

Fast, Accurate, Reliable Eye Tracking

EyeLink®

PORTABLE DUO

2000 Hz Standard with Every New EyeLink



Portable Eye Tracking
Uncompromised Data Quality



The EyeLink® Portable Duo

Portable Eye Tracking, Uncompromised Data Quality

The EyeLink Portable Duo by SR Research produces the highest quality data to emerge from a compact and easy to transport eye tracker. Everything required to take your EyeLink lab on the road will now fit into a carry-on bag. The Portable Duo features distinct dual-use data collection modes unique to EyeLink trackers, with specialized algorithms for head free-to-move and head-stabilized tracking modes. With the same high precision, high accuracy and low data loss that EyeLink systems are renowned for, the Portable Duo meets the scientific demands of researchers in every field of endeavor, allowing the highest quality data to be acquired even in medical, educational and home settings.



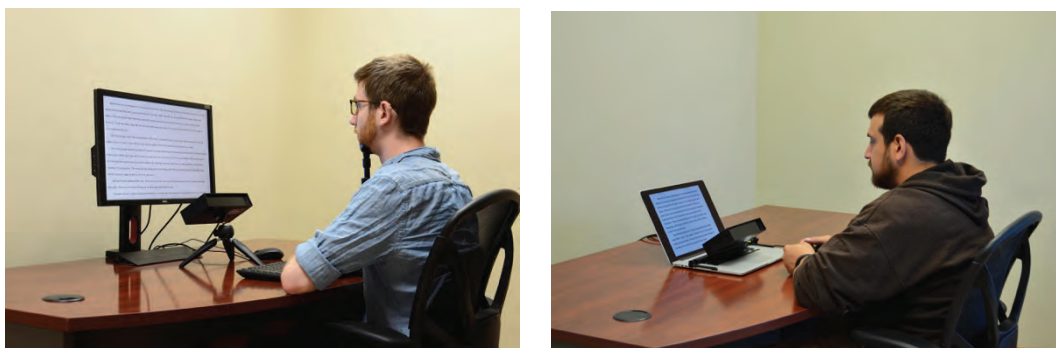
Distinguishing Features

The Portable Duo distinguishes itself from other portable eye trackers in a variety of ways:

- It has compact and powerful camera hardware yielding high-precision sample-level data, allowing it to produce accurate and precise measurements of gaze location and pupil size.
- It is a dual-use system, operating in discrete remote, head free-to-move and high-precision head stabilized modes, each with their own unique algorithms for ensuring low noise and high accuracy.
- Its consistent binocular sampling rate enables the most sophisticated and demanding eye movement research (up to 2000 Hz with the head stabilized, 1000 Hz with the head free-to-move), including:
 - gaze-contingent paradigms,
 - microsaccade detection and measurement,
 - clinical oculomotor assessment and
 - pupillometry.
- The EyeLink Portable Duo has been designed to meet the most stringent technical standards including IEC 60601-1 medical certification, making it ideal for clinical and hospital use.

Laptop and Desktop Mounts

The EyeLink Portable Duo comes with Laptop and Tripod Mounts for fast and easy tracking on a laptop screen or for use with an on-site display. The unique combination of portability, usability and high quality data makes the Portable Duo the perfect solution for researchers looking to take eye tracking out of the laboratory and into alternative environments like clinics, offices, daycares, schools and homes. With its high sampling rate and low noise, it is perfect for tracking patients, young children and other challenging participants.



The EyeLink Portable Duo includes adjustable Tripod and Laptop Mounts to enable superior quality eye tracking data collection in a wide variety of settings, both in and out of the laboratory.

Mobile, Flexible and Easy to Use

Everything researchers need will fit in a tough carry-on case for long distance transport, and a wheeled combination laptop bag/backpack allows for easy transport for local visits. In addition to Laptop and Tripod Mounts, the system comes with a lightweight Laptop Host PC, a compact head support, and a gamepad response device. Experiments can be delivered on laptop screens or other displays controlled by small PCs.

The EyeLink Portable Duo Host software has been redesigned with a streamlined graphical user interface, making the system faster and simpler to use than ever. Calibration can be performed in a few quick steps, or for the most demanding patient protocols, control over every aspect of data collection is only a few clicks or keystrokes away.



