info@biopac.com
support@biopac.com
www.biopac.com

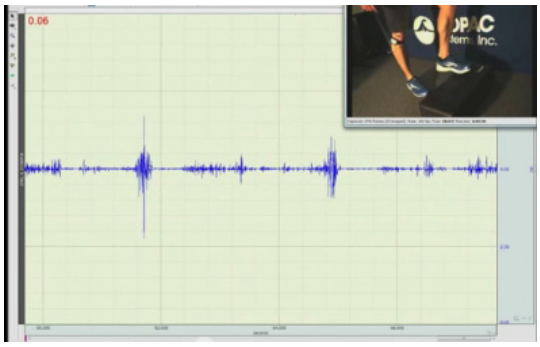
CAM-HFR-A HIGH FRAME RATE CAMERA

Tightly synchronize high frame rate video—up to 100 FPS—with physiological data recorded with a BIOPAC MP160 or MP150 Research System.

Included Components

- High Frame Rate Camera (CAM-HFR-A)
- Camera Lens, 6 mm (LENS-CAM-A)
- GigE Network Interface Card (ETHCARD3)
- CAT6 Ethernet Cable (CBLETH3)
- AC Power Supply, cord and Trigger Cable (AC300A and CBLHFR)
- Camera Tripod Kit with Mount (TRIPOD-KIT-CAM)

Requires Windows-based computer and AcqKnowledge 4.3.1 or above for Windows to support GigE camera; does not require auxiliary synchronization methods.

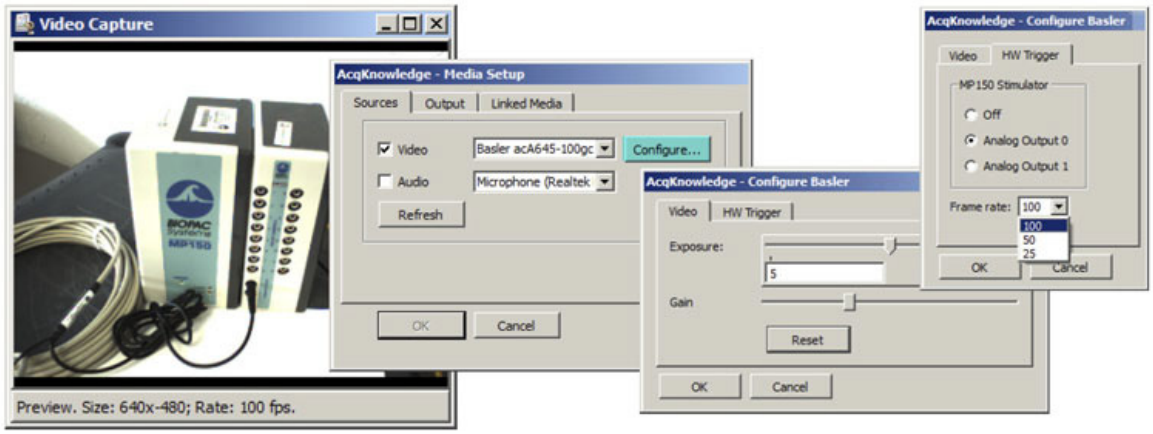


Use the High Frame Rate Camera System to capture precise movement activity at 100 frames-per-second (640 x 480 resolution) in conjunction with other recorded physiological variables.

With CAM-HFR-A and Acq*Knowledge* media tools, it's possible to obtain synchronization within 1 video frame (10 ms) between physiological data and video data, running at a rate of 100 frames per second, up to the computer's memory capacity. This very high performance video recording option incorporates automatic synchronizing between the video data and the physiological data, so no external synchronization marker is required. Furthermore, the high speed camera in CAM-HFR-A can be controlled from *AcqKnowl*edge for exposure times as short as 1 ms, running at 100 frames per second. This combination of high frame rate, automatic synchronization, and precise control over camera exposure times results in the ability to precisely characterize physical activity in relation to simultaneously recorded physiological data, such as EMG, Acceleration, Goniometry, Respiration, and more.

Media functionality allows users to capture and playback video and synchronize it with physiological information from an MP device. The key functionality is the strong link between the video and data cursor when physiological data graphs and associated video are reviewed in post-acquisition mode; changing the selection in the graph window will automatically jump the video to the time corresponding to the cursor position in the physiological data graph. The reverse connection is also in place where scrolling through the video will move the data cursor to the corresponding point in the physiological data graph.

