

Operation Manual  
For  
Assistive SCUBA Device

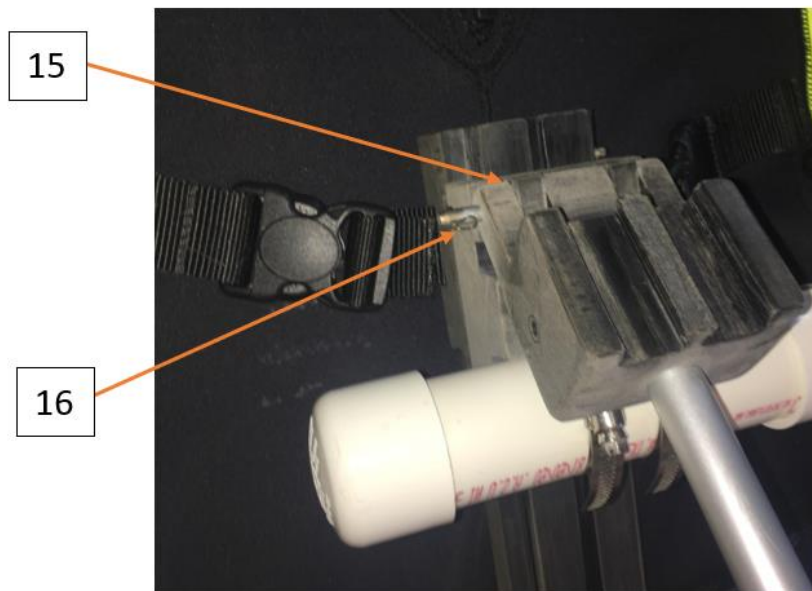
By: Team 525

## Overview

This assistive SCUBA device is designed for people that cannot control their legs due to a spinal injury. More specifically, it is designed for people with a cervical eight nerve injury or lower. The device is intended to aid users in dressing themselves, controlling the location of their legs, and controlling their body's orientation in the water. This device is only to be used by individuals that are certified SCUBA divers or individuals that are in the process of getting certified while under the supervision of qualified SCUBA instructors. The device is designed to not interfere with pre-existing SCUBA equipment and should not be used if it does interfere with pre-existing SCUBA equipment.

## Components







The proceeding numbered list describes each component. The numbers seen in the pictures above corresponds the numbers in the numbered list. \*\*Note: the “float assembly” refers to all components that are moved when the float’s position is adjusted. A picture of the float assembly can be seen below.



Float Assembly

### Numbered List of Components

1. **Front zipper** used to provide easy accessibility to get into and out of wetsuit.
2. **Straps** secures legs together to control diver’s location of their legs and secures track to wetsuit.
3. **Zippers** along both legs allows diver to get in and out of their own wetsuit.
4. The **float** for the float assembly provides the lift force to adjusts body’s orientation.
5. Float’s **track** supplies secure sliding location for float.
6. **Stopper** is used to ensure the float assembly will not be removed from track’s channel.
7. **Strap tabs** are used for loosening or tightening track to the wetsuit.
8. **Quick release clips** are connected to straps that secure the track to the wetsuit.
9. Handle **set screw** is used to secure handle to float assembly.
10. **Pin** is used to hold the pivot for the handle in place.
11. **Float’s end cap** is removable to allow lead pellets to be added or removed to adjust amount of lift the float supplies.
12. **Handle grip** is used provide a gripping surface for user.
13. The **handle** for the float’s assembly is used to move the float’s location via the hands.
14. **Clamps** secure float to float assembly.



15. **Pivot** for the handle which allows diver to fold the handle.
16. **Pin clip** ensures pin will be held in place.
17. **Track channels** provided a sliding path for the handle and the float assembly.
18. **Wedges** locks float assembly into place.

## Configurations

Track with Handle Folded Towards Feet and Float Up:



Track with Handle Folded Towards Chest and Float Up:



Track with Float Down:



## Operation

### **1) Steps for Determining the Appropriate Lift Supplied from Float**

These steps are essential to use the device safely and effectively and should be done **prior** to going on a full dive. Once the proper lift is determined these steps do not need to be repeated every for dive, pending similar diving conditions.

**Step 1.** Follow “Steps for Attaching Device Before Entering the Water” to ensure there is no interference with your dive equipment. If there is interference with your preexisting dive equipment do **not** dive with product. If no interference, then proceed to Step 2.

**Step 2.** This step is similar to determining the proper amount of weight you need to maintain proper buoyancy. Accompanied by other divers enter the water with device and all SCUBA equipment fully attached. Stay at the waters surface with your buoyancy compensator (BC) fully inflated. Slowly let air out of your BC and follow standard weighting procedures to ensure proper buoyancy.

