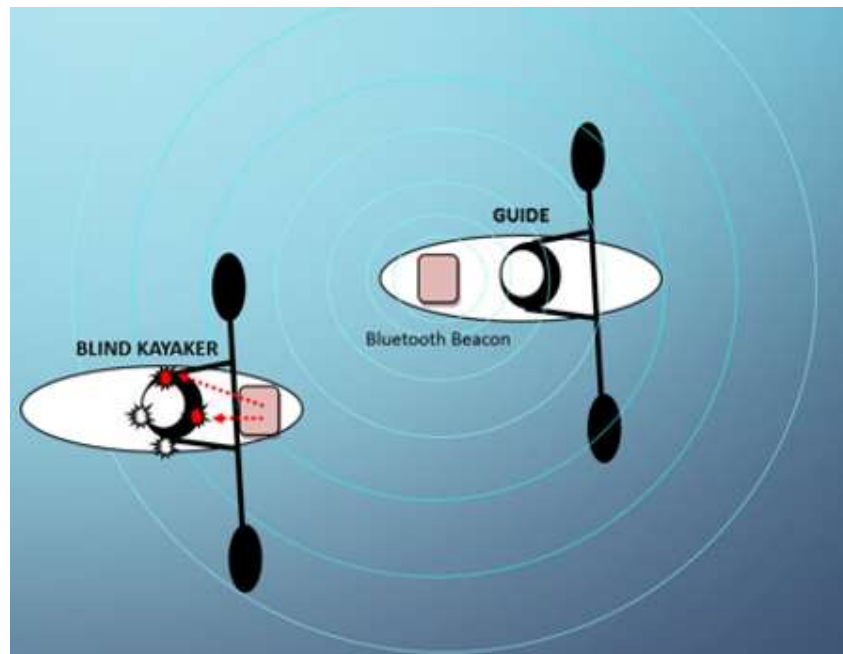


VibroGuide User Manual

SUMMARY

VibroGuide mixes Bluetooth Direction Finding and tactile technologies to augment guidance of blind and visually impaired (VI) athletes. It's intended use is for active follow-me, outdoor sports like kayaking, skiing, hiking and bicycling.

Follow-Me guidance refers to a method where a blind athlete follows directly behind (or near) a human guide who remains vigilant for hazards and offers directional instructions in a dynamic environment. VibroGuide technology seeks to mitigate difficulties encountered with classic audible or tether methods by employing a wireless connection between the guide and blind athlete.



The angle between a guide wearing a beacon and an athlete wearing the VibroGuide vest is computed and interpreted with tactile vibrations felt around the torso. This allows a blind athlete to dynamically “feel” the direction to their guide with heart-beat like pulses. The tempo of the pulses provides a relative indicator of distance to the guide. A built-in speech synthesizer announces instructions such as “right” “left” and distance to the guide and can be silenced with the press of a button.

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VibroGuide Mission

To enhance therapeutic experience in active adaptive sports. VibroGuide lowers the blind / VI athlete's dependence on hearing and physical connections thus enabling more enjoyment of nature and ambient environment sounds. This technology reduces the need for frequent "On-Me" chanting or audible instructions announced by the guide and opens more of the communication channel for chatting, describing the environment, attention to hazards or just quiet guiding.

Why Follow-Me Technology?

Our experience guiding outdoor adaptive sports like kayaking and skiing teaches that follow-me guidance is optimal for safety in highly dynamic environments. As well, outdoor sport venues can be far from WIFI networks, have limited cellular or satellite coverage and uneven terrain. All of this can affect the precision needed for outdoor guidance.

VibroGuide Features:

- Water and shock resistant enclosures.
- Maximum range between guide and blind athlete is about 65 feet.
- Battery life sufficient for 8 hours of continuous use.
- Easy to use. Just two buttons.
- Provides assurance to a blind athlete during operation that they are being tracked.
- Compact size of guide beacon. Can be worn on waist, in a pocket or a backpack.
- Lightweight and size adjustable sports vest made of breathable mesh.
- Ability to transfer VibroGuide electronics to a life jacket (PFD) for water sports.
- Blind Athlete receives alert if signal from guide beacon is broken.
- Blind Athlete can enable/disable audible announcement with Mode push-button.
- Blind Athlete can lower intensity of vibrations felt in vest to 50% power.
- Provide more outdoor sports opportunities for blind or visually impaired athletes.
- Guide-Assist device (optional) provides data about direction and distance and an alert if the beacon or vest become non-functional such as a dead battery or weak radio signal. The Guide Assist device can be worn on the guides wrist, fastened to the front deck of a kayak or on a bicycle handlebar.