Data streams from the video digitizer and the MP unit are automatically synchronized. In this manner—there is no requirement that the user create a visible synchronization marker to align physiological data with video. The combined CAM-HFR-A and Acq*Knowledge* System is very simple to use!



AcqKnowledge 4.3.1 and above automatically recognizes the HFR camera and simplifies setup for tight synchronization

The video capture field is a function of the lens placed on the high-speed camera. BIOPAC has included a high quality Navitar lens, suitable for nearly all sports science and exercise physiology applications. The provided C-mount lens will permit a 1.8 meter high x 2.4 meter wide field of view at a camera distance of 2.5 meters.

To perform close-up videos of heads, hands or feet, simply pull the camera in towards the subject. To capture movement of many subjects at once, just pull the camera away from the subjects. For exotic measurements, as when videoing a distant subject or performing an extreme close-up, simply switch out the provided lens for the appropriate C-mount lens.

The camera iris control can be adjusted to accommodate a range of ambient lighting conditions. Furthermore, the camera exposure time can be controlled from the Acq*Knowledge* software to allow for the sharpest imaging possible under fast subject movement conditions. When using short exposure times, video frames will hold very crisp images to allow for precise identification of subject position as a function of simultaneously collected physiological data.

System Requirements

Recommended	Minimum
Core i7 Quad Core or Xeon E3/E5 processor, 2.40 GHz	Core 2 Duo processor, 2.13 GHz
8 GB DDR2 memory, dedicated card for video capture	4 GB DDR2 memory
RAID0/RAID10 with enterprise grade “RAID Edition” hard disks, or Non-RAID 10,000 RPM (such as VelociRaptor®,) or 15,000 RPM, (such as Seagate Cheetah) > 125 MB/s sequential write speed	SAS/SATA III, 6 GB/s, 7200 RPM > 90 MB/s sequential write speed
• Windows Acq*Knowledge* 4.3.1 or above is required for high frame rate camera support. • To insure stable 100 fps frame rate, use the provided GigE Network Interface Card.	

info@biopac.com
support@biopac.com
www.biopac.com

Specifications

Resolution horizontal/vertical:	658 pixels x 492 pixels
Pixel Size horizontal/vertical:	9.9 µm x 9.9 µm
Frame Rate/Resolution:	25, 50 or 100 fps at 640 x 480 resolution
Mono/Color:	Color
Interface:	Gigabit Ethernet
Video Output Format:	Mono 8, Bayer BG 8, Bayer BG 12, Bayer BG 12 Packed, YUV 4:2:2 Packed, YUV 4:2:2 (YUYV) Packed
Communications:	GigE (system includes GigE ethernet card for Windows based processor)
Synchronization & Triggering:	Camera is frame-rate controlled from MP160/150 System via included triggering cable
Optics:	Navitar 2/3" lens, 6 mm, 1.4 f-stop with manual focus, iris and locking screws, C-mount
Field of View:	Nominally 1.8 meters high x 2.4 meters wide at 2.5 meters distant from camera
Pixel Bit Depth:	12 bits
Synchronization:	External trigger, free-run, Ethernet connection
Exposure Control:	Programmable via the camera API, external trigger signal
Housing Size (L x W x H) in mm:	42 x 29 x 29
Housing Temperature:	0° C – 50° C
Lens Mount:	C-mount, CS-mount
Digital Input:	1
Digital Output:	1
Power Requirements:	PoE or 12 VDC
Power Consumption (typical):	3.3 W
Power Consumption PoE:	3.6 W
Weight (typical):	90 g
Conformity:	CE, RoHS, GenICam, IP30, UL, FCC, PoE 802.3 af
Sensor Vendor:	Sony
Sensor Name:	ICX414
Sensor Technology:	Progressive Scan CCD, global shutter
Sensor Size (optical):	1/2 inch
Sensor Type:	CCD
Sensor Size (mm):	6.52 mm x 4.89 mm
Tripods:	Standard tripod 54” and mini-tripod 6¼”

