

Tobii® Technology

Tobii T/X series Eye Trackers

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Declaration of Conformity

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules and EMC directive 89/336/EEC. The product also conforms with the directive 73/23/EEC for low voltage.



All Tobii eye trackers are CE-marked, indicating conformity with the essential health and safety requirements set out in European Directives.

The Tobii Eye Trackers are for use in office and home environments.

Product Description for Tobii T & X Series Eye Trackers

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Introduction

Overview

Tobii T/X Series brings revolutionary high performance and user-centered design into eye tracking technology, making eye tracking studies easily accomplished by anyone. The T/X Series give twice as accurate eye gaze data and provides an even more natural environment for the subject to ensure realistic responses. Since it is fully plug-and-play, the eye tracker can be set up in minutes. Time and cost efficient automatic tracking enables eye tracking in much wider areas of application than has ever been possible before.



This document describes the features and functionality of the following products:

Tobii T60 & T120 Eye Trackers

The Tobii T60 and T120 Eye Trackers are integrated into a 17" TFT monitor. They are ideal for all forms of eye tracking studies with stimuli that can be presented on a screen, ranging from market research and usability studies to psychology studies, infant studies, reading studies, vision research and more.

Tobii T60 XL Eye Tracker

The Tobii T60 XL is integrated into a high-resolution 24" TFT wide screen monitor for large stimuli display. New technical advancements offer high-quality tracking over wide-screen gaze angles. High screen resolution and the possibility to position respondents close to the screen allow for studying small details and peripheral vision.

Tobii X60 & X120 Eye Trackers

The Tobii X60 and X120 Eye Trackers are standalone eye tracking units designed for eye tracking studies relative to any surface. They enable a variety of stimuli setups such as a TV or other displays, a projection screen or a physical object or a scene. They are our most flexible eye trackers, recommended for studies that require particular stimuli setups.

Application areas

Examples of applications where Tobii eye trackers are clearly suitable are:

- Web and software usability studies
- Web/TV/print advertisement testing
- Studies of store shelves, packaging and virtual shopping environments
- Psychological studies
- Studies of reading and dyslexia
- Studies of infants and children
- Visual perception research
- Low vision studies
- Clinical applications
- Human factors research
- Eye based computer interaction
- and much more...

Basic Operating Principles

During tracking, the Tobii eye tracker uses infrared diodes to generate reflection patterns on the corneas of the user's eyes. These reflection patterns, together with other visual information about the person are collected by image sensors. Sophisticated image processing algorithms identify relevant features, including the eyes and the corneal reflection patterns. Complex mathematics is used to calculate the three-dimensional position of each eyeball, and finally the gaze point on the screen; that is, where the user is looking.

Advantages of the Tobii Eye Trackers

100% automatic tracking

The quick and easy setup procedure makes Tobii eye trackers an extremely time saving and cost efficient platform for eye tracking studies. No manual adjustments are required and no additional software needs to be installed. No highly trained operator needs to be present during testing.

Works with standard computers

No requirements for specialized hardware so that most desktop and laptop computers can be used. This simplifies setup and installation and enables highly portable solutions.

Please note that some software applications used with Tobii eye trackers, such as Tobii Studio™, might require a high performance computer to manage heavy media processing.

Very quick and fully automatic calibration procedure

The calibration procedure involves having the system display a number of points on the screen. This may involve as few as only two calibration points, but will still yield high accuracy across the entire tracking range. The calibration also uses automatic filters to select good data points.

All of this enables very simple and quick calibrations, even on difficult subjects such as infants and low-vision subjects.

Powerful and easily managed programming interfaces and application software

The Tobii T/X Series provides easy to use and powerful programming interfaces using the Tobii Software Development Kit (SDK). Among other things, the kit provides high-level COM interfaces with tools for simple development of custom applications.

Several software packages support Tobii eye trackers, including Tobii Studio™ analysis software, E-Prime experimental software, and EyeTools usability solution.

Excellent tracking quality

Exceptional tracking ability

Tobii eye trackers track eye gaze of virtually everyone, regardless of ethnic origin, age, or glasses/contacts. This eliminates disappointing results from not being able to track a certain individual and enables high efficiency in large studies. A very high tolerance to varying light conditions also contributes to the outstanding tracking quality.

Automatic tracking optimization

During calibration both bright and dark pupil eye tracking methods are used and the most suitable method is chosen automatically. With automatic optimization for dark and bright pupil tracking the Tobii T/X Series Eye Trackers are able to increase both the tracking quality and the ability to track a wider range of the population.

Very high accuracy

Extraordinarily high accuracy provides reliable and precise results about the gaze position of the user. Excellent compensation for head movements and long-time drift effects also allow for a truly natural user environment.

Effective binocular tracking

Tobii eye trackers track both eyes simultaneously and automatically determines which eye is left and which is right regardless of head pose and blinking.

Binocular tracking enables more robust tolerance to head motion since tracking continues even if one eye is hidden from the field of view of the tracker. It also makes calibrations last longer, as parts of long-time drift effects are inversely symmetrical between the eyes and can be averaged out.

Validity measures

The eye trackers provide a built-in, real-time tracking status meter as well as numerical validity measures for each gaze data point, which indicates the correctness of the data recorded. Being able to verify the validity of each data point provides the basis for filtering out corrupt data points, which ensures quality data.

The 120 Hz trackers (T120 and X120 Eye Trackers) offer more fine-grained gaze data for studies of neurological processes where a higher quantity of detailed measurements is valuable.

Natural User Environment

Freedom of head movement

The eye trackers tolerate both large and rapid head movement—enough to provide an entirely unrestrained user experience. Head movements within the range of the tracking box are nearly perfectly compensated for.

Tracking is resumed instantly when the user moves back into the tracking box. This ensures a completely natural and relaxing environment for the subject and provides the most realistic responses to different stimuli.

As head movement is also very difficult to restrain for longer periods of time, the excellent head motion compensation of the Tobii trackers allows for unsurpassed tracking quality over long recording sessions.

Integrated hardware

All hardware, including user camera and speakers, is integrated into the slim casing of a TFT display (applies to T60, T120 and T60XL Eye Trackers). The eye tracking technology is practically unnoticeable since no sensors or other hardware elements are visible to distract the user.

