



# **HAMAMATSU** **PHOTONIC SYSTEMS**

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*A DIVISION OF HAMAMATSU CORPORATION*

# **Video Capture Driver for Image-Pro Plus**

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## **HAMAMATSU**

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# Overview

The Hamamatsu Video Capture driver for Media Cybernetics Image-Pro Plus allows you to use any Hamamatsu digital camera with a compliant DCAMAPI driver. Because it uses DCAMAPI, it will automatically detect which Hamamatsu camera you are using and allow you to control all of the functions available to the camera. Even if you have multiple Hamamatsu cameras of different models and capabilities, this will be the only driver you will need to interface them to Image Pro Plus.

It is understood that the user of this driver is familiar with Media Cybernetics Image-Pro Plus and its features. For additional information regarding Image Pro Plus, please refer to the Image Pro Plus manual.

It is also understood that the user of this driver is familiar with the Hamamatsu digital camera, its abilities, and its features. For additional information regarding technical specifications of the Hamamatsu digital camera, please refer to the manual that came with the camera.

## System Requirements

- Windows 2000/XP operating systems
- Hamamatsu digital camera with a DCAM API v2.1.3 compliant module
- Media Cybernetics Image-Pro Plus 6.0 or higher

# Supported Cameras

The following Hamamatsu cameras are supported with this driver. However, to use these cameras, the proper interface board and DCAM module is required. If you do not have the correct DCAMAPI module for your camera, you can download it from our website at <http://www.dcamapi.com>.

