In or Trigger SW In on the rear panel of the Processor. This approach to recording gives you an infinite amount of record time while you wait for something to happen. After the recording is stopped, you will have the last 8,192 frames of action stored in memory.

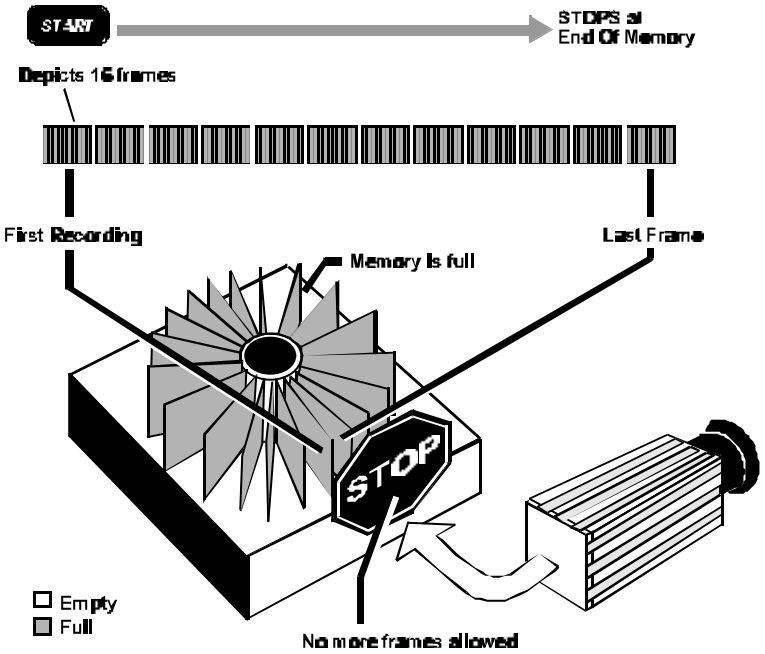
Use the End mode when you wish to end a recording session manually. This mode is used when the experiment has an observable end and you are interested in the action immediately before the recording was stopped.



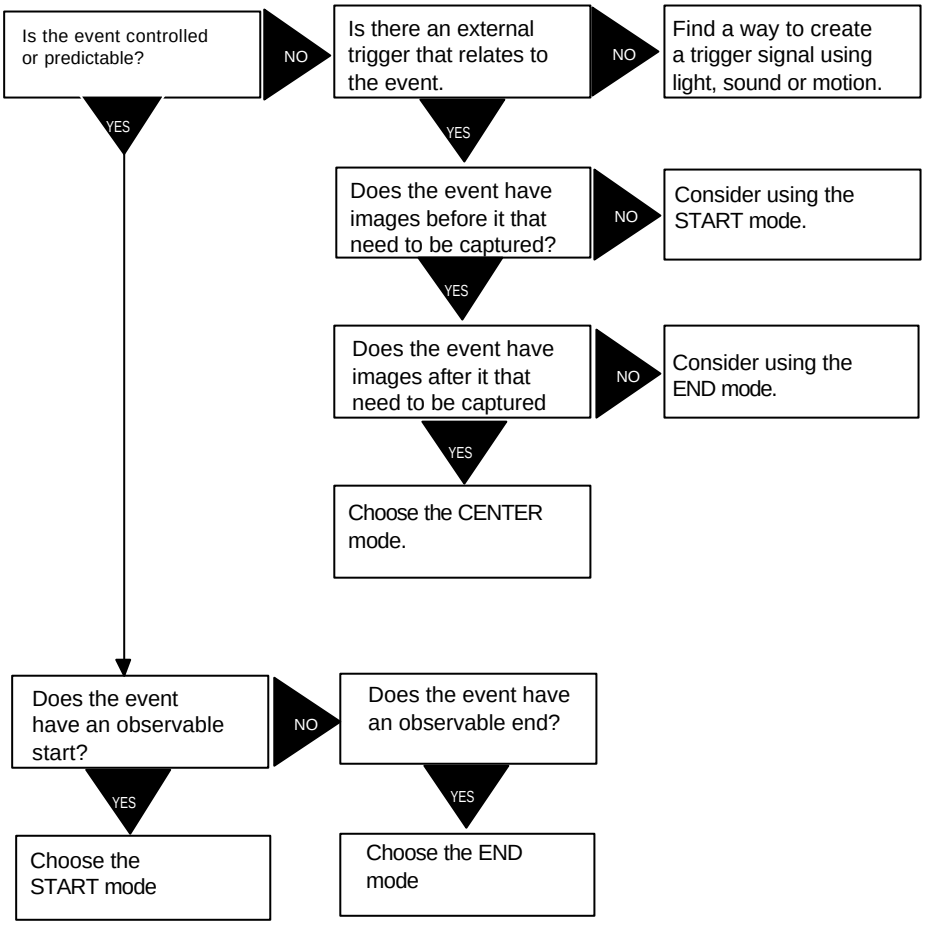
How the Processor Stores Images

RANDOM

The Random mode records a user selectable number of frames for each trigger signal received by the Processor. The Processor continues to record until the memory has been filled. The number of frames recorded for each trigger is set by switch 1, 2, and 3 of DIP switch SW1 on the rear panel of the Processor.