Comprehensive Technical Support

Every EyeLink Portable Duo includes perpetual technical support with no additional cost or hidden annual fees. Our Research Support team spans two continents. They understand research, and they understand your need for fast, competent assistance in collecting and analyzing high-quality data. Join our support forums for free now – <http://www.sr-support.com>.

Compatible with Existing EyeLink Applications

The EyeLink Portable Duo uses the well-established EyeLink Application Programming Interface (API) that has been in use for over 20 years, so existing programs developed for any EyeLink eye tracker can be used for both data collection and analysis. This gives you confidence that many programming options will be available for your eye-tracking task, and your programming efforts will benefit when you later want to expand from the lab to the field or even to fMRI – a single unified programming solution cuts across every setting.

Free Software Development Kits (SDKs):

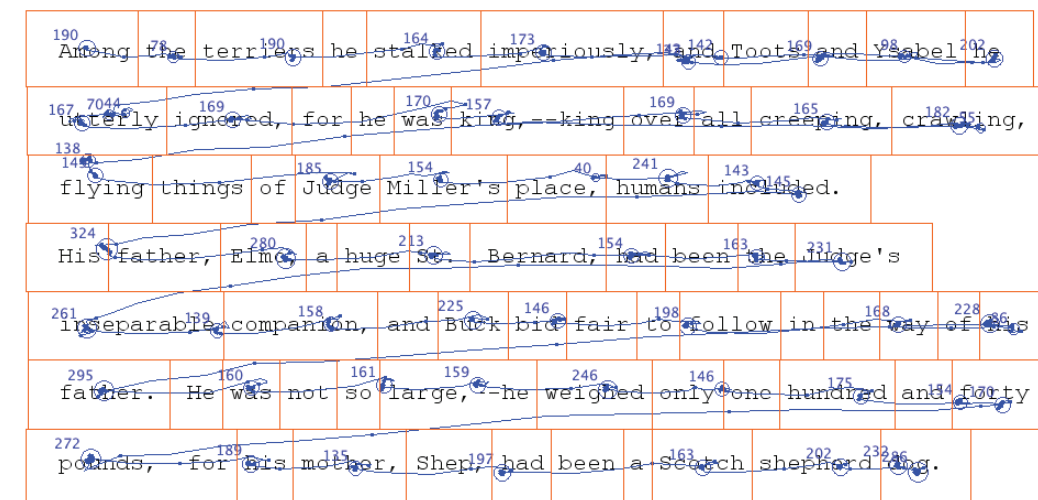
- are available for Windows XP / Vista / 7 / 8 / 10, Mac OS X, and Linux
- E-Prime, MATLAB via Psychtoolbox, NBS Presentation, LabView, PsychoPy, as well as C, COM interface and Python examples are included

Free SR Research Screen Recorder software enables:

- video capture of eye movements overlaid on anything a Windows computer can display (e.g., web browsing, interfaces, gaming, etc.)
- video and eye movement data load into EyeLink Data Viewer for visualization and analysis

Experiment Builder and Data Viewer

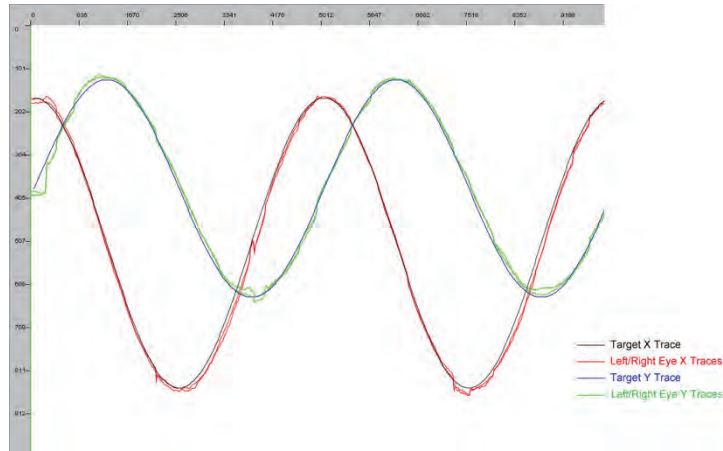
SR Research Experiment Builder (cross-platform OS X and Windows) is a full-featured experiment delivery system with hundreds of examples designed to assist you in quickly designing your experiment. EyeLink Data Viewer allows quick visualization of the data and the creation of data reports suitable for import to statistical analysis programs. See Pages 6 and 7 for details.