## **Cameras for 1394 OHCI interface**

ORCA-NRG, ORCA-ERG, ORCA-II ERG, ORCA-II EWG, C8484-xxG, ORCA-285G, ORCA-AG, ORCA-II BTG

## **Cameras for IC-PCI interface**

ORCA-NR, ORCA-ER, ORCA-II

## **Cameras for PC-DIG interface**

ORCA-NR, ORCA-ER, ORCA-II, ORCA-II ER, ORCA-II BT, ORCA-HR, C8000, C7190

## **Cameras for Phoenix Camera Link interface**

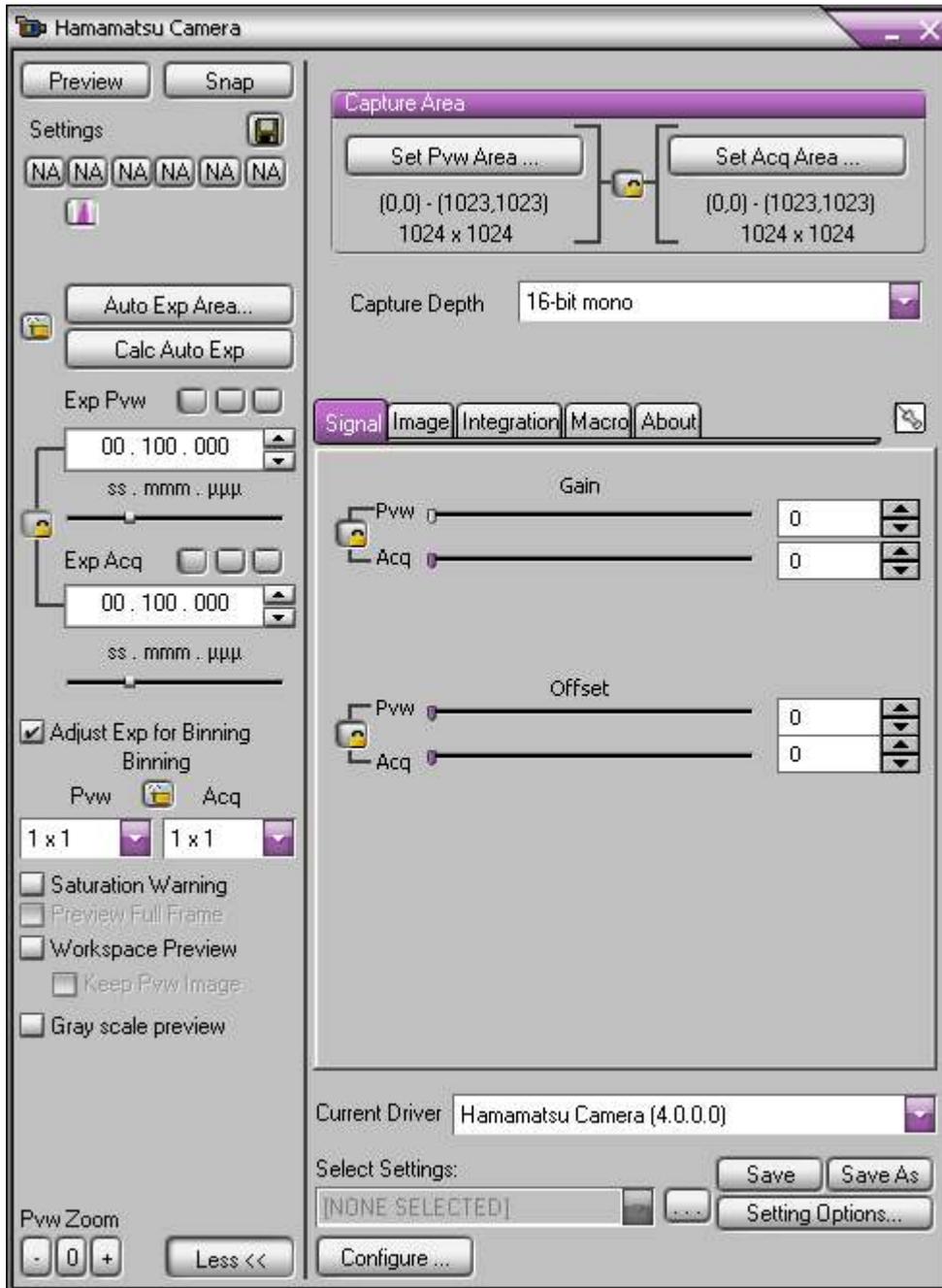
C8484-xxC, C8800, C9100, C9300

## **Cameras for Phoenix LVDS interface**

C7780, ORCA-NR, ORCA-ER, ORCA-II, ORCA-II ER, ORCA-II BT, ORCA-HR, C8000, C7190

# Control Panels

## IPP Capture Control Interface



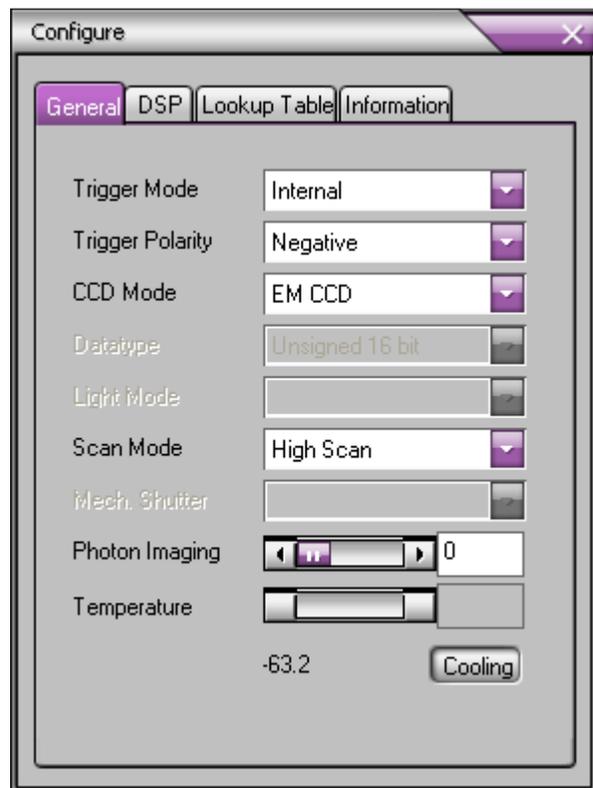
This is the new capture interface for Image-Pro Plus that is capable of controlling most of the basic functions of the Hamamatsu camera. These functions include exposure time, binning and subarray. Controls may vary depending on the camera that you use. Instructions on how to use this dialog box can be found in your Image Pro Plus manual.

