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EYE TRACKING SYSTEMS

BIOPAC offers an array of monocular and binocular eye tracking systems that are easily integrated with stimulus presentations, VR environments and other media.

Systems	Monocular Part Numbers	Binocular Part Numbers
Fixed System with HeadLock™ positioner and 90 Hz, 220 Hz, or 400 Hz camera	EYEFIXMONOCLAMP	EYEFIXBINOCLAMP
Movable Head for HMD1	EYETRKHMD1B-M90	EYETRKHMD1B-B90
Movable Head for HMD2	EYETRAKHMD2MONO	EYETRAKHMD2BINO
Movable Head for 3rd-party HMD	EYETRAKHMD3RDMO	EYETRAKHMD3RDBI
Frame Mounted Scene Camera	EYEFRAMESCENEMO	EYEFRAMESCENEBI

The following Analog output and Interface cables are included with all Eye Tracking packages:

- Analog output (4 channels)—real-time analog voltage signals
    - 4-Channel 12-Bit Analog Output Board with 48-Bits of Digital I/O
    - AnalogOut software for use with ViewPoint PC-6
    - 0.61 meter 100 Pin High Density Connector to 2 50 Pin IDC
    - 50 Pin Universal Screw Terminal and screws
    - TTL capabilities
- Interface cables to MP System: CBL100 x 4 and CBLEPM x 4
    - Use the full power of the MP Research System and Acq*Knowledge* software.
    - To record biopotential signals in the same record while maintaining subject isolation, add an AMI100D/HLT100C and one INISOA for each eye track channel

FIXED HEAD SYSTEMS (Monocular-EYEFIXMONOCLAMP, Binocular-EYEFIXBINOCLAMP)

These turnkey monocular or binocular eye tracking systems include the HeadLock™ positioner with 90 Hz, 220 Hz, or 400 Hz camera(s). The fixed head system provides a real-time display of gaze point history, gaze period, fixation duration, pupil size. The system interfaces with BIOPAC data acquisition and analysis systems to combine eye tracking information with other physiological data and stimulus presentation markers.

Fixed Head Binocular System with Clamp (EYEFIXBINOCLAMP)

Includes:

- USB capture device
- Close Focus Camera (90 Hz, 220 Hz, or 400 Hz) and illuminator system (2 cameras for Binocular system)
- ViewPoint PC-60 software—record vertical position, horizontal position, pupil size, etc. (Binocular option enabled for Binocular system)

![BIOPAC Systems, Inc. logo]

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MOVABLE HEAD SYSTEMS (Monocular- EYETRKHMD1B-M90, Binocular- EYETRKHMD1B-B90)

These turnkey systems include everything you need for monocular or binocular HMD eye tracking—including the Sony HMZ-1 head mounted display with eye tracking cameras and illuminator systems installed.

Monocular Movable Head System

Includes:

- Sony HMZ-1 (HMD1B)
- USB capture device
- ViewPoint PC-60 software—record vertical position, horizontal position, pupil size, etc.
- One eye camera and illuminator system (x 2 cameras and illuminator systems for Binocular system)
    - 90 Hz USB 2.0 camera
    - Eye camera(s) and illuminator system(s) include either a color 70º horizontal field of view scene camera or a black and white 60º horizontal field of view scene camera
- Universal power supply with country-specific adapter and 10 m video and power cable
- Waist pack cable holder (not shown)
- Additional hardware specs as shown

MOVABLE HEAD - HMD2 (Monocular-EYETRAKHMD2MONO, Binocular-EYETRAKHMD2BINO)

This turnkey system provides everything required to add monocular/binocular HMD eye tracking to an nVis SX HMD, including hardware, software, and professional mounting to the HMD at the factory. The system can be added to a new nVis SX purchased from BIOPAC (HMD2) or to an existing nVis SX HMD; if the system is being added to an existing nVis SX, the unit must be returned to BIOPAC for modification.

Part numbers:

MOVABLE HEAD - FOR 3RD PARTY HMD (Monocular-EYETRAKHMD3RDMO, Binocular-EYETRAKHMD3RDBI)

This system includes everything you need to mount monocular HMD eye tracking to existing third-party HMD.

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SCENE CAMERA (Monocular-EYEFRAMESCENEMO, Binocular-EYEFRAMESCENEBI)

Monocular & Binocular Viewpoint PC-60 Scene Camera Versions with EyeFrame hardware.