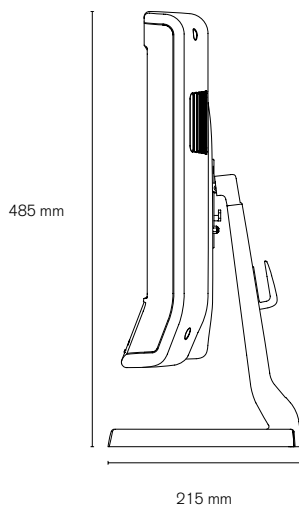
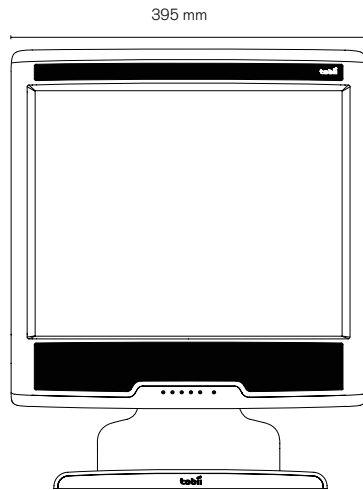
Long-lasting calibrations

Excellent head motion compensation, and other means of drift compensation are obtained due to the sensors being fixed relative to the tracking plane, which allows for long-lasting calibrations. A user only needs to calibrate once and can reuse this calibration over and over again. Long-lasting calibrations allow for a natural user environment as the user can move around and even go away and come back without recalibrating. On many other trackers calibration quality deteriorates after only a few minutes, and constant recalibrations are therefore required on such systems.

Technical Specifications

Tobii T Series Eye Trackers

Overall dimensions



| Models | T60/T120* | T120* |
|---------------------------|---|---------------------|
| Data rate | 60 Hz | 120Hz |
| Accuracy | typical 0.5 degrees | typical 0.5 degrees |
| Drift | typical 0.1 degrees | typical 0.1 degrees |
| Spatial resolution | typical 0.2 degrees | typical 0.3 degrees |
| Head movement error | typical 0.2 degrees | typical 0.2 degrees |
| Head movement box | 44 x 22 cm at 70 cm | 30 x 22 cm at 70 cm |
| Tracking distance | 50-80 cm | 50-80 cm |
| Max gaze angles | 35 degrees | 35 degrees |
| Top head-motion speed | 25 cm/second | 25 cm/second |
| Latency | maximum 33 ms | maximum 33 ms |
| Blink tracking recovery | maximum 17 ms | maximum 8 ms |
| Time to tracking recovery | typical 300 ms | typical 300 ms |
| Weight (excluding case) | ~ 9 kg / 19.8 lbs | |
| Eye tracking technique | both bright and dark pupil tracking | |
| Eye tracking server | Embedded | |
| Screen size | 17" TFT | |
| Screen resolution (Max) | 1280 x 1024 pixels | |
| Display colors | 16.7 M (true 8-bit) | |
| Vertical sync frequency | 56-75 Hz | |
| Horizontal sync frequency | 30-60 kHz | |
| TFT response time | 4 ms | |
| User camera | Built in, frame rate 640 x 480@ 30 fps | |
| Speakers | Built in, 2 x 4W power | |
| Connectors | LAN, VGA, DVI-D, Power, User Camera and Audio | |

Average values over the screen measured at a distance of 63 cm in a controlled office environment.

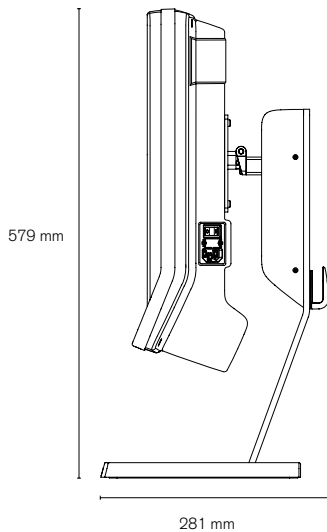
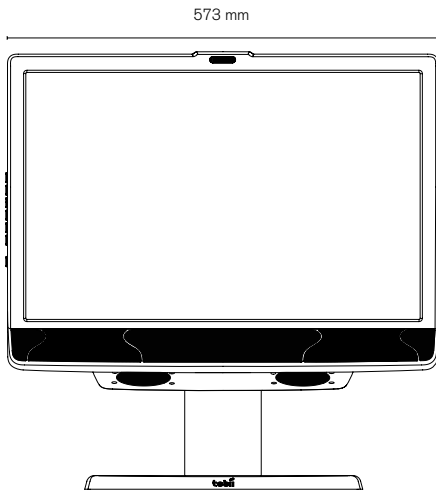
* The Tobii T120 Eye Tracker can be run in 60 or 120 Hz mode.

The Tobii T60 & T120 Eye Trackers allows you to set up an eye tracking session in minutes on any desktop or laptop computer. Achieve objective results time and cost efficiently, without need for expertise.

The Tobii T60 and T120 Eye Trackers are integrated into a 17" TFT monitor. They are ideal for all forms of eye tracking studies with stimuli that can be presented on a screen. Get objective results testing print ads, TV commercials, shopping shelves, packaging and product design. Research usability of web, software and computer games. Perform psychology studies, infant studies, reading studies, vision research and more.