## Camera Configuration Control Panel

The camera configuration control panel can be accessed by pressing the configure button in the main Image Pro capture dialog. This will allow you to control the features of the camera that are not available through the Image Pro capture interface. Adjustments made here will affect preview and acquire images. Features which are unavailable to the selected camera will be grayed out.

There are four tabs that contain different sets of controls. The General tab allows you to adjust particular functions available to the camera. These functions will either change the output data of the camera or adjust the method on how to control the camera. The Lookup Table tab allows you to adjust the lookup table for the preview and the acquire images. The Information tab will display information about the camera.

### General Controls



Under the General Tab, you will find several controls for the camera. Functions that are grayed are either unavailable to the camera or has only one option available.

#### Trigger Mode / Trigger Polarity

This allows you to select among the available trigger modes of the camera. This function is essential for synchronization with external hardware.

#### CCD Mode

In some cameras, you are capable of selecting between a normal CCD sensor and an EM CCD sensor. Adjusting this mode may also affect other capabilities of the camera. This option cannot be changed during preview mode.

#### Datatype

This allows you to select among the different output datatypes of the camera. It is important to understand that changing the datatype may have an affect on the available controls. For example, switching from a color datatype to a monochrome datatype will remove all color related functions from the available control panels. This option cannot be changed during preview mode.

## Light Mode

This allows you to select the different light mode of the camera. In high light mode, anti-blooming is turned on. Low light mode is designed for low light applications so that more data is collected. In this mode, anti-blooming is turned off.

## Scan Mode

This allows you to select the different scan mode of the camera. Higher scan modes are designed for applications where a faster frame rate is important. Lower scan modes are designed for applications where data accuracy is very important. In the lower modes, the readout is slower which allows for less readout noise. For some cameras, adjusting this setting will change exposure time limits as well as the number of output data bits. Please refer to your camera manual for more information.

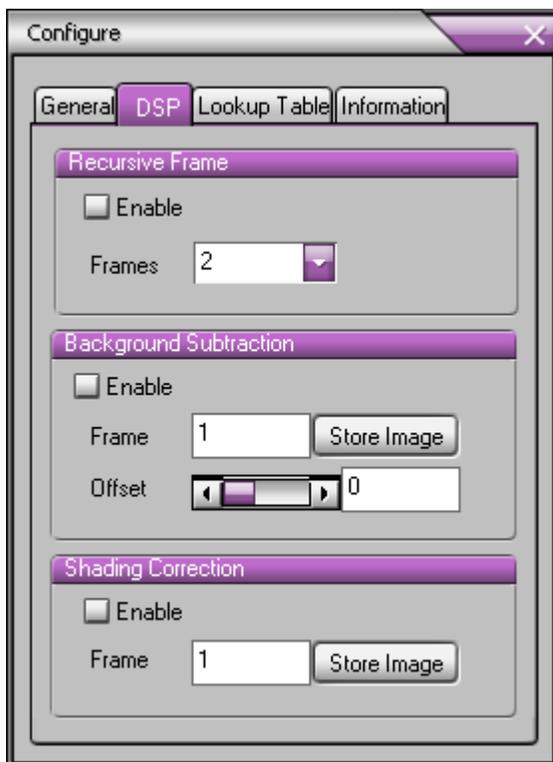
## Mechanical Shutter

Cameras with a mechanical shutter can use this function to adjust the shutter setting. In Open mode, the shutter stays open. In Auto mode, the shutter is only open during exposures. In Close mode, the shutter will remain closed. This mode is useful when taking background images.

