

TORCH-IT™

DEVICE

Self-learning User Manual

INDEX

- 1. Purpose of this manual**
- 2. Precautions for Independent Mobility with the Torch-It**
- 3. Precautions in using the Torch-It device**
- 4. Warnings**
- 5. What is Torch-It device?**
- 6. Who can use the Torch-It device?**
- 7. Working principle of the Torch-It device**
- 8. The Torch-It device package**
- 9. Exploring the Torch-It device**
- 10. Sensor orientation**
- 11. Vibratory patterns**
- 12. Determining the battery charge status**
- 13. Low-battery warning signals**
- 14. Charging**
- 15. Vibrator and Sensor Failure Checks**
- 16. Detection of fast-approaching obstacles**
- 17. Folding and carrying the device**
- 18. Add-on for white cane**
- 19. Learning Mobility with Torch-It device**
- 20. Cleaning**
- 21. Repairs and Warranty**

1. Purpose of this manual

The purpose of this manual is to familiarize the user with, the working principle and use of a mobility aid called Torch-It device. It is mandatory for the Torch-It users to carefully read and understand the contents of the manual before using the device. The contents of the manual are available in Clear Print for low vision persons and in accessible Daisy and Braille formats for visually impaired users.

2. Precautions for Independent Mobility with the Torch-It

- Using the device effectively in day to day mobility requires regular practice and usage.
- Always follow the white cane mobility techniques for detaching and negotiating objects that are above your knee/waist. Initially, you may take time to synchronize between the two but after a few days of practice it should come naturally to you.
- The Torch-It device is capable of reliably detecting the obstacles that come within the detection zone of the sensors. However, the detection of obstacles in your path also depends on the white cane mobility technique. Always tap your cane within your shoulder limit with the Torch-It sensors pointing in front to ensure reliable detection of the obstacles in your way.
- While using the device in crowded places, the short range mode is recommended. This will reduce the detection range to 0.6 or 1.2 meter in front of you. However, if you continue operating in the long range mode, the device would continuously vibrate due to the numerous objects/people within 1.5 meters.
- There may be an initial adaptation phase while learning the use of the device. During this time your walking speed might reduce slightly due to increased focus on vibrations. However, with regular practice, you are likely to get accustomed to these vibratory patterns and be able to walk at your regular or increased speed.
- The detection of fast moving obstacles is done within the range of 1.5 meters only. These features are intended only as a cautionary alert and you may not be able to fully move out of the way.
- If there is significant difference in the length of your old white cane and the cane on which Torch-It device is mounted, then you may experience some undue pain or discomfort in your wrist. In such a case, get the cane replaced with a compatible white cane of appropriate length available from a Torch-It distribution center. Please note that the replacement would be subject to availability of an appropriate cane.

3. Precautions in using the Torch-It device

Important precautions for user of the Torch-It device.

- The device is to be used when it is properly fitted on a compatible white cane or properly detached from their cane. Follow standard white cane mobility techniques which include tapping on left and right sides, and sweeping the cane tip close to the ground.
- While holding the cane, the sensor direction must point towards the chest of a person standing in front at a distance of 0.60 meters.
- Before starting a journey, check if the device is charged. Please ensure that the device is charged periodically every 6-7 days. More frequent charging may be required if the usage is more than 3 hours. Once the battery is fully charged, the device is expected to function for at least 20 hours under normal usage.
- Please ensure proper functioning by placing our hand in front of the sensors, thereby triggering pattern four vibrations. Set the MODE switch correctly depending upon whether you are indoors, outdoors or open areas.
- Please use the device only when the sensor is dry. If the sensor is wet due to rain or water spillage, the device might temporarily stop functioning or might function inaccurately. As in the case of most cell phones, please do not expose the device to water in the sensor area to dry before checking and using the device.
- Never submerge the device in water or liquid, this may cause permanent damage to the device.
- Do not short circuit the charging point as it can damage the device and might lead to fire.
- Avoid placing the Torch-It device fitted with white cane inclined against a wall as the cane may slip and cause damage to the device.
- Please fold the device along with the cane when not in use and tie it using the elastic string.
- The visually impaired USER is the intended OPERATOR.

The Torch-It Device needs to be used in accordance with the information provided in this manual.

4. Warnings

No modifications of this equipment are allowed. In case repairs or servicing are required, please contact the concerned service personnel.

