VUZIX ®

STAR 1200 & 1200XL
Augmented Reality Systems

User Guide

VUZIX CORPORATION

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STAR 1200 & 1200XL – User Guide

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Important Safety Instructions

Follow these safety instructions when using or handling your VUZIX Video Eyewear to reduce the risk of fire, electric shock, and injury to persons and property.

1. READ ALL OF THE INSTRUCTIONS AND SAFETY INFORMATION PROVIDED BEFORE USING THIS PRODUCT.

2. Use the product only for its intended use, as described in this manual.

3. Close supervision is needed when this product is used by or near children.

4. Children under the age of seven (7) are still learning to focus and track with their eyes. Their vision is still immature. For these reasons, THIS PRODUCT SHOULD NOT BE USED BY CHILDREN UNDER THE AGE OF SEVEN (7).

5. A very small portion of the population may experience epileptic seizures when viewing certain kinds of flashing lights or patterns that are commonly present in our daily environment. These persons may also experience seizures while watching some kinds of television pictures or playing certain video games on regular monitors, including the use of a display system such as this. These effects can be increased due to the large size of the video screens in this device. As a result consult a physician if you have any epileptic condition before using this device or if you experience any of the following symptoms while using this device: altered vision, muscle twitching, other involuntary movements, loss of awareness of your surroundings, mental confusion, and/or convulsions.

6. Immersive video, whether viewed on a regular TV, a movie theater screen or a VUZIX video display, can potentially have adverse effects on the user, including: motion sickness, perceptual after effects, disorientation, decreased postural stability, and eye strain. Take frequent breaks to lessen the potential of these effects, as is commonly suggested for other items, such as keyboards and computer monitors, that you may tend to fixate or concentrate on. If your eyes show signs of fatigue or dryness or if any of the above symptoms are noted, immediately discontinue use of this device and do not resume using it for at least 30 minutes after the symptoms have fully subsided.

7. Permanent or temporary hearing loss or impairment can result from excessive volume levels emitted from the headphones. Always adjust the volume to a safe level BEFORE wearing the product or headphones.

8. Always be aware of the world around you. This product will immerse you in realistic sights and sounds, possibly causing you to forget about the real world around you and the threats to your well being and the well being of others. DO NOT use this product near stairs, balconies, or other things that can be tripped over, run into, knocked down or fallen over. This product should only be used while you are seated and never while using sharp or potentially dangerous objects, operating any form of mechanical device, driving motor vehicles, or performing any act that normally requires you to see and/or be aware of your surroundings.

9. This product may be tethered to a power outlet and cables may extend between components. Be careful that these cords do not tangle around you or pose a potential threat to the safety of others.

10. Do not disassemble this product. If service work is required, contact VUZIX using the Support contact information shown in this manual.

11. Do not pull or yank on the cable, kink any of the cables or tie them in sharp or tight knots. Do not hang the product or allow it to be suspended by any of its cables. To disconnect cables, pull on the cable connector. Cables damaged by such actions are not covered by the product's limited warranty.

12. Do not drop, strike, or cause any portion of the product to be struck or shaken aggressively. Such actions may damage the product and void your warranty.

13. Save these instructions for future reference.

Immediately unplug the product from external power sources if:
- Liquid has been sprayed, splashed or poured on the product.
- Any component of the product has been dropped or damaged.
- The product exhibits any distinct change in performance.

Battery Safety Instructions

Batteries contain toxic materials. Do not burn, disassemble, mutilate, or puncture the batteries.

Do not dispose of batteries in a fire.

Dispose of batteries in a method that is consistent with your local laws and regulations.

Vuzix Hardware Limited Warranty

Vuzix warrants that your Vuzix hardware product shall be free from defects in material and workmanship for the length of time specified in the Warranty Period (one year), beginning from the date of purchase. If your Vuzix hardware product is used for commercial purposes (including rental or lease) the Warranty Period shall be reduced to only ninety (90) days from date of purchase. Except where prohibited by applicable law, this warranty is nontransferable and is limited to the original purchaser and does not apply to anyone else, including anyone to whom You later make any transfer or sale. This warranty gives you specific legal rights, and you may also have other rights that vary under local laws, some of which are not affected by the warranties in this Limited Warranty.

This Limited Warranty does not cover, and no warranty of any kind is provided with respect to any subjective or aesthetic aspects of the hardware product. Vuzix does not warrant that the operation of the product will be uninterrupted or error-free. The limited warranty stated above is the only warranty made to You and is provided in lieu of all other express or implied warranties and conditions (except for any non-disclaimable implied warranties that exist), including any created by any other documentation or packaging. No information or suggestions (oral or in a record) given by Vuzix, its agents, affiliates, dealers or suppliers or its or their employees or agents, shall create a warranty or condition or expand the scope of this Limited Warranty.

Any software distributed with the hardware product by Vuzix with or without the Vuzix brand name is not covered under this Limited Warranty. Refer to the licensing agreement accompanying the software (viewable upon its installation), for details of your rights with respect to its use.

Remedies
Vuzix's entire liability and Your exclusive remedy for any breach of warranty shall be, at Vuzix' option, (1) to repair or replace all or part of the hardware, 2) exchange the hardware with a product that is new or which has been manufactured from new or serviceable used parts and is at least functionally equivalent to the original product, or (3) to refund the price paid by You less reasonable depreciation based on your actual use, provided that the hardware is returned to the point of purchase or such other place

as Vuzix may direct with a copy of the sales receipt or dated itemized receipt. Except where prohibited by applicable law, all shipping and handling costs associated with transport (including packaging) for warranty service shall be at Your expense. Vuzix may, at its option, use new or refurbished or used parts in good working condition to repair or replace any hardware product. Any replacement hardware product will be warranted for the remainder of the original warranty period or thirty (30) days, whichever is longer or for any additional period of time that may be applicable in Your jurisdiction. This warranty does not cover problems or damage resulting from (1) Acts of God, power surge, misuse, abuse, negligence, accident, wear and tear, mishandling, misapplication, or other causes unrelated to defects in the hardware device (2) any unauthorized repair, modification, tampering or disassembly; (3) improper operation or maintenance, usage not in accordance with product instructions or connection to improper voltage supply; or (3) use of consumables, such as replacement batteries, not supplied by Vuzix except where such restriction is prohibited by applicable law.

How to Obtain Technical Support

Technical support is defined as assistance with questions on issues about the Vuzix hardware product. Technical support for hardware and its software is available for the first ninety (90) days from date of product purchase. Your dated sales or delivery receipt, showing the date of purchase or lease of the product, is Your proof of the purchase or lease date. You may be required to provide proof of purchase or lease as a condition of receiving software technical support. The addresses and technical service contact information for Vuzix can be found in the documentation accompanying your product and on the web at our global site: www.vuzix.com.

How to Obtain Warranty Support

Vuzix is the warrantor under this Limited Warranty. Before submitting a warranty claim, we recommend You visit the support section at www.vuzix.com for technical assistance. Warranty claims cannot be processed through the point of purchase and any other product related questions should be addressed directly to Vuzix. The addresses and customer service contact information for Vuzix can be found in the documentation accompanying Your product and on the web at our global site at www.vuzix.com, which will also identify any Vuzix subsidiary or

branch serving Your country and its local address. You may also write to: Vuzix Sales Support, 75 Town Centre Drive, Rochester, NY 14623, USA.