Simple reading data showing interest areas automatically generated by the Experiment Builder software, with eye traces and fixations overlaid using EyeLink Data Viewer.

Outstanding Accuracy and Precision

Whether recording with the remote, head free-to-move or head-stabilized tracking mode, the EyeLink Portable Duo provides the exceptionally high level of accuracy and precision for which all SR Research eye trackers are renowned.



The Portable Duo produces stable, low-noise, binocular recordings, even when the head is freely moving (at up to 1000 Hz, and up to 2000 Hz with the head stabilized). In the above remote, head free-to-move eye traces, small corrective saccades can clearly be seen in the binocular circular smooth pursuit data.

Pupil Size Accuracy

Pupil size data are available with every sample collected by the EyeLink Portable Duo. To evaluate the level of accuracy obtained in pupil size measures, dots between 2.0 and 5.0 mm in diameter were laser printed, and the pupil area was measured for each. The diameter of each dot in system units was computed, and the percentage difference in reported diameter compared to the expected difference for each dot was:

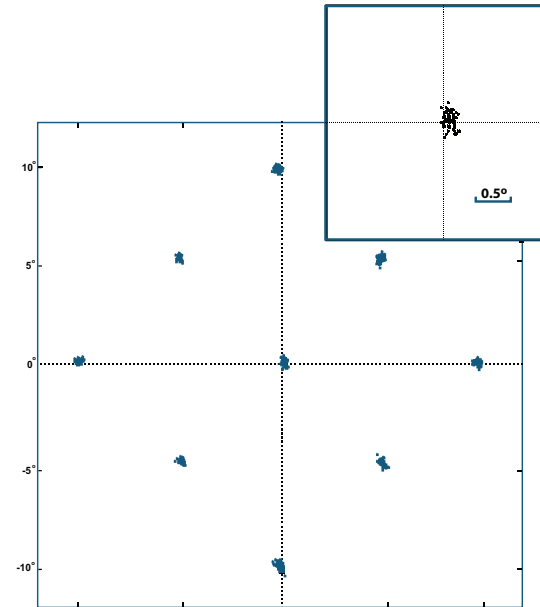
5 mm (142 pixels – 125.66% of 4 mm) - 1636 area – 40.4475 diameter - 125.60% for -0.06% error
 4 mm (113 pixels – 100.00% of 4 mm) - 1037 area – 32.2025 diameter - 100.00% for 0.00% error
 3 mm (85 pixels – 75.22% of 4 mm) - 593 area – 24.3516 diameter - 75.62% for +0.40% error
 2 mm (57 pixels – 50.44% of 4 mm) - 262 area – 16.1864 diameter - 50.26% for -0.18% error

Measurement error is below 0.4% error for all sizes.

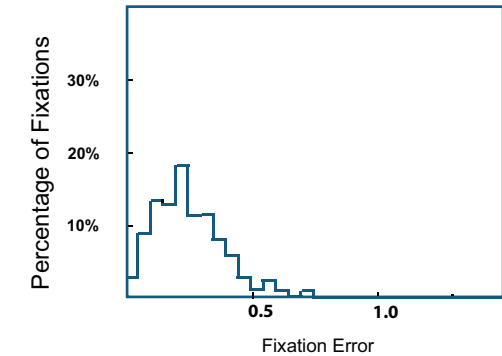
The second test was to see how well the system picked up smaller changes, so we used 4 dots of 4.1,4.0,3.9 and 3.8 mm and compared the reported sizes in relation to the 4.0 mm standard:

4.1 mm (116 pixels – 102.66% of 4 mm) - 1097 area – 33.1210 diameter - 102.85% for +0.19% error
 4.0 mm (113 pixels – 100.00% of 4 mm) - 1038 area – 32.2180 diameter - 100.05% for +0.05% error
 3.9 mm (111 pixels – 98.23% of 4 mm) - 998 area – 31.5914 diameter - 98.10% for -0.13% error
 3.8 mm (108 pixels – 95.58% of 4 mm) - 938 area – 30.6268 diameter - 95.11% for -0.47% error