VIBROGUIDE SYSTEM OVERVIEW:

BEACON:

Carried by leading guide. Transmits radio signal received by VibroGuide vest and used to calculate angle and distance to guide.



GUIDE ASSIST:

Optional - carried by guide. Receives and displays real-time data from the vest. Allows guide to monitor vest direction and distance instructions. Alerts guide of communication failure.



VIBROGUIDE VEST and CONTROL UNIT:

Worn by blind athlete. Receives beacon signal, calculates angle and distance to beacon, drives vibration motors in the vest for tactile navigation. Optionally announces approximate distance and direction to the guide.



Note: Some configurations may combine the Beacon and Guide Assist into one enclosure for convenience.

VIBROGUIDE SYSTEM COMPONENTS:

BEACON:



Function: Transmits Bluetooth 5.1 Constant Tone Extension beacon.

Range: 50 – 65 feet outdoors depending on temperature and humidity.

Power: Two AA 1.5v batteries (Duracell or rechargeable).

Typical battery life: 10-12 hours.

Enclosure: IP65 shock/water resistant -Polycarbonate

Dimensions: 4.75" L x 3.75" W x 1.5" D

Operation: Turn the device on using the side push button. A blue power light glows when it's running. Works best if kept away from metal and water. Typically worn on the back of the guide in a backpack, fanny pack, belt clip or strap. Use of VibroGuide indoors is not recommended as walls and furniture can create multipath reflections of the beacon signal producing unreliable results.

VIBROGUIDE VEST:



Function: Lightweight mesh fabric cooling vest with Industrial Velcro Panels to hold electronic Control Unit and vibration motors. Provides tactile connection to torso.

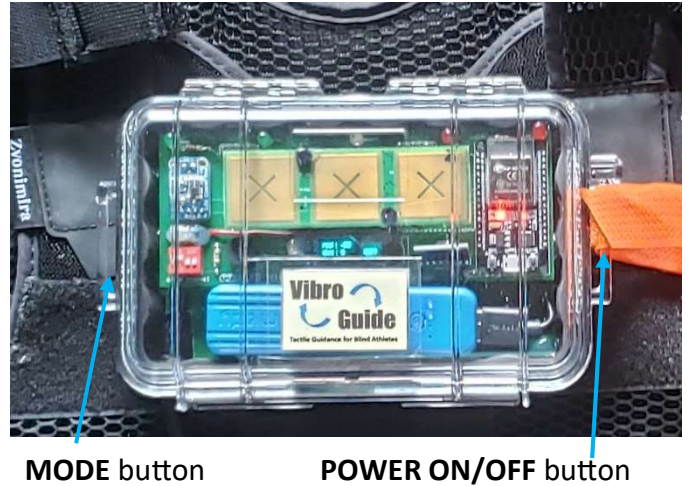
Five polymer encased **vibration motors** are located on the front inside of vest and adhered with Velcro. Vibration motors are wired to a central hub and cabled to the Control Unit.



Water Sports: Side entry life Vests (PFD's) can be custom fitted with vibration motors, wiring and Velcro to be used with VibroGuide. Ask about this modification. **IMPORTANT:** Modification to a life jacket may not adversely affect buoyancy, but can cancel the UL/USCG certification.