Limitation of Liability
VUZIX SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES WHATSOEVER, INCLUDING BUT NOT LIMITED TO LOSS OF PROFITS, REVENUE OR DATA (WHETHER DIRECT OR INDIRECT) OR COMMERCIAL LOSS FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY ON YOUR PRODUCT EVEN IF VUZIX HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. Some jurisdictions do not allow the exclusion or limitation of special, indirect, incidental or consequential damages, so the above limitation or exclusion may not apply to You, but the remainder of this Limited Warranty shall remain in full force and effect.

Duration of Implied Warranties
EXCEPT TO THE EXTENT PROHIBITED BY APPLICABLE LAW, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ON THIS HARDWARE PRODUCT IS LIMITED IN DURATION TO THE LIMITED WARRANTY PERIOD STATE ABOVE FOR YOUR PRODUCT. Some jurisdictions do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to You. Please note that in the European Union, any warranty period less than two years shall be increased to two years except in the case of use for commercial purposes.

STAR 1200 & 1200XL Overview

The STAR 1200 and STAR 1200XL Augmented Reality systems set the standard in first-person augmented reality. They combine multiple integrated components providing a complete and flexible AR solution.

Other than a small number of features and capabilities differences, the STAR 1200 and STAR 1200XL are essentially the same and operate in the same manner. Any differences between the two models are noted in the respective topic headings. Other than where such a distinction is made, both models will simply be referred to as the STAR 1200 through this User Guide.

System Requirements & Compatibility

A STAR 1200 is a modular design able to connect to and work with a number of host devices. Due to the ports and internal support provided by some devices they may not be compatible with certain STAR 1200 components

Tip: *A "host device" is the computer, mobile or other device used to process and provide the AR content.*

Key Product Components:
- Video Display
- Controller
- Audio System
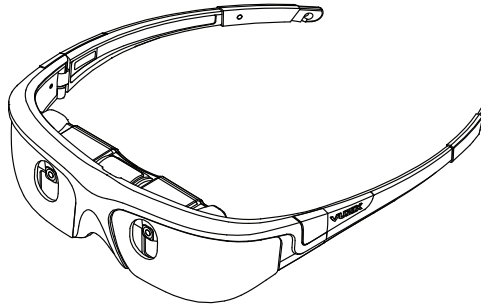- Head Tracker
- Video Camera

Compatibility:
- Windows 7, Vista and XP
- Video card able to support an second monitor
- VGA compatible video port
- USB 2.0 port (2)

Each of the "Key Product Components" is compatible with a Windows based personal computer, as specified above.

For other host devices, see each of the Key Product Components as listed below.

Video Display:

The video display is compatible with the host devices supported by the current Controller. Both 2D and 3D video are supported with the Controller governing the 3D formats supported. Both support the most common 3D format known as "side-by-side".
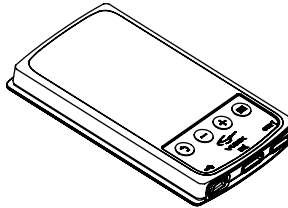
Controllers:

Two Controllers are provided with the STAR 1200. A VGA Controller enables connection to personal computers and the PowerPak+ Controller enables connection to host devices providing composite and component audio/video connections.
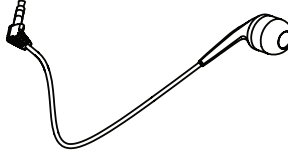
VGA Controller:
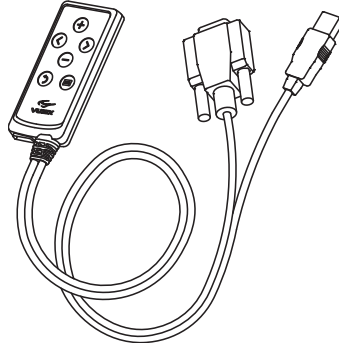
The VGA Controller connects to a VGA and a USB 2.0 port. A VGA compliant adapter can be used for connection to other video port formats. A USB hub may be used if sufficient USB ports are not available. The USB hub must be powered and be USB 2.0 compliant.
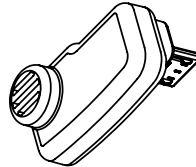
PowerPak+ Controller:

A PowerPak+ Controller connects host devices such as mobile phones and tablets that provide either a composite or component A/V connection. In addition to the side-by-side 3D video format, anaglyph 3D video is also supported when using this Controller.

Audio System:

The STAR 1200 is equipped with two removable stereo headphones. They are compatible with all devices supported by the VGA and PowerPak+ Controllers.

Head Tracker:

The Wrap Tracker connects to a host device through the VGA Controller. It is Windows compatible and works with supporting software only. It is not supported for use with non-Windows operating systems and does not work with a PowerPak+ Controller connection.

Software applications must be explicitly enabled to support a Wrap Tracker. A Vuzix SDK is available to aid in the addition of head tracking support in Windows software.

Camera:

A 1080p HD camera is provided with the STAR 1200. This camera is UVC (Universal Video Class) compliant, meaning it will work with Windows, Mac and Linux based PCs without additional drivers.

Tip: *Additional features and benefits may be available with added drivers and software. This camera is based upon a Logitech HD Pro Webcam C920 and software designed for that camera can be used to enhance its performance.*

The camera requires a separate USB 2.0 connection to the host device.

Tip: *The camera is recognized by a PC's operating system as a standard USB webcam.*

Note: *Most mobile devices do not support the connection of an external camera.*

Software:

The STAR 1200 includes a Documentation & Software package that you download from the Vuzix website: www.vuzix.com/dd. This download contains two software applications – VR Manager and maxReality – plus documentation and a variety of resources.

VR Manager is a Windows application that enables calibration of the head tracker and VR support for a broad variety of games and simulation program.

maxReality is a plug-in software that enables Autodesk 3ds Max scenes and content to be transformed into 3D AR content.

Tip: *The STAR 1200 is compatible with virtually all of the leading AR authoring applications – maxReality is just one of your AR authoring options.*

Package Contents*

STAR 1200 Video Eyewear
1080p HD Camera
VGA Controller
PowerPak+ Controller
Wrap Tracker

Digital Download Instructions
Safety & Warranty Booklet
STAR 1200 Quick Start Guide
maxReality Product License Key

iPod/iPhone Cable Adapter
USB Cable, Mini - B
Composite Cable, female RCA
Wrap 4-band Cable Adapter
Component Cable
Wrap Earphones w/Earphone Rings
Tether Strap
DVI/VGA Adaptor
Cloth Carry Pouch
Carrying Case
Dual-cable clips
Double Cable, Temple Clip
AR Marker Paddle – s0
AR Marker Paddle – m0

Note: Some product names indicated on some packaged items included in the STAR
1200 package differ from the names shown above.

Subject to change without notice.

Digital Distribution Products

Note: As indicated on the Digital Distribution Instruction Card included with the STAR
1200, the following documentation and software is made available for download
from the Vuzix website: www.vuzix.com/dd.