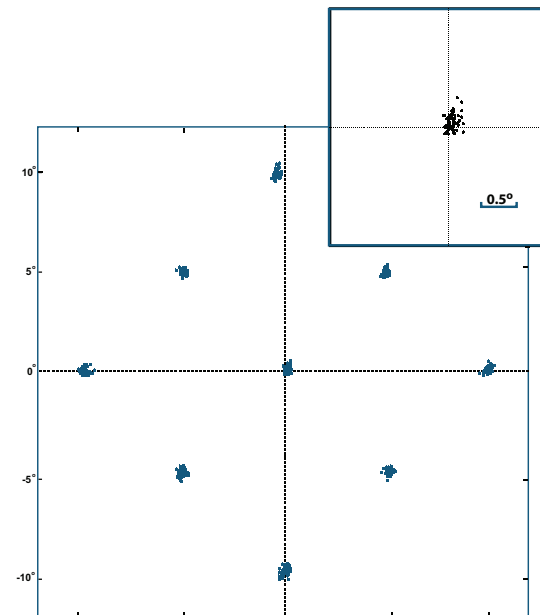
Fixation Accuracy (Head Stabilized)



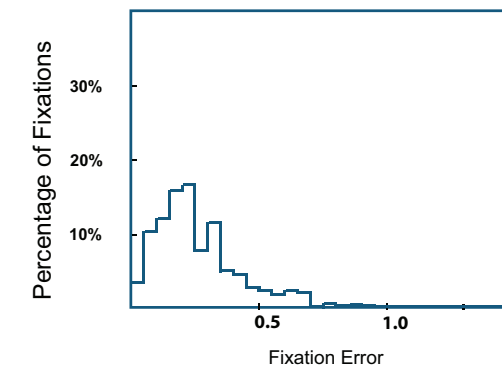
Repeated target fixations to nine screen locations recorded with the EyeLink Portable Duo with the head stabilized following a 13-point calibration. The inset plot represents an enlarged view of the fixation distribution around the center target position. On the right is a fixation error histogram demonstrating the tight fixation accuracy distribution (Mean = 0.25°, Median = 0.23°, and Standard Deviation = 0.14°).



Fixation Accuracy (Remote, Head Free-to-Move)



Accuracy was assessed without a head support using the Remote Mode following a 13-point calibration. Repeated target fixations to nine screen locations resulted in the low error levels demonstrated by the fixation error histogram below (Mean = 0.26°, Median = 0.22° and Standard Deviation = 0.16°). The inset plot is an enlarged view of the fixation distribution around the center target position.



SR Research Experiment Builder

Key Features:

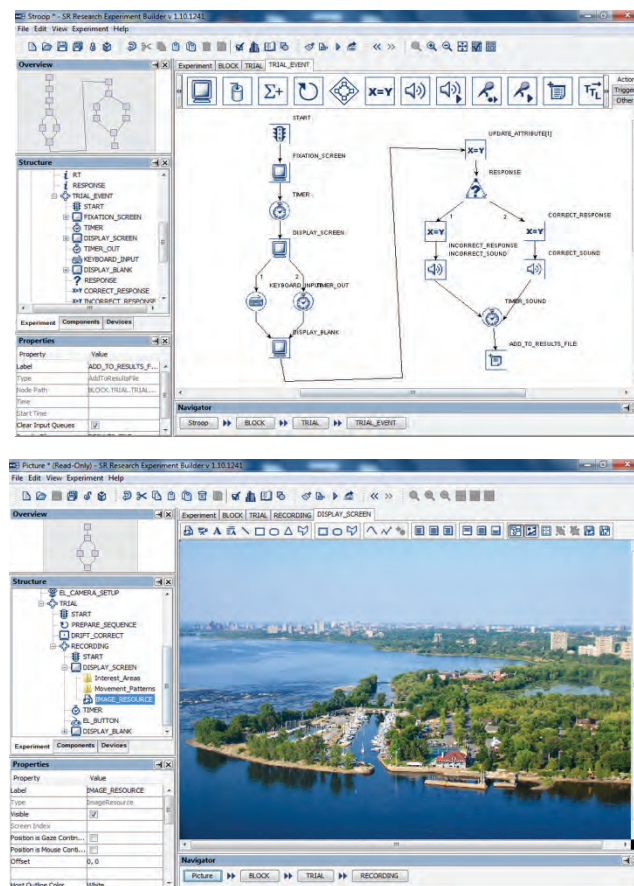
- Cross-platform compatible for Windows (32-bit and 64-bit) and Mac OS X
- Graphical User Interface supports drag and drop experiment programming
- Easy-to-use hierarchical experiment creation interface
- Supports simple to complex experimental paradigms
- Millisecond precise timing of video, audio, TTL and response devices
- Built-in screen editor allows:
 - Manipulating text, image, and video clip objects
 - Structured drawing of text and graphical objects
 - Automatic generation of interest areas for text
- Multilanguage / Unicode support throughout the application
- Advanced support for EyeLink eye trackers and seamless integration with Data Viewer software
- Add custom Python code to extend experiments as desired

SR Research Experiment Builder is a graphical programming environment for creating computer-based psychology and neuroscience experiments. EyeLink eye trackers are supported with many advanced interactive capabilities.