Tobii T Series Eye Trackers

Overall dimensions



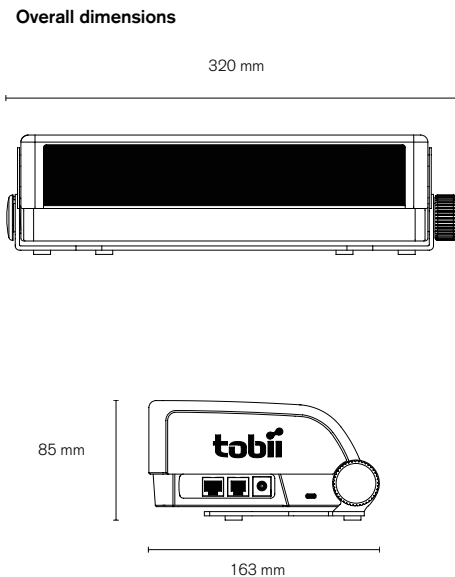
| Model | T60 XL |
|---------------------------|--|
| Data rate | 60 Hz |
| Accuracy | typical 0.5 degrees |
| Drift | typical 0.1 degrees |
| Spatial resolution | typical 0.35 degrees |
| Head movement error | typical 0.2 degrees |
| Head movement box | 44 x 22 cm at 70 cm |
| Tracking distance | 50-80 cm |
| Max gaze angles | 42 degrees |
| Top head-motion speed | 25 cm/second |
| Latency | maximum 33 ms |
| Blink tracking recovery | maximum 17 ms |
| Time to tracking recovery | typical 300 ms |
| Weight (excluding case) | ~ 13 kg / 29 lbs |
| Eye tracking technique | both bright and dark pupil tracking |
| Eye tracking server | Embedded |
| Screen size | 24" TFT |
| Screen resolution (Max) | 1080p (1920 x 1200 pixels) |
| Display colors | 16.7 M (true 8-bit) |
| Vertical sync frequency | 46-63 Hz |
| Horizontal sync frequency | 69-78.5 kHz |
| TFT response time | 4 ms |
| User camera | Built in, frame rate 640 x 480@ 30 fps |
| Speakers | Built in, 2 x 4W power |
| Connectors | LAN, VGA, DVI-D, S-Video, CVBS video, Power, User Camera and Audio |

Average values over the screen measured at a distance of 63 cm in a controlled office environment.

The Tobii T60 XL Eye Tracker allows you to easily, accurately and unobtrusively measure gaze over wide-screen stimuli. It is easy to transport and set up onsite

The Tobii T60 XL is integrated into a high-resolution 24" TFT wide screen monitor. New technical advancements offer high-quality tracking over wide-screen gaze angles. High screen resolution and the possibility to position respondents close to the screen, allow for studying small details and peripheral vision.

Tobii X Series Eye Trackers



| Models | X60/X120* | X120* |
|----------------------------------|-------------------------------------|---------------------|
| Data rate | 60 Hz | 120Hz |
| Accuracy | typical 0.5 degrees | typical 0.5 degrees |
| Drift | typical 0.1 degrees | typical 0.1 degrees |
| Spatial resolution | typical 0.2 degrees | typical 0.3 degrees |
| Head movement error | typical 0.2 degrees | typical 0.2 degrees |
| Head movement box | 44 x 22 cm at 70 cm | 30 x 22 cm at 70 cm |
| Tracking distance | 50-80 cm | 50-80 cm |
| Max gaze angles | 35 degrees | 35 degrees |
| Top head-motion speed | 25 cm/second | 25 cm/second |
| Latency | maximum 33 ms | maximum 33 ms |
| Blink tracking recovery | maximum 17 ms | maximum 8 ms |
| Time to tracking recovery | typical 300 ms | typical 300 ms |
| Weight (excluding case) | ~ 3 kg / 7 lbs | |
| Eye tracking technique | both bright and dark pupil tracking | |
| Eye tracking server | Embedded | |
| Screen size | - | |
| Screen resolution (Max) | - | |
| Display colors | - | |
| Vertical sync frequency | - | |
| Horizontal sync frequency | - | |
| TFT response time | - | |
| User camera | - | |
| Speakers | - | |
| Connectors | LAN, Power | |

Average values over the screen measured at a distance of 63 cm in a controlled office environment.

* The Tobii X120 Eye Tracker can be run in 60 or 120 Hz mode.

The Tobii X60 & X120 Eye Trackers allows you to experience how people look at physical objects or scenes.

The Tobii X60 and X120 Eye Trackers are stand-alone eye tracking units designed for eye tracking studies relative to any surface. They enable a variety of stimuli setups such as a TV or other displays, a projection screen or a physical object or scene. They are our most flexible eye trackers, recommended for studies that require particular setups.

Glossary - technical specifications

| | |
|----------------------------------|---|
| Data rate | Number of sampled gaze points per second. The TobiiT/X series Eye Trackers have a stable data-rate of 60 Hz or 120Hz; that is 60 or 120 gaze data points per second are collected for each eye. |
| Accuracy | The typical difference between the Measured Gaze Direction and the Actual Gaze Direction at different parts of the screen for a person positioned at the centre of the eye tracking box. This does not include drift effects and compensation errors from larger head movements. The accuracy of the Tobii eye trackers varies depending on external conditions such as lighting, quality of the calibrations, and individual eye characteristics. |
| Drift | Change in accuracy due to change in lighting. The specified value relates to complete inversion of screen color, e.g from black to white without recalibration in between. |
| Spatial resolution | The term “spatial resolution”, or “noise”, denotes the frame-to-frame variation of the measured gaze point. |
| Head movement error | Decrease of accuracy at the edges of the eye-tracking box as compared to the centre where the calibration was done. This includes head translations sideways as well as movement back and forth and up and down. The value is an average of the two types of translations. |
| Head movement box | Measures the box (height × width in cm) where at least one of the eyes is within the field of view of the eye tracker (the present value was measured at 70 cm distance from the sensor). |
| Tracking distance | The distances to the sensor within which the eye tracker is able to detect at least one of the eyes. |
| Max gaze angles | Maximum gaze angle that the eye tracker can detect at least one pupil. The angle is calculated from the centre of the sensor. |
| Top head-motion speed | The maximum speed that a user can move the head at which the eye tracker is able to still find at least one pupil. |
| Latency | Is calculated from the time when an image was shot to when a valid gaze point is delivered to an eye tracking application there is a certain delay. This delay is caused both by sensor hardware and by the computation of the eye tracking software algorithms. Since the timestamp is set at exposure, such delay does not affect the accuracy of the timestamp. |
| Blink tracking recovery | Blinking is the involuntary act of shutting and opening the eyelids. During each blink the eyelid blocks the pupil and cornea from the illuminator resulting in missing eye position data points. This measure represents the typical time the eye tracker takes to resume tracking when the eyelids are open again. During an eye blink tracking recovery is almost instantaneous. |
| Time to tracking recovery | An eye tracker working in a natural user environment may occasionally loses track of the eyes of the user, for example, when the user completely turns away from the tracker. This measure represents the typical time from complete tracking failure to when the eye tracker finds the eyes again. |
| Eye tracking technique | The Tobii Eye Trackers use two different techniques to determine eye position: 1. Bright pupil eye tracking, where an illuminator is placed close to the optical axis of the imaging device, and causes the pupil to appear lit up (this is the same phenomenon that causes red eyes in photos). And 2. Dark pupil eye tracking where the illuminator is placed away from the optical axis causing the pupil to appear black. |
| Eye tracking server | Gaze data calculations are performed by firmware embedded in the eye tracker. Different applications can be connected as clients to the eye tracker system over a LAN connector to gather eye gaze data and other data in real-time and to perform calibrations and other actions. |

Eye tracker data output

Different applications can be connected as clients to the eye tracker system over TCP/IP (LAN connector) to gather eye gaze data in real-time and to perform calibrations (and other actions). Examples of applications that can be used together with the eye tracker include the Tobii Studio™ analysis software, third party analysis products such as E-Prime, or your own custom written software for analysis, gaze-contingent applications, or eye control applications. For more information on how to create your own applications, please refer to the Tobii Software Development Kit (SDK) product description.

