

# Bertec<sup>®</sup> Balance Advantage<sup>®</sup> HMD System User Manual

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# Instructions for Use

This manual covers standard operating procedures for the following products:

Bertec® Balance Advantage® Head Mounted Display



*WARNING: Federal law restricts this device to sale or on the order of a medical practitioner. When prescribed for therapeutic purpose, the prescriber should clearly define the parameters of use (i.e. total work, maximum heart rate, etc.) to reduce the risk of patient injury.*

## Description of the Product

The Bertec Head Mounted Display (HMD) is a wireless headset with an ergonomic counterweight design. It includes a 98° high fidelity field of view, 6 degree of freedom room scale tracking, LCD screen, face cushion, built in speakers and two wireless hand controllers. The HMD will be used as a clinical balance and multisensory training device designed to be a step in the user's rehabilitation progression. It runs on the Balance Advantage software that contains training modules that can be used during each session. Throughout each training, the HMD will display the training, collect position information and may provide real-time feedback to the patient when appropriate. The Balance Advantage software will gather all relevant data from the HMD and/or the balance plate and then display settings and scoring information for the clinician on the End of Test reports.

# Read Carefully Before Proceeding

## Intended Use:

The Type 1006, Bertec Head Mounted Display System (HMD) is intended as an objective platform used for monitoring, training, and rehabilitating multisensory function in subjects with vision, neurocognitive, and vestibular/balance disorders.

The Type 1006, Bertec Head Mounted Display System should only be operated by qualified personnel.

The successful use of the Bertec® technology requires an appropriate level of professional expertise to develop proper treatment programs that are specific to the patient and their individual cases. The user should be confident they understand the operation of the system, can properly administer test protocols, and interpret results.

NOTE: Bertec® equipment must only be serviced by qualified personnel. Please do not attempt to service equipment yourself. Please contact Bertec® first for any service or support requests.



*WARNING: Do not modify Bertec® systems in any way. Modifications will void the warranty.*



*For additional product service or support, please contact: Bertec® Corporation 2500 Citygate Drive Columbus, OH 43219 phone: 614-450-0331 or support@bertec.com*

For additional product safety information, please see the system safety section of this user manual



## Indications for Use

The Head Mounted Display (HMD) system is indicated for patients with various types of balance problems or for those at risk of developing such problems. Any individual, symptomatic or asymptomatic, can be tested. The patient's age can range from pediatric to elderly.

## Contraindications

Patients with extreme visual motion sensitivity or severe balance issues should be excluded or monitored closely for risk of fall. They may have trouble performing all the functions with Head Mounted Display (HMD). Feasibility of use of HMD should be determined on a case-by-case basis.

**Balance Plate Use:** Patients with mobility impairments such as being in a wheelchair or needing walkers to stand up.

There are no other known contraindications, so long the patient meets the weight requirements.

**Patient weight limit 500lbs/226kg.**

## Potential Adverse Effects

In rare cases, the patient may experience transient dizziness. In that case, the test can be discontinued immediately.

# General Maintenance

Bertec® Head Mounted Display systems require only basic maintenance, performed on an as-needed basis.

## CLEANING INSTRUCTIONS

- Use an optical lens microfiber cloth dipped in water or a non-alcoholic disinfectant wipe to clean the lenses. Do not wipe the lenses with alcohol or other harsh or abrasive cleaning solutions, as this may lead to damage
- For face cushion care, use sterile wipes (alcohol-based ingredients allowed) or a microfiber dry cloth dipped in a small amount of 75% alcohol solution to gently wipe the surface and surrounding areas that are in contact with the skin.
- To clean the hand controllers, use a small amount of alcohol or cleaning solution, or a soft, dry cloth, preferably one that's made for cleaning lenses. Avoid using organic solvents, to clean the device.



*Note: The face cushion will exhibit the following effects after repeated cleaning and disinfection. Please contact Bertec to replace the face cushion if any of the following occur: Color change, sticky surface, or decreased facial comfort on the face.*



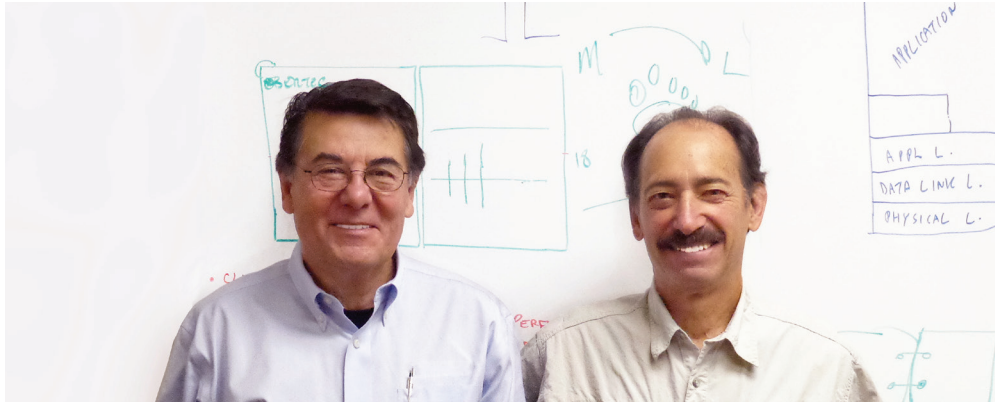
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## Company Overview



*Dr. Necip Berme (left) and Dr. Lewis Nashner (right)*

Bertec is an internationally recognized designer, manufacturer, and marketer of research-grade and clinical biomechanical equipment and software. Used by athletic trainers, physical therapists, and other professionals working to understand the movement of the human body, Bertec's tools help athletes and patients to meet their performance and rehabilitation goals

Institutions as varied as Nike, the US Olympic Swimming Team, Toyota Robotics, the NIH, Cleveland Clinic, Mayo Clinic, Harvard University, and hundreds of others around the world rely on Bertec, a 40-person technology firm based in Columbus, Ohio. Founded in 1987, Bertec continues to tackle some of the most ambitious engineering projects in multiple disciplines including biomechanics, mechatronics, immersive virtual reality, eye tracking, and computer vision to bring industry-leading solutions to practitioners, researchers, and clinicians.

# Welcome

Welcome to the Bertec® Head Mounted Display System User Manual. This is a concise, easy-to-use guide for both implementing and utilizing a Bertec® Head Mounted Display, along with its related components.

## **Bertec 2.3 BA HMD**

### Operating Environment

- Do not use the equipment in dusty, humid, dirty environments, or near strong magnetic fields, to sustain from internal circuit failure.
- Protect the lenses from light. Keep the headset away from direct sunlight or UV rays, such as windowsills or other strong light sources.
- Keep the product away from rain or moisture.
- Do not place the product near heat sources or exposed flames that may generate high temperatures.
- Do not apply excessive pressure to the product during storage or when in use to avoid damage to the equipment and lenses.
- Do not use strong chemicals, cleaning agents, or detergents to clean the product or its accessories, which may cause material changes that affect the eye and skin health.



# Bertec HMD System



## Standard Package

- Bertec Balance Advantage® Software
- Head Mounted Display
- Position-sensing Wireless Hand Controllers
- Power Cables and USB Hub
- Travel Wi-Fi Router and Dongle
- HMD System Case with Custom Foam
- Gait Belt
- One-year parts and labor with ongoing support

## Training Protocols

### Sensory

- Response Inhibition
- Spatial Memory
- Perception Span
- Reaction Training

### Vision

- Head Tilt Response (HTR)
- Rod & Frame (R&F) Subjective Visual Horizontal (SVH)
- Subjective Visual Vertical (SVV)
  - Visual Flow
  - Boardwalk
  - Park
- Driving
- Optokinetics Flow

## SPECIFICATIONS

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- Wireless Head Mounted Display
- Ergonomic Counterweight Design
- 98° High Fidelity Field of View
- 6 Degree of Freedom Room Scale Tracking
- 3664 x 1920 LCD screen
- Replaceable face cushion
- Built in speakers
- HMD position, rotation, acceleration, and velocity data
- Patented and HIPAA compliant patient database with merge and sync capabilities across all Bertec® Balance Advantage® products
- Safety "Passthrough" mode to view external environment from within HMD

### Options

- Extended Warranty

# Fundamental Operations

## Turning on the Head Mounted Display

1. The power button is located on the top right of the headset. Hold down the power button until the light turns blue



*Note: If an extended period of time passes and the headset has not turned on, it may need to be charged.*

To turn off the headset, hold the power button down until the blue light is gone

## Charging the Head Mounted Display

For wireless operation, the Head Mounted Display must be charged. When not in use, use the following steps to charge the Headset:

1. Plug the Headset's charging port into the wall charger. The status indicator will appear yellow, when the headset is charging.
2. The approximate charge time is 2.5 hours. The charge level needed to perform training protocol is at least 20%.
3. When the status indicator becomes a static green, it means it is fully charged and can be unplugged safely
4. Please do not keep the Balance Advantage software running while charging the Headset. Instead, start the software after placing the Headset on the patient, as described below.



*Note: We do not recommend charging the Headset through the laptop. Charging this way will take longer and relies on the charge of the laptop.*

## Setting Up the Bertec Balance Plate

1. Plug the Bertec Balance Plate into the computer via the USB cable attached to the plate.
2. An icon of a USB cable will appear in the top right of Balance Advantage when connected.
3. Clicking on this USB icon will provide more information on the Balance plate such as the connection type, Model Number, Serial Number, Firmware Version, Channels Provided, Data Rate, and Device Status.

## Using the System Remote

A wireless remote is included with every package to assist clinicians in managing the Balance Advantage® program while they assist patients. For HMD trainings with cognitive task, the first button will record a correct answer and the second button will record the incorrect answer. The third button on the remote can be used to start the training.

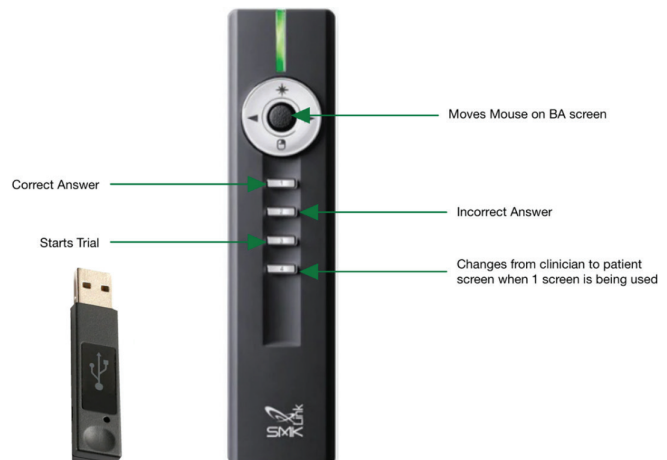


Figure 1: Clinician Remote

## HMD Set Up Instructions

### Proper Headset Placement

1. Turn the strap dial counterclockwise to loosen the VR headset and place the headset on the user.
2. Turn the strap dial clockwise to tighten the headset on the user so that the band does not slip when the head is moving and so that the eyes see a clear image through the lenses (Figure 2: Proper Headset Placement)
3. Ensure the user is comfortable.



Figure 2: Proper Headset Placement



Note: Users can use this product with prescription glasses.



Note: The user can press "A" to enter passthrough mode, and see their external surroundings, until ready to begin trial

### HMD Essentials

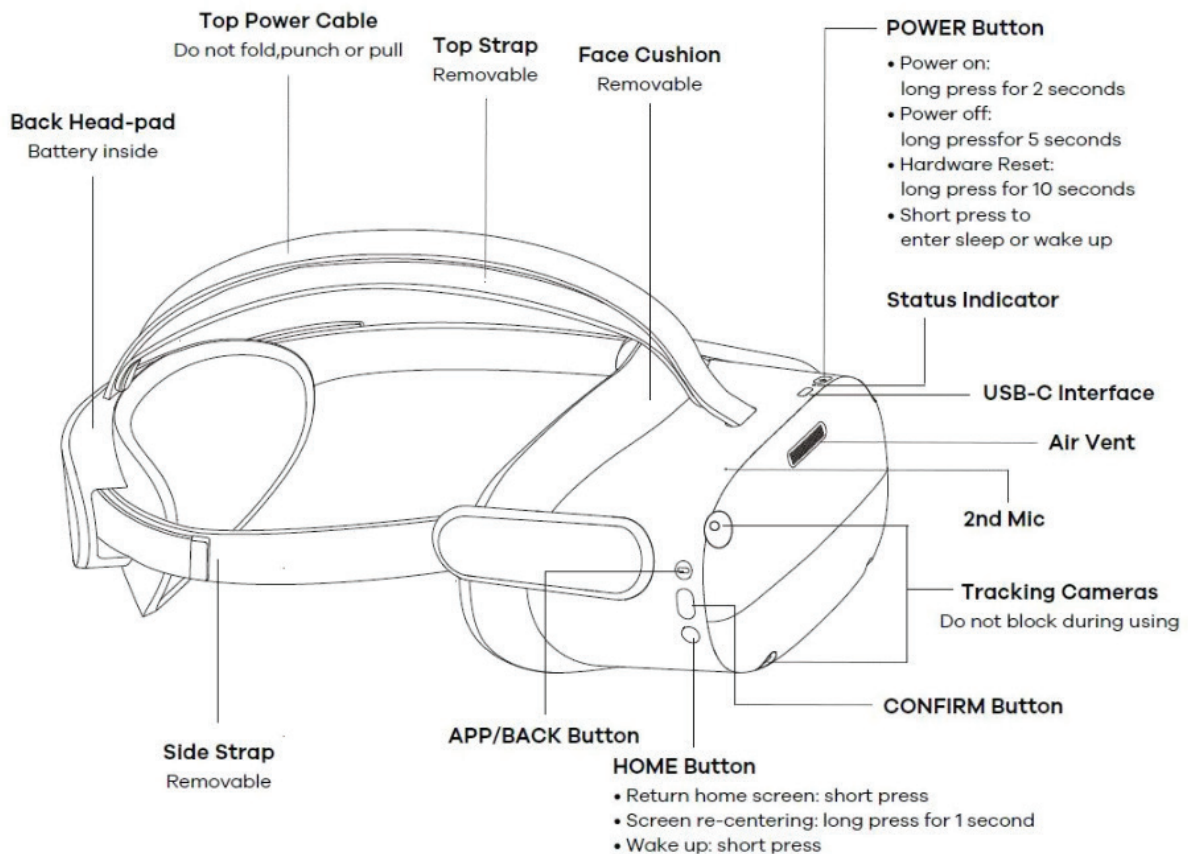


Figure 3: Headset Features

## Headset Brightness

To adjust the brightness setting in the Headset:

1. Click on the gear icon in the top right corner of Balance Advantage.
2. Go to "Configure HMD Brightness"

Adjust the brightness to the comfort of the patient

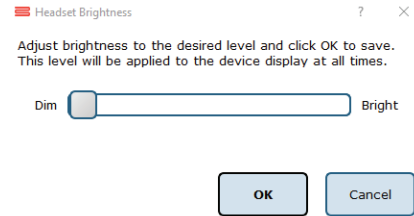


Figure 4: Headset Brightness


## Headset LED Status Indicator Legend

LED Color	LED Condition	Meaning
Blue	Solid	Powered on with battery over 20%
Red	Flashing	Battery is less than 20%
Blue	Flashing	Shutting Down
Red	Solid	Charging battery is less than 20%
Yellow	Solid	Charging battery is less than 98%
Green	Solid	Charging complete

## HMD Controller Essentials

Throughout any test, the patient can recenter the scene according to their position by holding down the Pico Home Button (Figure 5: Recenter Screen). Recentering the scene can also be enabled by the clinician by pressing the "Recenter HMD" button on the Clinician Screen.