**Step 3.** Fold handle towards chest and lock the handle into track.

**Step 4.** Descend approximately six feet below the water’s surface.

**Step 5.** Using the handle push the float all the way down the track until it locks into place.

**Step 6.** Swim in forward direction and observe your body’s orientation in the water. The goal is to effortlessly maintain a horizontal position (parallel to the water’s surface). If your feet are above the rest of your body proceed to **Step 7**. If your feet are below the rest of your body proceed to **Step 8**. If your head and feet are at the same depth below the waters surface proceed to **Step 9**.

**Step 7.** Return to the water’s surface and exit the water. Remove the float’s end cap and pour in one tenth of a pound of lead pellets into the float. Replace the float’s end cap. Repeat the “Steps for Determining the Appropriate Lift Supplied from Float”.

**Step 8.** Return to the water’s surface and exit the water. Remove the float’s end cap and remove one tenth of a pound of lead pellets from the float. Replace the float’s end cap. Repeat the “Steps for Determining the Appropriate Lift Supplied from Float”.

**Step 9.** The float has the correct amount of lift for your body’s composition and your current diving conditions. You may now proceed with rest of your dive as long as you have completely read the Operation Manual and are comfortable operating the device.

### **2) Steps for Attaching Device Before Entering the Water**

**Step 1.** Unzip the zippers of wetsuit along the chest and legs.

**Step 2.** Place legs into waist opening and zip both legs of wetsuit down towards feet.

**Step 3.** Zip wetsuit from waist to neck.

**Step 4.** Attach all standard scuba equipment to body (i.e. tank, regulator, buoyancy compensator, etc.)

**Step 5.** Ensure that handle of device is in the folded towards feet position

**Step 6.** Fasten all 4 quick release buckles, located on track, to the wetsuit.

### **3) Instructions for Operating Device in the Water**

**Step 1.** Ensure that all dive equipment and the device are securely attached to the body.

**Step 2.** Keep float in the highest position and handle folded towards the feet for transitioning into the water.

**Step 3.** Transition into water (with assistance if needed) and secure all diving equipment at the water's surface. This process should be carried out just as if the assistive device was not attached to you.

**Step 4.** Keep the assistive device's float in the highest position on the track while at the water's surface. The device is designed to aid you in staying in the vertical position when the float is in highest position. This will help you to keep your head above the water's surface.

**Step 4.** When preparing to descend to desired diving depth, fold the handle towards your chest and lock it into place using your hands.

**Step 5.** The float maybe kept in the highest position while descending to desired depth, but the float's location can also be adjusted towards the feet if desired.

**Step 6.** Transition to desired depth.

**Step 7.** Once at desired diving depth, using the handle, push the float all the way towards the feet until it locks into place. The float being located in this position will aid you in the moving throughout the water in the horizontal position.

**Step 8.** Throughout the dive if you dive to deeper depths repeat **Steps 5** through **7** of "Instructions for Operating Device in the Water".

**Step 9.** Throughout the dive as you to ascend to shallower waters or surface pull the float towards your waist, as necessary. This is only necessary if you are having difficulty controlling your body's orientation.

**Step 10.** Once surfaced, using the handle pull float to the top of the track and fold handle towards your feet.

**Step 11.** Exit the water the same way you would without having the device attached.

### **4) Steps for Detaching Device After Exiting the Water**

**Step 1.** Unfasten all 4 quick release buckles, located on track, from the wetsuit.

**Step 2.** Detach all standard scuba equipment from the body (i.e. tank, regulator, buoyancy compensator)

**Step 3.** Unzip wetsuit from neck down towards waist to the end of the zipper track.

**Step 4.** Unzip the zippers of wetsuit along the legs.

**Step 5.** Remove arms and legs from the sleeves and legs of the wetsuit.

**Step 6.** Place wetsuit in cool, dry area to avoid corrosion.

**Step 7.** Dry off device with a towel and place in a dry area to avoid deterioration.

## **Troubleshooting**

- If the device becomes entangled with any object or causes uncontrollable buoyancy issues, remove the track assembly by detaching the four quick release buckles.
- If there are bubbles seen coming out of the float, return to the water surface and ensure float's end cap is properly installed. After reinstalling the end cap, hold float under water and look for bubbles. Note: if float is damaged in any way (i.e. cracks or punctures) replace float prior to diving with device.
- If the float assembly gets stuck in the track, return to the water surface or if necessary, remove the track using the four quick release buckles. After surfacing inspect the channels of the track for foreign debris and remove as necessary. If no foreign debris is found inspect the track and float assembly for damage. If damage is found replace the damaged part and do not attempt to dive with device until repaired.
- If any of the four straps become loose, while in the water, attempt to tighten strap by pulling strap tab. If strap tab cannot be tightened underwater, then surface to tighten strap.
- If one of the quick release buckles becomes disconnected attempt to re-fasten buckle in the water. If this cannot be accomplished underwater, then surface to fasten buckle.