

Tobii Pro Glasses 2 Integration Edition

Product Description

Head Unit (Firmware version 1.25.3)
Recording Unit
Prescription Lenses
Controller Software

1 Introduction

1.1 Overview

The Pro Glasses 2 Integration Edition is intended for conducting eye tracking research and development in customized user applications. The eye tracking technology can be integrated in different head units, like ski masks, helmets etc. to deliver robust and accurate eye tracking performance at 50 Hz without interfering with the user experience. It contains hardware components and fine-tuned algorithms designed to deliver consistent high performing eye tracking in various scenarios for a large majority of the world population.

1.2 Package Content

The Pro Glasses 2 Integration Edition is a development kit containing:

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| Eye tracker unit |
| Recording unit |
| Nose pads in different sizes (6 pcs) |
| Rechargeable Li-ion batteries type 18650 (4 pcs) |
| Battery charger for Li-ion batteries + power cables (EU, US, UK + AUS) |
| USB charger for recording unit + power plugs (EU, US, UK + AUS) |
| SD memory cards (3 pcs) + sleeves + SD/USB adapter |
| Calibration cards (3 pcs) |
| Calibration stickers (10 pcs) |
| Carry case for Tobii Pro Glasses 2 |
| USB memory stick with documentation and software |
| Safety and compliance document (printed) |
| User's manual (PDF) |
| Quick start guide (printed and PDF) |
| HDMI A to HDMI D cable |
| Ethernet cable (3 meters) |
| USB to micro USB cable for recording unit charging |
| Controller software |
| SD Card Reader |
| WLAN functionality |

1.3 System Components

The Pro Glasses 2 Integration Edition is made up of several components. Each component is briefly described below.

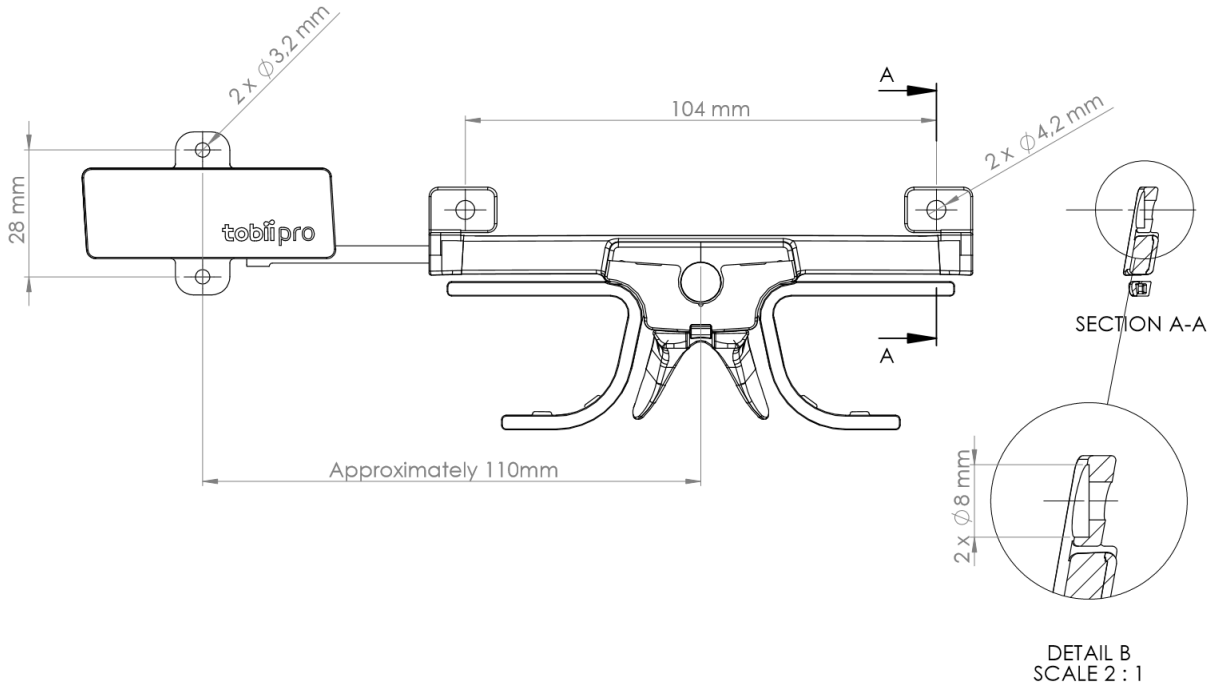
1.3.1 Eye Tracker Unit (For integration in existing equipment)

The eye tracker unit is a highly sophisticated measuring device. It consists of several very sensitive sensors and must be cared for as instructed for it to work properly.