- Do not attempt to expose or remove the internal components of this device (except for operating the grip to attach or detach the cane) as this may expose you to risks arising from the electronic or mechanical components.
- Do not short circuit the charging point as it can damage the device and might lead to fire.
- Do not attempt to clean, service or conduct maintenance while the device is charging.
- Do not attempt to replace the battery yourself. If required please contact the concerned service personnel.
- Do not put this device in fire, as there could be an explosion hazard due to the presence of the battery.

5. What is Torch-It device?

Torch-It device is an electronic travel aid used in conjunction with a normal white cane that assists a visually impaired person in mobility and navigation.

While the normal white cane only detects obstacles up to knee/waist height, this device is capable of detecting obstacles from knee/waist to head height. In other words, the Torch-It is not meant to replace the white cane but to augment its functionality. It can detect obstacles up to 1.5 meters when used in open areas, outdoor up to 1.2 meters, when used indoors it detects up to 0.6 meters. With this increased range, it warns the users about impending obstacles before a possible collision happens and helps in finding collision-free paths.

Torch-It device is not meant to replace white cane but to augment its functionality.

6. Who can use the Torch-It device?

Any person with visual impairment, who is a regular user of a white cane or having fear of colliding and collapsing with obstacles, for his or her mobility needs can use this device. This device is recommended for users with/without good white cane mobility technique. During the development phase, the device has been used effectively by persons in the age group of 15 to 50 years.

With adequate training, people with deaf-blindness too can use this device for their mobility needs. Use of this device is not recommended in hilly areas and places of high drop-offs where mobility without sighted assistance is considered to be risky.

7. Working principle of the Torch-It device

The Torch-It device uses ultrasonic waves to detect presence of obstacles. These are sound waves which are not audible to human beings. The device has ultrasonic sensor which can transmit as well as receive the ultrasonic waves. In the presence of obstacles are detected by the sensor of the device. If the obstacles from which waves are reflected lie within certain direction and distance range, warning is issued to the user in the form of vibrations similar to a cell phone.

It is necessary for the user to grip the device in a way that the sensor is directed forward in the direction of upcoming obstacles. The Torch-It device is fitted onto top fold of white cane as and when it is necessary and can be re-attached using a simple latching mechanism.

The benefits of using the Torch-It device are as follows:

- It helps to detect knee/waist-above obstacles which are usually not detected by the white cane. Such obstacles might include a tree branch, underside or a car, hanging cloth strings, protruding window air conditioners, etc. As these obstacles usually pose a risk of injury to the head and upper part of the body, it is critical to detect them early.
- It increases the detection range to 1.5 meters in the long-range mode and to 0.6 meters in short-range mode. The enhanced detection range helps in informing the user about the presence of obstacles much before touching the actual obstacle. An object as big as wall and as small as a 3 cm wide raised pipe at 3m can be detected from mentioned distance.
- It helps in finding collision free-path while walking by detecting and avoiding obstacles.

8. The Torch-It device package

The Torch-It device package contains the following:

- Torch-It device fitted on a regular white cane.
- Power charger with a charging cord.
- User manual in Clear Print for low-vision users and sighted assistance.
- Quick start guide in braille.

9. Exploring the Torch-It device

Once you obtain the Torch-It device package, you can start exploring it with the following step:

- Sit comfortably and read the braille label on the top of the box. It briefly explains about the device and its features.
- Gently take out the device. You will find the Torch-It device, with an elastic string.
- You will find an elongated gripping portion in the form of a handle that covers the top fold of the white cane which is your Torch-It device.
- Try holding the device (mounted on the cane) the same way as you usually hold a white cane. It is held at the gripping portion of the handle which is curved to suit different gripping styles. A grip at the handle helps the user feel the vibrations that are generated whenever an obstacle is detected.
- As you grip and explore the device you can feel that it consists of front and rear portions that can be distinguished using their differing textures. The rear half of the grip is coarse in texture whereas the front half is comparatively smoother. The elongated shape of the grip allows comfortable gripping and tapping. The depression marks on the front side help in maintaining a proper orientation of the device.
- As you explore further, you will find a box-like structure at the bottom portion of the device. This is the sensor box which houses two circular sensors, one to send out ultrasonic waves and the other to receive the reflected waves. These sensors should always face in the direction of your movement. You should try and feel the two circular protrusions on the front of the sensor box.
- On the right side of the sensor box you will find the power ON-OFF switch. It is used to switch the device ON and OFF. This switch is surrounded by an embossed rounded rectangle which is open at one end and has an embossed line coming out from this end. This shape resembles the standard power symbol. You can turn ON the device by sliding this switch in the forward direction to the position where this embossed line is present. The device will give a few beeps and vibrations signaling that power is turned ON. These beeps and vibrations convey the battery status and their number depends on the battery level.
- On exploring the sensor box further, you will see a small hole representing the charging port on the lower left side of the sensor. The charging of the device is similar to charging any of a cell phone. Charging can be done by connecting the plug of a charger to a power source and inserting the pin in the charging port. This port has an additional cover just like a camera shutter to avoid accidental exposure to water and dust during usage. As a precaution, keep this shutter closed when the charger is not plugged.
- On the upper left side of the sensor box, you will find the mode selection switch. Its purpose is to select one of the three modes of operation: the short range, medium range, and the long range mode. In short range mode the detection range of the device is 0.6 meters, in medium range detection range is 1.2 meters, whereas in long range mode the