If a patient is feeling dizzy or nauseous and needs to escape the virtual reality scene, they can do so by pressing X or A on the controllers (Figure 6: Passthrough Mode). Passthrough mode is a black-and-white live view of the surrounding environment.

Use the Pico Buttons  to recenter yourself in the scene

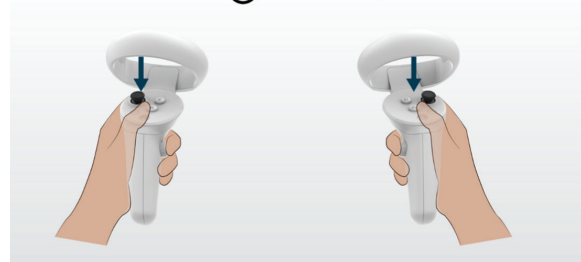


Figure 5: Recenter Screen

Use X or A buttons to enable Pass Through Mode

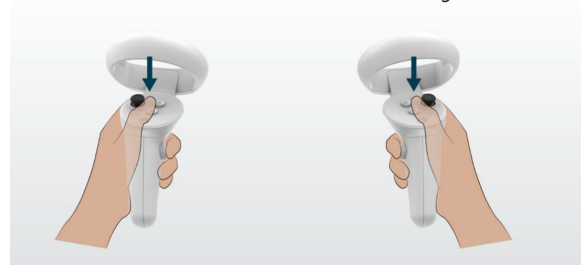


Figure 6: Passthrough Mode

## Wi-Fi Configuration

1. Unpackage the Wi-Fi router, take out the power cord, and plug the router into a wall outlet. The Wi-Fi router will have a small blue light when it turns on.
2. Plug the TP link Wi-Fi dongle into the USB port on the side of the laptop.
3. Connect the laptop to the travel router Wi-Fi by clicking your computer's Wi-Fi settings and finding the SSID that begins with "GL".
  - a. When prompted, enter the password "goodlife".
4. Now, open your Balance Advantage software, login, and click the Gear icon in the top right corner.
  - a. Select "Configure Wi-Fi Connection"
5. In the Popup window (show in Figure 7) click the box next to "WIFI Device" and choose "TP-Link Wireless Nano USB Adapter"
6. Click the box next to WIFI SSID and choose the Wi-Fi SSID that Begins with "GL"
7. Click the box next to WIFI Password and enter the password "goodlife"
8. Click "OK"
9. After the WI-FI router is configured in Balance Advantage, the Wi-Fi on your computer can be connected to an external Wi-Fi or it can stay connected to the WI-FI router for offline connection.



*Note: This ensures that when Balance Advantage is running, both the Travel Wi-Fi router and the HMD will automatically connect.*



*Figure 7 shows the correct way to set up the Wi-Fi router. All Wi-Fi routers that are sent with the HMD will have an SSID beginning with GL (NOT 5G) and the password will be 'goodlife'*

Your network infrastructure may require that Balance Advantage be connected to a specific WIFI network to use the Head Mounted Display reliably. Depending on your network setup, doing so may prevent you from accessing other network resources such as file shares, printers, and email.

Automatically connect/reconnect as needed

WIFI Device: TP-Link Wireless Nano USB Adapter

WIFI SSID: GL-SFT1200-2df Rescan

WIFI Password: \*\*\*\*\* ↑

OK Cancel

Figure 7: Configure Wi-Fi in BA

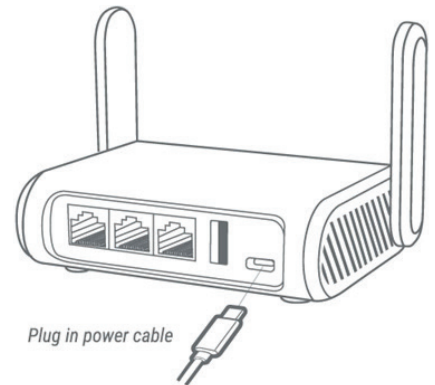


Figure 8: Wi-Fi Router

## Initial Startup and Login



All Bertec® Balance Advantage® systems include either a dedicated tower computer attached to a cart or a laptop. Instructions are included below for connecting the HMD to the computer.

To connect the HMD to the laptop and Bertec® Balance Advantage®. Connect the laptop being used with the headset to the travel Wi-Fi box using the small Wi-Fi dongle

1. Open Bertec® Balance Advantage®. Arrive at the login screen, shown in Figure 9: Login Screen
2. Click on the correct username within the Operator box.
3. Make sure the desired operator is highlighted in blue.
4. Type in the password that was set for the selected operator.
5. Click the "Login" button or press the Enter key to arrive at the clinician home screen. Refer to the following page for information regarding the clinician home screen
6. Ensure the HMD is connected by looking for the HMD icon in the top right corner of Bertec® Balance Advantage®.

After the initial startup and login, refer to the following instructions for subsequent logins.


1. Push and hold the power button on top of the headset until the light is blue.
2. Make sure the headset has more than 25% battery.
3. The HMD will automatically enter "Bertec World", which is a floating Bertec Island, with a green loading bar. When the HMD is connected, the green loading bar will be solid.
4. The operator will then open the preferred protocol on BA and the patient will be able to see the training within the headset.
5. Once a testing series is started, the user will be immersed in the scene.



Figure 9: Login Screen

## Software Update Instructions

When a new version of Balance Advantage Software is released, the software must be updated on both the computer as well as the Head Mounted Display. Follow the instructions below to update the HMD hardware so that it continues to work with your computer.

1. Install the new application on the desktop computer or laptop.
2. Open the newly installed version of Bertec® Balance Advantage®
3. Using the provided USB to USB-C cord, connect the HMD to the laptop.
4. In Bertec® Balance Advantage®, there will be a blinking red triangle icon, indicating that the HMD needs an update.
5. Click the gear icon  in the upper right corner of the screen, and then click "Configure/Update HMD"
6. A pop-up window will display. Click "Update" and the HMD will start to update.
7. Once the HMD is updated, the blinking red triangle icon will be replaced by the HMD icon, indicating that it is up to date and connected to Bertec® Balance Advantage®



*Note: Figure 10 displays the pop-up menu that will show when the HMD needs to be updated. The operator will want to ensure that there are no red words on the pop-up menu, that indicates that information is missing on the HMD. This pop-up menu also displays the HMD charge status.*

Connect the Head Mounted Display to the PC via the USB cable, and make sure the device is powered on. You do not need to be wearing the device while configuration is taking place, but it must remain connected to the PC during this process.

Device Serial Number:	PA7L40MGF8300067W
Device Status:	21.7c, 38%, charging
Installed software version:	<b>2.3.0.1943</b>
Is Configured for Kisok Mode:	Yes
Has Boundary Config:	Yes
Has Wifi settings:	Yes
Configured Wifi SSID:	GL-SFT1200-2df
Currently connected to Wifi SSID:	GL-SFT1200-2df
Is HMD network reachable?	Yes

**Device software is out of date; please click the Update button**



Figure 10: Configuration/Updating HMD

# Clinician Home Screen



The clinician home screen is the first screen seen immediately after the operator (or administrator) logs in. Upon logging in, the operator will automatically be shown the Patients tab and be able to see the system's list of patients. The screen is split into three main regions, or tabs, described below.

1. Patient: Patient information is displayed within the Patients tab. This is the primary interface for loading a patient, creating a patient, and viewing a patient's history.
2. Training: All HMD protocols have a wide range of options available to help rehabilitate a patient in the Training tab (Figure 11) These options include:
  - a. Vision
  - b. Quick Training
  - c. Sensory
3. Assessments: This tab will not be compatible with the HMD headset; however, it can be used without it.



Once a patient is selected, an operator may complete trainings by clicking on the Training tab



Closed Chain, Seated, Mobility and Weight Shifting tabs will also be visible with the HMD connected, however, these are not compatible with the HMD

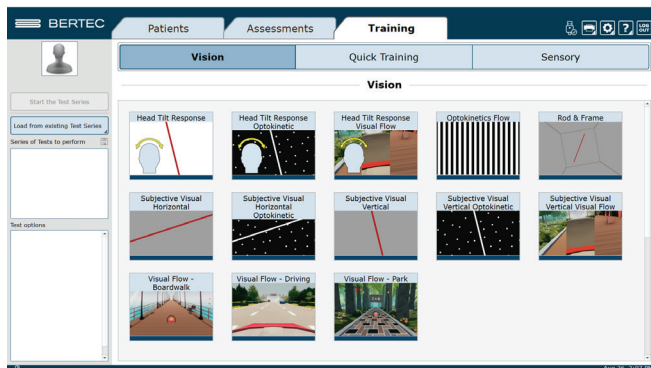


Figure 11: BA Training Tab

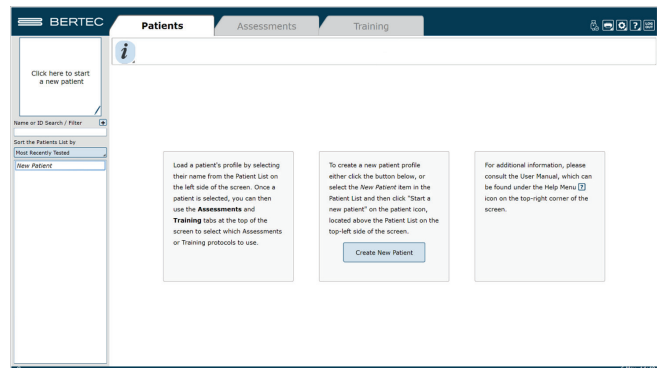


Figure 12: Clinician Home Screen



## Patient Trainings

To start patient training:

1. Create New Patient or access an Existing Patient (reference the Static System User Manual for more details).
2. To perform new training, click the Training tab (Figure 11), drag and drop the desired training(s) into the Test Series List, located on the left.



*Note: Trainings can be re-ordered within the test series by clicking and dragging the test name to a new position. For a description of the trainings, refer to the appropriate chapter devoted to that training further in this manual.*

3. After setting up the order to perform the trainings, select Start Test Series, located directly below the patient's name in the top left corner.
4. If the balance plate is required for a training, the patient's feet will need to be properly positioned on the balance plate. For most trainings, a patient will position their feet such that their medial malleoli are aligned with the line running from left to right and the lateral calcanei are aligned with the small, medium, or large lines. This will be indicated on the clinician screen. In general, the patient is allowed to splay their feet equilaterally so that they are standing comfortably. Proper foot placement is illustrated in Figure 13.
5. Properly position the Head Mounted Display on the patient's head by placing the lens on the eyes, then rotate the strap down over the patient's head. (Figure 14)
6. Place controllers in the correct hands and place the patient's fingers in the correct position. Proper finger placement is illustrated in Figure 15.
7. Perform the training as directed on the computer screen. At any point during the training, the clinician may input notes by clicking in the Test Notes area, located in the bottom left corner of the screen.

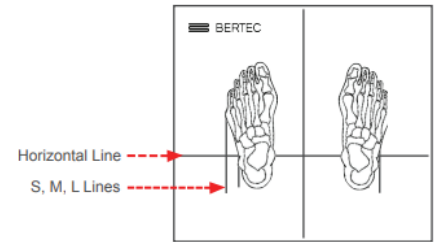


Figure 13: Proper Foot Placement

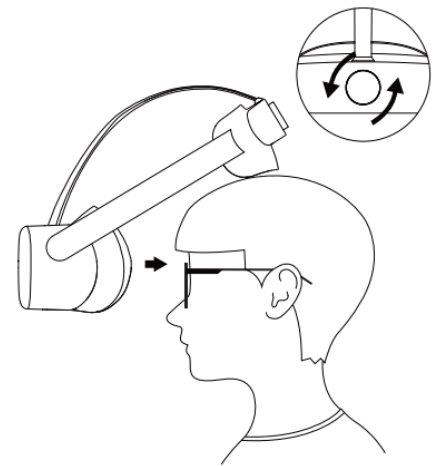


Figure 14: Headset Placement



Figure 15: Hand Placement

## Training Reports

Training results may be present through an Individual Test Report or a Combined test report.

### Individual Test Reports

An individual test report may be generated for any single training or assessment performed on a specific day. Figure 16 is an example of a single test report.

### Combined Reports

Combined Reports merge the results from multiple trainings. For the tests to be combined, select the patient profile, and click the ‘i’ information box on the left side of the test report header. A drop-down menu will appear where “Combined Reports” can be selected. Using the available options, users can filter the range of dates as well as the assessments or trainings included to create one large file of test reports.