STAR 1200 User Guide
PowerPak + Controller Addendum
VR Manager software installer

VR Manager User Guide
maxReality software installer
maxReality User Guide
maxReality Marker Library PDF
maxReality Viewer - Key Commands Reference Sheet

Software Updates and Upgrades

Vuzix provides two web locations for downloading software and documentation.

The Digital Distribution web page (www.vuzix.com/DD) provides complete packages of the current versions of all software and documentation the specific product.

A Downloads and Drivers web page (www.vuzix.com/downloads) provides software and documentation updates for individual files.

Installation
& Setup

The following instructions lead you through the basic connection and setup of a STAR 1200 Augmented Reality System on a Windows based PC, the most common operating environment for this AR eyewear model.

Note: If you have not already done so, download the STAR 1200 software and documentation package from www.vuxiz.com/dd and read the Safety and Warranty information provided with this product before proceeding.
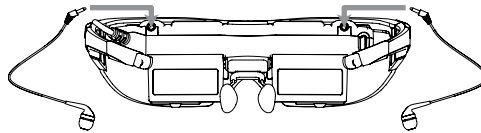
Step 1: Accessory Installation

Earphones

The Wrap noise-isolating earphones are an optional use accessory, not required for the operation of the display module and other components.

Three sizes of noise isolators are provided.

The earphones are interchangeable left to right and the eyewear can be used with or without the earphones.

▪   Plug the stereo earphones into the jacks above the eyewear displays.

Be sure to adjust the volume to a safe and comfortable level before inserting the earphones into your ears. Volume is controlled using the left

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and right directional arrows (< >) on the Controller. If an alternate audio system is used, volume is provided through that system's controls.

Note: *When you connect your STAR system a Windows based computer Windows will detect a new USB audio system and automatically configure your computer to output sound to the Wrap earphones.*

- To use an alternate audio system, select it from the "Playback" section of the Windows "Sound" Control Panel.

Tracker

The Wrap Tracker is an optional use accessory and is not required for the operation of the display module and other components.
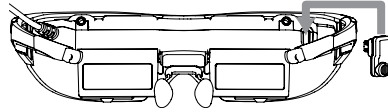

- Plug the Tracker into its port above and to the right of the right side display.

Prior to using the tracker it must be calibrated. Calibration is performed using the VR Manager software, explained later in this User Guide.

Note: *Although the Tracker connector may look similar to a USB Mini-B connector, it is not. This is a proprietary connector and connecting a USB device to the Tracker port on the eyewear or connecting the Tracker to a USB connector may damage these devices.*

Step 2: Hardware Connections

Connecting the Camera

If your camera is not still connected from when the camera software was installed, connect it now to an available USB port.


USB
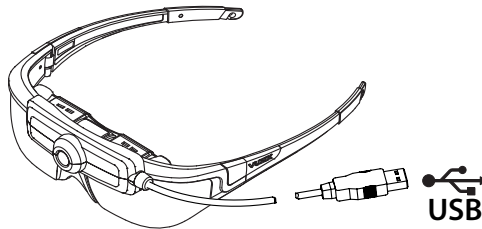
The camera connects to a standard USB 2.0 port. If a free port is not available, a powered USB 2.0 powered hubs can be used. Unpowered hubs may not provide the required power. USB 2.0 compliant extensions can also be used if required.

Connecting the VGA Controller

The STAR 1200 includes a VGA Controller that interfaces with a Windows based netbook, laptop or desktop personal computer. Additional Control Box interfaces are available for other host systems, including mobile phones and media players. See the Vuzix website (www.vuzix.com) for additional information.

This Controller can be used to connect to other operating systems though some features and capabilities of the STAR 1200 may not be available or supported on other operating systems.
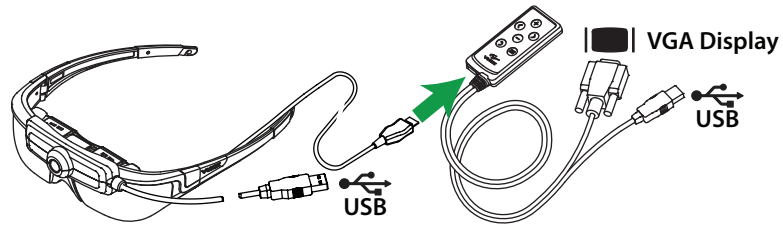
- Connect the lead from the video eyewear to the Controller, as shown above. The black side of the connector faces up, toward the control buttons.

- Connect the VGA display connector to a VGA port on your computer or your computer's graphics card.

Tip: *If your computer does not have a 15-pin VGA port available, a graphics port adaptor, such as the VGA/DVI adaptor provided, may be used. Additional VGA adapter styles are available from most computer stores.*

- Connect the Controller's USB connector to a USB 2.0 port on your computer.

Note: *USB 2.0 powered hubs and extensions can be used. If an unpowered USB hub or USB extension cable that is not USB 2.0 compliant is used, the associated devices and other STAR 1200 components may not function as intended.*

Computer Display Configuration

Your computer display must be configured correctly to be compatible with the STAR displays. The specific steps required to configure the display options will vary from one operating system to another and even between different versions of Windows.

The following steps demonstrate configuring Windows 7 for a 1280 x 720 display resolution – the maximum resolution compatible with the STAR 1200.

- Left-click on an open area of a Windows 7 desktop and select "Screen resolution" from the drop menu.

- From the Control Panel's "Multiple displays:" drop list, select "Duplicate these displays"

Tip: *Other versions of Windows may refer to "Duplicate displays" as "Mirrored Displays" or "Cloned Displays".*

- From the "Resolution:" drop list, choose "1280x720".

- Click on "Advanced Settings".

- Select the "Monitor" tab.

- Select a "Screen refresh rate:" of "60 Hertz" (60 Hz).

- Apply the changes and close the Control Panel.

If all is well, your desktop monitor display should be mirrored in the Star 1200 displays. If the STAR eyewear does not mirror your desktop display, go back through each of the above steps and correct the incorrect setting.

Regardless of the operating system being used, the following display configuration is required:

- Mirrored or duplicate displays – the same image for your desktop and video eyewear displays.

- Screen resolution, for both desktop and eyewear displays of 640x480, 800x600, 1024x768, or 1280 x 720.

- Refresh rate of 60 Hz.

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Tip: *It is suggested to set the STAR eyewear as the Primary display. It the STAR is not configured as the Primary display, it may not function correctly on some systems.*
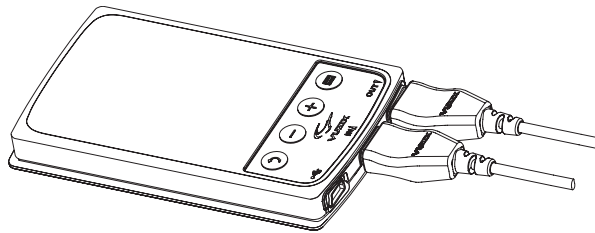
Note: *640x480 may not work on some Windows XP systems.*

PowerPak+ Controller

Your STAR 1200 includes a Wrap PowerPak + Controller. This is a rechargeable lithium-ion Controller supporting composite and component video connections.
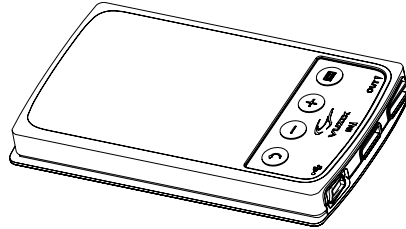

Note: *The PowerPak + Controller does not support the tracker data communications.*

- Connect the STAR eyewear to the PowerPak's "Out" labeled port, toward the right side.