detection range of the device is 1.5 meters. Generally in an indoor environment or in a crowded place, objects are usually close to the user, whereas in an outdoor/open areas environment obstacles are usually encountered at a greater distance. Therefore while moving in an open environment the long range mode will be useful for detection. In a closed environment, the short range mode will be more useful. It is important to select the appropriate mode for optimal usage.

10. Sensor orientation

Before using the Torch-It device, it is necessary to adjust the orientation of the sensor for right detection. As different people have different gripping and holding styles, the ultrasonic sensor orientation will be different in each case. For this purpose, a sensor angle adjustment mechanism is provided in the device. With this mechanism, two angle adjustments are possible.

In order to mounted on cane, sensor move in the perpendicular to the cane. When standing in front of a person at a distance of 2 meters, the sensors must always point towards the chest of the person standing in front of you. Every time you start using the device, ensure that the sensors are pointing in the direction of travel. The middle position is recommended for the average height users, the top position for very tall users and the bottom position for short height users.

11. Vibratory patterns

Whenever an obstacle is detected by the Torch-It device, the information about its distance is conveyed through vibration signals. Depending on the distance through vibratory signals. Depending on the distance of the depending obstacle, you will feel four different vibratory patterns in the long range mode and three vibratory patterns in the short range mode. There are only three vibratory patterns in the short range mode as the detection range is reduced to 0.6 meters in comparison to 1.5 meters in the long range mode. The type of vibratory patterns felt on the devices is described next.

A single vibration pulse repeated approximately every second indicated that the obstacle is farthest (0.6 to 1.5 meters) but within the detection limits. This pattern is available only in long range mode and is absent in the short range mode. As the distance between the obstacle and device decreases the pulses of the vibration will increase homogeneously. Vibration pulses that are fast and repeating indicate that the obstacle is within the range of half to 1 meter in both the modes. Finally, very fast repeating pulses indicate that obstacle is very close and is at a distance of less than half meter for both short and long range modes.

12. Determining the battery charge status

You can easily determine the battery charge level by turning the device ON in the long range mode. Immediately after turning ON it gives a specific number of beeps and vibrations to indicate the battery charge level. Three beeps with three vibrations indicate that the battery charge level is 70% and 100%. Two beeps with two vibrations indicate that battery charge lies between 30% and 70%. Finally, a single beep with single vibration indicates that the battery is low and its charge level is less than 30%. It is recommended to charge the device in low battery condition. If the device is turned ON in short range mode then the same information is conveyed through vibrations alone. The audio beeps are not present in the short range mode to provide the user with the flexibility of turning it ON silently whenever required.

Battery Charge level	Device turned ON in long range mode	Device turned ON in short range mode
Full: 70% to 100%	Three beeps with three vibrations	Three vibrations
Medium: 30% to 70%	Two beeps with two vibrations	Two vibrations
Low: less than 30%	Single beep with single vibration	Single vibration

13. Low-battery warning signals

If battery charge level goes below 30% while using the device, it will continue to function normally. The device will indicate the low-battery condition by producing short beeps repeating every minute. In this condition, charge the device immediately. However, if the device is continued to be used without charging, the battery is likely to go into a deep discharge state. Before reaching this condition, four short beeps with four vibrations will be generated and the device will enter sleep mode and stop functioning. However, after re-charging the battery, the device will resume normal functioning.