Below you can find a list of all data that can be accessed through the output of the eye tracker. In Tobii Studio™ analysis software this data can be accessed through a Raw data text export function, and easily imported into a spreadsheet for further analysis.

| | |
|-------------------------|--|
| Timestamp | Timestamp in milliseconds for when the gaze data was collected |
| Gaze PointXLeft | Horizontal screen position of the gaze point for the left eye |
| GazePointYLeft | Vertical screen position of the gaze point for the left eye |
| CamXLeft | Horizontal location of the left pupil in the camera image (0 is left edge, 1 is right edge) |
| CamYLeft | Vertical location of the left pupil in the camera image (0 is top, 1 is bottom) |
| DistanceLeft | Distance from the eye tracker to the left eye. The distance is given in mm on a straight axis right out from the eye tracker plane |
| PupilLeft | Size of the pupil (left eye) in mm. The distance and pupil size measures are calculated to be as close to real values as possible. However, individual differences in the eyes of subjects and the strength of glasses/contact lenses will cause errors in these values. The measures still reflect changes in head position and pupil size accurately. |
| ValidityLeft | Validity of the gaze data. The validity is 0 if the eye is found and the tracking quality good. If the eye cannot be found by the eye tracker the validity code will be 4. Read more under the Validity codes section further down |
| Gaze PointXRight | The horizontal screen position of the gaze point for the right eye |
| GazePointYRight | Vertical screen position of the gaze point for the right eye |
| CamXRight | Horizontal location of the right pupil in the camera image (0 is left edge, 1 is right edge) |
| CamYRight | Vertical location of the right pupil in the camera image (0 is top, 1 is bottom) |
| DistanceRight | Distance from the eye tracker to the right eye. The distance is given in mm on a straight axis right out from the eye tracker plane |
| PupilRight | Size of the pupil (right eye) in mm. The distance and pupil size measures are calculated to be as close to real values as possible. However, individual differences in the eyes of subjects and the strength of glasses/contact lenses will cause errors in these values. However, the measures still reflect changes in head position and pupil size accurately |
| ValidityRight | Validity of the gaze data. The validity is 0 if the eye is found and the tracking quality good. If the eye cannot be found by the eye tracker the validity code will be 4. The value is for the right eye. Read more under the Validity codes section further down |

Additional data available in the Tobii Studio Raw Data Export

| | |
|---------------------------------|---|
| DateTimeStamp | Timestamp recalculated using the computer date time, shown in hours, minutes, seconds and milliseconds (hh:mm:ss:ms) |
| DateTimeStampStartOffset | Timestamp converted into hh:mm:ss format. The start time for the recording is also shown in the Replay and Visualization views in Tobii Studio if the option Show Date is selected in the Recordings field. |

| | |
|-----------------------------|---|
| Number | Timestamps in numbered order |
| FixationIndex | Indexes for the fixation points (values correspond to the order of the fixation). |
| GazePointX | Gaze PointX can be the horizontal screen position for either eye or the average for both eyes. The value to show here is specified in Tobii Studio. This value is also used for the fixation definition. |
| GazePointY | GazePointY can be the horizontal screen position for either eye or the average for both eyes. The value to show here is specified in Tobii Studio. This value is also used for the fixation definition. |
| Event | Events, automatic and logged, will show up under Events. The automatic events are start and end events for the different media, mouse clicks and key presses. The automatic events are listed in the event table under Event Key and Data. The logged events are the manually logged events entered either in the replay view or from the remote logger |
| EventKey | Unique event key is shown for different key presses. |
| Data1 | Data field for the event. The contents of this field vary depending on what type of event this is. |
| Data2 | Data field for the event. The contents of this field vary depending on what type of event this is. |
| Descriptor | Description of the event. The contents vary depending on what type of event this is. |
| StimuliName | The file name of the media given in the setup in Tobii Studio |
| MediaWidth | Media size in pixels |
| MediaHeight | Media size in pixels |
| MediaPosX | Distance from the left side of the screen to the media on the screen given in pixels |
| MediaPosY | Distance from the top of the screen to the media on the screen given in pixels |
| MappedFixationPointX | X coordinate for the fixation point mapped to the media coordinate system, where the origin for the coordinate system is the top left corner of the image/media |
| MappedFixationPointY | Y coordinate for the fixation point mapped to the media coordinate system, where the origin for the coordinate system is the top left corner of the image/media |
| FixationDuration | Fixation duration. The time in milliseconds that a fixation lasts |
| AOIDs | ID number for the AOI, usually a counter starting at zero for the first AOI |
| AoiNames | Name of the AOI or AOIs if fixations on multiple AOIs are to be written on the same row |
| WebGroupImage | Filename of the image file that is used to visualize the web group |
| MappedGazeDataPointX | X coordinate for the raw gaze data point mapped to the media coordinate system where the origin for the coordinate system is the top left corner of the image/media |
| MappedGazeDataPointY | Y coordinate for the raw gaze data point mapped to the media coordinate system where the origin for the coordinate system is the top left corner of the image/media |
| MicroSecondTimestamp | Timestamp for this export row in microseconds |
| ValidityCodes | Validity code for each data point. This code is based on whether the system is able to identify correctly both eyes. It is recommended that the validity codes should always be used for data filtering, to remove data points that are obviously incorrect. |

Eye Tracking Setups:

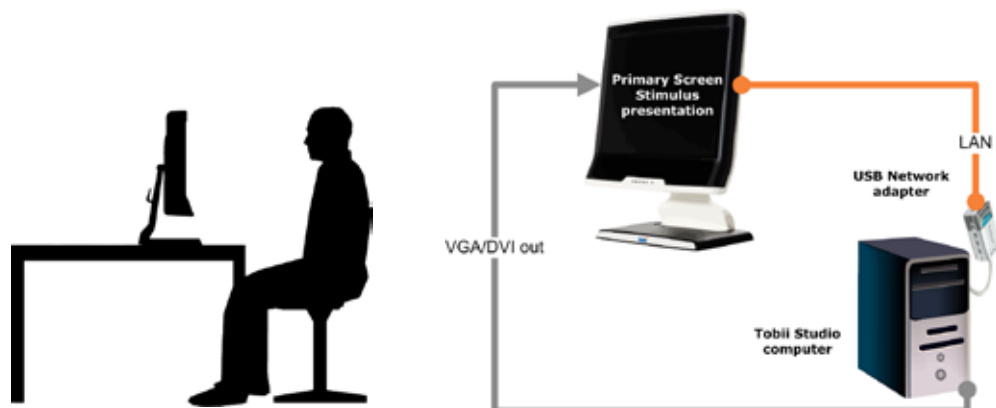
The following chapters describe a number of recommended setup configurations which are suitable for different types of studies. Your particular needs may of course differ from these standard configurations, but they should give valuable insights in any event. More detailed information is available in the Eye Tracker User Manual delivered with the product. For specific information about custom configurations, or detail questions on the system configurations, please contact your Tobii sales representative, or Tobii technical support at support@tobii.com.

Tobii T series setups

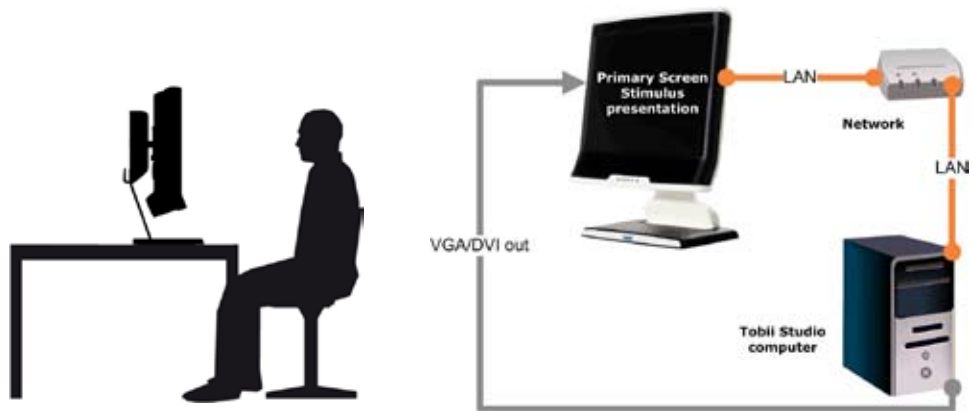
This basic setup is the simplest setup when using on screen stimuli, such as images, movies, web or screen for advertising & usability testing, psychology research, reading research, etc.

The pictures below illustrate the single screen setup with the two eye tracker connection alternatives using a USB-LAN adapter and a network connection. To get a portable lab replace the computer in the setup drawing with a laptop or shuttle computer.

Option 1 - The eye tracker is connected via USB-LAN adapter.



Option 2 - The eye tracker is connected via a local network.



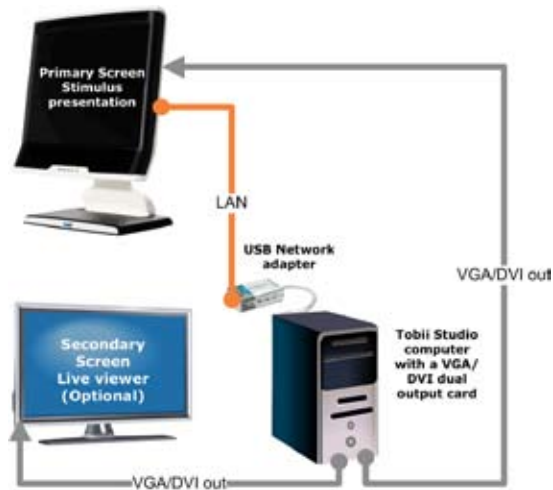
Local Live Viewer

This setup requires Tobii Studio Professional or Enterprise version. The setup below is used when the test is to be supervised from a screen next to the eye tracker setup. This test setup is suitable when using on screen stimuli, such as images, movies, web or screen for advertising & usability testing, psychology research, reading research etc.

In a lot of studies it is important to see the participant's reactions and record the conversation between test leader and test participant, as well as using think-aloud. In this case it is possible to use the built-in user camera and connect a microphone to record the participant's image and sound.

An alternative to using the adapter in the setup drawing is to connect the eye tracker to a local network, see more under the single screen setup option.

To get a portable lab replace the computer in the setup drawing with a laptop or shuttle computer.



Note: The eye tracker can be connected directly to the Network instead of using the USB Adapter. See the single screen setup for more information.

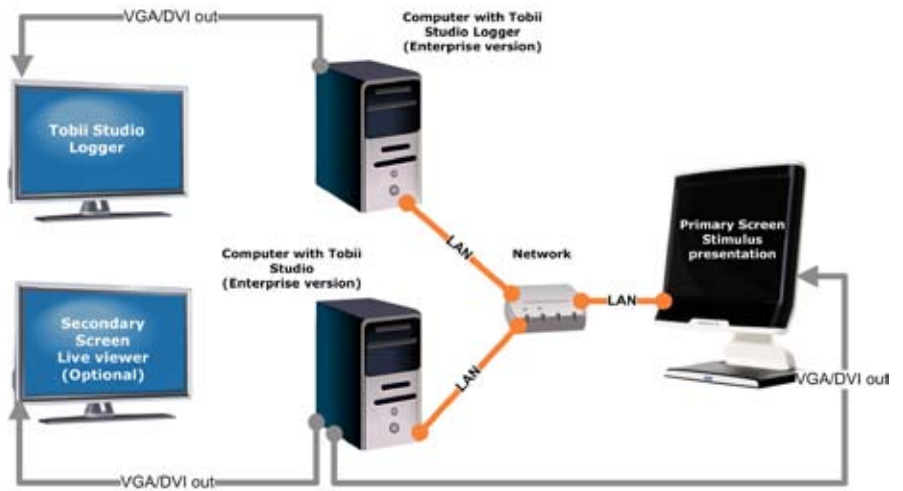
Remote Live Viewer

This setup requires Tobii Studio Enterprise version. This setup is used when the test should be supervised and/or controlled from one or more remote stations. It can be a computer in the next room where a supervisor is sitting and a computer connected to a wide screen for remote viewing for customers etc. This test setup is suitable when using on screen stimuli, such as images, movies, web or screen for advertising & usability testing, psychology research, reading research etc.