## Temperature Controls

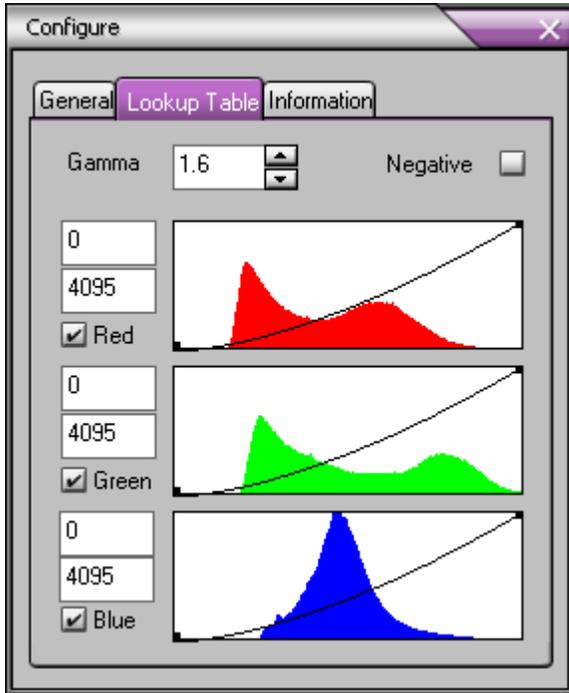
Some cameras may allow you to control the sensor temperature. Some of these cameras allow you to adjust the target temperature for the sensor. This is useful in certain environmental conditions where it is impossible for the camera to have a stable temperature at maximum cooling. If the camera has a controllable fan, a button allows you to enable or disable it. This is useful to prevent any possible vibrations during image acquisitions. However, it is not recommended to leave these fans off for a long period of time as some sensors could get damaged from overheating.

## Image Processing Controls



Under the DSP tab are image processing functions available to some of the newer Hamamatsu cameras. Not all cameras will support these functions. When enabled, Recursive Frame will output frames that are an average of a number of frames specified by the user. When enabled, Background Subtraction will subtract the image stored in the frame buffer specified by the user and then it will add the offset. This could be used to remove the noise in the camera caused by defects.

## Lookup Table Controls



Under the Lookup Table tab, you will have the ability to adjust the output image of the camera before it is displayed in the Image Pro workspace. If you have a monochrome camera, one channel is displayed. If you have a color camera, all three color channels are displayed. For each channel, a histogram for the actual output data will be displayed. A checkbox by the name of each color will give you the option of selecting which color channels you wish to view. You have the ability to adjust the minimum and maximum intensities of the output to be displayed. This can be done by either typing in the values or by dragging the end points of the LUT line.

Changes made here will affect the live preview display as well as acquired images. It is also important to understand that the histogram that is display is taken from the preview image. If a preview is not running, than no histogram data will be displayed.

## Camera Information

Under the Information tab, you will be able to get some information concerning the camera. This can be useful when you have multiple cameras connected to the system at the same time and you wish to be sure that you are using the correct camera at the time.

# Macro Functions

Because there are several capabilities of the Hamamatsu cameras not available on the main control panel, new macros were needed to control these functions as well. Listed below are the macro functions to assist you to control your camera. When you are recording a macro, these functions are entered automatically when you adjust certain settings.

## IpDcamSubarray(hpos, vpos, hsize, vsize)

This allows you to adjust the region of interest within the limitations of the camera for both preview and acquire modes. HPOS is the horizontal offset from the left, VPOS is the vertical offset from the top, HSIZE is the horizontal width, and VSIZE is the vertical width. If the values you use are invalid, it will use the next valid values. Please check your camera manual to determine its limitations.

## IpDcamBinning(binning)

This function allows you to adjust binning of the camera. To set to 2x2 binning, you should send a value of 2. For 4x4 binning, you send a value of 4, etc. Please check with your camera manual for value binning values.

## IpDcamTriggerMode(mode)

This sets the camera's trigger mode if the camera supports modes other than internal.

<u>mode value</u>	<u>effect</u>
DCAM_TRIGGER_INTERNAL	sets to internal trigger
DCAM_TRIGGER_EDGE	sets to external edge trigger
DCAM_TRIGGER_LEVEL	sets to external level trigger
DCAM_TRIGGER_MULTISHOT	sets to multi-shot sensitive
DCAM_TRIGGER_CYCLEDELAY	sets to cycle delay
DCAM_TRIGGER_SOFTWARE	sets to software trigger
DCAM_TRIGGER_FASTREPETITION	sets to fast repetition / PIV mode
DCAM_TRIGGER_START	sets to start trigger
DCAM_TRIGGER_SYNCREADOUT	sets to sync readout mode

## IpDcamTriggerPolarity(polarity)

If the camera supports external trigger, use this function to change the polarity.