- Connect the cable from your source device to the PowerPak's middle port, labeled "In".

The PowerPak + is recharged using a USB cable equipped with a mini-B connector. Its power source can be a powered USB port on your computer or a USB power adapter that plugs into the wall.

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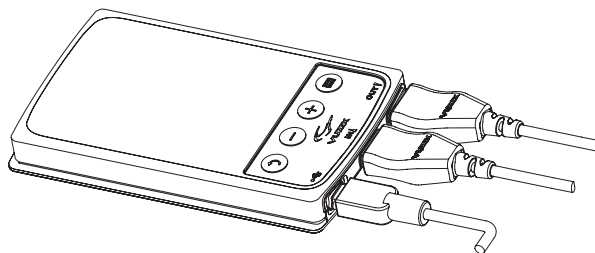
- Connect a USB mini-B cable to the PowerPak's left port.

   Note: Charge the PowerPak for a minimum of four (4) hours before using it.

   The Vuzix icon will flash while the PowerPak is charging. Allow it to fully charge before connecting it to your AV source and Wrap video eyewear.
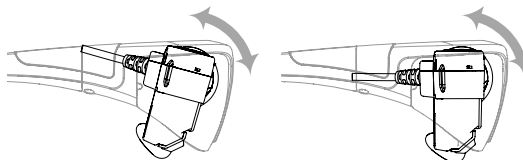
Step 3: Adjustment

Audio

- Adjust the volume of your STAR earphones using the Controller Adjustment Buttons. If you are using an alternate audio system, use the volume controls provided by that system.

Accutilt® Display Angle Adjustment
The display angle of the STAR displays can be adjusted by rotating the display assembly up or down.

- Adjust the display angle, by rotating the up/down tilt of display module, to achieve the best quality image.

### *Focal Adjustment (STAR 1200 only)*
The STAR AR display can be worn over many styles of prescription eyeglasses. A focal adjustment is also provided on the STAR 1200, alleviating the need for glasses for many users.

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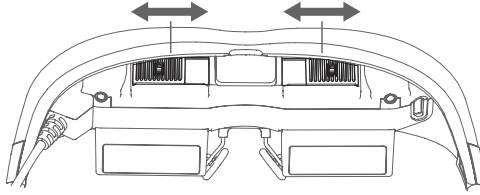
- While viewing an image through the STAR displays, close one eye and slide the focus adjuster for the corresponding display left and right to achieve the sharpest image.

- Repeat the above step for the other eye and display.

### Eye Separation *(STAR 1200XL only)*

The distance between your eyes or InterPupillary Distance (IPD) varies from one person to another. The STAR 1200XL provides an IPD adjustment to accommodate your specific IPD for the best display quality.
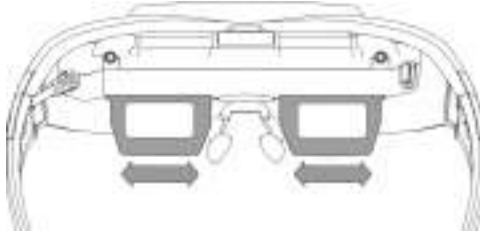
- Close one eye and slide the display left and right to find the location that provides the best display quality.

- Repeat the above for the other eye and display.

Nose Bridge

The nose bridge assembly is adjustable. It consists of an insertion arm that can be slid into and out of the eyewear display assembly to adjust its reach and the wire stems of the nose pads can be bents to accommodate the most comfortable fit.
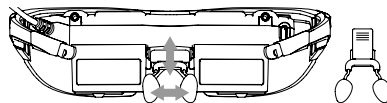
- Adjust the video eyewear's nose bridge length and separation for a comfortable fit. The eyewear displays should align at the same level as your eyes.

Tip: *The nose pad stem can be pulled out of the display module to enable easy replacement. If the stem pulls completely out, simply slip it back into its slot taking care that the serrated strip faces toward you – away from the eyewear display assembly.*

Note: *Just as is the case with prescription eyeglasses, the wire arms of the nose pads are designed for adjustment for consistent users. Excessive frequency of adjustment of the wire arms or sharp bends may weaken and break the arms. Replacement nose pads are available from Vuzix.*

Tether Strap

For applications where greater security of the eyewear is required, such as when moving around, a provided tether strap can be used.
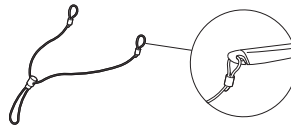
- Attached each end of the tether strap to the eyelets on the eyewear stems.

- Adjust the strap synch for a comfortable and secure fit.

Step 4: Software Installation

There are two software installers included in the STAR 1200 software and documentation package – VR Manager and maxReality.

VR Manager is a software application used to calibrate the head tracker and enable head-tracking and 3D stereoscopic video in virtual reality applications. Its installation is required if the head tracker is to be used.

MaxReality is an optional use software application that is not required for using the STAR 1200 AR eyewear system. maxReality is plug-in for Autodesk 3DS Max that enables 3ds Max objects and scenes to be transformed into 3D AR content. The maxReality installation package includes the maxReality plug-in as well as a stand-alone Viewer application. It does not include Autodesk 3ds Max, which must be purchased separately

Tip: The STAR 1200 works with virtually all of the most popular AR content authoring system – not just maxReality.

VR Manager Installation

VR manager is a 32-bit Windows application that will run on 32 or 64-bit XP, Vista and 7 version of Microsoft Windows operating system. Its installation is vital to enabling tracker calibration on Windows system.

Note: Tracker use is not supported on host devices that are not powered by a Windows operating system.

- Open the "VR Manager Installer" folder from the STAR 1200 documentation and software package you downloaded from the Vuzix website (www.vuzix.com/dd).

- Run the VR Manager "setup.exe" program to install VR Manager.

The VR Manager install program will lead you step by step through the install process. This process will vary from one version of the Windows operating system to the next. When requested to provide permissions during the install, simply accept the default choices provided.

Tip: For now, you do not need to launch VR Manager. It will be run later during the setup process when we calibrate the Tracker.

Camera Software Installation

The STAR 1200's camera is UCV compliant and does not require additional drivers, other than those provided by Windows.

Note: The STAR 1200 AR system utilizes a modified Logitech HD Pro Webcam model c920. Additional software may be available direct from Logitech to enhance the performance of the camera.

maxReality Installation

The maxReality installation process will vary depending upon the version of the Windows and other software already installed on your computer.

If you have Autodesk 3DS Max or 3DS Max Design installed on your computer, the maxReality 3DS Max plug-in and the maxReality Viewer application will be installed. If you have neither of these on your system, only the maxReality Viewer will install.

The maxReality install program will guide you through the installation process and suggest the appropriate steps required. Unless you are very knowledgeable about your computer and operating system, we highly recommend you accept the recommended steps and choices.