VEST CONTROL UNIT:

Function: Houses VibroGuide Vest electronics.
Power: Rechargeable 5-volt battery. USB connector.
Typical battery life: 8-10 hours.
Enclosure: IP65 shock/water resistant -Polycarbonate
Dimensions: 7.50" x 5.06" x 2.12"
Cable: A single 8-pin IP65 (waterproof) aviation cable exits the control unit at the lower corner and connects to the vibration motor hub (circuit board). A latching Power On/Off push button is located on the left side (facing outward) and a momentary Mode button is located on the right side (facing



MODE button

POWER ON/OFF button

GUIDE ASSIST (Optional):



Function: Receive and display telemetry from vest control unit
Range: 50-65 feet outdoors depending on environment
Power: Two AA 1.5v batteries.
Typical battery life: 4-6 hours.
Enclosure: IP65 shock/water resistant -Polycarbonate
Dimensions: 4.75" L x 3.75" W x 1.5" D

Guide Assist Purpose: To help the guide monitor vest direction pulses, distance and stop/start. This means less rubber-necking (turning around) for the guide. It also alerts the guide if the VibroGuide Vest loses power due to accidental shut down or dead battery.

The Guide Assist device can be attached to the front deck of a guide’s kayak, worn on the forearm or hand-held. It allows the guide to quickly glance and tell if their blind person is veering off course, dropping behind or is stopped.

How Guide Assist Works: Both the VibroGuide vest as well as the Guide Assist device have inertial measurement units (IMU’s) built into their electronics. An IMU detects tilt, acceleration and spin. This data helps inform the guide when the vest wearer is stopped or moving.

Operation: Red, white and green LEDs on the Guide Assist display indicate the direction the vest is pulsing. This matches what is happening in the vest. A digital display indicates approximate distance between guide and vest in feet. There is also a blue LED that lights up when the vest wearer is moving and goes out as soon as the vest stops. While a guide is hiking, kayaking or skiing out front, they can quickly glance to tell if their blind person has stopped, is dropping behind or has veered off course without turning around. This is meant to augment and not replace the responsibility of a guide. You can still look and speak as needed.

Guide Assist is optional. It does not need to be used for the beacon and vest to work together.

OPERATION GUIDE

Tips on getting started and usage

BATTERIES!! – Are they fresh?? VibroGuide needs power! Don't get caught in the middle of an adventure with dead batteries and no spares. A good practice is to keep two sets of batteries charged. Before training or embarking on a VibroGuide adventure, snap a fresh battery set in the vest, beacon and Guide Assist. Bring another battery set in a waterproof zip-lock or box if you're going to be out for a while. Please refer to the section on **CHANGING BATTERIES** at the end of this document for instructions.

WHERE TO START: Regardless of the sport or activity you are planning to use VibroGuide, it's best to learn the basic operation on an open level surface like a lawn or field that you have all to yourself. VibroGuide is not designed for indoor use where close walls and furniture reflect misleading radio signals (multipath error).

SAFETY: The optimal VibroGuide team includes three people: 1) A leading guide who will carry a beacon (about 10-12 feet) from the vest. The guide should always be close enough to reliably hear/talk to the blind person. 2) A blind person wearing the VibroGuide vest. 3) A wing-person who travels close to the blind vest wearer as a companion and additional guide. Please remember: Guides still need to guide, stay vigilant for hazards and alert the athlete as needed. Don't over-guide. Allow the vest wearer to learn how to respond to the vest. Above all, be patient and go slow!

FIRST TIME USE

Note that the vest and beacon are buddies and whenever one is turned on and does not sense a signal from the other, you can expect it to complain with beeping, flashing lights and buzzing vibrations. This is a safety feature to assure a connection exists between the two. **Also, VibroGuide is designed to be used outdoors!** Indoor use is directionally unreliable because walls, furniture and appliances reflect and bounce the beacon signal.

WEARING THE VEST: The VibroGuide vest works well when worn over a light layer of clothing. Wearing the vest on top of heavy sweaters or parkas may blunt the tactile feel of the vibrations. Parkas, sweaters or jackets without metal zippers in front are OK to be worn over the vest. Similar to the beacon, be aware that any metal worn close to the vest control unit (box) may absorb or alter the beacon signal causing unreliable results.

Take note that the Power on/off button is located on the left side under the strap (if vest is being worn) and the Mode button is located on the right side. Use of the Mode button is explained later.

FIT THE VEST: The blind athlete should fit the vest so it is snug but comfortable and all five of the vibration motors are making contact with the torso. Common mistakes are having the overall fit too loose or leaving the side panels sticking out. Please assure correct fit for proper operation. Offering to help the vest wearer adjust the hook-and-loop waist or shoulder straps is great... but ask permission as a courtesy.