### Subjective Visual Vertical Report October 17 2022

Head Axis: Roll		Target Head Angle: 0	Color Set: Grey/Red
Mean Head Angle 0.5 (R)		Mean Absolute Error 0.45	
Trial	Initial Rod Angle	Head Roll Angle	Error
1	40 (L)	0.2 (R)	1.13
2	10 (L)	0.5 (L)	0.37
3	40 (L)	0.1 (R)	0.54
4	0 (R)	1.2 (R)	0.27
5	30 (L)	0.9 (R)	-0.16
6	15 (L)	0.6 (R)	-0.59
7	45 (L)	0.7 (R)	-0.53
8	5 (R)	0.2 (R)	-0.03

Figure 16: End of Test Report

## ASCII Data Export

Data export may be initiated by holding down the Ctrl+F6 keys on the keyboard while viewing a test report from the Patients tab; performing this keystroke will open the Data Export viewer. Within this screen, a range of options are available to the user. Available options include choosing to export the current patient or all patients, the type of tests to be exported, how to organize exported information, export between which dates, and where to save the exported information. All exported data is saved in common comma-separated values (CSV) files and can be opened with other data analysis programs. The data export screen is shown in Figure 17. The exported data cannot be re-imported back into the Bertec® Balance Advantage® software; for performing a system back-up, please refer to the Database Maintenance section.

Figure 17: Data Export

# Setting Up a Training Session

To begin setting up a training session, follow these steps from the BBA program:

1. First, make sure the correct patient is selected from the patient list.
2. Next, select the Training tab at the top of the screen. Trainings available for the HMD are organized into 3 categories:
  - a. Vision
  - b. Quick Training
  - c. Sensory
3. Select the appropriate training category to see the icons which represent specific trainings.
4. Select, drag and drop a training icon into the left side of the screen into the "Series of Tests to perform" box.
5. Any available options for the selected trainings will appear in the section below titled "Test Options". All trainings require the appropriate options to be selected, based on the capabilities of the patient.

# Training/Test Options

Additional Training options allow for the training conditions to be tailored to a patient's needs. Possible options are included below.



*During a training, greyed out options are unable to be changed, however, options that are blue can be changed*

## Quick Training Testing Options

### Limits of Stability (LOS)

This controls the distance of the targets from the center home target.

The patient may progress from 25% to 100% for additional levels of difficulty. Changing the percent of LOS adjusts how far a patient must move to reach a target.

### Training Time

The available time ranges from 1 minute to 15 minutes. Each individual exercise may have a specific time limit. If the "save all raw data" configuration option is checked, a warning message will appear in this window reminding the user that all data is being saved and that this option will accelerate the database's enlargement.

### Camera Gain

Controls how much the scene moves while performing a training protocol.

- A setting of 0 means the environment does not move at all.
- A setting of 2 rotates the environment twice the amount the patient is leaning on the balance plate.
- A setting of -1 rotates the environment the same amount the patient is leaning (but in the opposite direction).

### Pacing

Pacing ranges from 1 second through 15 seconds.

- On-Demand: The target will move from one target to the next as each target is reached.
- Random Pacing: The target will move within a preselected range of time from 1 second through 15 seconds.
- No Pacing: The target will be stationary. The patient may be verbally instructed to make the changes between the targets or other stimuli may be used to instruct the patient to move between the targets. No compliance score is generated in this format.

### Color Set

Controls the color settings of the target

- Normal
- High Contrast
- Black and White

### Scene

Allows the user to select which scene to use to incorporate various levels of distractions. The scene options are Blank Field, Rock Wall, Checkered Room, Moving Lines, Infinite Tunnel, Fountain, and Airport Lounge.

### Scene Motion

Allows the user to change the degree of oscillation of the scene. These oscillations rotate in a clockwise and counterclockwise motion

- 0° – 8°

### Show Grid

The grid is the lines which connect the LOS ellipse targets. If unchecked, the lines will not be visible.

### Show COG cursor

This is automatically enabled. It shows where the user's COG is.

### Show COG targets

The targets are automatically displayed if this box is left check marked.

### Beep on Advance

An audio indicator will be provided when the target has advanced.

If this box is left unchecked, there will be no audio indicator.

### Use Random Targets

When enabled, the targets will be automatically chosen at random, and not in the same pattern each time. A greater degree of difficulty is possible when the patient is unable to anticipate the location of the next target. To provide a greater degree of difficulty, check this box.


	<b>Limits of Stability: 35%</b>	35%	60%	100%
	<b>Testing Time: 2 minutes</b>	1 minute	2 minutes	10 minutes
	<b>Camera Gain: 0.00</b>	-2.00	0.25	2.00
	<b>Pacing: 2 sec</b>	Random	2 sec	5 sec
	<b>Color Set: Normal</b>	Normal	High Contrast	Black and W...
	<b>Scene: Checkered Room</b>	Blank Field	Rock Wall	Checkered ...
	<b>Scene Motion: None</b>	None	0.2 degrees	0.8 degrees
	<input checked="" type="checkbox"/> Show Grid			
	<input checked="" type="checkbox"/> Show CoG Cursor			
	<input checked="" type="checkbox"/> Show Targets			
	<input type="checkbox"/> Beep On Advance			
	<input type="checkbox"/> Use Random Targets			

Figure 18: Quick Training Therapist Options

## Vision Training Scene Options

# Visual Flow: Boardwalk, Driving, Park, Optokinetics

### Speed Option

The operator can define the speed of the scene's movement. Three speeds will be available

- Slow
- Medium
- Fast

### Optokinetic Speeds

- 0-25 (in increments of 5)

### Test Time Option

The operator can define the length of the trial time

- 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 min

### Obstacles Option

The operator can decide whether there is static, dynamic or no obstacles.

- Static: The obstacles do not move in the scene
- Dynamic: The obstacles move left to right or right to left in the scene

### Central Density Option

The operator can define the density of the objects that are in the center of the scene.

- Simple
- Hard

### Peripheral Density Option

The operator can define the density of the objects that are on the periphery.

- Low
- Medium
- High

### Optokinetic Density Option

- 1-10

### Distraction Frequency Option

The operator can define if there will be distractions on the scene and if so, how frequently they will happen.

- Low
- Medium
- High
- Off

### Cognitive Frequency

The operator can choose to include the cognitive task in the trial and if so, choose the frequency of the task

- Low
- Medium
- High
- Off

## Cognitive Task

Visual Flow Driving has an option called “Cognitive Task” which allows the operator to decide the kind of cognitive tasks.

- Stroop Incongruent
- Stroop Congruent
- Stroop Random
- Math

## Optokinetic Flow Directions

This changes which direction the scene moves.

- Left
- Right
- Up
- Down

## Camera Position

The operator can define the position of the camera for the user.

- 1st person
- 3rd person
- Cabin view



*Note: This setting is unique to Visual Flow Driving*

## Lighting Checkbox

The operator can change the lighting of the scene. When enabled the scene will replicate daytime and when disabled the scene will replicate nighttime.

## Display Target Circle Checkbox

The operator can choose to display the target circle in the scene or not.

## Display COG Cursor Checkbox

The operator can choose to display the COG cursor in the scene or not.



*Note: This option is only available for the 3rd person camera position in Visual Flow Driving.*

## Audio Feedback Checkbox

The operator can choose to enable or disable the audio in the scene.

## Recenter HMD button

When clicked, it will recenter the patient in the scene. It can be used to reset the position of the scene if the trial has started before positioning the patient.

## Passthrough toggle

When clicked, it will enable the passthrough function which disables the virtual world and shows their surroundings so that the patients can orient themselves. When clicked again it will turn off the passthrough function and shows the virtual world.



*Note: Passthrough mode can also be accessed for the patient by pressing the 'A' or 'X' button on the controller.*

## Vision Training Scene Options

# Subjective Visual Vertical (SVV), Subjective Visual Horizontal (SVH), and Rod and Frame (R&F)

### Trials

The operator can define how many trials will be performed in one protocol.

### Head Axis

The operator can choose an axis for the user to perform the training at.

- Pitch
- Roll
- Off

### Target Head Angle

The angle in either the pitch or roll direction for the user to position their head at for the training series. The Tilt Angle option will be reflected on the angle visualization tool under the options

### Rod Angles

The operator can define a range from which the software will randomly choose from to display the initial rod angle throughout the training. Reference Figure 19 to change rod angles

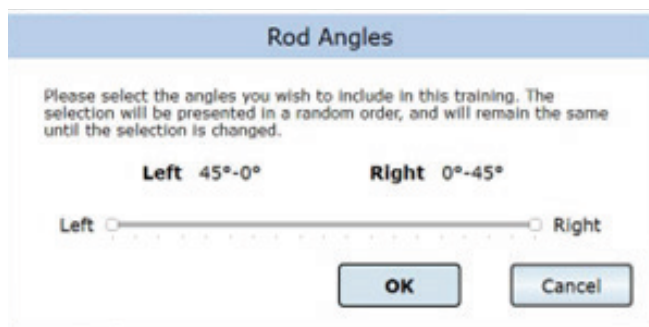


Figure 19: Angle Selector Tool

### Frame Angles

For R&F only, the operator can define a range from which the software will randomly choose from to display the frame tilt angle throughout the training.

### Color Set

The operator can select the predefined color combinations for the rod and the background to be used in the training. The background will always be grey, there will be three rod color choices

- Red Rod
- Green Rod
- Black Rod

### Show Directional Indicators

When turned on, a directional arrow will tell the user which direction to move the rod.

### Head Angle Visualization Tool

The operator can see the intended initial head angle and the current head angle of the patient. When a target head angle is chosen the black needle will be positioned accordingly. The green needle shows the current angle of the patient. Using this tool, the operator can arrange the patient's head with their hands to match the head angle and then start the training (Figure 20)

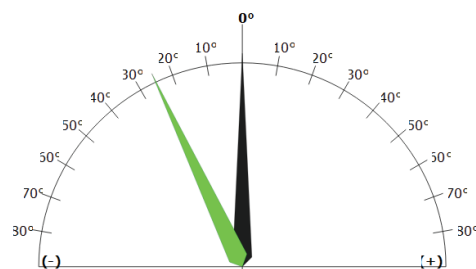


Figure 20: Head Angle Tool



## Vision Training Scene Options

# Subjective Visual Vertical (SVV) and Subjective Visual Horizontal (SVH) with Optokinetic

In addition to SVV and SVH options:

### Scene

The operator can choose from two different optokinetic scenes that will be used in the background.

- Striped
- Starfield

### Rod Color

The operator can define the color of the rod.

- Yellow
- Red
- Green

### Direction

The operator can define the direction of the optokinetic movement.

- Up
- Down
- Left
- Right
- Counter-Clockwise
- Clockwise

### Speed

The operator can define the speed of the optokinetic movement

- Speed ranges from 0-25 in increments of 5

### Density

The operator can define the density of the optokinetic scene.

- Low
- Medium
- High

## Vision Training Scene Options

# Subjective Visual Vertical (SVV) with Visual Flow

In addition to SVV options:

### Scene

The operator can choose the type of visual flow scene that will be used in the background

- Park
- Boardwalk
- Driving

### Speed

The operator can define the speed of the scene's movement.

- Slow
- Medium
- Fast

## Vision Training Scene Options

# Head Tilt Response (HTR)

### Frequency

Defines the frequency at which each rod angle is displayed. Low frequency will display each rod angle once. Medium frequency will display each rod angle twice. High frequency will display each rod angle three times.

### Tilt Angles

The operator can define a range from which the software will randomly choose from to display the initial tilt angle of the scene throughout the training.

### Color Set Option

The operator can select the predefined color combinations for the rod and the background to be used in the training. The background will stay grey, but the rod color can change

- Red
- Green
- Black

### Show Directional Indicators

A checkbox that when turned on, will tell the user which direction to rotate their head.

### Upright Between Trials

A check box that when turned on, every other trial will have a rod angle of 0 degrees. This allows the user to realign their head at the vertical before the next trial begins.

### Head Angle Visualization Tool:

The operator can see the initial tilt angle of the scene (black) and the current head angle of the patient (green). This tool can show the operator how accurate the patient's head tilt is in comparison with the scene tilt.

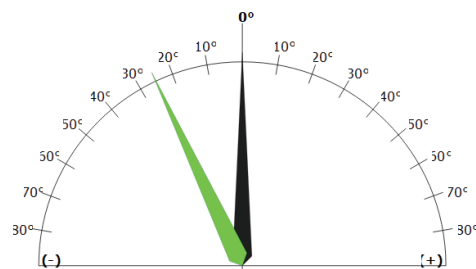


Figure 21: Head Angle Tool

## Vision Training Scene Options

## Head Tilt Response – Optokinetic

In addition to HTR:

**Scene**

The operator can choose the type of optokinetic that will be used in the background.

- Striped
- Starfield

**Direction**

The operator can define the direction of the optokinetic movement.

- Up
- Down
- Left
- Right
- Clockwise
- Counter-Clockwise

**Speed**

The operator can define the speed of the optokinetic movement.

- 1-10

**Density**

The operator can define the density of the optokinetic scene

- 1-10

**Rod Color**

The operator can define the color of the rod

- Red
- Green
- Yellow

## Vision Training Scene Options

## Head Tilt Response – Visual Flow

In addition to HTR:

**Scene**

The operator can choose the type of visual flow scene that will be used in the background.

- Park
- Boardwalk
- Driving

**Speed**

The operator can define the speed of the scene's movement.

- Static
- Slow
- Medium
- Fast

## Sensory Training Options

### Training Types

There are six training offerings available under the “sensory” tab

- Spatial Memory Baseline
- Perception Span Baseline
- Spatial Memory
- Perception Span
- Response Inhibition
- Reaction Trainer

### Interaction Types

There will be both laser and hand interaction types for each training mode in the static grocery scene.

- Laser interaction mode uses the laser as input and the view is farther back, making the entire grocery shelf visible. The controller will be shown pointing the laser in the scene.
- Hand interaction mode uses hand controls to interact directly with the objects on the shelf. When hand is touching can, click index trigger to select can.

### Target Set

For all Sensory Training Types, there will be a “Target Set” option, allowing the operator to choose the size of the target scene.

- Standard
- Medium (default)
- Large

### Trials

The operator can choose the number of trials being performed.

- 3, 5, 8 (default), 10, 12, 15

### Object Count

The operator can choose the number of objects that the patient is required to remember. There will be three options visible, plus six other options that will pop up in another window when “object count” is clicked on.

- Visible Options: 2, 3, 4
- Second Window Options: 2, 3, 4, 5, 6, 7, 8, 9, 10

### Display Time

The operator can define the length of how long the objects that will be visible in the scene.

- Visible Options: 1 sec, 2 sec, 3 sec
- Second Window Options: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 seconds

### Wait Times

For perception span and spatial memory modes, there is an optional “wait time” where the patient must remember the pattern before repeating the sequence.

In both Laser and Hand Mode the “wait time” is indicated by a green loading bar and the objects will be blurred out. When the wait time is over the objects are easily visible again and the patient can select the objects.