Tip: *If you don't have 3ds Max installed but want to try out maxReality, download and install the 3ds Max trial version from the Autodesk website. maxReality will work with a 3ds Max trial installation.*

- Open the maxReality software package folder and double-click the "maxReality_setup.exe" program to launch the installer.

Note: *Additional software such as a Visual Studio 2008 Runtime and DirectX June 2010 Runtime will be installed if they are not already on your system.*

- When the software installation is complete, run 3ds Max to complete the setup.

When you launch Autodesk 3DS Max or 3DS Max Design, a license authentication window will appear.

- Enter the Product Key, provided on a card included with your STAR 1200, into the "Product Key" field at the top of the license authentication window.

- Press the "Email Activation Number" button.

A short time later you will receive an "Activation Number" by email. You can continue using maxReality for up to 30 days without the Activation Number being input.

- When you receive you "Activation Number", run 3ds Max again to bring up the license authentication window.

- Enter the Activation Number and then press the "Activate" button to complete the license authentication process.

- Refer to the "maxReality User Guide" for instructions on installing the maxReality plugin in the Utilities Panel.

Step 5: Tracker Calibration

The STAR 1200 is equipped with a Wrap Tracker, a 3 degree of freedom (DOF) IMU (Inertial Measurement Unit), more commonly known as a head tracker. Most tracker enabled applications support pitch, yaw and roll.

The Wrap Tracker utilizes a series of nine sensors (3-accelerometers, 3-gyros and 3-magnetic field sensors). As magnetic field sensors are sensitive to your environment their performance is affected by magnetic interference from nearby metal and electrical objects as well as the earth's natural magnetic fields. A calibration process helps to minimize external influences.

Tip: Take note of potential magnetic interference nearby to where you are using your tracker-enabled eyewear. Hidden objects, like that huge base speaker under your desk or other objects can sometimes be relocated for increased accuracy and reliability.

To calibrate the tracker on your Wrap eyewear:

- Connect your STAR 1200 with its tracker to your computer.

- Launch the VR Manager application.

If this is the first time you have started VR Manager with the Tracker attached, a *Zero Gyros* screen will appear.

- Place the Wrap eyewear flat on your desk facing your computer.

- Do not move the eyewear while the gyro zeroing process is being performed.

- Follow the on-screen instructions to zero the Tracker's gyros.

Once the gyros are zeroed, VR Manager will present you with its *Calibration* screen.

- Press the "Begin Calibration" button.

Tip: *For the most accurate calibration, minimize earphone movement and position your eyewear as close as possible to the position it will be in when used, upright and facing your desktop computer monitor.*

- Rotate your eyewear fully through each of the three axes.

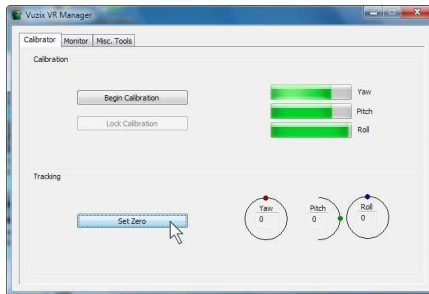*Yaw*   *Pitch*   *Roll*
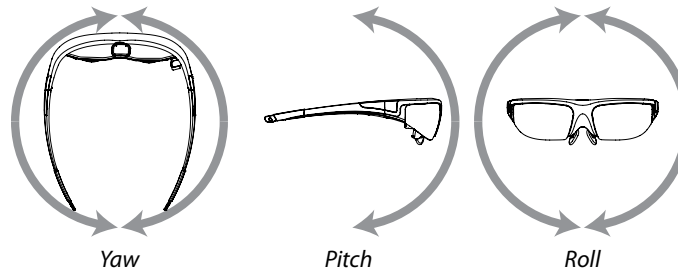
This process captures tracker data through its full range of movement. The indicator bars will move while new data is being received and stop progressing when no additional new data is received. The indicator bars will not fill completely – this is normal.

- When the indicator bars stop moving, press the "Lock Calibration" button.

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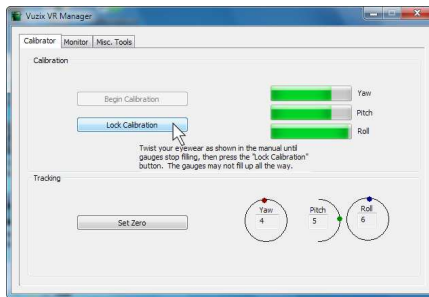
- Put on your eyewear positioning them as they will normally be used – upright, at eye level and facing your computer – and then press the "Set Zero" button.


The Set Zero button establishes the Tracker's home or centered position. As you move your head you will see the indicators and values in the Yaw, Pitch and Roll indicators reflect movement relative to that centered position.

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Control Button & on Screen Display

The STAR 1200 provides an On Screen Display (OSD) for adjusting and configuring your STAR display and audio. The layout and options provided by the OSD may vary when you are using different Controllers, but their options and the function of the Controller buttons are similar.
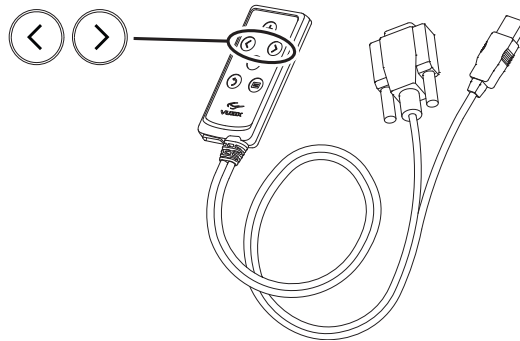
VGA Controller

Below are examples of the buttons and OSD functions for the VGA Controller.
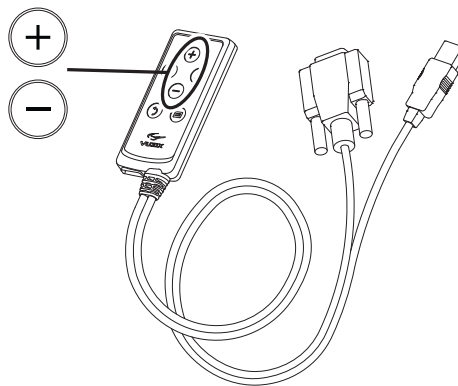
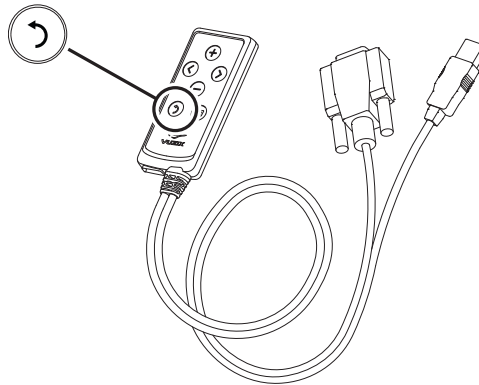*Menu Select Buttons*

OSD Displayed: Press to change OSD selection.

OSD Not Displayed: Opens and displays the OSD.

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Adjustment Buttons

OSD Displayed: Adjusts the selected OSD option.