<u>polarity value</u>	<u>effect</u>
DCAM_POLARITY_POSITIVE	camera will wait for positive trigger
DCAM_POLARITY_NEGATIVE	camera will wait for negative trigger

## IpDcamExposure(sec)

This function will adjust the exposure time of the camera. The input value is the absolute value of the exposure in seconds. If you place an invalid exposure time, the camera will round up and acquire for the next longest exposure. If used with a color camera, the exposure times will adjust for all color channels and keep the current color ratio. This function will ignore the Ratio Lock button.

## IpDcamGain(gain)

This is used to adjust the gain of the camera. The input value is relative. Please refer to your camera manual for absolute values.

## IpDcamOffset(offset)

This is used to adjust the offset of the camera. The input value is relative. Please refer to your camera manual for absolute values.

## IpDcamLightMode(mode)

This allows you to change the light mode of the camera if this feature is supported.

<u>mode value</u>	<u>effect</u>
DCAM_LIGHTMODE_LOW	sets camera to low light mode
DCAM_LIGHTMODE_HIGH	sets camera to high light mode

### **IpDcamDatatype(datatype)**

If the camera supports multiple datatypes, this function will allow you to switch between them.

<u>datatype value</u>	<u>effect</u>
DCAM_DATATYPE_UINT8	sets to unsigned 8 bit
DCAM_DATATYPE_UINT16	sets to unsigned 16 bit
DCAM_DATATYPE_UINT32	sets to unsigned 32 bit
DCAM_DATATYPE_INT8	sets to signed 8 bit
DCAM_DATATYPE_INT16	sets to signed 16 bit
DCAM_DATATYPE_INT32	sets to signed 32 bit
DCAM_DATATYPE_BGR24	sets to BGR 24 bit
DCAM_DATATYPE_BGR48	sets to BGR 48 bit
DCAM_DATATYPE_RGB24	sets to RGB 24 bit
DCAM_DATATYPE_RGB48	sets to RGB 48 bit

### **IpDcamScanMode(mode)**

This allows you to change the scan mode of the camera if this feature is supported.

<u>mode value</u>	<u>effect</u>
DCAM_SCANMODE_FAST	sets camera to fast scan mode
DCAM_SCANMODE_SLOW	sets camera to slow scan mode

### **IpDcamMechanicalShutter(mode)**

This will allow you to set the mechanical shutter to open, auto, or close.

<u>mode value</u>	<u>effect</u>
DCAM_MECHSHUTTER_OPEN	shutter will stay open
DCAM_MECHSHUTTER_AUTO	shutter is only open during exposures
DCAM_MECHSHUTTER_CLOSE	shutter will stay closed

### **IpDcamTemperature(temperature)**

If using a camera that has a temperature control option, this function allows you to easily adjust the temperature. The input value is absolute.

### **IpDcamPowerTemperature(mode)**

This function will allow you to toggle the temperature control on and off if the camera has this ability.

<u>mode value</u>	<u>effect</u>
SET_OFF	sets temperature control off
SET_ON	sets temperature control on

### **IpDcamSensitivity(sensitivity)**

This function allows you to adjust the sensitivity of an EB-CCD or EM-CCD camera.

### **IpDcamPowerSensitivity(mode)**

This will allow you to toggle the sensitivity high voltage control on or off.

<u>mode value</u>	<u>effect</u>
SET_OFF	sets sensitivity control off
SET_ON	sets sensitivity control on

### **IpDcamStartAcquire(frames)**

This function will start a capture, but it will immediately return after the capture session has started so that other functions may be called while collecting image data.

## **IpDcamStopAcquire()**

If IpDcamStartAcquire() is called, this function must be called when all of the processing is completed. This function will destroy all images in the buffer. Be sure to use IpDcamTransferImages() to retrieve your images before calling this function.

## **IpDcamWaitEvent(event, timeout)**

This function allows you to wait for a specified event. If that event does not occur during the timeout specified in milliseconds, then the function will return 0.