- Visible Options: None, 6 sec, 10 sec
- Second Window Options: None, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 seconds

### Testing Time Option

For Response Inhibition Training the operator can define the length of a trial, from 30 seconds to 10 minutes

- Visible Options: 30 sec, 6 min, 10 min
- Second Window Options: 30 seconds and 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 minutes

### Cognitive Task

The operator can define if there will be a cognitive test and what kind of test it will be. Multiple cognitive tasks will be available.

- Stroop Congruent
- Stroop Incongruent
- Stroop Random
- Math
- Off



*Note: Cognitive tasks cannot be performed in hand mode*

### Cognitive Frequency

If a cognitive task is occurring, the operator can choose between three different frequencies of the cognitive task.

- Low (20 seconds)
- Medium (15 seconds)
- High (10 seconds)

### Pace Time Option

The operator can define the pace of the objects in seconds.

- 1 (default), 1.25, 1.5, 2, 3 seconds

### No-Go Option

For Response Inhibition Training the operator can choose the percentage of no-go objects in the trial

- 10%, 25%, 50%, 75%

### Time Between

The operator can choose the time between the objects that will be shown. They will be able to choose between 0 and 8 seconds.

- Visible Options: None, 5 sec, 8 sec
- Second Window Options: None, 1, 2, 3, 4, 5, 6, 7, 8 seconds

### Show Instructions Check Box

Instructions on the patient screen are automatically enabled. If the operator unchecks this box, the patient screen will no longer show instructions



# HMD Trainings

## Vision

There are 15 Visual Training Scenes:

1. Visual Flow - Boardwalk
2. Visual Flow - Driving
3. Visual Flow - Park
4. Optokinetics Flow
5. Subjective Visual Vertical (SVV)
6. Subjective Visual Vertical - Optokinetic (SVV-OPK)
7. Subjective Visual Vertical - Visual Flow (SVV-VF)
8. Subjective Visual Horizontal (SVH)
9. Subjective Visual Horizontal - Optokinetic (SVH-OPK)
10. SVV Baseline
11. SVH Baseline
12. Rod and Frame (R&F)
13. Head Tilt Response (HTR)
14. Head Tilt Response - Optokinetic (HTR-OPK)
15. Head Tilt Response - Visual Flow (HTR-VF)

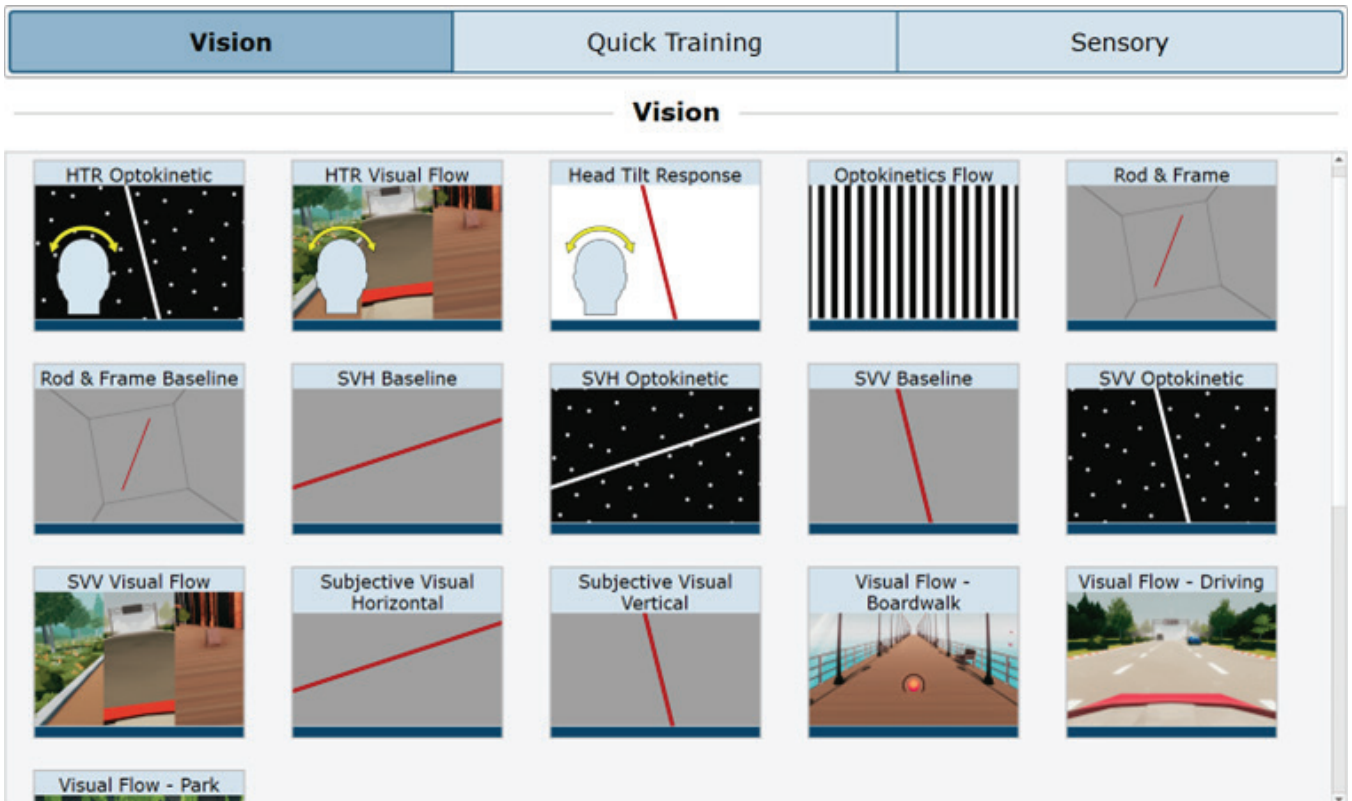


Figure 22: Vision Tab

## Vision

# Visual Flow – Boardwalk, Driving, Park

Visual Scene designed to help the patient adapt to visual stimuli during balance exercises.

### Goal

The patient should maintain their balance while shifting their COG around the targets as they approach and as the scene complexity and task difficulty increases.

### Protocol

“The patient will be asked to maintain balance throughout a moving scene while dodging objects by shifting their COG, answering simple cognitive tasks, and ignoring various visual and auditory distractions.

### Patient View



Figure 23: Park Visual Flow



Figure 24: Boardwalk Visual Flow



Figure 25: Driving Visual Flow



### Clinician View

For Cognitive Testing, Button 1 on the remote indicates a Correct response, while Button 2 indicates an Incorrect response.  
Align the medial malleolus to the black horizontal line, and the lateral calcaneus to the large lines.

**⚠ Warning: Visuals in the Head Mounted Display may cause motion sickness or dizziness ⚠**

Figure 26: Visual Flow Clinician View

### End of Test Report

The end-of-test report is compiled after the completion of a test. This report will include the patient information, the settings from the test, and any data/metrics pertaining to the test. For Visual Flow - Boardwalk, Driving, and Park:

- Compliance score (TRG): The percentage of time the patient stays within the target circle throughout the trial.
- Obstacle Count (OBS): Percentage of the obstacles avoided.
- Cognition score (CGN): If a cognitive task is present, the cognition score is the percentage of questions answered correctly.



Note: This report mostly contains information on the patient and the settings of the test. Data can be analyzed further using the corresponding ASCII file

Time	Speed	Obstacles	Central Density	Peripheral Density	Distraction Frequency	Cognitive Frequency	Lighting	Target / COG	Training Time	Score
11:39:26	medium	dynamic	simple	medium	low	off	true	on / on	00:42.3	Trg:80% Obs:100%

Figure 27: Visual Flow Report

## Vision

# Optokinetics Flow

Visual Scene designed to help the patient adapt to visual stimuli during balance exercises.

### Goal

The patient should maintain balance and stand as still as possible while immersed in the visual scenes

### Protocol

The patient will be asked to maintain balance throughout a moving scene while having the option of answering simple questions by selecting a cognitive task

### Patient View



*Figure 28: Starfield Patient View*



*Figure 29: Striped Patient View*

## Clinician View

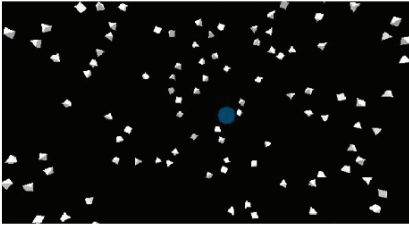
Background: Starfield	Stripes	Starfield	
Density: 3	1	6	10
Speed: 5	0	15	25
Direction: Top	Left	Top	Bottom
Test Time: 2 minutes	1 minute	6 minutes	10 minutes
Cognitive Task: Off	Off	Stroop Ran...	Math
Cognitive Frequency: Low	Low	Medium	High

Display Visual Aid

2:00







0%

Patient View



Recenter HMD    Show External View

### Key Commands:

-  : increase speed
-  : decrease speed
-  : increase line density
-  : decrease line density
-  : toggle direction of flow
-  : toggle orientation of flow

**For Cognitive Testing, Button 1 on the remote indicates a Correct response, while Button 2 indicates an Incorrect response.**

**Align the medial malleolus to the black horizontal line, and the lateral calcaneus to the large lines.**

**Please ensure the patient is standing on the plate.**

**⚠ Warning: Visuals in the Head Mounted Display may cause motion sickness or dizziness ⚠**

Figure 30: Visual Flow Clinician View

## End of Test Report

- Time: The time of day that the test took place
- Density: How dense the objects are in the scene
- Speed: How fast the scene is moving
- Direction: The direction the scene is moving in
- Visual Aid: Whether or not the blue circle was present for the patient to focus on.
- Training Time: The duration of the training

Vision

# Subjective Visual Vertical, Subjective Visual Horizontal, and R&F

Visual scene designed to assess the patient’s ability to align the rod with respect to the gravitational vertical (0°) or horizontal (180°) by using the joystick or middle finger trigger of the controller.

**Goal**

The patient should use the controller to align the rod with respect to the gravitational vertical (SVV and R&F) or horizontal (SVH) in a fully immersive VR scene.

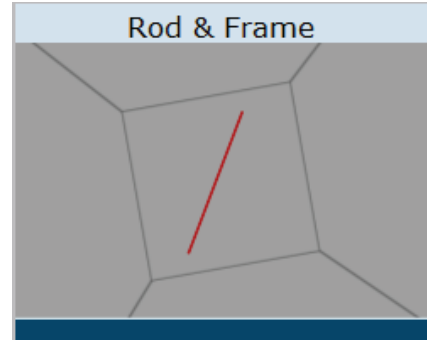


Figure 31: Rod & Frame

**Protocol**

The patient will be asked to use the right and/or left controllers to position the rod at the gravitational vertical or horizontal. They will submit their response by using the index trigger. Once the response is submitted, the correct rod angle will display. Both rods will then disappear, and a new rod will show. Various levels of difficulty can be implemented with the optokinetic and visual flow options listed above.



*Note: SVV visual flow will not display a rod. The patient will use controllers to align the scene vertically.*

Refer to the images below for instructions to better understand the functionality of the controllers:

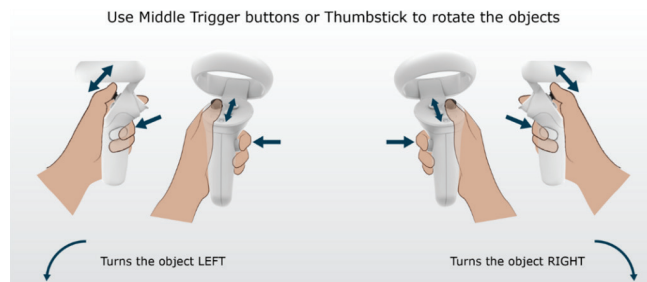


Figure 32: Rod rotation

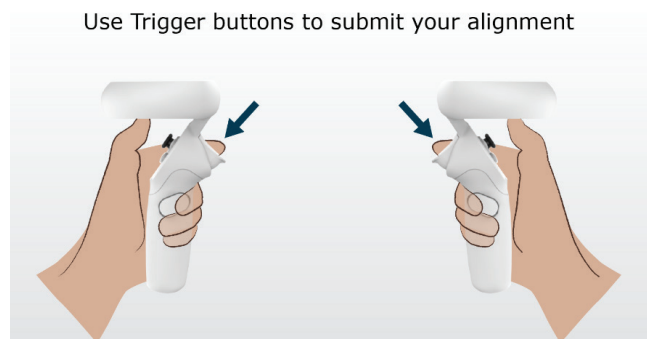


Figure 33: Index Trigger

Clinician View

**BERTEC** Patients Assessments **Training**

Megan Cotterman

Start Stop

Exit Testing

SVV Optokinetic

SVV Visual Flow  
End of Tests Report

Session Notes:

Trials: 8 8 24 32

Head Axis: Roll Off Roll Pitch

Target Head Angle: 5 -45 5 45

Rod Angles

Scene: Stripes Stripes Starfield

Rod Color: Yellow Yellow Red Green

Direction: Right Up Right CCW

Speed: 3 1 6 10

Density: Medium Low Medium High

Show Directional Indicators

Starting Angle: 25 degrees  
Angle Input: 25 degrees  
Cumulative Mean Error: 0 degrees

Trial 1/8

Patient View

Recenter HMD Show External View

0°  
10° 20° 30° 40° 50° 60° 70° 80° 90°  
(-) (+)

**Warning: Visuals in the Head Mounted Display may cause motion sickness or dizziness**

The subject should be seated to avoid a possible falls injury

Sen 12 9:04 AM

**BERTEC** Patients Assessments **Training**

Megan Cotterman

Start Stop

Exit Testing

SVV Optokinetic

SVV Visual Flow  
End of Tests Report

Session Notes:

Trials: 8 8 24 32

Head Axis: Roll Off Roll Pitch

Target Head Angle: 0 -45 5 45

Rod Angles

Scene: Park Boardwalk Park Driving

Speed: Slow Static Medium Fast

Show Directional Indicators

Starting Angle: -40 degrees  
Angle Input: -40 degrees  
Cumulative Mean Error: 0 degrees

Trial 1/8

Patient View

Recenter HMD Show External View

0°  
10° 20° 30° 40° 50° 60° 70° 80° 90°  
(-) (+)

**Warning: Visuals in the Head Mounted Display may cause motion sickness or dizziness**

The subject should be seated to avoid a possible falls injury

Sen 12 9:03 AM

Figure 34: SVV Optokinetic, SVV Visual Flow (respectively)

## End of Test Report

The end-of-test report is compiled after the completion of a test. This report will include the patient information, the settings from the test, and any data/metrics pertaining to the test. For SVV, SVV-Visual flow, SVV-Optokinetic, SVH, SVH-Optokinetic, and R&F:

**Overall Score** – Averages or settings that were measured throughout the whole test

- Mean absolute error degree (+/-): The average absolute error from the vertical (SVV and R&F) or horizontal (SVH) from all of the trials based on the angle of the rod at the time of submission.
- Mean head angle across trials: The average angle (pitch or roll) of the patient's head throughout the test
- Target Head angle: The head angle the patient is supposed to keep their head at throughout the duration of the test. This is chosen in the test settings.