OSD Not Displayed: Adjusts Wrap earphone volume.
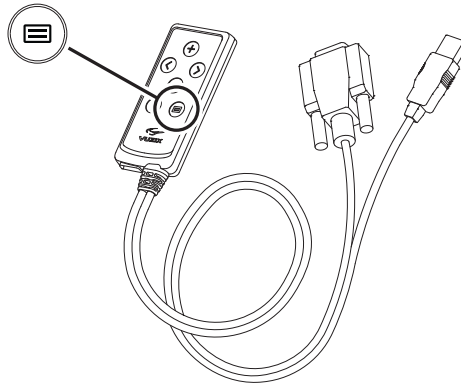

OSD Off & Toggle View Button

OSD Displayed: Turns off OSD display.

OSD Not Displayed: Double-press to toggle to the previous 2D or 3D mode setting.

Press and hold to toggle between Straight and Cross-eye 3D Views.
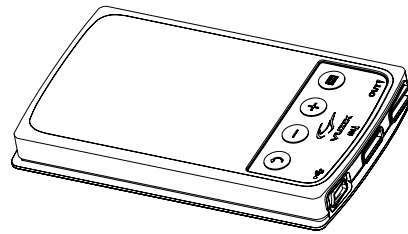
OSD Menu Button

OSD Displayed: Press to cycle through OSD selections.

OSD Not Displayed: Press to turn on eyewear and display the OSD.

                      Press and hold to turn off the eyewear.

PowerPak+ Controller

The Control Buttons on the PowerPak are slightly different from those on a VGA Controller. This Controller provides only four buttons.

Menu/Power

The Menu/Power button is used to powers up the video eyewear and turn on its on-screen menu (OSD).

Plus Selector

The Plus Selector changes your OSD selection to the next option and increases adjustment settings.

$$\ominus$$

Minus Selector

The Minus Selector   changes the OSD selection to the option and decreases adjustment settings.

$$\circlearrowleft$$

Return

A double-press of the Return button toggles between 2D and the last 3D setting, if the OSD is not displayed. Press it once to turn off the OSD, if it is displayed.

Note: *Charge the PowerPak for a minimum of four (4) hours before using it.*

The Vuzix icon will flash while the PowerPak is charging. Allow it to fully charge before connecting it to your AV source and Wrap video eyewear.

OSD Display Options
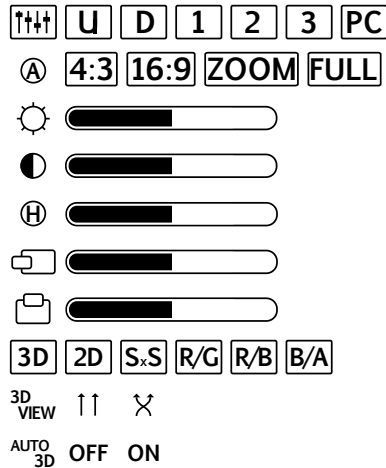
The OSD, or on-screen display, provides access to a variety of display options and controls.

[̍⊥̍⊥̍] [U] [D] [1] [2] [3] [PC]

OSD Presets

Preset configurations allow for easy one-step adjustment of your video eyewear for common viewing conditions.

U A "User" configured setting is saved when custom settings are adjusted with this option selected. They are recalled when this setting is selected again.

D The "Default" configuration, as shipped from the factory.

1 A preset for viewing light video content.

2 A preset for viewing medium video content.

3 A preset for viewing dark video content.

PC "PC" is a configured for viewing computer-based content when used with a Wrap VGA Adapter Controller.

Ⓐ [4:3] [16:9] [ZOOM] [FULL]

Aspect Ratio

The Wrap 1200VR supports multiple aspect ratios. The following choices allow you to select the one best suiting your content.
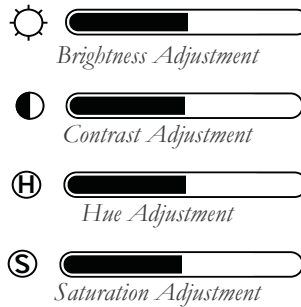
4:3 Configures the displays for 4:3 or "standard" aspect ratio content. If 16:9 content is played using a 4:3 aspect ratio setting, the image will compressed horizontally and pillars will be displayed vertically on the left and right.

16:9 Configures the displays for 16:9 or "widescreen" aspect ratio content. If 4:3 content is played using a 16:9 aspect ratio setting, the image will be stretched horizontally.
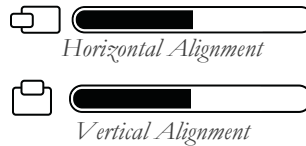
ZOOM Zoom stretches content in whichever direction is required to fill the screen.

FULL Full stretches horizontally only, to fill the screen in that direction. This option is not available when viewing 3D content.

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The function of the following four options is self-evident.

Brightness Adjustment

Contrast Adjustment

Hue Adjustment

Saturation Adjustment

Their values are adjusted using the left and right arrow Adjustment Buttons.

Horizontal Alignment

Vertical Alignment

The screen position may vary when Wrap eyewear is connected to different PCs therefore requiring horizontal and/or vertical adjustment, the same as is sometimes required with a desktop monitor.

3D 2D SxS R/G R/B B/A

Format Selection

Your Vuzix video eyewear supports standard 2D video and multiple formats of stereoscopic 3D content.

2D   This option is used for displaying all standard 2D content. It is the default format option.

SxS   A "Side-by-Side" format is as used for many TV broadcasts and Wrap stereoscopic 3D support for Windows applications.

R/G   Three formats of anaglyph 3D video are supported. This option is for content designed to use red and green filters.

R/B   Anaglyph 3D format support for red and blue filters.

B/A   Anaglyph 3D format support for blue and amber filters.

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3D VIEW ↑↑ ⤬

3D View

3D images and video can be composed in parallel or cross-eye views. In parallel view the left-camera image is shown on the left display where as cross-eye format crosses the images over.

With no industry standard for this the 3D View may change from one video to the next but a quick double-press of the Power Off & Toggle View Button makes adjustment fast and easy without requiring the OSD.

AUTO 3D OFF ON

Auto 3D

Vuzix has developed a watermark technology that, when placed in a 3D video, enables Vuzix eyewear to identify and automatically reconfigure to match the content's 3D format and view options.

Note: By default the Auto 3D option is turned off.

STAR Hardware

The STAR 1200 provides a unique first-person view of AR content through a carefully integrated series of industry standard components.

STAR Display

The STAR 1200 utilizes a unique display system that provides a see-thru real-world view with an augmented content overlay.

Other than a minimal intrusion of the display frame, the STAR 1200 provides a real-world view not unlike that seen through a pair of sunglasses. A semi-transparent video content overlay can be displayed on the twin high-resolution WVGA (852 x 480) LCD displays. Widescreen, 16:9 displays with a 31-degree field of view produce a 75-inch virtual screen as viewed from ten feet (~3m).

By default the STAR display supports standard 2D video. Stereoscopic 3D video support is included for side-by-side content when the appropriate display options are selected through the on screen display.

Computer Connection
The STAR 1200 and the provided VGA Controller are designed for use with a Windows based PC, including Windows XP, Vista, and Windows 7, both 32-bit and 64-bit versions.