The eye tracker unit consists of the following parts:

1. **High-definition scene camera** – Captures a Full HD video of what is in front of the participant.
2. **Microphone** – Picks up sounds from the participant and its surroundings.
3. **Eye tracking sensors** – Records eye orientation e.g. the direction of the eye gaze.
4. **IR illuminators** – Illuminates the eyes to support the eye tracking sensors.
5. **Micro HDMI connector** – Connects to the recording unit via the supplied HDMI cable.

1.3.2 Dimensional Drawing

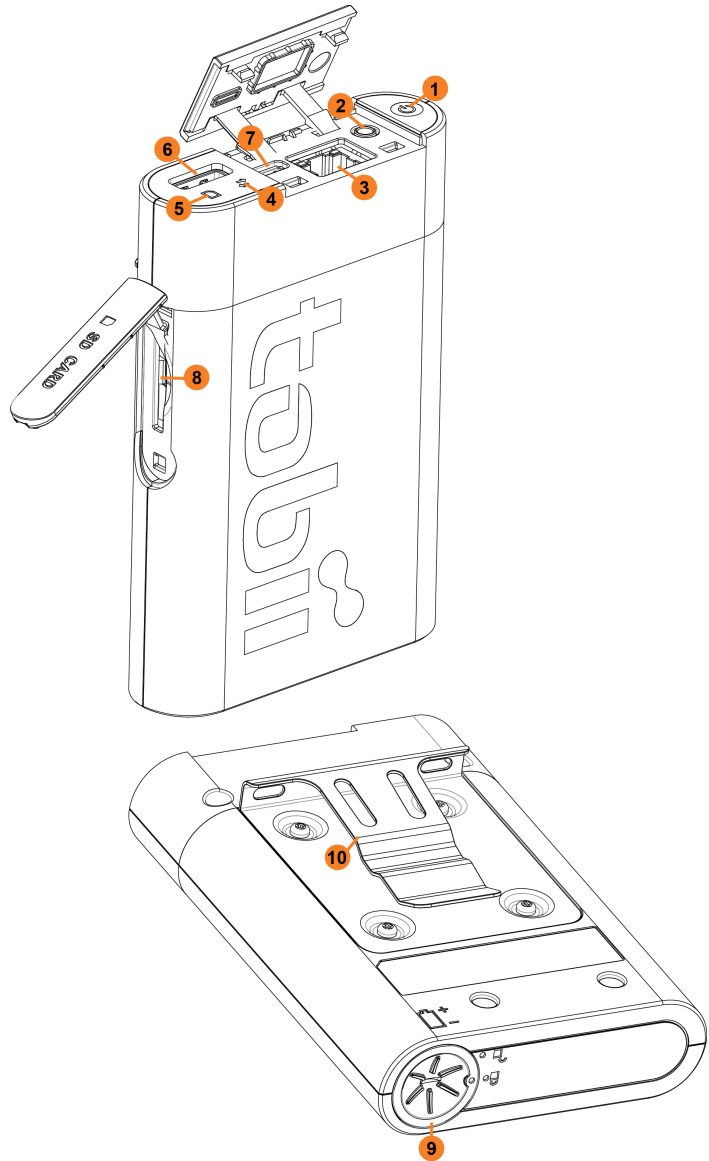


1.3.3 Recording Unit

The recording unit is a small computer that controls the head unit (the eye tracking glasses). It records and stores eye tracking data, sounds and scene camera video on a removable SD memory card. The recording unit carries a replaceable and rechargeable Li-ion battery that supplies power to both the recording unit and the head unit. The recording unit has several connectors and a power button and is controlled from the controller software.