*** It is recommended that the battery is charged before reaching the deep discharge state.

14. Charging

The Torch-It device has a rechargeable battery similar to the one in mobile phones. The battery can be charged using the charger provided in the package.

Once the device is fully charged, then it can be used continuously for at least 20 hours even if it is vibrating continuously. In order to charge the battery, one should connect the charger provided with the device to the charging port in the similar manner as one charges the mobile phone. The device requires 4 hours to be fully charged from a completely discharged state. While getting charged from a fully discharged state, it takes an hour to reach a 50% charge level, two hours to reach a 90% level and approximately 4 hours to get fully charged. If the device is ON and the charger is connected, the device will enter the charging mode, stop the obstacle detection and would subsequently start giving two beeps that repeat every 60 seconds. However, the absence of beeps in such a scenario indicates that the power source is not properly connected. Once the battery is fully charged and the charger is still connected, the device will start producing a long beep indicating that the charging process has completed.

The above beeps can be turned off by simply charging the device in OFF mode. You can always remove the charger and turn the device ON to determine the battery charge level through battery status signals.

***Always use the charger provided with the device. The charger has the shape similar to a regular mobile phone charger and is placed in the packaging box adjacent to the device.

15. Vibrator and Sensor Failure Checks

The Torch-It device uses ultrasonic sensors to detect the various objects coming in the path of the user and conveys the distance of the obstacle using vibratory patterns produced by a vibrator. The ultrasonic sensors and the vibrator are critical to the proper functioning of the device. In the unlikely event of either of them failing, the Torch-It device would inform the user about the failure using the following alert signals.

- **Sensor Failure:** Long beep with vibration repeated every second.
- **Vibrator Failure:** Long beep followed by two short beeps repeated every second.

The beep patterns will persist till the device is ON. In this case, the user should turn OFF the device, detach it from the white cane and contact service personnel for repair.

16. Detection of fast-approaching obstacles

While operating, if the Torch-It device encounters fast approaching objects such as a car, bus, cycle or a fast walking person in its detection range, it will produce a continuous beep as long as the object remains within the detection range. Since the obstacle is only detected within a range of 1.5 meters, the warning beep may only allow the user to take a sudden protective or reflex action.

***Several users have mentioned that this feature may be beneficial as it prevents sudden collisions with fast approaching obstacles without warning. However, this feature is implemented as a cautionary feature and you may not be able to take corrective action due to very limited reaction time which in turn is dependent on the speed of approaching objects.

17. Folding and carrying the device

The Torch-It device mounted on the white cane be folded in a similar way as one folds the normal white cane. The sideways string on the white cane emerges out from a small cut near the middle part of the device grip. This can be used for strapping the folded cane with the device when required.

18. Add-on for white cane

In case the white cane provided with the device gets damaged during use, then one can easily remove the cane from the device. To attach the device on the compatible white cane, place the white cane in the opened device grip such that its top bulb sits properly in the cavity provided in the device grip and the elastic strip (used for folding) emerges out from the small cut near the middle part of the device grip. Once the cane is properly placed, one can fold the second half and press against the first half of the device grip. You can hear a click sound on proper locking of buttons indicating the correct operation.

19. Learning Mobility with Torch-It device

- Step 1: Holding the device and positioning sensors correctly

Hold the Torch-It device mounted on the white cane, in the same way as you hold your regular white cane. Check that the sensors are oriented properly, facing towards the chest of the other person standing in front of you at a distance of approximately 2 meters.

***The sensors must be facing in the direction of movement. Incorrect sensor direction may lead to objects in your path not getting detected. If the sensors are facing extreme left/right while walking forward, then the device may keep vibrating due to the detection of objects on sides or even your own body (sensors incorrectly facing downwards). Ensure that the device does not rotate in hand while walking.

- Step 2: Following the white cane mobility techniques

Follow the basic white cane mobility techniques such as regular cane tapping, shore lining etc. The Torch-It device is an enhancement to white cane and is meant to provide additional information about knee/waist-above objects only. The white cane technique necessary for getting ground information.

- Step 3: Understanding the vibration patterns and the corresponding distance of obstacles/objects

After turning ON, the Torch-It device produces a few beeps and vibrations conveying the battery status. It will start vibrating if there is anything present in front of it within a distance of 1.5 meters in the long range mode and 0.6 meters in the short range mode. However, the nature and the intensity of vibrations will vary according to the distance of that object from the device.