Note   *A STAR 1200 may work with other operating systems such as a Mac or Linux but some functionality may be limited. These alternate operating systems are not*

For the STAR eyewear to properly display video from a Windows based PC the computer must be configured in a specific manner:

- The computer must be configured for two monitors displaying the same image. Depending upon the version of Windows being used this might be referred to as using the duplicate, mirrored, or clone display mode.
- The following display resolutions are supported:
  640 x 480, 60 Hertz (VGA)
  800 x 600, 60 Hertz (SVGA)
  1024 x 768, 60 Hertz (XGA)
 1280 x 720, 60 Hertz (720p)

Tip: *The sharpest image is achieved lower display resolutions.*

Note: *Some of the above resolutions may not be available on some Windows XP system.*

2D and 3D are supported on all known makes and models of Windows compatible graphics cards.

Display Remounting
The STAR 1200 is a unique product and user feedback has indicated it will be used in a variety of unprecedented ways.
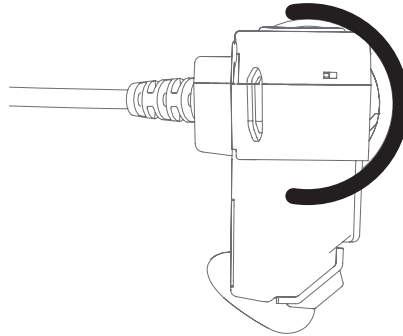

The display assembly is cradled in a pivot ring, similar to that shown in the illustration. After dismounting the camera assembly, the display can be

pulled back, out of the pivot ring for remounting in an alternate mounting system, such as a pair of safety glasses or helmet.

No electrical connects bind the display to its original sunglass style mounting system and tracker, nose bridge, focus and Controller connections are virtually unaffected.

Nose Bridge

Your STAR 1200's nose bridge and pads are adjustable. For the best viewing experience your displays should be centered in front of your eyes. By sliding the nose bridge assembly's stem in or out of the display module you can adjust the resting height of the displays. By bending the wire nose pad arms you can address the angle and spread of the pad to achieve optimum comfort.
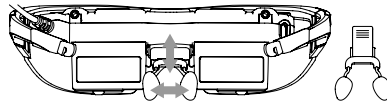
To adjust the nose bridge:

- Slide the nose bridge assembly in and out to adjust its reach to position the eyewear displays directly in your line of sight.

Note: *If you withdraw the nose bridge assembly too far enough, it will come completely out of the display module. Don't worry if this happens as it can be easily slid back in and enables you to replace the nose bridge assembly should it be broken.*

- Gently bend the wire arms of the nose pad to achieve a comfortable fit with the pad's face resting on the bridge of your nose – in the same manner that you would adjust the nose pads on standard eyeglasses.

Tip: *Gentle persuasion with a pair of needle nose pliers works best to bend the wire nose pad arms. This places the least amount of strain on the assembly and adjacent parts.*

Note: *The wire nose pad arms are not designed for frequent bending or sharp angles as this may weaken and break them. Replacement nose pad assemblies are available for purchase from Vuzix (www.vuzix.com).*

Focus Adjustment **(STAR 1200 only)**

Your STAR video eyewear can be worn over many styles of prescription glasses. The STAR 1200 (*not available on STAR 1200XL*) also provides independent left and right eye focal adjust from +2 to -4 diopters.
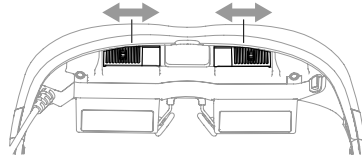
To adjust the focus:

- Play some video content that provides a sharp and clear image.

- Close one eye and slide the focus adjuster, above the display, for your open eye to a position that provides the sharpest image.

- Repeat for the other eye.

## Eye Separation **(STAR 1200XL only)**

The distance between your eyes or InterPupillary Distance (IPD) varies from one person to another. The STAR 1200XL provides an IPD adjustment (*not available on STAR 1200*) to accommodate your specific IPD for the best display quality.
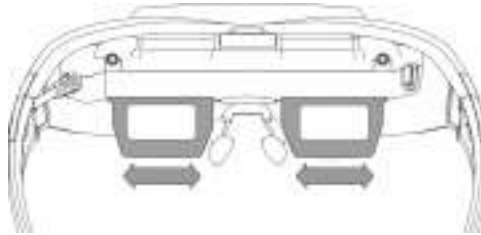
- Close one eye and slide the display left and right to find the location that provides the best display quality.

- Repeat the above for the other eye and display.

Accutilt Adjustment

Your Wrap 1200 is equipped with a patented view angle adjustment called "Accutilt". The Accutilt mechanism allows you to rotating and tilt the display module up and down approximately 15° to achieve the best quality display.
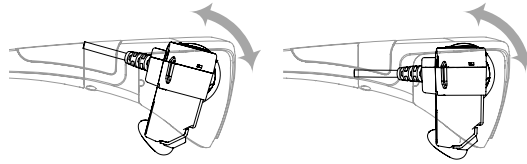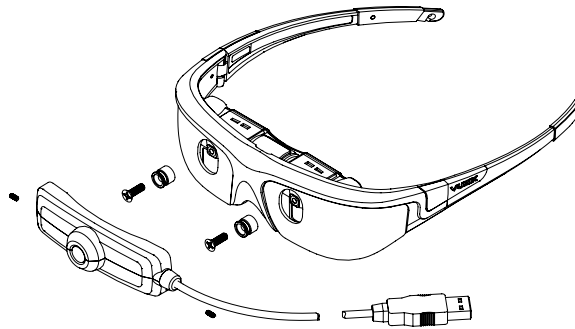

To adjust the viewing angle:

- Pivot the display assembly to achieve the best quality display.

Camera Removal

The STAR camera assembly is an optional use accessory and is not required for the operation of the display module and other components.


To remove the STAR camera assembly:

- Loosen the retainer screws on either side of the camera assembly. They require a 0.35 Allen wrench (hex key).

- Pull the camera assembly off the receivers protruding through the eyewear shields (lens).

- Reverse the above procedure to reinstall the camera assembly.

Wrap Noise-Isolating Earphones

The noise isolating earphones provided with the STAR 1200 are removable, allowing the STAR to be used with or without the earphones attached. Both earphones are the same and interchangeable for either the left or right side.
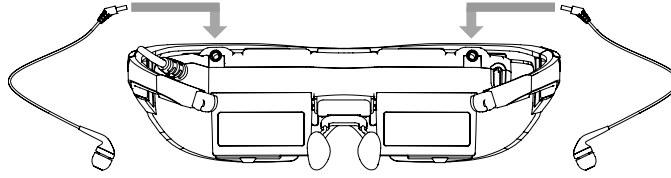
Three sizes of noise-isolators are provided. Simply sliding the existing noise isolator off the speaker stem and sliding another on makes changing noise isolator size easy.


Adjustment Buttons

Volume adjustment for the STAR earphones is controlled using the Adjustment Buttons on the Controller. Volume adjustment is only available when the OSD is not displayed.

If you are using an alternate audio system, use its controls to adjust volume.

Windows Speaker Selection
When a new device with a speaker system is connected to a Windows based computer, Windows automatically configures the new speaker system as the currently selected speakers. If you prefer to use different sound system, open the Windows "Sound" Control Panel and choose the preferred audio system.