**Trial Specific** – Measurements that were taken for each trial

- Initial rod angle: The angle of the rod at the beginning of the trial
- Error degree (+/-): The error from the vertical (SVV and R&F) or horizontal (SVH) based on the angle of the rod at the time of submission.
- Head angle degree (+/-): The head angle the patient's head is positioned at the time of submission.



*Note: These same metrics are found in the SVV-Visual Flow, SVV-Optokinetics, SVH-Optokinetics, and R&F reports.*

### Subjective Visual Vertical Report October 12 2022

Head Axis: Roll		Target Head Angle: 0	Color Set: Grey/Green
Mean Head Angle		Mean Absolute Error	
	0.8 (R)		1.76
Trial	Initial Rod Angle	Head Roll Angle	Error
1	15 (R)	2.3 (L)	0.60
2	15 (L)	0.4 (R)	0.09
3	5 (R)	0.4 (R)	-0.33
4	40 (L)	0.7 (R)	-1.47
5	10 (L)	0.4 (R)	-9.27
6	0 (R)	0.8 (R)	-1.13
7	0 (R)	1.3 (R)	-0.77
8	40 (L)	0.1 (R)	-0.45

Figure 35: SVV Report



## Vision

# Head Tilt Response

Visual scene designed for the patient to align their head with the rod tilt angle or scene (HTR-Visual Flow) that appears on the screen while sitting or standing.

There are three separate Head Tilt Response training protocols:

1. Head Tilt Response (HTR)
2. Head Tilt Response Visual Flow (HTR-VF)
3. Head Tilt Response Optokinetics (HTR-OPK)

### Goal

The patient should be able to tilt their head (+/- 40 degrees max) to align with the rod or scene inside the headset.

### Protocol

For HTR and HTR-Optokinetic, using a rod on the screen, the patient must align their head with the rod and use the index trigger to submit their response when they are aligned. The rod will disappear on submission and a new rod will appear at a new angle, at which point they will align with the new rod. The first trial will always be a calibration trial. During this trial, the clinician should watch the head angle tool on the clinician screen, while aligning the patient's head to 0 degrees. The patient is to click the index trigger once their head is aligned at 0 degrees. The remaining trials will alternate between left and right head tilts. This continues for the number of trials selected.

When the "Upright between trials" checkbox is selected, every other trial will display a rod at 0 degrees. This allows the user to realign their head with the vertical before tilting it again. The trials in between will alternate rod angles.



*For HTR-Visual Flow, the rod is not shown, and the scene rotates instead. The patient should align their head to make the scene vertical. Various levels of difficulty can be implemented with the optokinetic and visual flow options listed above.*

### Patient View

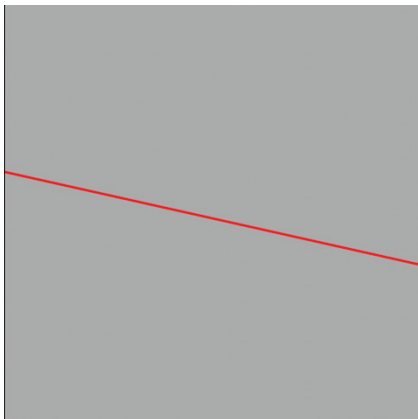


Figure 36: HTR

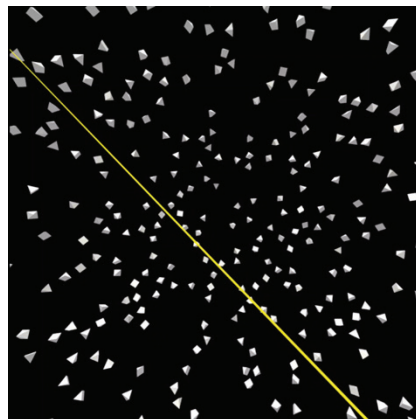


Figure 37: HTR Optokinetic



Figure 38: HTR Boardwalk



### Clinician View

Show Directional Indicators

Head Tilt: 0 degrees  
Target Angle: -45 degrees

Trial 7/8

Patient View

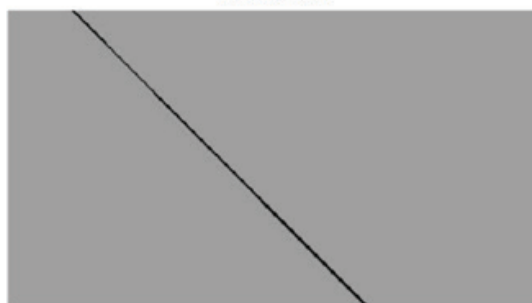


Figure 39: Clinician HTR

Show Directional Indicators

Head Tilt: -40 degrees  
Target Angle: 45 degrees

Trial 5/8

Patient View

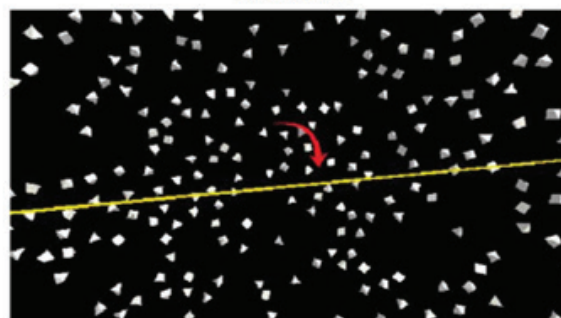


Figure 40: Clinician Optokinetic HTR

## End of Test Report

The end-of-test report is compiled after completion of a test. This report will include the patient information, the settings from the test, and any data/metrics pertaining to the test. For HTR:

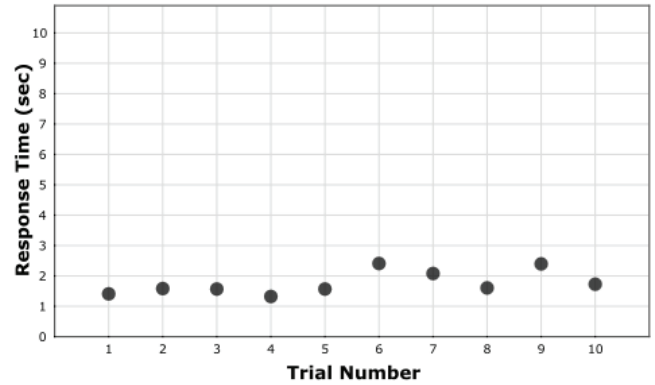
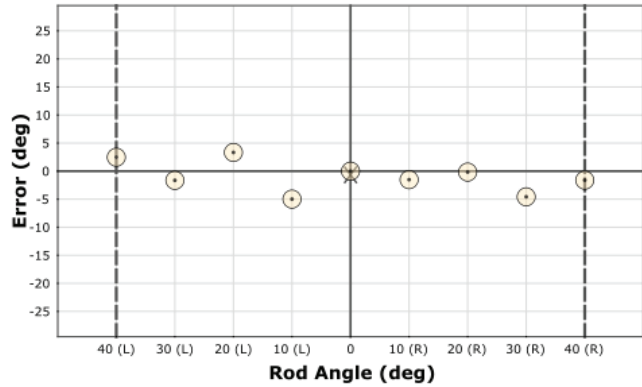
**Overall Score** – Averages or settings that were measured throughout the whole test

- Mean/Abs Error
- Mean Response Time
- Mean Delay Time
- Mean Overshoot

**Trial Specific** – Measurements that were taken for each trial

- Rod Angle: The angle that the rod is presented at.
- Error: The degree at which the patient's head angle was off from the rod angle.
- Response Time: Amount of time it takes to submit a response after the rod appears.
- Delay time: Time between when the rod is displayed and when the patient begins moving their head.
- Overshoot %: Maximum head tilt value as a percentage of the rod angle presented.

## Head Tilt Response Report December 5 2022



Mean/Abs Error -0.9 / 2.1		Mean Response Time 1.77	Mean Delay Time 0.36	Mean Overshoot 5.2	
Trial	Rod Angle (°)	Error (°)	Response Time (s)	Delay Time (s)	Overshoot (%)
⊙ 1	10 (R)	-1.5	1.41	0.43	30.6
2	20 (L)	3.3	1.58	0.34	1.7
3	30 (R)	-4.6	1.57	0.25	0.1
4	10 (L)	-5.0	1.32	0.19	0.6
5	40 (R)	-1.6	1.57	0.29	0.1
6	40 (L)	2.5	2.41	0.54	0.1
7	0	0.0	2.08	0.32	5.0
8	30 (L)	-1.6	1.61	0.55	0.3
9	20 (R)	-0.2	2.40	0.33	13.5
X 10	0	-0.7	1.73	0.33	0.1

Figure 41: Head Tilt Response Report

## Quick Training

Training Exercises designed to meet the basic needs of training quickly and easily.

### Goal

The goal is to have easy access to basic training exercises that test balances under distracting stimuli (virtual reality scenes)

### Protocol

Position the patient on the balance plate in the correct position and place the headset on the patient's head. The clinician will then choose one of the quick training protocols and choose one of the seven scene options. Each protocol will have a different target area, the patient is to stay on the balance plate and shift their weight towards the target being displayed on the headset.

### End of Test Report

- User Settings
- Compliance
- Training Time

### Clinician Screen

The Clinician Screen interface includes the following controls and information:

- Limits of Stability:** 40% (selected), 35%, 60%, 100%
- Testing Time:** 1 minute (selected), 1 minute, 2 minutes, 10 minutes
- Camera Gain:** 0.00 (selected), -2.00, 0.25, 2.00
- Pading:** 5 sec (selected), Random, 2 sec, 5 sec
- Color Set:** Normal (selected), Normal, High Contrast, Black and W...
- Scene:** Fountain (selected), Blank Field, Rock Wall, Checkered ...
- Scene Motion:** None (selected), None, 0.2 degrees, 0.8 degrees
- Checkboxes:**
  - Show Grid
  - Show CoG Cursor
  - Show Targets
  - Beep On Advance
  - Use Random Targets

**Score: 100.0%**

**0:26**

**55%**

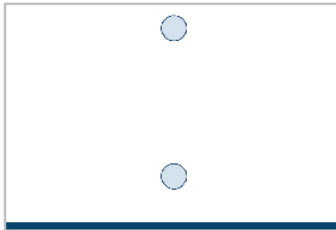
**Patient View**

**Recenter HMD**   **Show External View**

Figure 42: Quick Training Clinician View

# Quick Training Report - October 12 2022

**Anterior Posterior @ 10:08:15**



**LOS:** 35%  
**% WB:** n/a  
**Sway Gain:** n/a  
**Camera Gain:** 0.00  
**Color Set:** Normal  
**Scene:** Blank Field  
**Pacing (sec):** 2 seconds  
**Training Time:** 01:00.0  
**Compliance:** 50.0%  
**Advance Beep:** Off

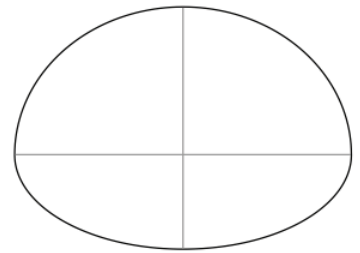


Figure 43: Quick Training Report

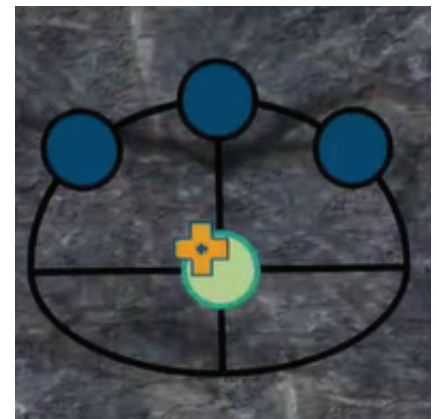
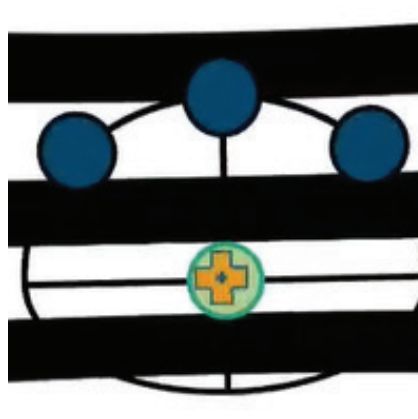
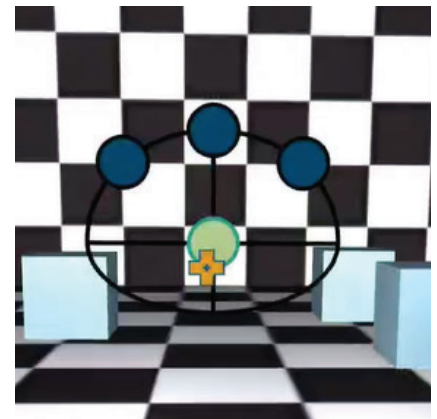
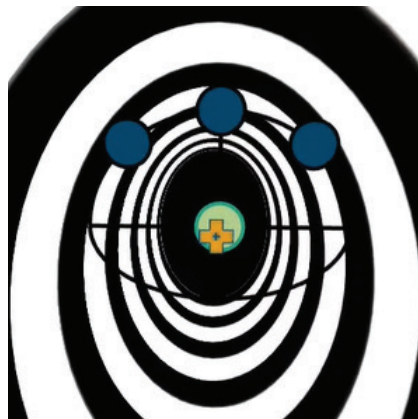
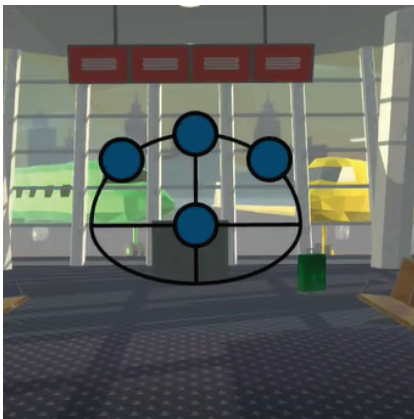


Figure 44: Quick Training Scenes

## Sensory Training Spatial Memory Training – Baseline

### Goal

The goal is to get to the highest level possible, by identifying multiple sequences in the same order as they were initially presented

### Protocol

Position the patient either sitting or standing, with the headset on and the controllers in the correct hands. The patient will be shown a sequence of items sitting on a grocery store shelf. These items will be introduced in a particular order and will appear for a couple of seconds and disappear. Then the patient will identify the items on the shelf using the handheld controllers in the same sequence they were initially presented.