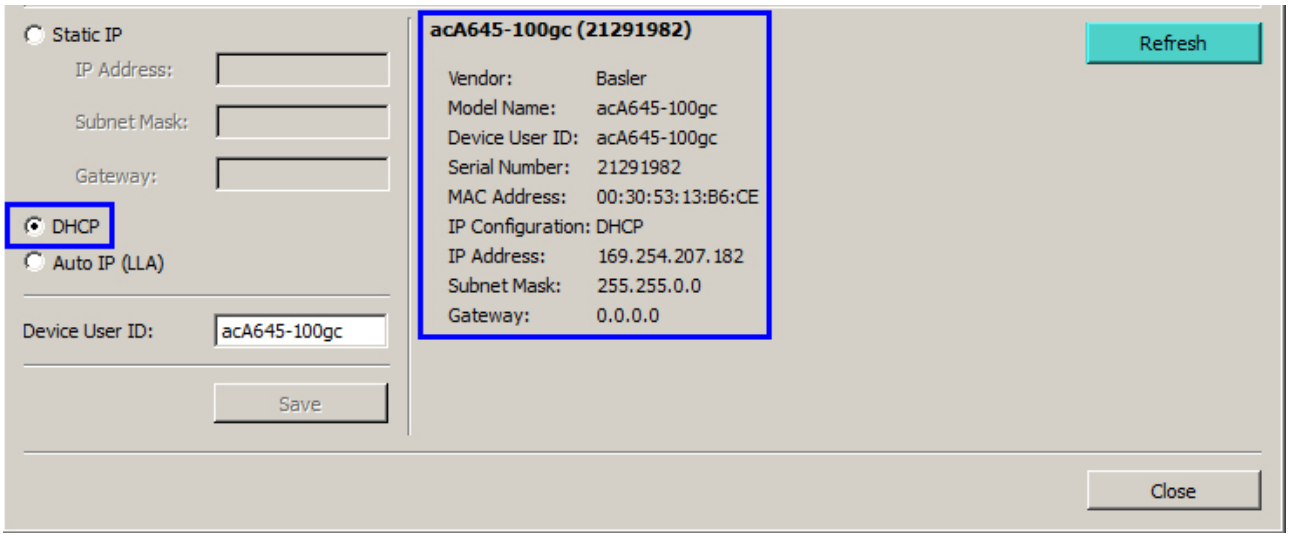
Connecting Camera Hardware:

Before you begin:

Make sure the camera drivers and the provided ETHCARD3 Network Interface Card are installed.

1. Connect the CBLHFR 6-pin-connector to the camera input.
2. Connect the female end of the CBLHFR connector to the AC300A power supply adapter cable.
3. Plug the AC300A power supply cord into wall socket.
4. Connect the Ethernet cable between the camera's Ethernet port and the ETHCARD3 network interface card supplied with your system. Attach the 6 mm lens to camera (included as LENS-CAM-A).

Launch the pylon IP Configuration Tool from the Desktop shortcut to verify camera/network connection. If successful, the camera's network settings will appear in the IP configuration window as shown below**. (**Make sure the IP configuration is set to DHCP.)

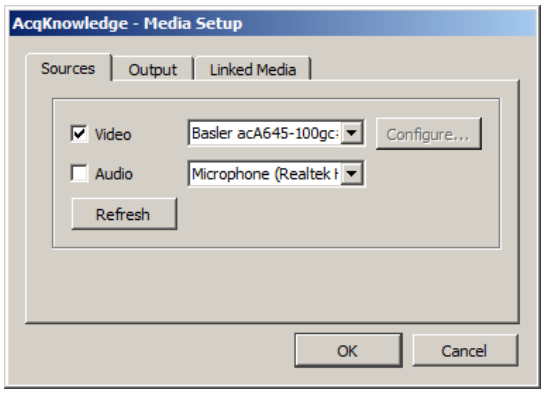


NOTE: If the camera's network settings don't appear in the pylon IP Tool Configuration window, click the "Refresh" button and highlight the camera device from the list at the top of the Configuration Tool.