The recording unit consists of the following parts:

1. **Power button and power indicator LED** - Touch button that turns the recording unit on and off. LED indicates power state and remaining battery power.
2. **3.5 mm connector for data synchronization** - TTL pulse for synchronization with external data sources.
3. **LAN port** - Connects to a Windows tablet or computer running the controller software, via the supplied Ethernet cable. The recording unit can also be connected to the tablet or computer via WLAN¹.
4. **Connection status LED** - Indicates connection to the controller software.
5. **SD card Activity LED** - Indicates if SD memory card is present and if the recording unit is busy writing on the SD memory card.
6. **HDMI connector** - Connects to the head unit via the supplied HDMI cable.
7. **Micro USB connector** - Connects to USB charger for powering the unit and charging the battery.
8. **SD memory card slot** - Slot for SD memory card for storage of recorded data.
9. **Battery compartment** - Holds the battery for the recording unit and the head unit
10. **Belt clip** - For attaching the recording unit to participant's belt.



The package contains an external SD card reader for users using computers not equipped with an internal SD card reader. For installation instructions, see the documentation in the SD card reader's package or the manufacturer's website. Use of the SD card functionality requires a password supplied by Tobii customer service.

1. Not available in the Tobii Pro Glasses 2 Live View Package.

1.4 Application Areas

Without losing the vital parts for functionality, the **Integration edition of Pro Glasses 2** seamlessly fits into advanced helmet systems and face protection systems with pre-made mounting interfaces and an adjustable flex cable. Aviation, conventional military, and special forces can leverage this Integration edition for their head gear in both training and real-world scenarios.

Tobii Pro Glasses 2 Integration Edition is suitable for research applications in areas such as:

- Psychology research, especially in phobia and trauma treatment
- Neuroscience
- Market research
- Skill transfer
- Way finding
- A/B testing
- Gaze interaction
- Gaze-contingency

1.5 Basic Operating Principles

Eye trackers from Tobii Pro use infrared illuminators to generate reflection patterns on the corneas of the subject's eyes. These reflection patterns, together with other visual data about the subject, are collected by image sensors. Sophisticated image processing algorithms identify relevant features, including the eyes and the corneal reflection patterns. Complex mathematics calculate the 3-D position of each eyeball and the gaze point on the screen; representing where the subject is looking.

2 Technical Specifications

2.1 Eye Tracking Specifications

The characteristics of the gaze data from an eye tracker can be described in terms of accuracy and precision. Accuracy describes the angular average distance from the actual gaze point to the one measured by the eye tracker. Gaze precision describes the spatial variation between successive samples collected when the subject fixates at a specific point on a stimulus.

| | |
|----------------------------|--------------------------------|
| Eye tracking technique | Corneal reflection, dark pupil |
| Binocular eye tracking | Yes |
| Sampling rate | 50 Hz |
| Calibration procedure | 1 point |
| Parallax compensation tool | Automatic |
| Slippage compensation | Yes, 3D eye tracking model |
| Pupil measurement | Yes, absolute measure |

2.2 Eye Tracker Unit

| | |
|--|---|
| Material | Grilamid plastic, poly-carbonate, stainless steel, aluminum |
| Protective lens | Plastic, in 2 versions: clear and tinted |
| Interchangeable lenses | Yes |
| Nose pad | Grilamid plastic, interchangeable |
| Scene camera, video resolution | 1920 × 1080 at 25 fps |
| Scene camera, video format | H.264 |
| Scene camera, field of view | 90 deg. 16:9 format |
| Scene camera horizontal and vertical FOV (approx.) | 82 deg. horizontal / 52 deg. vertical |
| Weight | 45 grams including protective lens |
| Frame dimensions (width × depth × height) | 179 × 159 × 57 mm |
| Cable length | 1200 mm |
| Visual field of view (frame obstruction) | More than 160 deg. horizontally, 70 deg. vertically |
| Audio | Integrated microphone |
| Design characteristics | Light weight and discreet |
| Number of eye tracking sensors | 4 sensors |
| Fixed geometry | Yes |
| Sensors | Gyroscope and accelerometer |

2.3 Recording Unit

| | |
|-------------------------------------|--|
| Battery recording time | 120 min. |
| Battery type | Rechargeable 18650 Li-ion, Capacity: 3 400 mAh |
| Storage media | SD (SDXC, SDHC) card |
| Connectors | HDMI, Micro USB, 3.5 mm jack |
| Dimensions (height x width x depth) | 130 x 85 x 27 mm |
| Weight | 312 grams |
| Sync Port | 3.5 mm jack (TTL signal) |

