



User Manual

The purpose of this manual is to familiarize the user or their well-wisher with, the working principle and use of a mobility aid called Saarthi device.

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



1. Saarthi device

Saarthi 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 can only detect obstacles up to knee/waist height, this device is capable of detecting obstacles from knee/waist to head height. In other words, the Saarthi is not meant to replace the white cane but to augment its functionality. It can detect obstacles up to 3.2 meters when used in open areas, outdoor up to 1.3 meters, when used indoors it detects up to 0.6 meters. With this increased range, it warns the users about impending obstacles before the possible collision happens and helps in finding collision-free paths.

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2. Precautions in using the Saarthi device

- The device is to be used when it is properly fitted with 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 15-16 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 50 hours under normal usage.

- Please ensure proper functioning by placing our hand in front of the sensors. Set the MODE switch correctly depending upon whether you are indoors, outdoors or open areas.
- Please fold the device along with the cane when not in use and tie it using the elastic string.

3. Working principle of the Saarthi device

The Saarthi device uses ultrasonic waves to detect the presence of obstacles. These are sound waves which are not audible to human beings. The device has an 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, a 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 Saarthi 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 Saarthi 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 of 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 3.2 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 a wall and as small as a 3-cm wide raised pipe at 3m can be detected from a mentioned distance.
- It helps in finding collision free-path while walking by detecting and avoiding obstacles.

4. Exploring the Saarthi device

Once you obtain the Saarthi device package, you can start exploring it with the following step:

- Try holding the device 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 on the handle helps the user feel the vibrations that are generated whenever an obstacle is detected.
- As you explore further, you will find a structure at the bottom portion of the device. This is the sensor 'two circular sensors', one to send out the sonar wave 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.
- On exploring the sensor further, you will see a small rectangle hole representing the charging port on the lower side of the sensor. The charging of the device is similar to charging any of android cell phone. Charging can be done by connecting the plug of the charger to a power source and inserting the pin into the charging port.
- On the upper left side of the sensor, you will find the slide switch. Its purpose is to switch on/off the device and selection of one of the three modes of operation: the short range (indoor), medium range (outdoor), and the long-range mode (open areas).
- In short range mode, the detection range of the device is 0.6 meters, in medium range detection range is 1.3 meters, whereas in long range mode the detection range of the device is 3.2 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. It is important to select the appropriate mode for optimal usage.

5. Charging

The Saarthi device has a rechargeable battery. Once the device is fully charged, then it can be used continuously for at least 50 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 to 5 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 3 hours to get fully charged.

***Use the charger provided with the device or you can use your normal android phone charger (micro USB). The charger has the shape similar to a regular mobile phone charger and is placed in the packaging box adjacent to the device.



6. 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.

No/Zero beep and vibration indicates that the battery charge level is 80% to 100%. One beep and vibration indicates that battery charge lies between 60% and 80%. Two beeps and vibration indicate that the battery is low and between 40 to 60% and three beeps indicate its charge level is less than 40%.

7. 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. In this condition, charge the device immediately. However, if the device is continued to be used without charge, 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.

8. Folding and carrying the device

The Saarthi 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 cane to be used for strapping the folded cane with the device when required.

9. Learning Mobility with Saarthi device

● **Step 1: Holding the device and positioning sensors correctly**

Hold the Saarthi 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 0.6 to 3.2 meters, according to a mode which you select.

***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 by 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 Saarthi 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 Saarthi 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 0.6 meters in the short-range mode, 1.3 meter in the medium-range mode and 3.2 meters in the long-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, start moving. Initially, no vibrations will be perceptible; however, as soon as your distance becomes 0.6 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 0.3 meters.

● **Step 4: Using the vibration patterns for obstacle avoidance and pathfinding**

The Saarthi 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 0.6meter in indoor (small range), 1.3 meters in outdoor range (medium range) and 3.2 meters in open areas (large range). It may not directly come in your path. In this case, continue walking confidently without taking any corrective action. It shows that you have to take action now.

Mode/ Range	Vibration pattern 1	Vibration pattern 2
Indoor, Small	0.6 meters (2 Feet)	0.3 meters (1 Feet)
Outdoor, Medium	1.3 meters (4 Feet)	0.6 meters (2 Feet)
Open area, Large	3.2 meters (10 Feet)	1.3 meters (4 Feet)

➤ **Danger Zone** - If the vibration pattern changes to second then it means that the obstacle is within a distance of 0.3 meters in indoor (small range), 0.6 meters in outdoor range (medium range) and 1.0 meters in open areas (large range). By this time the cane should collide with the obstacle in indoor mode. If the cane is still not making contact with anything but the device is vibrating in pattern second 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. You should stop immediately to avoid a 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 Saarthi 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 Saarthi device in known environments**

Based on the techniques learned above, start using the Saarthi 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 detects and negotiates him/her without making any contact with your cane. Once you have learned to negotiate 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 the 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 Saarthi 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.

10. Repairs and Warranty

The warranty applies to Saarthi 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 torchit to the authorized channel partner. 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 Saarthi 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.

Precautions for Independent Mobility with the Saarthi

- 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 Saarthi 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.
- 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 a 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.

Thank you.