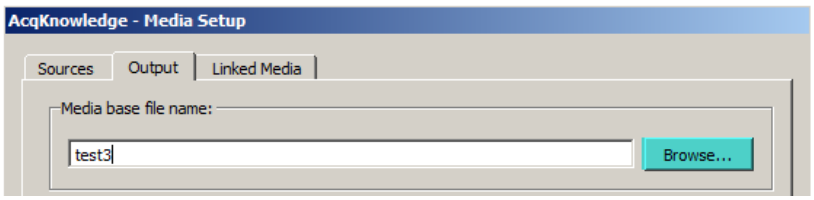
If the camera's network settings still don't appear, or appear in the pylon IP Configuration Tool window as "unreachable", reset the IP configuration to Static IP.

Set Up Camera Configuration in Acq*Knowledge* Software:

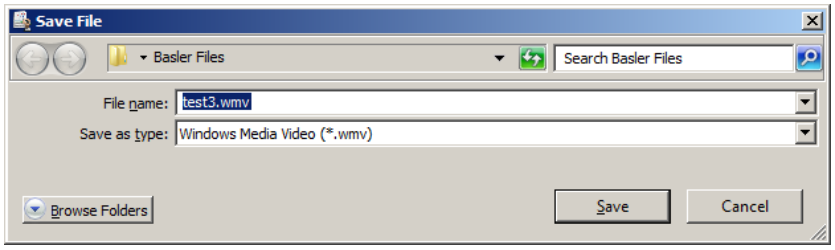
1. Launch Acq*Knowledge* and select Media > Set Up. The Basler camera should appear as selected in the "Video" list.
2. Check the "Video" option (and "Audio" if sound is to be recorded).



3. Click the "Output" tab and type in a media file name.
4. Click "Browse" and choose a format (*.wmv or *.avi) and directory for the new media file.

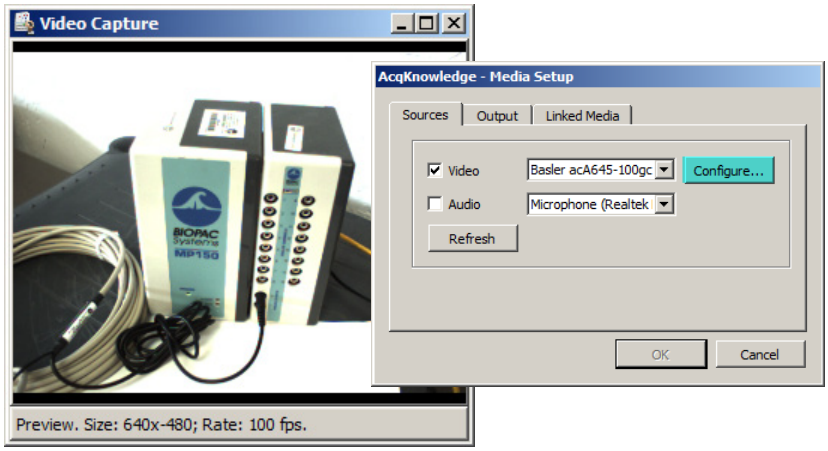


5. Click "Save".

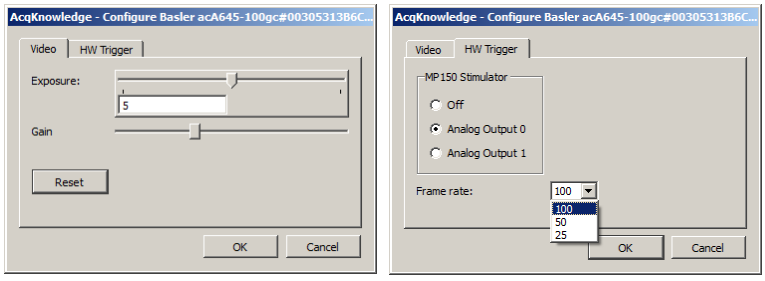


6. Click "OK" to bring up the Video Capture Viewer. This is useful for determining proper camera positioning, lighting, etc…
7. To access the "Video" properties (Exposure or Gain controls,) go to Media > Set Up and click the "Configure" button.

   NOTE: The "Configure" button is not active until the Media > Set Up dialog is dismissed with "OK" and reopened.



8. Click the "HW Trigger" tab to:
   - Use the MP160/150 Stimulator to trigger and synchronize the camera recording with Acq*Knowledge*.
   - Set the camera frame rate. (25, 50, or 100 fps.)



For Support contact: support@biopac.com or visit the Support page at www.biopac.com