2.4 Compatible Software

| | |
|----------------------------|---------------------------------------|
| Recording and live viewing | Tobii Pro Glasses Controller Software |
| Data analysis and export | Tobii Pro Lab Software |

2.5 Controller Software — Feature overview

- Manage participants
- Manage recordings
- Live viewing of recordings
- Instant replay of recordings
- One point calibration
- WLAN configuration settings — connect to existing wireless networks
- Recordings playable from local medias
- Gaze based exposure (Gaze spot meter) possible
- Eye images video possible in live view and stored on the SD card (password supplied by Tobii customer service)

2.6 Controller Software — Minimum system requirements

Operating System: Windows 7, 8, 8.1 and 10 (32 bit and 64 bit)

CPU: Intel Core i5

Resolution: 1024 × 768

Memory: 2 GB

Appendix A Safety and Compliance

A1 Safety and Usage

A1.1 Usage Warning



The Tobii Pro Glasses 2 system is composed of several components as described in the user manual and should be used according to manufacturer instructions. Connecting, or by other means using any other component than advised in the user manual may damage or injure a person, their property or recorded data, and is done entirely at the user's own risk.

The head unit should be fitted on the test participant according to manufacturer instructions. Tobii or its agents are not liable for damage or injuries to a person or their property due to a head unit being dropped in any configuration. Fitting the head unit onto a test participant is done entirely at the user's own risk.

The head unit is equipped with a head strap to enable tighter mounting of the head unit onto the wearer's head. Neither Tobii nor its agents are liable for damages or injuries to a person or their property caused by the head unit's head strap

A1.2 Emergency Warning



The Tobii Pro Glasses 2 system is to be used for research purposes only. Be aware that due to the low, but possible risk of failure or distraction, Pro Glasses 2 should not be relied upon or used in dangerous or otherwise critical situations.

A1.3 Child Safety



The Tobii Pro Glasses 2 system is an advanced computer system and electronic device. As such it is composed of numerous separate, assembled parts. In the hands of a child some of these parts may become detached from the device, possibly constituting a choking hazard or another danger to the child.

Young children should not have access to, or use of the device without parental or guardian supervision.

A1.4 Infrared Warning



When activated, the head unit emits pulsed infrared (IR) light. Certain medical and other devices are susceptible to disturbance by IR light and/or radiation. Do not use the Tobii Pro Glasses 2 system when in the vicinity of such susceptible devices as their accuracy or proper functionality could be impaired.

A1.5 Epilepsy Warning



Some people with photosensitive epilepsy (PSE) are susceptible to epileptic seizures or loss of consciousness when exposed to certain flashing lights or light patterns in everyday life. This may happen even if the person has no medical history of epilepsy or has never had any epileptic seizures.

A person with PSE would also be likely to have problems with TV screens, some arcade games, and flickering fluorescent bulbs. Such people may have a seizure while watching certain images or patterns on a monitor, or even when exposed to the light sources of an eye tracker. It is estimated that 3 to 5% of those diagnosed with epilepsy have this type of epilepsy. Many people with PSE experience an "aura" or odd sensations before a seizure occurs. If you, or the wearer of the head unit, feel odd during use, turn off and remove the head unit.

A1.6 Mechanical Shock Warning



The Tobii Pro Glasses 2 system is a delicate measuring instrument used for research purposes and should be treated with care at all times. To avoid breaking or damaging the internal electronic circuits, do not drop, knock, or shake the device. Eye tracking quality or accuracy can be seriously affected if the head unit or recording unit has been dropped. If the eye tracker is exposed to mechanical shock, for example, when dropped, do not try to start it or connect it to a power source. Contact Tobii Support for instructions.

A1.7 Bending Warning



To avoid breaking or damaging the internal electronic circuits, do not bend any part of the eye tracking system. Eye tracking quality or accuracy can be seriously affected if the head unit or recording unit has been bent.

A1.8 Do not open the devices



Do not open or disassemble the head unit or the recording unit. Non-compliance will result in loss of warranty! There are no user serviceable components inside. Contact Tobii Support if Tobii Pro Glasses 2 is not working properly.

A1.9 Connectors



The head unit and recording unit have numerous external interfaces (connectors). Connecting any other device or connector than those intended may cause personal injuries and/or damage Tobii Pro Glasses 2. Tobii or its agents are not liable for any damages or injuries to a person or their property due to connecting unintended connectors.