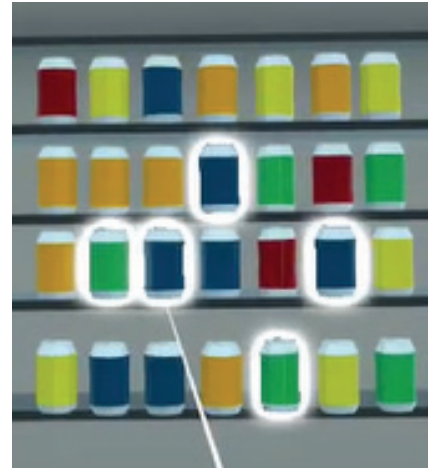


Figure 45: Laser Selection

If the patient gets the sequence correct, they will move to the next level. If they get the sequence incorrect, they will move back one level. The patient will continue until they get a total of three incorrect sequences.



*When the patient is selected, the first level that appears is the last level the patient successfully achieved.*

This is a baseline training, which will use fixed values for the following settings:

- Wait Time: 1 second
- Delay Between Objects: None
- Display Time: 1 second

### Patient Instructions

“Watch the pattern and remember the order. After the pattern is played, the scene will change during the waiting period. Once the waiting period is over, you can begin to identify the items on the shelf according to the same order they were shown by using the controller input methods”

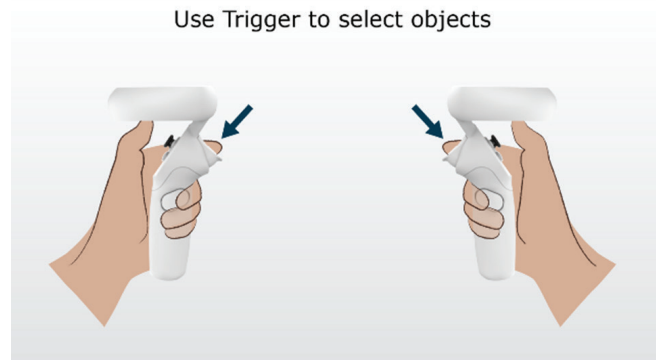


Figure 46: Using Index Trigger for Object Selection

**End of Test Report**

- Response Time
- Object Score
- Order Score
- Overall Score

**Scoring Components**

- Two Components in [X.Y] format
  - X = highest level attained
  - Y = number of objects correctly selected at the highest level
- Max score is 28.0 if the patient completes level 27 with 10 correct answers
- Minimum score is 1.0, which occurs when the patient fails to select an object on level 1 for three consecutive trials.

## Spatial Memory Baseline Report November 10 2022

Trial	Level	Target Set	Response Time	Object Score	Order Score	Overall Score
1	12	large	2.57 s	0/5	0/5	0%
2	11	medium	2.88 s	5/5	5/5	100%
3	12	large	3.08 s	5/5	5/5	100%
4	13	standard	2.72 s	0/6	0/6	0%

Figure 47: Spatial Memory Baseline Report



Assessment Level will automatically advance to the next or previous level based on test results.

Level	Target Set	Objects
1	Standard	2
2	Medium	2
3	Large	2
4	Standard	3
5	Medium	3
6	Large	3
7	Standard	4
8	Medium	4
9	Large	4
10	Standard	5
11	Medium	5
12	Large	5
13	Standard	6
14	Medium	6
15	Large	6
16	Standard	7
17	Medium	7

Show Instructions

**Score: 1.0**

Patient View



Recenter HMD

Show External View

**⚠ Warning: Visuals in the Head Mounted Display may cause motion sickness or dizziness ⚠**

Figure 48: Spatial Memory Baseline; Clinician Screen

## Sensory Training Perception Span Training – Baseline

### Goal

The goal is to get to the highest level possible by identifying items on the shelf that were previously highlighted.

### Protocol

Position the patient either sitting or standing, with the headset on and the controllers in the correct hands. The patient will be shown several highlighted items on a grocery shelf at the same time. They will be highlighted green for a couple of seconds, and then a wait period will occur. After the wait period, items will be present on the shelf again, and the patient will be required to identify the same items that were originally highlighted green on the shelf.

If the patient gets the sequence correct, they will move to the next level, if they get the sequence incorrect, they will move back one level. The patient will go until they get a total of three incorrect sequences.

This is a baseline training, which will use fixed values for the following settings:

- Wait Time: 1 second
- Display Time: 3 seconds

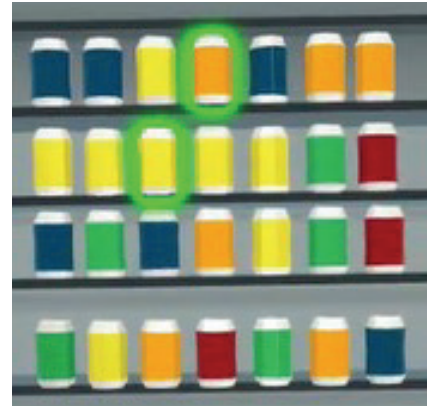



Figure 49: Correctly Highlighted Cans

### End of Test Report

- Response Time
- Object Score: the number of objects correctly selected out of the total number of objects
- Score: Percentage of object score

 Assessment Level will automatically advance to the next or previous level based on test results.

Level	Target Set	Objects
1	Standard	2
2	Medium	2
3	Large	2
4	Standard	3
5	Medium	3
6	Large	3
7	Standard	4
8	Medium	4
9	Large	4
10	Standard	5
11	Medium	5
12	Large	5
13	Standard	6
14	Medium	6
15	Large	6
16	Standard	7
17	Medium	7

Show Instructions

Score: 1.0

Patient View



Recenter HMD

Show External View

**⚠ Warning: Visuals in the Head Mounted Display may cause motion sickness or dizziness ⚠**

Figure 50: Perception Span Baseline Clinician Screen



## Sensory Training

### Spatial Memory Training

#### Goal

The goal is to evaluate if the patient can identify the same sequence of items that were initially presented.

#### Protocol

Position the patient either sitting or standing, with the headset on, and the controllers in the correct hands. The patient will be shown a highlighted sequence of items sitting on a grocery store shelf. These items will be introduced in a particular order and will appear highlighted for a couple of seconds and then a wait time will occur. After the wait time, the patient will identify the items on the shelf using the handheld controller input methods and they are to select the items in the same sequence they were initially present.

#### End of Test Report

- Object Score: The ratio of objects in the sequence that were correctly selected
- Response Time: The time it takes for the patient to input the pattern
- Order Score: The number of objects that were correctly chosen in a row (before first miss) out of the possible objects in the sequence
- Overall Score: The percentage of correct items in the most recent trial
- User Settings
- Trial Information

## Spatial Memory Report - September 1 2022

Trial	Target Set	Response Time	Object Score	Order Score	Overall Score
1	Medium	1.70 s	3/3	3/3	100%
2	Medium	1.47 s	3/3	3/3	100%
3	Medium	1.06 s	3/3	3/3	100%

<b>Interaction:</b> Laser	<b>Display Time:</b> 1 second	<b>Wait Time:</b> 2 seconds
---------------------------	-------------------------------	-----------------------------

Figure 51: Spatial Memory Report

## Sensory Training Response Inhibition Training

### Goal

The goal is to hit the “go” (green highlighted) object as quickly as possible and to avoid hitting the “No-go” (red highlighted) object.

### Protocol

The Patient will be sitting or standing with the headset on and the controllers in the correct hands. They will be shown a grocery store shelf with items on it that will be randomly highlighted in one of two colors. If the object is highlighted in green, the patient is to select the item as quickly as possible. If the item is highlighted red, the patient should not select the item. After one object is highlighted, the highlight will disappear from that object and a new object will become highlighted.

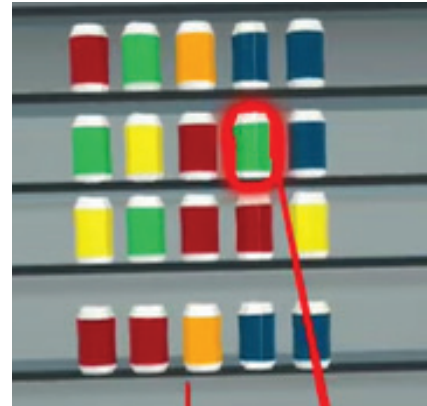


Figure 52: Highlights a “No-Go” Can



*The clinician can set a pace time which determines how long the targets will appear on the screen unless the target is selected before the pace time ends. The no-go% is also able to be set, which is the likelihood a no-go (red highlight) target will appear.*

### End of Test Report

- User Settings
- Trial Information
- Fastest Hit
- Slowest Hit
- Average hit
- Go Ratio
- No-Go Ratio

## Response Inhibition Report October 16 2022

Trial	Go	No-Go	Fastest Hit	Slowest Hit	Average Hit
1	28/35	0/5	0.40 s	0.76 s	0.58 s
<b>Interaction: Hand</b>		<b>Target Set: Medium</b>	<b>Pace Time: 1.0 sec</b>	<b>Testing Time: 30 seconds</b>	<b>No-Go: 10%</b>

Figure 53: Response Inhibition Report

Interaction: Laser    Laser    Hand

Target Set: Medium    Standard    Medium    Large

Testing Time: 30 seconds    30 seconds    6 minutes    10 minutes

**Pace Time: 2.0 sec**    1.0 sec    2.0 sec    3.0 sec

**No-Go: 25%**    10%    50%    75%


Show Instructions

**Score: 85.7%**

**0:23**

20%

Patient View



Recenter HMD    Show External View

Figure 54: Response Inhibition Clinician View

## Sensory Training

# Perception Span Training

### Goal

The goal is for the patient to identify the items on the shelf that were previously highlighted.

### Protocol

The Patient will be standing or sitting with the headset on and the controllers in the correct. They will be shown several items on a grocery store shelf, at the same time. The items will appear highlighted for a couple of seconds and then a wait time will occur. Then the patient will identify the items on the shelf using the handheld controller input methods. The pattern can be repeated in any sequence.

There is feedback after a valid "hit" where the item is highlighted in white as the patient is repeating the pattern. Each of the items the patient selects will be highlighted white until they reach the maximum number (number of objects shown in the sequence pattern), then the playback will occur to show what was correct and incorrect. After the patient has selected the maximum number of items, the correct items will be highlighted green, and the incorrect items will be highlighted red.

### Patient Instructions

"Watch the pattern and remember the objects in the pattern. After the pattern is shown, a wait time will occur. Once the wait time is complete, select the correct items that were previously highlighted."

### End of Test Reports

- Object Score: How many objects in the sequence that were correctly selected
- Overall Score: The percentage of correct items in the most recent trial
- Response Time: The time it takes for the patient to input the pattern
- User Settings
- Trial Information

## Perception Span Report October 19 2022

Trial	Target Set	Response Time	Object Score	Overall Score
1	Medium	1.53 s	3/3	100%
2	Medium	1.30 s	3/3	100%
3	Medium	1.40 s	3/3	100%

<b>Interaction:</b> Laser	<b>Display Time:</b> 1 second	<b>Wait Time:</b> None
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Figure 55: Perception Span Report

## Sensory Training Reaction Trainer

### Goal

The goal is to select the object highlighted, as quickly as possible.

### Protocol

The patient will be sitting or standing with the headset on and the controllers in the correct hands. A grocery store shelf scene will be displayed on the headset. One of the objects on the shelf will randomly be highlighted and the job of the patient is to select the highlighted item as quickly as they can. When an item is "hit" a new item will be highlighted, and the patient is to hit as many items as they can in the given time.

There is a dual task option for reaction training that includes a cognitive task above the shelf of the grocery items. There are four cognitive task options: Stroop Congruent, Stroop Incongruent, Stroop Random, and Math. The operator will record correct/incorrect tasks with their remote control. This option is only available when the laser input method is being used and will not be available when using the hand input method.

### End of Test Report

- User Settings
- Cognitive Task Type
- Fastest Hit
- Slowest Hit
- Average Hit
- Total Hits
- Task Score: Performance on dual task



Figure 56: Hand Selecting Can



Figure 57: Math Cognitive Task

## Reaction Time Report October 16 2022

Trial	Fastest Hit	Slowest Hit	Average Hit	Total Hits	Cognitive Task Score
1	0.02 s	1.35 s	0.56 s	50	0
<b>Interaction:</b> Laser		<b>Target Set:</b> Medium		<b>Testing Time:</b> 30 seconds	
				<b>Cognitive Task:</b> Off	

Figure 58: Reaction Time Report

# Shut Down Procedure
















To shut down the Bertec Head Mounted Display









1. Exit Balance Advantage Software
2. Hold down the power button on the headset until the light flashes blue

# Bertec HMD System Safety

This guide contains information, cautions, and warnings which must be followed to ensure the safe performance of the static systems. Local government rules and regulations, if applicable, should be followed at all times.

## Symbols Used

Symbol	Description
	Carefully read these instructions prior to use
	Caution
	Mandatory action
	High Voltage
	Power on
	Power off
	Earth (Ground)
	Alternating Current
	Fuse
	Class II Equipment
	Type B Applied Part
	Electronic equipment covered by the Directive 2002/96/EC on waste electrical and electronic equipment (WEEE). All electrical and electrical products, batteries, and accumulators must be taken to separate collection at the end of their working life. The requirement applies in the European Union. Do not dispose of these products as unsorted municipal waste. You can return your device to Bertec or to any Bertec supplier. you can also contact you local authorities for advice on disposal.
	Your remote has been programmed to work with a static system
	Your remote has been programmed to work with a dynamic system.
	Your remote has been programmed to work with Bertec Vision Advantage (BVA)

Symbol	Description
	<p>Catalog Number (used in compliance with ISO 15223-1)</p>
	<p>Serial Number (used in accordance with ISO 15223-1)</p>
	<p>Consult Instructions For Use (used in accordance with IEC 60601-1)</p>
	<p>Indicates device manufacturer Includes name and address of the manufacturer (used in accordance with ISO 15223-1)</p>
	<p>Manufacturer build date (used in accordance with ISO 15223-1)</p>
	<p>Direct Current (used in accordance with IEC 60601-1)</p>
	<p>ON/OFF (Power/Stand-by) (used in accordance with IEC 60601-1)</p>
	<p>Equipment Safe Working Load XXX indicates specific weight (used in accordance with IEC 60601-1, Cl. 7.2.21)</p>



## Warning Notes

Bertec Head Mounted Display is designed to be used in conjunction with the Bertec Essential system. All parts of the Bertec Balance Advantage system packages represented here are suitable for use within the patient environment.