Choosing a Record Mode



Notes

Chapter 7 - Routine Care

Care of Lenses

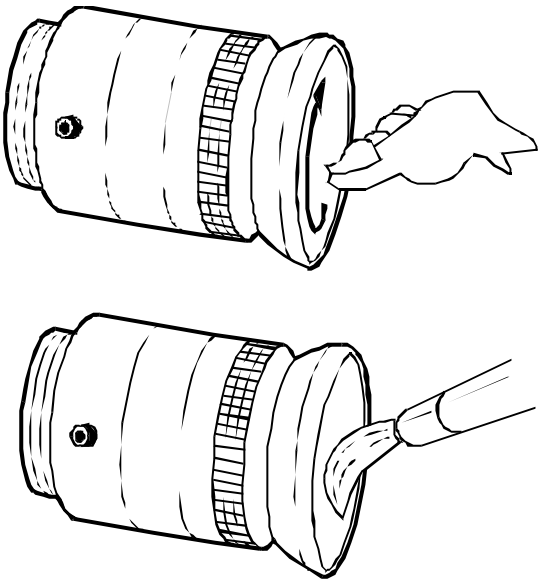
Specifications

Notes

Care of Lenses

The surface of photographic lenses have special coatings that reduce chromatic aberration, and unwanted reflections. Extra care should 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 hair brush or loosely folded piece of lens paper to remove dust particles. For stubborn dirt use photographic lens cleaning solution and lens wipes. Never rub the lens with direct pressure or drop cleaning solution directly on the lens surface.



Specifications

PHOTRON FASTCAM-ultima SE

Keypad: Hand-held device providing control of all Processor functions. The keypad is attached to the Processor through a 16 foot cable.

Recording Technique: Digital images stored in Dynamic Random Access Memory (DRAM).

Recording Modes:
START: Records images until memory is full and then stops.
END: Continually records images until RECORD button is pressed or trigger signal is received.
CENTER: Records images until trigger signal is received. Saves equal number of frames before and after the trigger.
RANDOM: Records 1, 2, up to 256 frames at each trigger input until memory is full.
User can set number of frames to record on rear panel of the Processor.
AUXMEM: Automatically calibrates video electronics for best results.

Record Rates: Full frame: 30, 60, 125, 250, 500, 750, 1125, 2250 and 4500 frames per second.
Partial frame: 9000; 13500; 18000; 27000; 40500 frames per second.

Frame Storage: 8192 full frames with 512 megabytes of memory installed (-1 model). 16384 full frames with 1.0 gigabytes of memory installed (-2 model).
24576 full frames with 1.5 gigabytes of memory installed (-3 model).

Playback Rates: 2, 5, 10, 15 or 30 pictures per second (NTSC). 2, 4, 8, 12 or 25 pictures per second (PAL) plus single step, freeze frame forward or reverse.

Specifications

PHOTRON FASTCAM-ultima SE Processor

Video Output: System can be configured for either NTSC or PAL compatible output.

Synchronizing output: EXT OUT BNC connector can output vertical sync or RECORD gate.

Report Display: Frame number, record rate, ID number, playback rate, playback mode, LIVE status, READY status and RECORD status.

Signal Inputs: TRIGGER IN: BNC connector CMOS level optically isolated input, 10 mA from 5 volts to trigger.
TRIGGER SW IN: BNC connector accepts contact closure to trigger.

Size: 340(W) x 220(H) x 500(D)mm
13.4(W) x 8.7(H) x 19.7(D) inches

Weight: 21.5kg. 47lbs.

Power: 110 / 220 Volts AC, 60 / 50 Hertz, 500 VA

PHOTRON FASTCAM-ultima SE Remote Control Keypad

Interface: RS-232C

Size: 166(W) x 82(H) x 34(D) millimeters
6.5(W) x 3.2(H) x 1.3(D) inches

Weight: 0.53 kg, 1.2lbs

Power: Derived from Processor

PHOTRON FASTCAM-ultima SE Camera

Sensor: 256 x 256 pixels.

Sensitivity: Equivalent to ISO 3000 at high gain setting.

Gray Scale: 256 levels.

Lens Mount: C-Mount.

Tripod Mount: 1/4-20 UNC-2B.

Imager Cable: 4.8 meters, 15 ft.

Camera Size: 92(W) x 86(H) x 190(D)mm.
3.7(W) x 3.4(H) x 7.6(D)inches.

Weight: 1.8 kg. 4lbs.

Power: Derived from Processor.

Operating Temperature :3 to 113 degrees Fahrenheit (0 to 45 degrees Centigrade)

Storage Temperature :-4 to 158 degrees Fahrenheit (-20 to 70 degrees Centigrade)

Notes

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2000512-001 Rev. A

Printed in Japan