Turn ON the device in the long range mode and request your companion to speak something so that you can slowly start moving towards the person. Initially, no vibrations will be perceptible, however, as soon as your distance becomes 1.5 meters, you will feel the first vibration pattern. Now, take a couple of footsteps towards the person. Now, the vibration pattern will change to the second once your distance becomes 1.2 meters. Again, take few more steps and the vibration pattern will change to the third type when your distance to the person becomes 1 meter. Finally, take another step and the vibration pattern will change to fourth type indicating that your distance is 0.6 meter. Each time the pattern changes, wait and imbibe the vibration pattern for few seconds.

- Step 4: Using the vibration patterns for obstacle avoidance and path finding

The Torch-It device detects the presence of obstacles and indicates the distance through distinct vibration patterns. These indications can be used to negotiate the obstacle from a safe distance. This is done by observing the type of vibration pattern felt on the device. Each vibration type is associated with a distinct zone related to the distance of the detected obstacle. As described next, the zones are classified according to the action to be taken.

Awareness Zone - If the first vibration pattern is being felt, it implies that there is some obstacle at a distance of 1.5 meters i.e. at least 5-6 steps away. It may not directly come in your path. In this case, continue walking confidently without taking any corrective action.

Action Zone - While walking, if the vibration pattern changes to second then it means that the obstacle is now within a distance of 0.8 to 1.2 meters from you and there is a high probability that it will obstruct your path. This is the point where you should start moving left or right to search for an obstacle free path (where either there are no vibrations or at least lesser vibrations) and try to negotiate and avoid the obstacles from a safe distance without making any contact with it.

Danger Zone - If the vibration pattern changes to third then it means that the obstacle is within a distance of 0.3 to 0.8 meter from the user. By this time the cane should collide with the obstacle. If the cane is still not making contact with anything but the device is vibrating in pattern three then these surely indicate the presence of an overhanging obstacle. At this point you should continue finding the free path and also take upper hand/arm protection to avoid any injury.

Stop Zone - If the vibration pattern is fourth then it means that the obstacle is at a distance of less than 0.3 meter. You should stop immediately to avoid collision and may take a few steps back and continue finding the free path. If you don't stop at this point then it is possible for the obstacle to move out of the view of Torch-It sensors. In this case, the device will stop vibrating and you may interpret this as an absence of obstacle which in turn may result in serious injury.

- **Step 5: Using the Torch-It device in known environments**

Based on the techniques learnt above, start using the Torch-It device in known environments. Try to detect obstacles such as tables, chairs and try to negotiate them without making any physical contact. Identify someone among your friends or family members to help you train appropriately. The person should be asked to come in your path silently as you walk along with the device. Safety detect and negotiate him/her without making any contact with your cane. Once you have learnt negotiating simple objects and people, practice the detection and avoidance of overhanging objects by requesting the identified person to bring their arm silently in front of you from left or right side while you are walking with your device. Keep practicing until you successfully learn to avoid simple objects, people and overhanging objects. After that, start moving out with the Torch-It device on known outdoor paths for practicing detection and negotiation of real obstacles like parked vehicles, overhanging tree branches, pillars, etc. After a few days of practice on these known routes start moving out on unknown routes also.

20. Cleaning

Clean the exterior of the Torch-It device with dry cloth. Do not use any solvents to clean the electrical parts or plastic enclosure as it may lead to device damage and improper operation.

21. Repairs and Warranty

For any repairs, the customer is required to send the device to the point of sale or to the following address: torch-it electronics limited, office no. 6, first floor, c block, PDPD, Gandhinagar, Gujarat-382007. All associated expenses would be borne by the customer.

The warranty applies to Torch-It device purchased from an authorized channel partner by the original purchaser for normal use and not for resale. The warranty lasts for twelve months from the date of purchase. A valid proof of purchase may be required to prove eligibility. If you do not have a valid proof of purchase, the warranty period will be calculated from the date of sale from Phoenix to the authorized channel partner. The warranty applies only to the Torch-It device and does not apply to the white cane. The white cane is procured from third party vendors who may not provide warranty for the same.

The warranty period will not be extended or renewed or otherwise affected due to subsequent resale, repair or replacement of the Torch-It device. However, repaired parts will be warranted for the remainder of the original warranty period or for 30 days from the date of repair, whichever is longer. The warranty lasts for twelve months from the date of purchase.