### event value

DCAM\_WAIT\_FRAMEBEGIN  
DCAM\_WAIT\_FRAMEEND  
DCAM\_WAIT\_CYCLEEND  
DCAM\_WAIT\_VVALIDBEGIN

### effect

returns when a frame begins copy into buffer  
returns when a frame ends copy into buffer  
returns when all frames have copied into buffer  
returns when frame has completed exposing

## **IpDcamTransferImages(destination)**

This function will take all of the frames collected from IpDcamStartAcquire() and transfer them to the Image Pro. The user can specify the destination.

### destination value

ACQ\_NEW  
ACQ\_CURRENT  
ACQ\_FILE  
ACQ\_SEQUENCE

### effect

transfers frames to new windows  
transfers frames to current window  
transfers frames to disk  
transfers frames to new sequence window

## **IpDcamFireTrigger()**

This function will fire a software trigger to the camera to begin an exposure. This can only be used during software trigger mode and while capturing images with IpDcamStartAcquire().

## **IpDcamCCDMode(mode)**

This function allows you to select between normal CCD mode and EM CCD mode. This function is not available on all cameras.

## **IpDcamRecursiveMode(mode)**

This function allows you to toggle on or off the camera's recursive filter. The number of frames can be adjusted with IpDcamRecursiveFrames().

### mode value

SET\_OFF  
SET\_ON

### effect

sets recursive filter off  
sets recursive filter on

## **IpDcamRecursiveFrames(frames)**

This function allows you to adjust the number of frames to be used in the camera's recursive filter. Recursive filter can be enabled and disabled with IpDcamRecursiveMode().

## **IpDcamAveragingMode(mode)**

This function allows you to toggle on or off the camera's frame averaging function. The number of frames can be adjusted with IpDcamAveragingFrames().

### mode value

SET\_OFF  
SET\_ON

### effect

sets recursive filter off  
sets recursive filter on

## **IpDcamAveragingFrames(frames)**

This function allows you to adjust the number of frames to be used in the camera's frame averaging function. Recursive filter can be enabled and disabled with IpDcamAveragingMode().

### **IpDcamSubtraction(mode)**

This function allows enable or disable the background subtraction function of the camera. When enabled, you will not be able to select a subtraction frame memory with IpDcamSubtractionSelectFrame() nor will you be able store a new subtraction frame with IpDcamSubtractionStoreFrame(). This function is not available on all cameras.

mode value

SET\_OFF

SET\_ON

effect

sets background subtraction off

sets background subtraction on

### **IpDcamSubtractionSelectFrame(frame)**

This function allows you to select which frame memory to use for background subtraction. You cannot use this function while background subtraction is enabled. This function is not available on all cameras.

### **IpDcamSubtractionStoreFrame(frame)**

This function allows you to store a new background subtraction image to the memory buffer specified by frame. This function cannot be used while background subtraction is enabled. This function is not available on all cameras.

### **IpDcamSubtractionOffset(offset)**

This function allows you to adjust the offset of a background subtraction. This function is not available on all cameras.

### **IpDcamShading(mode)**

This function allows enable or disable the shading correction function of the camera. When enabled, you will not be able to select a correction frame memory with IpDcamShadingSelectFrame() nor will you be able store a new correction frame with IpDcamShadingStoreFrame(). This function is not available on all cameras.

mode value

SET\_OFF

SET\_ON

effect

sets shading correction off

sets shading correction on

### **IpDcamShadingSelectFrame(frame)**

This function allows you to select which frame memory to use for shading correction. You cannot use this function while shading correction is enabled. This function is not available on all cameras.

### **IpDcamShadingStoreFrame(frame)**

This function allows you to store a new shading correction image to the memory buffer specified by frame. This function cannot be used while shading correction is enabled. This function is not available on all cameras.

### **IpDcamSpotNoiseReducer(mode)**

This function allows you to toggle on or off the camera's spot noise reducer function.

mode value

SET\_OFF

SET\_ON

effect

sets recursive filter off

sets recursive filter on