<b>Note 1</b>	WARNING: Federal law restricts this device to sale or on the order of a medical practitioner. When prescribed for therapeutic purpose, a physician should clearly define the parameters of use (i.e. total work, maximum heart rate, etc.) to reduce the risk of patient injury.
<b>Note 2</b>	Thoroughly read this user manual before using your Bertec system. Failing to read the instructions prior to use may result in following improper test procedures, affecting test results.
<b>Note 3</b>	The Head Mounted Display system should only be used as specified in the user manual.
<b>Note 4</b>	A gait belt must be worn by the subject at all times when they are completing a protocol on the BBA Head Mounted Display system. Proper use of the gait belt should be achieved using industry standard practices.
<b>Note 5</b>	Only use approved power supplies.
<b>Note 6</b>	WARNING: To avoid risk of electrical shock, Head Mounted Display systems must only be connected to properly grounded power sources as appropriate for your product. Only items that have been specified as part of the system, or compatible with the system, shall be connected.
<b>Note 7</b>	Use biocompatible bouffant cap with the system. Bouffant caps are single use and should be discarded after each patient.
<b>Note 8</b>	Ensure children are supervised around equipment and that unused receptacles are covered in pediatric environments.
<b>Note 9</b>	None of the Bertec system parts are user serviceable. For the sake of safety, and in order not to void the warranty, the system should only be serviced by authorized service personnel. In case of defects, please make a detailed description of the defect(s) and contact your supplier. Do not use a defective device.
<b>Note 10</b>	Keep Bertec Head Mounted Display systems away from liquids. Do not allow moisture inside the device.
<b>Note 11</b>	Do not use the device in the presence of flammable anesthetics (gases).
<b>Note 12</b>	No parts may be eaten, burnt, or in any way used for purposes outside of those specified.
<b>Note 13</b>	Bertec Head Mounted Display systems can be disposed of as normal electronic waste, according to local regulations.
<b>Note 14</b>	Installation of any third-party software (application, programs, or utilities) other than those specified by Bertec can compromise the safety or effectiveness of the system.
<b>Note 15</b>	The device is disconnected from the mains by pulling the plug from the wall outlet.
<b>Note 16</b>	The Head Mounted Display system needs to be installed and put into service according to the EMC information provided in this manual. Portable and mobile RF communications equipment can affect medical electrical equipment. The System may be interfered with by other equipment with CISPR emission requirements.
<b>Note 17</b>	The use of accessories and cables other than those specified in the Accessories List may result in increased emissions or decreased immunity of the system.
<b>Note 18</b>	The emissions characteristics of this equipment make it suitable for use in industrial areas and hospitals. If it is used in a residential environment (for which CISPR II class B is normally required) this equipment might not offer adequate protection to radio-frequency communication services. The user might need to take mitigation measures, such as relocating or re-orienting the equipment.
<b>Note 19</b>	WARNING: No additional networking/data coupling is to be made outside of what has been designed for the Bertec Head Mounted Display. According to IEC 60601-1 standards, this system will only be connected wirelessly to the internet. If your facility is a hospital or university setting, please contact Bertec support to discuss your specific environment and conditions so that we may provide the best solution for syncing databases.
<b>Note 20</b>	Bertec Head Mounted Display systems are intended to only be connected to the specified computer, which has been tested as part of the ME Equipment.
<b>Note 21</b>	The operator of the equipment is responsible for providing and educating any system users instructions on how to use the Bertec Head Mounted Display system & external components properly.

<b>Note 22</b>	The Bertec Head Mounted Display system is only approved for the components provided. Use of third-party components, such as computers or laptops, is prohibited.
<b>Note 23</b>	Ensure that this product is used in a safe environment. By using this product to view an immersive virtual environment, users will not be able to see their physical environment. Move only within the safe area that you set: keep your surroundings in mind. Do not use near stairs, windows, heat sources, or other hazardous areas.
<b>Note 24</b>	Portable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm (12 inches) to any part of the Head Mounted Display System including cables specified by the manufacturer. Otherwise, degradation of the performance of this equipment could result.
<b>Note 25</b>	Do not use high volume for extended periods of time to prevent possible hearing damage. When using headphones, use the minimum volume required to avoid hearing damage. Prolonged exposure to high volume may cause permanent hearing damage.
<b>Note 26</b>	If hand controllers are not likely to be used for long periods of time, batteries should be removed from the device.

## Responsibility of the Manufacturer

The manufacturer is to be considered responsible for the effects on safety, reliability, and performance of the equipment only if:

- All assembly operations, extensions, re-adjustments, modifications, or repairs are carried out by the equipment manufacturer or personnel authorized by the manufacturer.
- The electrical installation to which the equipment is connected complies with EN/IEC requirements.
- The equipment is used in accordance with the instructions for use.

The manufacturer reserves the right to disclaim all responsibility for the operating safety, reliability, and performance of equipment serviced or repaired by other parties.

## Operating Environment

These systems are suitable for use in the patient environment.

Temperature: +15° C to +35° C (+59° F to +95° F)

Rel. Humidity: 30 to 90%, non-condensing

Air Pressure: 600 hPa to 1060 hPa

Operations at temperatures below -20° C (-4° F) or above +60° C (+140° F) may cause damage

### Operating Mode

Warm-up time: <5 minutes

Mode of Operation: Continuous

### Storage and Handling

Temperature: -20° C (-4° F) or above +60° C (+140° F)

Rel. Humidity: <90%, non-condensing

Air Pressure: 500 hPa to 1060 hPa

### Standards

Safety: IEC 60601-1, Class I, Type B, IPX0

System: IEC 60601-1

EMC: IEC 60601-1-2

# System Components

Part Number	Part Name
97P-0109	Bertec Head Mounted Display System
97P-0108	Pico Neo 3 Pro Eye 6 DoF Standalone VR Head Mounted Display
37P-0143	Hand Controllers
97P-0111	Head Mounted Display System Case with Custom Foam Inserts
97P-0110	Gait Belt with Handles
37P-0053	4 Port USB Hub
37P-0146	Wi-Fi Router
37P-0147	USB Wi-Fi Adapter
80P-0161	Head Mounted Display System User Manual
80P-0164	Head Mounted Display System Quick Start Guide

## Optional Accessories

Part Number	Part Name
37P-0142	Pico HMD Face Cushion Replacement

## Cables

Item	Origin	Termination	Quantity
White USB-C cord w/ re-attachable USB charging white block	HMD USB-C Interface	Wall outlet	1
Wi-Fi router USB-C power cord	Wi-Fi Router USB-C Interface	Wall outlet	1

## Appendix A: Abbreviations and Glossary

**Center of Gravity (COG):** Represents the focus of gravitational forces on a person's body, typically located in a standing person at the S1-S2 level, just anterior to the ankle joint.

**Head Tilt Response (HTR):** This training can be used to analyze how one may perceive the gravitational vertical in static or dynamic conditions. A rod appears on the screen and the user it to tilt there head until the rod looks to be vertically straight (0 degrees). This training includes visual, otolithic, and neck proprioception information.

**Head Mounted Display (HMD):** VR headset that will be used to train users using the trainings available Balance Advantage software. The device consists of 98 DoFof freedom sensors, Wi-fi and Bluetooth connectivity and two wireless controllers with 9DoF.

**Optokinetics (OPK):** These trainings test the optokinetic response; an eye movement reflex that is prompted by visual field motion

**Perception Span Training:** Training mode to challenge the user's perceptual span – the amount of information that can be quickly captured and held shortly in sensory storage. The goal is to increase the users' amount of visual information that can be processed in a given fixation.

**Reaction Time Training:** This training module incites the user to select objects highlighted in green as fast as possible, exercising their reaction time. Reaction time is the time that it takes the patient/user to complete a task (select a highlighted object) after its presented.

**Response Inhibitions (Go/No-Go):** Response inhibition is the ability to stop repetitive behavior that is not desired or acceptable. This training is used to train response inhibition, by highlighting "go" cans in green and highlighting "no-go" cans in red. The user to select the green highlighted cans and avoid selecting red highlighted cans, all while doing so quickly as possible.

**Rod & Frame (R&F):** This test is similar to the SVV; however, the vertical line (or rod) is placed inside of a tilted box. Using a remote control, the subject is instructed to line up the rod to the gravitational vertical and the error is calculated by the difference between the actual vertical.

**Spatial Memory Training:** In this training, the user will be presented with a certain number of highlighted objects and will be instructed to remember the specific order of objects that were highlighted and to reselect them in the same order after the wait time is over. The goal is to train individuals to remember the location of the different objects and the spatial relationship between the objects.

**Subjective Visual Horizontal (SVH):** This test analyzes how one may perceive the gravitational Horizontal as a stimulus moves further away from the horizontal in static and dynamic conditions. Abnormalities in this test can be a sign of vestibular disease that impacts the otolithic pathway

**Subjective Visual Vertical (SVV):** This test analyzes how one may perceive the gravitational vertical as a stimulus moves further away from the vertical in static and dynamic conditions. Abnormalities in this test can be a sign of vestibular disease that impacts the otolithic pathway

**Visual Flow Training:** trainings used to habituate the patient to visual flow environments. These trainings are used with a balance plate.

# Appendix B: Frequently Asked Questions

Included below are answers to commonly asked questions.

## **Why use the digital copy of the manual?**

Listed below are several reasons to use the digital copy of this manual.

- The digital copy of this manual is searchable. Holding the keyboard's Ctrl key and tapping the F key once will open a search form. Specific words and phrases can be directly identified in this manual through this form.
- The Table of Contents is clickable--clicking on a section will bring a user to that section.
- Reference notes are clickable--clicking a reference note will bring a user to the corresponding citation.
- Images are in color.

## **What is the default password to the Balance Advantage® program?**

The default password is "password". Use all lower-case characters and do not include quotation marks.

## **How often should I turn off my computer?**

The computer system should be turned off every night to promote software longevity and prevent database errors.

## **How do I export raw data?**

Data export may be initiated by holding down the Ctrl+F6 keys on the keyboard while viewing a test report from the Patients tab. Refer to page 30 for additional information.

## **How do I fix my database?**

Database issues are often caused from incorrectly shutting down a computer. Corrupt/damaged databases are almost always repairable, though. Contact Bertec® Support for assistance.

## **How do I delete a single set of patient data?**

From the clinician home screen, select the patient to delete. Right click on the patient. In the dropdown list, select Mark Patient Deleted. Click Yes to confirm. Deleted patients cannot be recovered.


## **Does the VR headset support wearing glasses?**

Yes, The fitting width is 16 cm (6.3 inches).

## **How do I clean the VR headset and hand controller?**

Use a small amount of alcohol or cleaning solution, or a soft, dry cloth, preferably one that's made for cleaning lenses. Avoid using organic solvents, to clean the device.

## Appendix C: License and Support Features

The Bertec® Balance Advantage® software includes built-in license, support, and help features, all of which can be accessed from the  symbol (located on the upper right-hand corner of the Clinician Screen, next to the Logout button). Clicking on this symbol will open a list of three to four different options, described in bold on the following pages. Immediately below are the different functions which can be completed from this tab—shown as step-by-step instructions on the following pages.

Functions: Register/Update License, Copy/Paste System Info, Upload System Info to Support, Opt Out of Sending Anonymous Program Reports to Bertec®, Schedule a Remote Support Session, Conduct a Remote Support Session.

About Bertec® Balance Advantage®: This option will open a new window, shown in Figure H1. The new window contains five different tabs: Version, Addons, System, License Agreement, and Support. These tabs are underlined/ described below and on the following page.

### Version

The Version tab displays the program's version, license registration, license number, and an Add License button.

To register or update a license:

1. Click on the Add License button.
2. Enter a valid license key, along with other optional fields, in the new window.
3. Click on the Register License button.
  - a. System has access to the internet: If the license key is successfully registered, click Ok, then click Yes to exit and restart the software.
  - b. No access to internet: contact Bertec support for assistance.

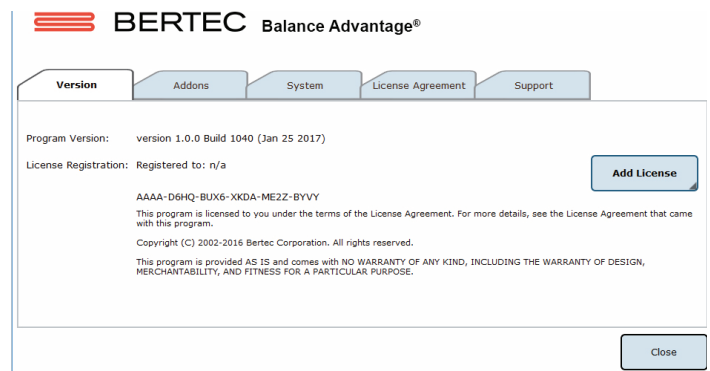


Figure 59: About Window Tabs.



*Note: The computer does not need to be connected to the internet to register a license key, however, an activation code obtained from the Bertec support team is required if registering offline*

## Addons

The Addons tab displays the program's Plugins (along with version, build, and date), Extras Menu, Reports, and Tests in a list.

## System

The System tab displays the Program's Application Name, System Operating System, Total Memory (and available memory), Primary Disk Space (total and available), the program's associated DLL files, and Device Information. This tab also contains two buttons: one to copy this information to the computer's clipboard and one to send this information directly to support.

To copy/paste this information from the clipboard

1. Click the Copy to Clipboard button. This information is now saved in the computer's clipboard.
2. To paste this information from the computer's clipboard, right click where the information should go (i.e. an email). On the dropdown list, select Paste.
3. Alternatively, select a text box to paste the information into, press and hold the Ctrl key on the keyboard, then tap the v key.



