

# OTW Dive Module

## System Assembly & General Maintenance

The dive module produced by OTW has been designed for ease of use and maintenance. The instructions contained in this assembly and maintenance document will provide the necessary information to provide many years of enjoyable R/C submarine running.

### **Cylinder Overview:**

Three sections, or compartments, make up the dive module:

- **Forward** – contains the functional components of the ballast system which are made up of the pump, solenoid valve and the control electronics. The optional bow plane servo is located here. On the aft bulkhead are the three ballast tank volume probes, the hose fitting to connect the ballast tank to the solenoid and the opening for the wiring chase that connects the forward and aft sections. On the forward bulkhead (also called the forward end cap), you will find the two battery connections, the bow plane servo rod fitting, and the hose fitting used to connect the pump to the external environment.
- **Center** – this is the ballast tank. Within it is the wiring chase tube and one or more baffles.
- **Aft** – contains either one or two motors and their mounts, the pitch controller, speed controller, R/C receiver, and the rudder and stern plane servos. The forward bulkhead has the opening for the wiring chase that connects the forward and aft sections. The aft bulkhead (also called the aft end cap) has the openings for the motor mount(s) and the two servo rod fittings.

### **Initial Assembly**

When you first receive your new dive module you will need to install the two aft servos and, if required, the optional bow servo. In addition, the R/C receiver will need to be installed and connected to the speed controller, servos, pitch controller and ballast control system. The following will guide you through the process:

To begin you will need to learn how to disassemble the dive module forward and aft end caps. This information will be generally useful for those times when it may be desired to open one or both end sections.

1. Unscrew the three knurled brass nuts located on the end cap. This will allow the end cap to be pulled free of the three brass rods. The forward end cap will need to be disconnected from the hose that is connected to the hose fitting for complete removal.
2. The servo rods exit through rubber bellows that mount on brass fittings. To remove an end cap, you will also need to slide each servo out of the bellows. Be careful not to damage the bellows.

## Servo Installation:

The holes for mounting the servos are pre-cut in the black trays, but depending on which servo used they may need to be enlarged slightly. The forward servo must not extend for more than  $\frac{3}{4}$  of an inch (19mm) below the bottom of the pump tray. Once mounted, install the provided stainless steel servo rod to each servo.

You also require servo extensions for the pump control and bow servo (if fitted). These are pushed from the front section where the pump is located through the wiring chase in the ballast tank and into to the rear section of the module. This allows connection to the receiver.

## Assembly:

There is not a correct or incorrect order to assemble the dive module, but the following tends to be the easiest.

### The Aft (Drive Motor) End:

1. Connect the black tray to the rear end cap by connecting the motor plug(s) and inserting the servo rods into the rubber bellows. Ensure that the large O-rings are correctly fitted to both the ballast tank bulkhead and end cap.
2. Now slide the tray into the rails located inside the aft tube and mate up to aft end cap.
3. Slide the acrylic tube w/endcap over the three brass tie bars to within approximately 50mm of the center section (ballast tank). This will allow you to connect the main power plug, pump control lead, and the optional bow servo to the R/C receiver.
4. Push the tube all the way onto the ballast tank bulkhead and locate end cap on the three tie bars and screw in the knurled nuts.

**Note: Tighten with fingers only.**

### The Bow (Pump) End:

1. Lay the black tray on the bottom two brass tie bars. Always connect the blue hose to the union fitting on the bottom of the ballast tank bulkhead first.
2. Connect power leads, servo and pump control (look for green spot) leads to their correct sockets.
3. Make sure the large O-rings are correctly fitted to the ballast tank bulkhead and the end cap.
4. Push the acrylic tube over the tray with the **white rails on top** of the **black** tray.
5. Fit the forward servo rod (if fitted) into the bellows
6. Plug in the power lead (connecting it the forward endcap).
7. With a pair of smooth long-nose pliers (note: if pliers have a serrated surface, protect with insulation tape or similar). **Carefully grip** the blue hose about one-half to three quarters of an inch (13 to 19mm) from the open end and carefully push over the brass fitting on the end cap.
8. Push the acrylic tube onto the ballast tank bulkhead and locate the end cap onto the three brass tie bars.

9. Fit and tighten the knurled nuts **with fingers only**. Make sure the cables are not jammed between the ends of the black pump tray and the ballast tank bulk head or the end cap before tightening the three knurled nuts... again **only finger tight**.
10. The two external leads can be connected to the battery and insulated with epoxy glue or silicone bath sealant. The black (negative) lead can be used as the power switch.

**Caution:** Always disconnect both power leads from the dive system before charging the batteries.

## Final Checks:

When you have re-assembled the dive module, test it in the bath tub, tank, or window box from a garden centre.

1. Fill the ballast tank up to the top probe until the failsafe cuts out the pump. Check for air bubbles around the linkage bellows, O-rings and the motor shafts. This is very important. If you are losing air through leakage you will create a vacuum when you empty the ballast tank. Water can then enter the module through the areas of air leakage.
2. The motor mount(s) use an O-ring to seal the motor shaft. The pressure on the O-ring can be adjusted to either increase or decrease that pressure. If the adjusted to tightly, the O-ring will exert too much pressure on the motor shaft and cause binding as well as increased battery amperage draw. If adjusted to loosely, air will escape as the ballast tank is filled with water and water will be pulled in when the ballast tank is emptied. To properly adjust the O-ring, first loosen the inner round knurled jam nut. Once loosened, adjust the outer round knurled nut to achieve the desired pressure on the O-ring. Re-tighten the jam nut when done
3. If there are no leaks, pump out the ballast tank and verify that the pump stops automatically. This will indicate that the probes are working correctly.

## General Maintenance

Remember a little maintenance now can save a swim in the pond later!

- Always check the water probes in the forward end of the ballast tank. If they look tarnished or dirty, unscrew carefully and clean with brass or silver polish. (mark the location of each probe before removal) Screw back into place taking care to screw in to a snug fit.
- View the O-rings from all sides to make sure all are evenly compressed. Do not over tighten. Check all large O-rings at least once a year for integrity.
- *Never use grease on the seals* or brass parts it attracts dirt and dirt causes leaks.

Any questions or problems please email me at [otwdesigns7@gmail.com](mailto:otwdesigns7@gmail.com).

Bob Dimmack – OTW Designs

**NB: Modification of the dive module invalidates the warrantee.**