POWER UP THE BEACON:

Power the beacon (orange wrist band) ON by pressing the small pushbutton on the back of the case – under the hinge. A blue light will glow indicating power is ON and the beacon is transmitting. The beacon works best where there is an un-obstructed direct path back to the vest for the radio signal. A fanny pack, backpack,

pocket, belt clip or Velcro strap can be used to secure the beacon to the back of the guide. Holding it in your hand works also. Avoid placing metal or other electronic objects (such as phones) close to the beacon. For water sports, do not place the beacon close to the surface of water (such as on the back deck of a kayak). Doing so may cause the signal to be absorbed or weakened thus lowering its range. Fastening the beacon about shoulder high on the back of a kayak guide's life jacket has worked well.

POWER UP THE VEST: With the guide wearing the powered-on beacon and standing 10 feet away, ask the vest wearer to turn the vest ON. This is done with a single press of the power button which is located on the left-back side of the vest control unit. On power up, the VibroGuide Control Unit will perform a self-test where it will announce and pulse each of the five vibration motors. This is your chance to verify that each vibration motor is working and each can be felt. The guide can also watch the indicator lights flash on the vest control unit as each vibrator is pulsed.

GET ORIENTED

When the vest self-test completes, the Control Unit will announce *"Test Complete"* as it locates the guides beacon, begins pulsing the vest. As indicated earlier, if the beacon is not turned on, the vest will complain. With the beacon in front of the vest, the blind athlete will feel a pulse directly in the center of the vest. If the guide is NOT directly in front of the vest, it will announce pulse the right or left vibrate motors depending on which way the blind person should turn to re-center on the guide.

At this point, the vest wearer may try the Squawk Mode by pressing the Mode button once. The vest will respond with **"SQUAWK ON"** and begin announcing the approximate distance (feet) to the guide or *"Left"* or *"Right"* to turn if that is the direction to the guide beacon. Pressing the Mode button again once, will announce **"SQUAWK OFF"** and the announce voice will be quiet but vibrations will continue. For now, leave the Squawk mode ON.

LESSON 1 - How VibroGuide informs direction

Ask the vest wearer to stay in one place and point with their hand to the guide who is **s-l-o-w-l-y** moving to the left or right of the vest. The vest wearer will feel the vibration pulses shift to the side of the vest that is closest to the guide as well as audibly hear *"right"* or *"left."* This is to inform which direction the blind athlete needs to turn to re-center on the guide. As he/she turns so that the guide and vest are aligned, the distance will be announced as vibration pulses will be felt back in the center of the chest. Lastly, the guide should remain stationary to allow the vest wearer to slowly turn right or left to learn how the vibration pulses shift in the vest as when they may veer off course.

LESSON 2 - How VibroGuide informs distance

Whenever the vest wearer is centered and aligned on the guide (assuming mode *SQUAWK ON* is enabled), an approximate distance (in FEET) will be announced. The distance / range to the beacon is determined using a high accuracy ultrawide band module similar to what is found in commercially available electronic tape measures.

With the blind person remaining stationary and the guide standing several yards in front, the guide should slowly begin walking away and stop at about 30 ft. As the distance between guide and vest increases, the blind

person will hear the announced number of feet increase. In addition, they will also feel the tempo (speed) of the vibration pulses DECREASE, becoming slower as the distance between vest and beacon increases. This is important to note because once the guide and blind person begin moving together, the tempo of pulses felt in the vest helps to inform the vest wearer that they are maintaining a relatively constant distance and pace. If the guide slows or blind athlete speeds up to shorten the “between” distance, the tempo of vibration pulses will INCREASE, becoming very quick. **So... CLOSE = FAST PULSES FAR = SLOW PULSES.**

There is also a new mode added called **GLIDE** (long MODE button press) that allows a blind athlete to set a sweet-spot distance that emits a high-pitched tone when close, a low tone when far away and a medium-pitched tone when at the sweet-spot distance. Read more about it under the AVAILABLE MODES section.