Binocular Scene Camera System

Includes:

- USB capture device
- ViewPoint PC-60 software scene camera version—record vertical position, horizontal position, pupil size, etc. (Binocular version enabled for Binocular system)
- Eye camera(s) and illuminator system(s) mounted to the EyeFrame hardware
  - EyeFrame hardware includes eye camera and illuminator system and either a color 70º horizontal field of view scene camera or a black and white 60º horizontal field of view scene camera
- Universal power supply with country specific adaptor and 10 M video and power cable.
- Waist pack cable holder (not shown)
- Additional hardware specs as shown

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EYE TRACKING SYSTEM SPECIFICATIONS

Real-time display	Gaze point history, gaze trace, fixation duration, pupil size and ROIs, can be graphically displayed over stimulus image. Visible to the user and / or the subject for fixed and HMD options.
	Real-time pen plots of X and Y position of gaze, velocity, ocular torsion, pupil width and pupil aspect ratio.
Allowable head movement	Fixed and HMD options: Small movements allowed. Subject's pupil and corneal reflection must remain within the camera image.
	Scene camera options: unlimited
Tracking Method	Infrared video. Monocular or binocular options. Pupil tracking—Fixed and HMD options = bright or dark pupil; scene camera options = dark pupil.
Visual range	Fixed options: *Horizontal* ±44° of visual arc, *Vertical*± 20° of visual arc
	HMD options: tracking will depend on the field of view of the HMD.
	Scene camera options, included with the system either: Color 70º horizontal field of view **or** B&W 60º horizontal field of view.
Measurement principle	The user can select between three methods: Pupil only, corneal reflection only, or both together (both provides greater tolerance to head movements for the fixed and HMD options).
Accuracy*	Approximately 0.25° - 1.0° visual arc
Spatial resolution*	Approximately 0.15° visual arc
Temporal resolution	between 60 Hz and 30 Hz, user-selectable
Blink suppression	Automatic blink detection and suppression
Pupil size resolution	Measures pupil height and width to better than 0.03 mm instantaneous (no averaging).
Auto threshold	The program scans over the video image for the pupil and / or for the corneal reflection. Little or no manual adjustment required.
	luminance threshold can be adjusted
	auto threshold feature provides good threshold levels automatically
Real-time communication	Same computer: Software Developers Kit (SDK) supplies everything required for seamless interface between ViewPoint and the program. This includes: DLL with shared memory, .h and .lib files plus sample source code written in C Language.
	Serial port: Sends eye data packets and asynchronous packets equivalent to information in ASCII data files at rates of up to 56K. Receive real time data from other programs and store it asynchronously into data files.
	AnalogOut option: Selectable unipolar or bipolar voltage ranges: +/- 10, 5, 2.5. Selectable data items: position of gaze (x,y), pupil (h,w), velocity (dx,dy), and raw pupil, glint or vector data. TTL capabilities. 2 or 4 channel options.
	TTL in/out option: Eight TTL input channels are interfaced to place marker codes into the *ViewPoint* data file. Eight TTL output channels that indicate when the position of gaze is inside *ViewPoint* region of interest areas ROI-0 to ROI-7.
	Ethernet: full real-time synchronization across machines via the Ethernet.

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Stimulus Presentation	Pictures and movies can be displayed in full stimulus windows or in user specified ROIs. Auditory cues can be integrated. Gaze contingent stimulus presentation via state logic.
Data recorded	Data is stored in ASCII files.
	Eye data: X, Y position of gaze, pupil height and width, ocular torsion, delta time, total time, and regions of interest (ROI).
	Asynchronous records include: State transition markers, key presses, data from other programs.
Calibration	Fixed and HMD options: ViewPoint starts in a roughly calibrated state that is adequate for determining screen quadrants or other relative movement measurement such as objective preference-of-looking tasks.
	Scene camera options: Calibration is performed relative to the pixels of the CCD array, not the image content. This is analogous to calibrating relative to the CRT screen and not the image displayed on it.
	New subject setup time between 1-5 minutes. For accurate position of gaze, calibration is required only once per subject—settings can be stored and reused each time a subject returns.
	Easy Slip Correction feature and re-presentation of stray calibration points.
System requirements:	OS: Windows 7/Vista or XP
	Machine: Fixed and HMD options—Pentium compatible
	Scene camera options—2.8 GHz Pentium or higher, or
	Athlon XP 2800+ or higher

Fee-based consulting for integration can be provided.

These eye tracking systems use **Arrington Research**® technology and include cables required to interface to a BIOPAC MP system—MP160 or MP150 data acquisition unit and Acq*Knowledge* software.