In a lot of studies it is important to see the participant's reactions and record the conversation between test leader and test participant, as well as using think-aloud. In this case it is possible to use the built-in user camera and connect a microphone to record the participant's image and sound.

An alternative to using the adapter in the setup drawing is to connect the eye tracker to a local network, see more under the single screen setup option.

To get a portable lab replace the computer in the setup drawing with a laptop or shuttle computer. For Tobii Studio more than one remote viewer can be used during the test.



Tobii X series setups

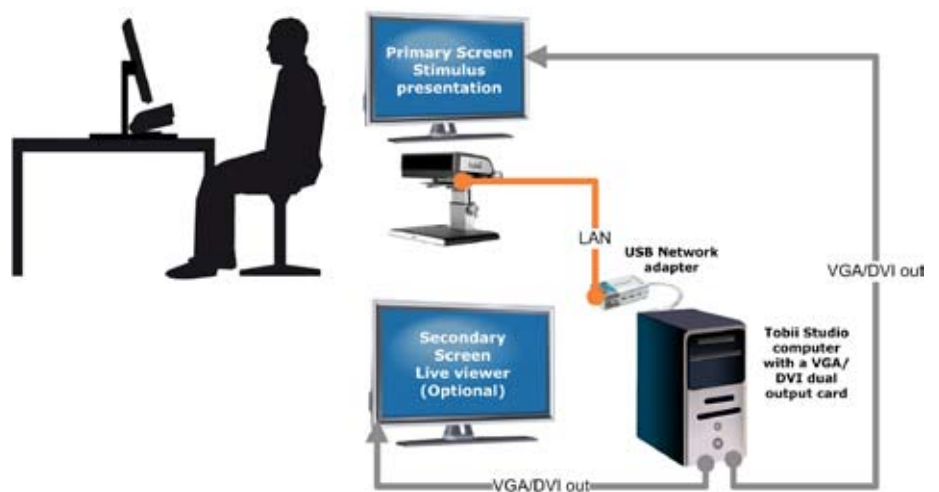
Monitor, TV and Screen projection

The Tobii X120 Eye Tracker allows for eye tracking using multiple stimuli types such as TV, monitor and projection screen. In the drawing a monitor is shown, but it can be replaced by a TV or projection screen as long as the input comes from the computer.

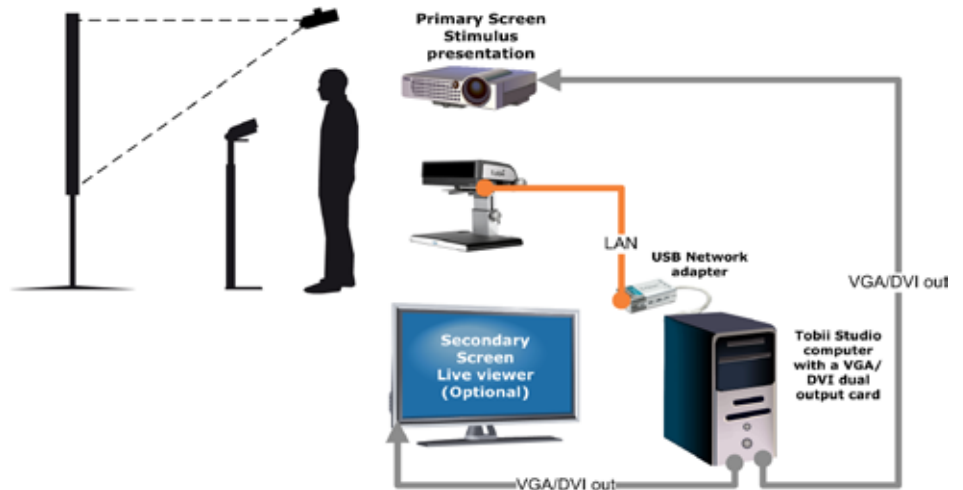
To record the participant's reactions and the conversation between the test leader and test participant as well as using think-aloud you need to connect an external user camera and microphone to the computer running Tobii Studio. The setups below do not include the user camera and user sound.

To use the user camera and sound option or the Live Viewer in Tobii Studio a Professional or Enterprise edition of the software is required.

Monitor/TV setup



Screen projection setup

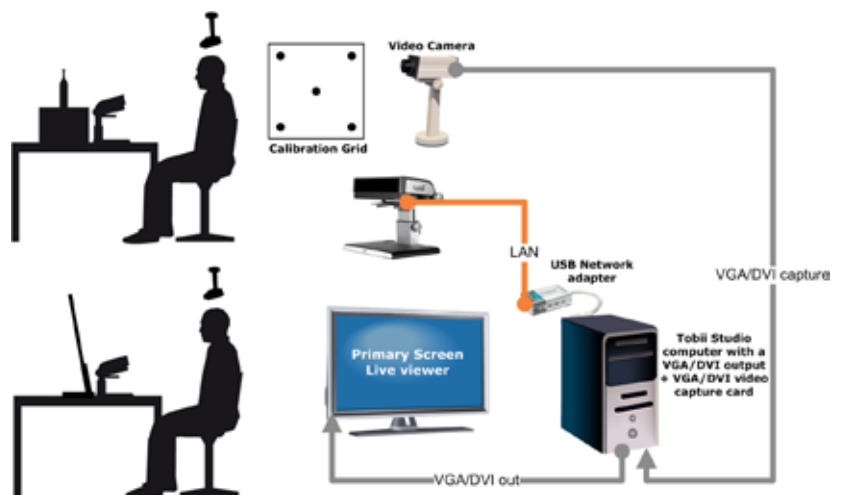


Physical objects and scene camera setup

The scene camera setup is suitable when using a Tobii X120 Eye Tracker for recording and analysis of eye tracking data, when the stimulus is a physical object, for instance an object on a table or a PDA.