GO FOR A WALK! Once guide and blind athlete understand how VibroGuide works, go for a short walk on a lawn or field. If you have a 2nd guide (advised) as a wing-person, have them walk near the vest wearer to provide assurance, watch for hazards or describe the environment. Note: While a blind athlete is learning VibroGuide, the wing-person should stay vigilant for hazards, but keep verbal instructions to a minimum. This will allow the vest wearer to learn, listen, feel and react to the vest, rather than the helper. The blind athlete will quickly learn that as the front guide turns, pulses in the vest will shift to the side of the vest that is closest to the guide. The vest wearer simply needs to turn into the pulses to get back on track. This works the same when the blind person veers off course. The more you do it, the better you get!

LOST BEACON SIGNAL: If the beacon signal is lost due to accidental shut down or dead battery, the VibroGuide vest will complain by pulsing all vibrators and lights as well as announce “**STOP - RADIO’S OUT!**” as a warning. You can test this by briefly turning off the beacon. When the beacon is turned back on, the VibroGuide Vest will return to operation after a few seconds needed to re-acquire the signal.

LOST VEST SIGNAL: If the Guide Assist device is being used, it will monitor if the vest signal is lost due to dead battery or accidental shut down and alert the guide with flashing lights and beeping.

CHANGING MODES

There are three handy operational modes that the blind vest wearer can select using the MODE button on the right side (to vest wearer) of the control unit.

AVAILABLE MODES:

One Quick Press - SQUAWK mode – This allows for quiet mode as it toggles on or off the announcer voice about guide direction and distance. For most activities, a vest wearer can still navigate using just the vibration pulses felt in the vest and can interpret the fast or slow rate of pulses for relative distance. This is nice to use when you just want quiet – like while drifting along in a kayak on a peaceful stretch of river or relaxing conversation. Turning on or off this mode will announce “**SQUAWK ON**” or “**SQUAWK OFF.**”

Two Quick Presses – BOOST mode – When the vest is powered on, the vibration motor power is set to 50%. For some folks, this level can be too light to adequately feel the vibrations. Two quick presses of the MODE button will toggle the vibrate power to 100% or “**BOOST ON.**” No, this will not knock your socks off 😊 but you will feel the vibrations stronger. Two quick MODE button presses will switch back to “**BOOST OFF.**”

One LONG Press (hold for 2 seconds) – GLIDE mode – The intended use of this mode is to produce tones to maintain an approximate distance between the guide beacon and vest wearer. For example, if you are going for a hike and you'd like the blind athlete to stay about 10 feet behind the guide, you would start by spacing yourselves apart by that desired distance and ask the vest wearer to press and hold the MODE button for 2 seconds. The vest will announce "**GLIDE ON**", announce and remember that distance and then emit a medium level tone. If the vest gets closer than 1 foot plus the preset glide distance, a higher pitch tone will emit. If the vest wearer drops back from the glide distance more than 1 foot, a low pitch tone will emit. The objective for the vest wearer is to maintain that "sweet-spot" glide distance by listening to the tones and adjusting their speed accordingly.

GLIDE mode can be set to difference distances for different sports. For example, while hiking a VibroGuide team may set the glide distance at about 10 feet. For kayaking on a flat lake or calm river, 30 feet may seem more appropriate. For skiing, maybe 20 feet glide distance will work. You and your blind athlete are encouraged to find your "sweet-spot" distance for each activity.

Exit GLIDE mode by pressing the MODE button once. This returns VibroGuide to silent (SQUAWK OFF) mode. Pressing the MODE button once more will turn SQUAWK ON so that distance and direction is announced.