Tether Strap
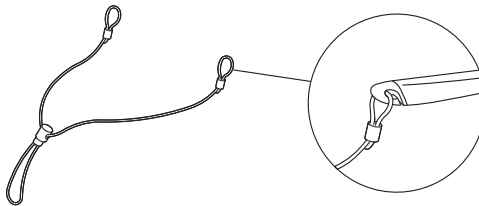
Those unaccustomed to wearing glasses or who are moving around may wish to secure the STAR to prevent it falling off and possibly damaged. A tether strap or lanyard is provided. The ends of the tether strap loop over the hooks on each stem of the eyewear.

Wrap Tracker

The Wrap Tracker is a 3-DOF (Degrees of Freedom) tracker with compass. It plugs into the back of the display module and communicates with your computer through the VGA Controller's USB connection.
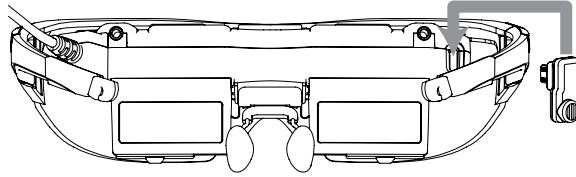
To install the Wrap Tracker:

- Plug the tracker into the port on the back of the display module near the right temple.
- Calibrate the Tracker using VR Manager.

Note: *Although the tracker connector looks similar to a mini-USB connector, it is not. Do not attempt to connect a USB device or cable into this port or plug the Tracker into a USB port.*

The Tracker requires calibration before being used and periodically thereafter. If you connect your Tracker to a different computer, you should reset or zero the Tracker's gyro (see Misc Tools in VR Manager.) If you move the tracker to a different location or rearrange nearby electronic devices, we suggest re-calibrating the tracker as the changes may have effected its calibration.

Tip: *Periodically "Set Zero" to re-center the home position*

Refer to the "VR Manager" User Guide for detailed information calibrating the Tracker.

Software requires specific Vuzix tracker support to read and utilize the tracker data. This can be added into software using an SDK provided royalty free by Vuzix.

Note: A royalty free Software Developer Kit (SDK) is available to assist software developers in enabling native support for the Wrap Tracker 6TC in their applications. It provides sample code and technical information that enables programmers to read raw tracker sensor data. See the Support section of this User Guide for additional information on the Vuzix Developer Program, found in the Developer Program section of the Vuzix website: www.vuzix.com/developer.

Developer Tools
& Support

Vuzix works with thousands of academic institutions, private and commercial developers. One of the developer services we provide is are SDKs that can be downloaded from our website. An SDK for enabling 3D stereoscopic video, head tracking and AR video capture is available royalty free for non-competing products and applications, including commercial software..

Vuzix VR/AR SDK – Windows version

The Vuzix VR/AR SDK (Software Development Kit) is a set of development resources and examples that demonstrate the application of native support for features and capabilities provided by certain models of Vuzix video eyewear. It demonstrates support for stereoscopic 3D video, head tracking and video capture for AR applications.

It is available in a Windows version with examples provided in, C++, C# and XNA and demonstrates support for:

- OpenGL: Full screen and windowed mode
- Full screen and windowed mode
- DirectX: Full screen and windowed mode
- Full screen and windowed mode
- XNA: Full screen and windowed mode

MFC windowed mode application, demonstrating head tracking only support.

Product ID
The SDK demonstrates using "Product ID" to identify what products features and capabilities are operational. Different Vuzix eyewear models may feature different stereoscopy, head tracking and other technologies.

Head Tracking
The SDK demonstrates 30DOF Wrap Tracker support. To utilize more than the basic 3-DOF (yaw, pitch and roll) support additional calibration and algorithms, not provided by Vuzix, are required.

RAW and Cooked output is available from the Wrap Tracker and is demonstrated in the SDK.

AR Extension
Support for the AR camera and ALVAR fiduciary markers provided by the Vuzix SDK in its AR Extension, packed in a separate installer. It demonstrates the use of OpenCV for camera support.

Acquiring Vuzix VR/AR SDK
The Vuzix VR/AR SDK is available for download from the Vuzix website's Support/Developer Program web page:
www.vuzix.com/developer.

Eyewear Care & Support

The STAR 1200 is generally maintenance free. Occasionally it may require a little cleaning and possibly technical support.

Cleaning

Your Wrap eyewear is virtually maintenance free, requiring only occasional cleaning with a soft microfiber cloth. Do not spray cleaners onto the eyewear or any of its components or immerse them in water. If required, spray a small amount of optical lens cleaner on a microfiber cloth and use that to clean stubborn marks or oily film.

Never use solvents, abrasive cleaners or paper towel on your eyewear. These items will damage the lens coatings, permanently degrading the eyewear's image quality.

Support Services

Technical Support

Support for Vuzix products is offered through facilities in the region in which the product was purchased. In some cases this may mean that the Vuzix regional office closest to you does not provide support services for product purchased elsewhere. As an example, if you are located in the United Kingdom but purchased Vuzix eyewear through an online vendor located in the US, support is provided by our US region, not our UK distribution or technical support team.

For product support and information please contact Vuzix in the region from which your product originated.

- **For products provided from the Vuzix US office and distribution center:**

  - Corporate website: www.vuzix.com
  - Email Customer Support: technical_support@vuzix.com
  - Customer Helpline: (800) 436-7838
  - Customer service hours: 9 AM to 6 PM EST, weekdays

- **For products provided from the UK and Euro office and distribution center:**

  - Corporate website: www.vuzix.co.uk
  - Email Customer Support: info@vuzix.co.uk
  - Email Technical Support: vuzix@tmti.com

- **For products provided from the Japan office and distribution center:**

  - Corporate website: www.vuzix.jp

Getting the Best Technical Support

For the best customer support experience, please gather the following information before making your call:

- **Complete model name and model number of your video eyewear.**

Vuzix manufactures many models of video eyewear and several may share parts of their model name, such as "Wrap" or a number like "920". Though they may share some common name content, they can be very different in feature and capabilities.

- **Make and model of the audio/video device being used with the eyewear.**

Vuzix manufacture eyewear for hundreds of different computers, mobiles and other audio/video devices. Though you may associate the eyewear with your make and model of device, we need to know what that is in order to provide you with prompt and effective assistance.

- **Detailed explanation of the symptoms you are experiencing.**

One of the most common challenges in providing effective technical support is being aware of all of the symptoms related to a problem.

Commonly we tend to present our own analysis of the problem or only the symptoms we feel are relevant. By not including all the symptoms we sometime leave out vital clues that could more quickly lead to a solution.

Miscellaneous

FCC Compliance

NOTE: 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. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: 1) Increase the separation between the equipment and receiver or 2) Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Waste Electrical & Electronic Equipment (WEEE)

1. The equipment that you bought has required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment.

2. In order to avoid the dissemination of those substances in our environment and to diminish the pressure on the natural resources, we encourage you to use the appropriate take-back systems. Those systems will

reuse or recycle most of the materials of your end life equipment in a sound way.

3. The crossed-out wheeled bin symbol invites you to use those systems.

4. If you need more information on the collection, reuse and recycling systems, please contact your local or regional waste administration.

5. You can also contact us for more information on the environmental performances of our products.