Complex visual and auditory stimulus delivery with extremely high levels of precision and synchronization is made accessible.

Experiment Builder is simple enough for a novice user but rich enough to handle advanced experimental paradigms. Python data structures and commands can be incorporated for increased flexibility.

A free demo version is available (<http://www.sr-research.com/eb.html>) with sample projects and a comprehensive user manual that illustrates how these examples were created. Many additional examples, video tutorials, and programming resources are available at the SR Research's support website (<http://www.sr-research.com>).



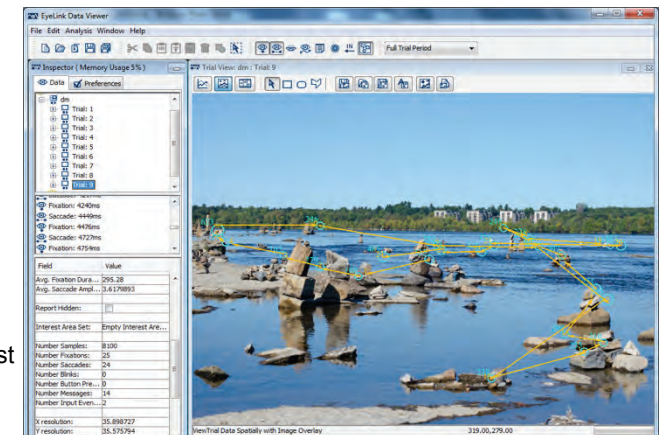
EyeLink Data Viewer

Key Features:

- Data visualization
 - Animation Playback View shows a movie of the trial with eye movements overlaid (including bee-swarm for multiple trials)
 - Spatial Overlay View superimposes saccade and fixation scan-path information over an image
 - Temporal Graph View supports visualization of eye data over time
 - Supports both static and dynamic interest areas (rectangular, elliptical, or freeform polygons)
- Generate static or dynamic heat maps for selected trials or groups of trials
- Output eye sample, fixation, saccade, interest area, or trial-based reports for statistical analysis
- Output Time Series (binning) reports for Visual World / Dynamic tasks
- Calculate hundreds of dependent measures including most common reading measures
- Create interest periods for temporal data filtering
- Highly integrated with SR Research Experiment Builder, E-Prime, Presentation and any custom programming method

EyeLink Data Viewer is a powerful yet intuitive software package that can be used for viewing, filtering, and processing gaze data recorded with EyeLink eye trackers. Several different viewing options provide convenient ways to visualize and inspect both temporal and spatial aspects of eye movement recordings.

The software provides a range of analysis tools that can be used to generate tab-delimited summary reports based on interest areas, fixations, saccades or samples.



Hundreds of basic and advanced report variables are provided, including a wide range of dependent measures used in reading research. The software allows multiple data files to be loaded into a single viewing session, meaning that visualization graphics and data reports can be created for entire experiments.

A free demo version of the EyeLink Data Viewer software is available at <http://www.sr-research.com/dv.html>.