GUIDE TIPS

- **Stay vigilant:** A guide needs be mindful and communicate safety or hazard information back to their blind athlete. Stay within comfortable hearing range so that your athlete can hear you and you can hear them. Be aware of any audible or sensory issues that your athlete may have.
- **Twists and Turns:** Avoid getting too far ahead. Keep the distance between you and your blind athlete close when there are twists and turns in the route. As you make a sharp turn, VibroGuide will immediately signal the vest to turn and if there is a tree or object between you (around which you turned), your athlete may walk into it. When the route ahead of you is straight and clear, you can open the distance a bit while still making sure that you are within comfortable hearing range.
- **Objects Near Beacon:** When you are carrying the guide beacon in a pocket or backpack, do not place it next to your mobile phone or other metal objects like zippers or keys. Mobile phones emit Bluetooth and WIFI signals that could conflict with the beacon signal. Metal objects like keys, tools or or zippers can also absorb or deflect the beacon signal.
- **Traveling (almost) Side-by-Side:** It is possible for the vest wearer to travel next to and slightly behind the guide for conversation. The blind athlete can stay on track by simply keeping the vibrations on that side of the vest - rather than turn into it to center the vibrations. In this way, you can easily carry on a conversation (almost) side-by-side while hiking, skiing or kayaking. Exercise caution to never let the vest get ahead of the guide. If the pathway narrows, simply inform the vest wearer to drop behind you to find the center vibration. With a little practice, this is easy to accomplish.

TAKING A BREAK OR CALLING IT A DAY – Power down all devices! You’d be surprised how many people forget to power-down and leave the vest or beacon powered on resulting in dead batteries.

Also, collect all equipment and store in the VibroGuide case. It is very easy to forget and leave a beacon in a guide’s backpack or coat pocket which may go home with them

When shipping or storing VibroGuide for a while, it is recommended to remove all batteries, recharge and store in the VibroGuide case battery box.

CHANGING BATTERIES

ALL VIBROGUIDE DEVICES:

- 1) Choose a dry/stable location to open the electronics enclosure and change batteries. NOT while sitting in a kayak, in rain or where water / dirt might could get inside the device and damage the electronics.
- 2) **POWER OFF!!!** Should go without saying but.... we’ll say it anyway.
- 3) Got good batteries? If you are not certain, test your replacements to assure they are fresh.
- 4) Carefully unlatch the enclosure cover. This will expose the electronic components.
Handle with care!
- 5) Locate the battery (or batteries) at the lower end of the enclosure.
- 6) FOLLOW BELOW INSTRUCTIONS PER DEVICE TO REPLACE BATTERIES.....



VEST CONTROL UNIT BATTERY:

It’s not necessary to remove the enclosure from the vest but IT IS ADVISED that the vest not be worn while changing batteries.

- 1) Lay the vest on a flat surface and locate the rectangular battery “stick.”
- 2) Gently lift the battery out about an inch and pull the USB power cable out of the end.
- 3) Hold new battery close and insert the USB power cable. 5 volt ONLY batteries!
- 4) Lay the battery back into the compartment and follow the **CLOSING VIBROGUIDE ENCLOSURES** section below.



BEACON UNIT BATTERIES:

The beacon device uses two (2) AA batteries. These can be standard or rechargeable as long as each battery is 1.5 volts.

- 1) Lay the device on a flat surface and locate the double battery holder at the bottom.
- 2) Gently lift the string under the batteries to lift paying attention to the polarity: + or -
- 3) Snap new batteries back into the holder paying attention to polarity that is marked on the clip!
- 4) Follow the **CLOSING VIBROGUIDE ENCLOSURES** section below.

CLOSING VIBROGUIDE ENCLOSURES (To assure water resistance is maintained):

- 1) Inspect the entire inside rim of the lid and case EVERY time before closing. A rubber gasket runs completely around the edge of the case where the lid makes contact. Make sure there is no dirt, pine needles, wires or anything laying across this gasket otherwise the lid may not close tightly to make a good watertight seal.
- 2) Press the lid firmly closed and snap the latch securely.
- 3) Verify the new batteries work by doing a quick power ON to verify that it lights up.
- 4) Power OFF until ready to use. If you will be storing VibroGuide for a while, remove and charge the batteries so they will be ready for the next adventure.

CARE/CLEANING OF VELCRO PANELS:

Industrial Velcro is very useful and works well in VibroGuide but may need some occasional attention to assure the adhesive effect stays strong. Over time, dirt or fragments from clothing or hair may find it's way into the Velcro hook and loop fabric thus weakening its ability to hold tight. Velcro can be easily cleaned using a small wire brush and light brisk strokes.

FEEDBACK!

We'd love to hear about your VibroGuide experience as well as any questions or suggestions you have.

Please email: Jim Riley support@vibroguide.com