Please refer to the "Tobii X120 Eye Tracker User Manual" for precise configuring of the geometry in a Tobii X120 Eye Tracker setup.

Scene camera setup



Advanced setups for T and X series Eye Trackers

External video stimulus recording

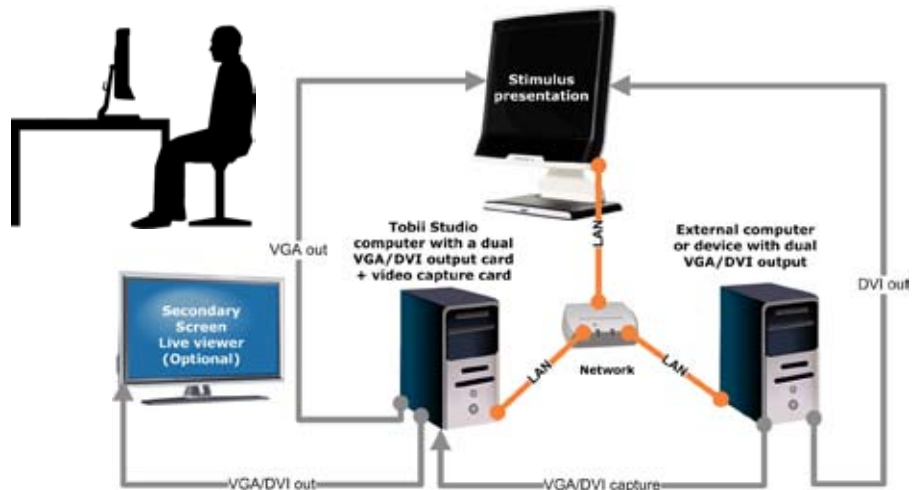
This setup is suitable when using a Tobii Eye Tracking system for analysis of eye tracking data when the stimulus is presented from a separate computer or some other type of RGB or VGA source. This could for instance be when doing usability testing on a computer game, or even when stimulus is presented on a computer running a different operating system such as OSX, Linux or Solaris.

Please note that if the external application runs under Windows operating system, and does not make use of 3D graphics acceleration, it may be more suitable and less complex to instead run this on the same computer as Tobii Studio, and use the Screen Recording option in Tobii Studio.

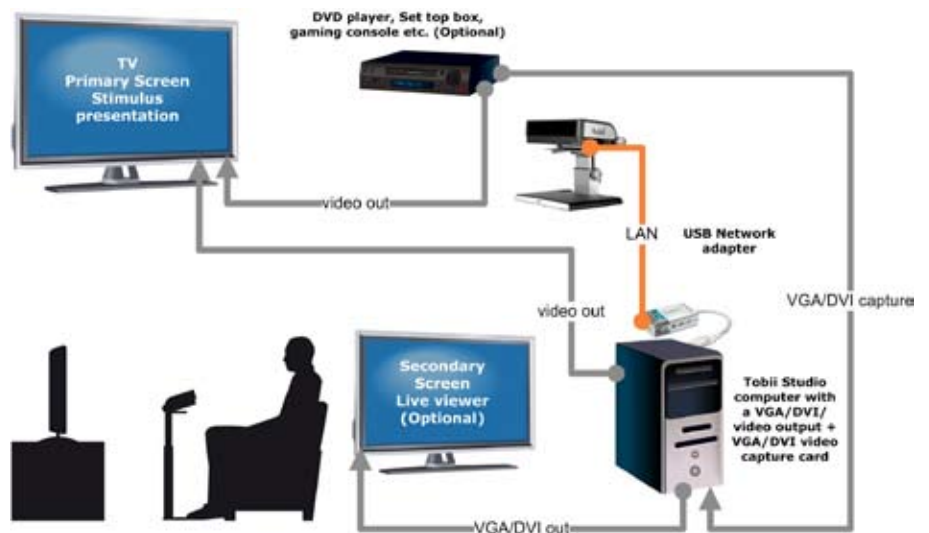
For this setup, the image from the Tobii Studio computer has to be displayed on the Tobii T60 Eye Tracker display during calibration (to display the calibration points), whereas the external stimulus computer should be shown on the Tobii Eye Tracker display during the actual test. Therefore, both computers have to be connected to the Tobii T60 Eye Tracker. To switch between the inputs press the source button on the Tobii T60 Eye Tracker front.

The video shown on the eye tracker display also has to be sent to Tobii Studio to record the video stream and synchronize it with the gaze data. If the stimulus is presented from an analogue video source, for instance a VCR or an analogue video camera, it is possible to use a similar setup with slightly modified components.

Basic setup



Tobii X series External Player setup



Tobii E-Prime integration setup

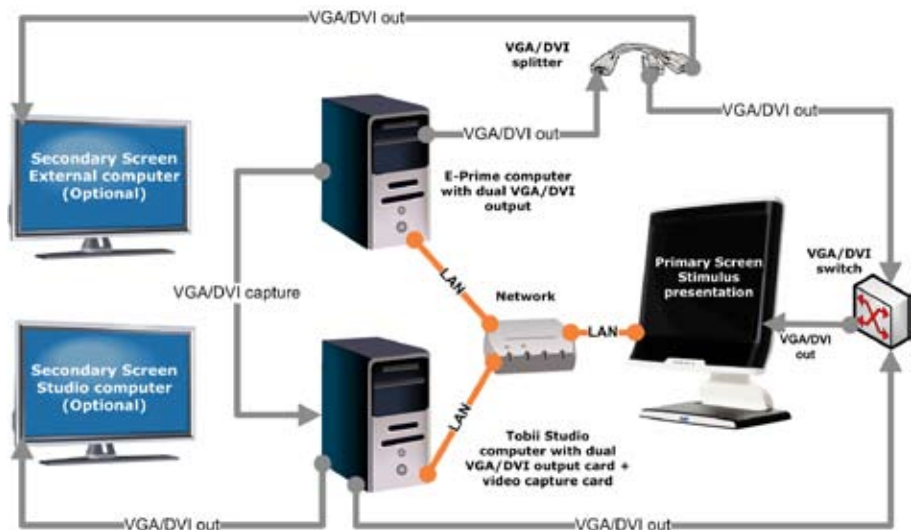
E-Prime is a leading software package for designing and conducting psychological experiments available from Psychology Software Tools. There is an extensive package called “E-Prime extensions for Tobii” for integrating the E-Prime software with the Tobii eye tracking system. This enables you to use E-Prime and E-Basic to design sophisticated stimulus, for instance to create gaze-contingent, conditional and counter-balanced experiments.