*Note: It is okay to exit the program once the information has been copied to the clipboard.*

To directly upload this information to support

1. Click on the Upload to Support button.
2. Fill out the name and email fields. The comment field is optional, but recommended.



*Note: This information is extremely useful in the case that technical support is needed.*

## License Agreement

The License Agreement tab displays the license agreement, included in this manual.



## Support

The Support tab includes information and instructions for contacting support, in addition to Bertec<sup>®</sup>'s address and the option to collect and report anonymous program performance data.

To opt out of sending anonymous program reports to Bertec<sup>®</sup>

1. Click on the box to the left of the phrase "Collect and report anonymous program performance data" so that no check-mark shows.
2. Close the window by clicking the Close button.



*Note: Bertec<sup>®</sup> only collects data related to how the program is used by clinicians; all collected data is encrypted. No patient information is collected.*



*Note: If the system cannot be accessed, support contact information is also included in Appendix I.*

HMD User Manual: This option opens a digital copy of this manual outside of the Balance Advantage<sup>®</sup> program.



*Note: Digital copies are searchable. Holding down the Ctrl key and tapping the 'f' key once will open a search menu. A word or phrase can be entered into this search bar to jump to every time that the word or phrase is used within the document.*

Remote Support: This option is used for Remote Support sessions. Clicking this option will open a new window which asks if the operator has a remote session scheduled.

If the operator does not have a remote session scheduled

1. Click the No button.
2. Email or call Bertec<sup>®</sup> Support to schedule. Contact information will appear once the operator clicks the No button.

If the operator does have a remote session scheduled

1. Click the Yes button.
2. Fill out the fields for Your Name, Email and Facility Name. The phone number field is optional but recommended.
3. Click the Ok button.
4. Click the Yes button if Windows asks if it is okay for the program to make changes to the computer.
5. Wait approximately 30 seconds for the session code to load.
6. Fill out the Your Name field
7. Wait for Bertec® to connect to the desktop.
8. Once the representative attempts to connect to the computer, select the Allow button within 30 seconds.



*Note: If the Bertec® Remote Support window disappears once the operator clicks away from the screen, click on the Windows key (between the Ctrl and Alt keys) to reveal the computer's open programs. Click on the Remote Support window (blue and white square symbol) to open it again.*



*Note: It is recommended that the operator calls and talks with a Bertec® representative during this process*

## Appendix D: Error Messages

Error Message	Possible Cause/Solution
Bertec Balance Advantage is currently running without a valid license and is in read-only report mode. For more information click here.	Balance Advantage has either lost its license key activation, or was not assigned a license key. The key should either be recovered or a new key can be requested from Bertec Support.
WARNING: All data is being stored - long timer periods can impact database size.	When the option to store all data is selected, performing long trainings can cause the database size to increase more quickly
We are sorry, but the program is unable to communicate with the server at this time. Error code: Unable to communicate with server	This error occurs when you are trying to communicate with the website for activation of your license key, uploading support files, or using the remote support option.
The software license key XXX-XXX has been used on too many systems, and has been deactivated.	If you attempt using a license key on multiple systems, this error will be presented to inform you that the key has been deactivated.
The hardware serial number is not valid.	The serial number on the computer you are currently using is not valid. Please contact Bertec Support to investigate.
The software license key XXX-XXX is not valid	The license key you are attempting to use is not valid. Please contact Bertec Support to investigate.
Unable to validate the software license key.	When registering a new license key, validation error may occur if the key is entered incorrectly or if it is already being used on another system.
This installation is currently without a valid license, and is in read-only report mode	Balance Advantage is in read-only mode. Patient records on the system can be viewed, but no new data can be collected.
There are no test or training protocols currently installed. Without these protocols, Balance Advantage will not be able to process or display results, and importing of previous data will fail. Click OK to continue anyways, Cancel to exit, or Ignore to stop showing this message.	Balance Advantage needs to be re-installed. There are critical files missing that are necessary for software operation.
The database has become corrupted and Balance Advantage cannot continue until this is fixed. Balance Advantage can attempt to perform an automatic recovery but there is a risk that some of the most recent data will be lost. Please contact Bertec Technical Support at: support@bertec.com before continuing.	The most likely cause of database corruption is sudden power loss to the PC. Automatic recovery tools built into the Balance Advantage software will likely be able to restore collected patient results with the most likely candidate for loss being newly created data. Please contact Bertec Support to investigate.
The database has been recovered. The original database has been renamed. Click OK to restart Balance Advantage with the recovered database	Database recovery tools built into the software are usually able to recover all data during a database corruption situation. Restarting the program with the newly constructed database is necessary for verification
The database was not able to be recovered. Balance Advantage cannot continue and you will need to contact Bertec Technical Support at support@bertec.com for further assistance.	In the unlikely case that the built-in database recovery tools are unable to completely recover a corrupted database immediately, please contact Bertec Support for assistance. Our team will do everything we can to reconstruct your complete set of patient files.
Balance Advantage is unable to open the database - the database format is incompatible. Please contact Bertec Technical Support at support@bertec.com for assistance.	The database structure is incompatible with your software version. This can happen immediately upon performing a major update, but is uncommon. The Bertec Support team should be contacted to provide assistance
The license for Balance Advantage has been changed. In order for the new license to take effect, Balance Advantage must be restarted. Exit Balance Advantage and restart it now?	Any time a license key is recovered, registered or activated Balance Advantage must be restarted to let the change take effect.
The current password you typed does not match. Please re-type the current password	To change the password on the system, the current password must first be entered correctly on the system.

Error Message	Possible Cause/Solution
The passwords you typed do not match. Please type the same passwords into both Password and Confirm Password	To change the password on the system, the new password must first be entered twice correctly on the system
Automatic database backups unavailable in read-only report mode	The automatic backup feature is not available in read only mode. The system needs an active license key to perform automatic backups. Manual backups can be performed in this state
Unable to validate the software license key	When registering a new license key, validation error may occur if the key is entered incorrectly or if it is already being used on another system.
This installation is currently without a valid license, and is in read-only report mode	Balance Advantage is in read-only mode. Patient records on the system can be viewed, but no new data can be collected.
You cannot delete the currently logged in operator.	The user who is logged into the software cannot be deleted. Only other operators who are not currently using the system can be deleted through Configuration Options
You cannot delete the Administrator account.	The Administrator account cannot be deleted because this account is necessary for basic use of the software.
You cannot delete a security role that is currently in use.	A security role assigned to the user who is currently logged into the software cannot be deleted. Only security roles not in use can be deleted through Configuration Options.
Attempting to save the Additional Patient Fields failed.	There was an error with the Additional Patient fields that you attempted to create and save. Please try again. If you continue having problems, consult the manual and then contact Bertec Support.
Attempting to save the Operator "XXXX" failed	There was an error with the Operator that you attempted to create/modify and save. Please try again. If you continue having problems, consult the manual and then contact Bertec Support.
Attempting to save the Security Role "XXXX" failed. Attempting to save the Security Role "XXXX" failed because the identifier is null	There was an error with the Security Role that you attempted to create/modify and save. Please try again. If you continue having problems, consult the manual and then contact Bertec Support
Attempting to delete the Security Role "XXXX" failed	There was an error with the Security Role that you attempted to delete. Please try again. If you continue having problems, consult the manual and then contact Bertec Support
Merging the database from XXDatabaseNameXX. Your existing database was not merged with the other database, and is unchanged. Click OK to continue working with the current, unchanged, database. failed to complete Merge Failed	The merge function encountered an error and the original version of your database has instead been kept without changes or problems. You may continue using it or try performing the Merge again. If problems are still experienced, contact Bertec Support
Restoring the database from XXDatabaseNameXX. The existing database was not replaced. Click OK to continue testing with the current, unchanged, database. Restore Failed	The Merge and Restore function encountered an error and the original version of your database has instead been kept without changes or problems. You may continue using it or try performing the Restore again. If problems are still experienced, contact Bertec Support.
The integrity check did not find any errors with the database.	An Integrity Check can be run on the system's database to ensure that nothing in the structure is problematic or has the potential to become a problem in the future.
There appears to be some problem with the database - you may want to restore from a backup copy or use the Rebuild Database feature.	Unknown issue identified with your system's database. Restoring from a recent backup through the Merge and Sync options or utilizing the Rebuild Database built-in tool are both viable options before contacting Bertec Support.

Error Message	Possible Cause/Solution
The database was not able to be optimized; this may be due to lack of disk space or memory	The "Optimize" option in the Database tools was not able to perform its function. Likely, more free space is needed on your PC. Old backups can be moved off of the PC or automatic backup features can be directed to save the file in another location. Please contact Bertec Support for assistance in setting this up.
The database was not able to be recovered, possibly due to lack of disk space. Your original database has been left intact, and you should contact Bertec Technical Support at support@bertec.com for further assistance. Recovery Failed	A recovery operation was requested, but could not be completed. If the PC's hard drive is too full of information, this error can occur. Consider removing old backups and then trying the recovery process again.
The additional field "XXAdditionalFieldXX" is already being used. Please enter a new name for this additional field. Name error	You cannot name two Additional Fields the same thing when you are creating them in the Configuration Options dialog. Each field must have a unique name
The operator name "XXOperatorNameXX" is already being used. Please enter a new name. Name error	The software does not support two Operators with the same name when you are creating them in the Configuration Options dialog. Each name must be unique.
The Balance Advantage Database needs to be upgraded. If you do not have a recent backup copy of the database, we recommend that you perform a backup now. Backup the database before performing the database upgrade?	Before upgrading the structure of your database, it is always wise to create a copy of your current database so that no information can be lost. The upgrade should not need the back-up copy, but it is good to have in case
The License Key that you have entered is invalid. Please check to make sure that you have entered the correct license key. If you believe that you have, then please contact Bertec Corporation at support@bertec.com to obtain a valid License Key	The license key activation process is multi-step and requires that your key be entered into a specific field. If there is any error in the key entry, this error will occur. If you believe this message is occurring in error, please contact Bertec Support for assistance
It appears that the program is unable to register your information automatically online - would you like to register your license key via phone or email? If you believe that this message is in error, please check the license key and registration information that you have entered, or for support and resolution with this matter. The Activation Code that you have entered is invalid or empty. Please check to make sure that you have entered the correct activation code. If you believe that you have, then please contact Bertec Corporation at support@ bertec.com to obtain a valid activation code. Invalid Activation Code	The license key activation process is multi-step and requires that your PC be connected to the internet. If you are not able to obtain an internet connection, please contact Bertec Support to manually register your license key over the phone. All information must be entered correctly for the manual registration process to work. The Activation Code is only necessary when manual activation is used, and this error is usually due to a typo.
The operator "XXOperatorXX" cannot be logged in. Please check that the operator name and password are correct, and that operator "XXOperatorXX" has the proper access rights. Please click OK and re-enter the operator name and password in order to log into the system Login Error	There are several reasons that a Login Error can occur. The system does not limit login attempts. The Operator name and password must match, and the appropriate access rights for the Operator must be assigned to allow login
It looks like there is no email client program installed or configured to send emails. This is common if you are using some form of web-based email such as Google Mail, Hotmail, Yahoo Email, or similar. You would like to save the PDF report to your Documents folder so that you can send it yourself using your web-based email? Mail send failure	This error appears when the Support Report form cannot be sent because the Balance Advantage software cannot gain access to an email client on its own. The software is requesting to save the document as a PDF that you can email to support using your email client of choice
One or more of the required patient fields are blank or incorrect. Please complete the fields and press Save again. Unable to commit	There is information missing in the Patient Information profile that you are creating. The required fields preventing the commit are highlighted in yellow.

Error Message	Possible Cause/Solution
One or more of the required Additional Fields values are blank. Please complete the fields and press Save again. Unable to write patient additional field records to database. Changes have not been saved	There is information missing in the Patient Information profile that you are creating. The required Additional Fields preventing the commit are highlighted in yellow.
The entered patient identifier is already in use by another patient - please check the patient list to make sure that you do not already have a patient by this name or identifier already entered. Changes have not been saved.	When creating a New Patient profile, you cannot use the same patient identifier as one that already exists. Please use a unique identifier and try to Save again.
Unable to write the patient picture to database. However, the other changes have been saved.	There is an error in saving the image information for the patient's picture to the database, but the rest of the Patient Information will be retained. Close out of the program and try taking the picture again
Do you really want to delete XXPatientNameXX? This operation cannot be undone! Delete Patient	Marking a patient as deleted means that their information will no longer be visible to any Operator that logs into the system. This information is still in the database, but will not ever be available again unless you contact Bertec Support for assistance in retrieving it.
Are you really sure that you wish to restore the archive from XXArchiveNameXX? If you click Yes, then you will be logged out of the program, and any existing Patients, Operators, Test Results, and everything else will be replaced with the database archive. This operation cannot be undone! Anything you currently have in the database will be gone forever! This is your last chance to change your mind!	Restoring the database from an archive will completely replace all existing information with the information in the archive that you are restoring it to. The operation comes with an ample number of warnings to ensure that the operator understands that data will be lost during this process if the archive that is being restored does not have everything that they need.
Note: during and after this operation, the Database Sync will be turned off. After the restore or merge has completed, you will need to manually turn the Database Sync option back on.	The database sync function is turned off during the restore operation so that no other sync'd databases are effected by the operation. Sync will need to be manually re-activated through the Database Maintenance menu after the restore operation is complete.
This test was completed successfully. Are you sure that you want to redo it and overwrite the data? This cannot be undone!	This message only occurs if a successfully completed test is being overwritten by another test. There are very few protocols that allow this functionality
Are you sure that you want to delete the last collected results? This cannot be undone! Delete Results	This message occurs when a completed trial is deleted with the Ctrl+Bksp hotkey command to verify the operator wants to delete the most recent trial.

## Appendix E: Contact Bertec

If this manual does not satisfactorily answer a question, or if additional information or purchases are desired, contact Bertec® via email or phone. Our office hours are Monday–Friday, 8am–5pm Eastern Standard Time.

Phone: +1 (614) 543-8099

Support: +1 614-450-0331

Fax: +1 (614) 430-5425

Information: [balanceinfo@bertec.com](mailto:balanceinfo@bertec.com)

Sales: [balancesales@bertec.com](mailto:balancesales@bertec.com)

Support: [support@bertec.com](mailto:support@bertec.com)



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