A1.10 HDMI Cable Warning



The provided HDMI cable should only be used to connect the head unit with the recording unit. Do not use the HDMI cable for any other purpose or for connecting to any other devices. Only use HDMI cables provided by Tobii to connect the head unit with the recording unit. Tobii or its agents are not liable for any damages or injuries to a person or property due to wrong use of the provided cables.

A1.11 Environment



The Tobii Pro Glasses 2 system is designed for use in dry indoor environments. Avoid any exposure to direct sunlight as this will affect eye tracking quality and longer exposure can overheat the equipment. Avoid exposure to any liquids, gels, moist, rain, sweat or other damp materials or environments. Do not use the eye tracker near water — the device is not water resistant.

The device complies with IP Class 20 and has no protection against objects smaller than 5 mm. Keep the eye tracker in a clean and dust free environment. When using the equipment take adequate precautions against dust and dirt.

Do not place or use the equipment in places subject to extreme temperatures and humidity, such as on top of and or near a heating element, in a hot or damp room, or in a hot automobile in the sun. Usage temperature: 0°C to +30°C / 32°F to 86°F

A1.12 Battery Warning



The Tobii Pro Glasses 2 system includes rechargeable Lithium-ion batteries. Lithium-ion batteries can explode or cause a fire if they are used or charged incorrectly or if they are defective.

Do not short circuit the battery poles. Do not expose the battery to water or humidity. Do not expose batteries to heat, direct sunlight, solder, or fire. Immediately disconnect the batteries if, during operation, they emit an unusual smell, feel hot, change shape/dimensions, or behave abnormally. Do not use any defective batteries.

To recharge the batteries, use a battery charger specifically designed for the purpose and comply with the recharging instructions specified by the manufacturer of the charger. Charge the batteries under supervision and do not place combustible materials close to or on top of the batteries or the charger as this may result in overheating, explosion or fire.

CAUTION: Danger of explosion if battery is incorrectly replaced. If replacing the battery is necessary, replace only with the same or equivalent type recommended by the manufacturer, discard used batteries according to the manufacturer's instructions.

Avertissement relatif aux batteries

Le système Tobii Pro Glasses 2 système comporte des piles lithium-ion rechargeables. Les batteries lithium-ion peuvent exploser ou provoquer un incendie si elles sont utilisées ou chargées de façon incorrecte ou si elles sont défectueuses.

Ne pas court-circuiter les pôles de la batterie. Ne pas exposer la pile à l'eau ou à l'humidité. Ne pas exposer les batteries à la chaleur, à la lumière du soleil, une soudure ou un feu. Déconnecter immédiatement les batteries si, pendant le fonctionnement, elles émettent une odeur inhabituelle, sont chaudes, changent de forme/dimensions ou se comportent de manière anormale. Ne pas utiliser des batteries défectueuses.

Pour recharger les batteries, utiliser un chargeur spécialement conçu à cet effet et se conformer aux instructions de recharge fournies par le fabricant du chargeur. Recharger les batteries sous surveillance et ne pas placer de matériaux combustibles à proximité ou au-dessus des batteries ou du chargeur en raison du risque de surchauffe, d'explosion ou d'incendie.

ATTENTION: Danger d'explosion si la batterie est mal remplacée. Remplacer uniquement par le même type ou équivalent recommandé par le fabricant, jeter les piles usagées selon les instructions du fabricant.

A1.13 Wireless Warning



The Recording Unit contains radio transmitters and receivers (WLAN). Make sure that it is placed as far as possible from any equipment, objects or body parts sensitive to such signals.



電波法により5GHz帯は屋内使用に限ります。

A1.14 Transportation



Always use the supplied carry case and packaging material to transport the eye tracking equipment and provide added protection.

A1.15 Accessories



Only use accessories provided by or approved by Tobii.

A1.16 Cleaning



Before cleaning any part of the Tobii Pro Glasses 2 system, unplug the power cord from the outlet and make sure the device is turned off. Both the head unit and recording unit have surface coatings that require special care. Only use the supplied microfibre cleaning cloth or similar products specially intended for cleaning screens or glass with a special coating. Avoid touching or scratching the glass and the eye tracking sensors and illuminators on the head unit and keep all the surfaces clean. Eye tracking quality may be degraded if surfaces are dusty or damaged. Some plastic parts, such as the ear pieces and the nose pads, can be cleaned with water or disinfectant applied on a piece of soft cloth. Avoid contact with any other parts such as the illuminators, sensors and all electronic components.