The Tobii extensions for E-Prime offer a set of native E-Prime objects tailored for the Tobii eye tracking system. These offer functions on two different levels:

TET level - In this mode, E-Prime controls the Tobii Eye Tracker Server directly, without the need for using Tobii Studio at all. E-Prime performs calibrations, collects gaze data and saves this to file.

Tobii Studio level - In this mode, E-Prime remote controls Tobii Studio. Timing is synchronized between E-Prime and Tobii Studio, data is collected by both E-Prime and/or Tobii Studio, and Tobii Studio can also be used for data visualization and analysis.

It is recommended to run the E-Prime software on a separate computer, and have this communicate with the Tobii Eye Tracker Server and Tobii Studio software over TCP/IP. An RGB capture card may be used to capture a video of the stimulus presented by E-Prime into Tobii Studio for visualizations and post-recording analysis.



For more information about E-Prime, please visit www.pstnet.com.

Minimum System Recommendations

For best performance of Tobii Eye Tracking hardware and software it is recommended to use computers with the following specifications:

- IntelCore 2 Duo processor
- 2.0 GHz CPU
- 4GB RAM
- Dual head video card with 512MB memory (for use with the Tobii T60 XL Eye Tracker it should also be able to support a screen resolution of 1920 x 1200 pixels at 1080p)
- Windows XP (only x32 edition) or Windows Vista 32 Bit
- DVI connector

A list with all types of components that can be used together with Tobii studio is also available, please contact your Tobii sales representative or Tobii technical support (at support@tobii.com) if you wish to receive it.

Accessories & Related Products:

Hardware

All eye trackers are shipped with sturdy cases that can also be used for subsequent transportation. Tobii T60 XL Eye Tracker and T60/120 Eye Tracker cases are by default shipped with wheels and a foldout handle for easy transportation.

A package with scene camera, adjustable mounting arm, calibration board, and video capture card can be provided to capture video of a scene when using Tobii X120 Eye Tracker in real-world setups. The calibration board is a grid of dots that can be used for calibration procedures in such scenes.

A monitor arm for Tobii T60 XL Eye Tracker and T60/120 Eye Tracker can be used for flexible positioning of the eye tracker relative to the user. The arm can be provided either with a wall mount or a desk mount. For more detailed information visit www.tobii.com or enquire your local sales representative.

Software

Tobii Software Development Kit (SDK)

The Tobii SDK enables the development of application software for controlling and retrieving data from the Tobii Eye Trackers. This is useful for highly customized experimental routines as well as many varieties of interaction applications based on eye tracking.

The SDK provides interfaces on different levels, which are suitable for different kinds of applications – ranging from low level interfaces with high level of customization, to high level interfaces which require a minimum of programming effort. Well documented code samples provide a straight-forward introduction to the functionality of the SDK.

The SDK is aimed at developers that do not necessarily need a lot of programming experience. Just the basics.

Tobii Studio™ Gaze Analysis Software

Provides sophisticated analysis tools for usability tests, psychology studies, and market research. For further information, please refer to the Tobii Studio™ product description. A short overview is also provided below.

Integration package with E-Prime experimental software

In-depth integration between Tobii eye trackers and E-Prime experimental software allow for complex stimulus setup. Please enquire for more information.

Tobii Studio™ Gaze Analysis Software

Tobii Studio™ by Tobii Technology offers a comprehensive platform for recording and analysis of eye gaze data, facilitating interpretation of human behavior, consumer responses, and physiology. It combines easy preparation of test procedures with powerful high-level data analysis and striking visualizations and statistics.

Tobii Studio™ is ideal for evaluating interactive media such as websites, software, email campaigns, computer games, interactive TV, as well as print and online advertising, TV commercials, shopping shelves, and physical products. Scientific research use includes psychological response studies, infant research, reading studies, and studies of autism, ADHD and vision deficiencies.

For more information about Tobii Studio™, please refer to the Tobii Studio™ product description.



Appendix I: Feature Comparison

Use the following guide to determine which Tobii eye tracker to use for your application area.

| Application area | T60 | T120 | T60 XL | X60 | X120 | Features |
|---|-----|------|--------|-----|------|--|
| Psychology and media studies with movies or images as stimuli | x | x | x | | | Integrated TFT monitor, easy to set up, portable and completely unobtrusive user experience. |
| HCI research, web and software usability studies | x | x | x | | | Integrated TFT monitor, representative of the user's ecological environment, easy to set up, portable and completely unobtrusive. |
| Newspaper and magazine ad testing | | | x | x | x | Measure print ads in their "real" environment and measure how an ad captures attention relative to editorial text and other competing ads. T60 XL fits natural size of a magazine and the wide gaze angle makes it possible for the user to sit relatively close to the screen, which facilitates reading. The high resolution 24" TFT wide screen is imperative for showing readable newspapers and magazine spreads. |
| Studies of store shelves, packaging and virtual shopping environments | | | x | x | x | Wide screen facilitates display of shelves and packages. High resolution & accuracy display are crucial for readability of logos and text. |
| Virtual reality environments, human factors research | | | x | x | | Greater immersion in any test situation where the stimuli is supposed to model a real world setup. Large freedom of head movements. T60 XL is an integrated solution for VR studies on 16:9 paradigm interfaces, plug & play, portable and completely unobtrusive. The X60 allows studies of any real-world flat surface or scene. |
| Studies of infants and children | x | x | x | | | Flexible adjustment of the Eye Tracker in relation to the infant (if combined with a monitor arm) |
| Studies of preferential looking and peripheral vision | | | x | x | x | Wide screen stimuli presentation |
| Eye based computer interaction | x | | | | | High tolerance to both large and rapid head movements |
| Studies that require finer gaze data detail, related to neurological processes (such as medical, vision and reading research) | | x | | | x | Provides data in 120 Hz data rate |
| Studies where stimuli are presented on a projection screen, TV, or stimuli that include real-world physical objects | | | | x | x | Enables studies of real-world flat surfaces or scenes |

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