EyeLink® Portable Duo Technical Specifications

	EyeLink Portable Duo	
Eye Tracking Mode:	Head Stabilized Tracking	Remote, Head Free-to-Move Tracking
Sampling Rate	Monocular or Binocular 250, 500, 1000, 2000 Hz	Monocular or Binocular 250, 500, 1000 Hz
Eye Tracking Principle	Pupil with Corneal Reflection (CR)	
Average Accuracy ¹	Down to 0.15° (0.25° to 0.5° typical)	
Saccade Event Resolution	0.05° microsaccades	
Spatial Resolution ²	0.01°	
Noise with Participants ¹	Filter (Off / Normal / High) 1000 Hz: 0.03°/ 0.02°/ 0.01° 2000 Hz: 0.05°/ 0.03°/ 0.02°	Filter (Off / Normal / High) 500 Hz: 0.03°/ 0.02°/ 0.01° 1000 Hz: 0.05°/ 0.03°/ 0.01°
End-to-End Sample Delay ³	M = 1.34 msec, SD = 0.18 msec @ 2000 Hz M = 1.88 msec, SD = 0.36 msec @ 1000 Hz	M = 2.10 msec, SD = 0.37 msec @ 1000 Hz M = 3.21 msec, SD = 0.61 msec @ 500 Hz
Blink Recovery Time	0.5 ms @ 2000 Hz 1.0 ms @ 1000 Hz	1.0 ms @ 1000 Hz 2.0 ms @ 500 Hz
Pupil Detection Models	Centroid or Ellipse Fitting	Ellipse Fitting
Pupil Size Resolution ¹	0.1% of diameter	
Gaze Tracking Range	Customizable – Default is 32° horizontally, 25° vertically	
Allowable Head Movement	±25 mm horizontal or vertical	20 cm horizontal X 20 cm vertical at 52 cm
Optimal Camera-Eye Distance	42 - 62 cm	
Glasses Compatibility	Excellent	
On-line Event Parsing	Fixations / Saccade / Blink / Fixation Update	
EDF File and Link Data Type	Gaze, Raw, and HREF eye position data / Pupil size / Online events / Buttons / Messages / Digital inputs	
Real-time Operator Feedback	Eye position gaze cursor superimposed on static image or position traces with camera images and tracking status	
Certifications	IEC 60601-1 ed. 3., AAMI ES60601-1, CSA C22.2#60601-1 ed. 3.1, IEC 62366 ed. 1, ISO 15004-1, ed. 1, ISO 15004-2, IEC 62471 ed. 1, ISO 14971. ed. 2, IEC 60601-1-6 ed. 3.0, IEC 60601-1-2, ed. 4	

Specifications are subject to change without notice. Availability of some features depends on options purchased.

1. Measured with real subject fixations.
2. Unfiltered data measured with an artificial eye.
3. Time from physical event until first registered sample (unfiltered) is available via Ethernet

EyeLink® Model Comparison Chart

The EyeLink Portable Duo is a powerful eye tracker. To help you make the right choice, here are some ways in which it varies from the EyeLink 1000 Plus.

	EyeLink Portable Duo	EyeLink 1000 Plus
Mounting Options	Laptop Mount (included) Tripod Mount (included) Arm Mount Screen Mount	Desktop Mount Arm Mount Tower Mount Primate Mount Long Range Mounts (fMRI, MEG)
Weight	EyeLink Portable Duo and Laptop Mount - Approximately 1 kg Minimal Setup ¹ - 3.7 kg	EyeLink 1000 Plus with Desktop Mount – Approximately 2.1 kg Minimal Setup - 7.0 Kg
Dimensions (WxHxD)	21 cm x 4.5 cm x 11 cm	Approx. 29 cm x 18 cm x 9 cm with Desktop Mount
MRI / MEG tracking	-	Yes – with Long Range Mounts
Analog Voltage Output	-	Yes – with Analog Output option
Participant Age Range	TBD – older infants through to adults	All ages – infants ¹ through to adults
Allowable Head Movement in Remote Mode	20 cm horizontal X 20 cm vertical at 52 cm	35 cm horizontal X 35 cm vertical at 60 cm 40 cm horizontal X 40 cm vertical at 70 cm
Optimal Camera-Eye Distance	42 - 62 cm in all modes	40 – 70 cm in Head-Stabilized and Remote Modes 60 – 150 cm in Long-range Mount
Sampling Rate	Up to 2000 Hz monocular or binocular head stabilized or 1000 Hz monocular or binocular head free-to-move	Up to 2000 Hz monocular or binocular head stabilized or 1000 Hz monocular or binocular head free-to-move ²
Travel Case, Wheeled Laptop Bag	Included	-
Lightweight Head Support	Included	-
Gamepad Response Device	Included	-
Camera Interface	USB 3.0	Gigabit Ethernet
Power Requirements	5.0 V, 1800 mA USB powered	12 V, 2000 mA from external power supply
Eye Tracker Enclosure	Camera, lens, and illuminator are sealed inside an anodized aluminum enclosure with acrylic optical window	Camera (with interchangeable lens) and illuminator can be mounted separately

Specifications are subject to change without notice. Availability of some features depends on options purchased.

1. Weight of the Host PC and eye tracker.
2. With appropriate hardware components.

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