A1.17 Disposal



Do not dispose of the device in general household or office waste. Follow local regulations for disposal of electrical and electronic equipment.

Do not dispose of the batteries in general household or office waste. Follow your local regulations for the disposal of batteries.

A2 Other limitations and considerations

A2.1 Intended use



Tobii Pro Glasses 2 Integration Edition is intended to be used in research activities about human behavior including eye movements, involving adult participants in a dry and dust free indoor environment. The product should only be used as described in the user manual. Please read the user manual and other supplied documentation thoroughly before using the product.

A2.2 SD memory cards



SD memory cards used in the recording unit must be formatted as FAT32. SDHC cards are usually pre-formatted as FAT32 and will work out of the box while SDXC cards must be formatted as FAT32 before they can be used with the recording unit. Only use SD cards recommended by or supplied by Tobii.

A2.3 Multiple connections between the controller software and the recording unit



Under no circumstances should the tablet or computer running the controller software connect to the same recording unit using both a wireless and a wired connection at the same time.

A2.4 Eye movement classification



Gaze presented in Live Viewer and replay tabs of the controller software is filtered through a five-point moving average filter. Such filters do not entirely mimic true eye movement behavior and fixations may seem to dynamically shift locations. This has no significant impact for qualitative observational analysis in the controller software. When data is transferred to Tobii Pro Lab, only raw, unfiltered data is transferred, giving the analyst full access to more advanced eye movement classification filters suitable for quantitative analysis of gaze data.

A2.5 Light conditions



We recommend that eye tracking studies be performed in a controlled and well-lit environment. Sunlight should be avoided since it contains high levels of infrared light which will interfere with the eye tracker system. Sunlight affects eye tracking performance severely and longer exposure can overheat the eye tracker. The eye tracker is not designed for exposure to (direct) sunlight. Eye tracking generally does not work in strong direct sunlight. Shielding the eye tracker adequately from the sun may prevent sunlight from interfering with eye tracking. For better performance, use the supplied tinted lenses if the product is used in an environment with strong sunlight..

A2.6 Eyelashes



Long eyelashes can be obstructive when the participant's eyes are less open, especially if the participant is wearing mascara. In rare cases, eyelashes may completely block the view of the participant's pupils, making eye tracking impossible.

A2.7 Droopy eyelids



Droopy eyelids or otherwise obstructive eyelids can block the view of the participant's pupils. In rare cases, such eyelids may completely block the view of the participant's pupils, making eye tracking impossible.

A2.8 Eye glasses and contact lenses



Tobii Pro Glasses 2 Integration Edition is not designed to work in conjunction with standard eye glasses.

Standard contact lenses may slightly increase noise but do not normally introduce any errors in the data. Colored or fancy lenses that change the appearance of the pupil or iris should be avoided as they might make eye tracking impossible.

A2.9 WLAN connectivity



WLAN signal quality is affected by different environmental factors such as the distance between the recording unit and the tablet/computer, the presence of walls, windows, furniture and other objects, and the presence of other WLAN devices and networks in the same area. A weak or low quality WLAN signal will decrease the quality of, or even interrupt the Live Viewing video in the controller software or even disconnect the recording unit from the tablet/computer.

A2.10 Power



We recommend that you connect the power cord of the chargers to an outlet with a protective earth/ground connection. Use an accessible outlet and make sure the cords are properly placed to avoid the risk of tripping. Never use damaged power cords.



The Recording unit is intended to be supplied power by a UL Listed Adapter rated 5V, 2A min.

A2.11 Keeping the controller software and the recording unit's firmware up to date



From time to time Tobii will release updates for the eye tracker firmware and Tobii Pro Glasses Controller Software that will improve performance and/or introduce new functionality. When a new version of Tobii Pro Glasses Controller Software or the recording unit's firmware is available, the user will be notified with an alert symbol at the top of the user interface if the computer is online. Alternatively, the latest firmware and software can be downloaded from the Tobii Pro Support website <http://www.tobii.com/learn-and-support> Make sure to regularly check for and update to the latest version of the software and firmware.



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