

# Modular Sub-Driver (MSD) Semi-Aspirated System (SAS)

## Radio Controls

used to operate sub for diving

Ch 5 and 6 Switches may be 2 or 3 position depending on Radio

Auto Use for emergency dives  
Leave in Auto for normal dives

6 5

4 3 2 1

Fwd Blow Rev L R Up Dn

1 - Rudder  
2 - Bow Planes  
3 - Throttle  
4 - Ballast Vent/Blow  
5 - Rear dive plane override  
6 - Spare/Torp

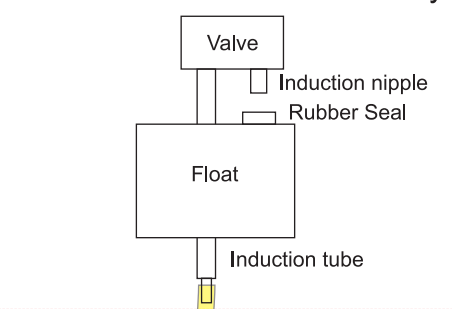
Ballast vent and Rear dive plane will both operate equally well on a Spring return Proportional channel or a 3-way switch channel. Ch 4,5,6 inputs can be changed as desired, as long as the switches are 3-way. Check radio TX

**Submerging:**

- Push the transmitter left stick all the way to the left, to vent the ballast tank.
- The ballast tank fills with water, and the model submarine transitions from surfaced trim to submerged trim.
- Release the spring-loaded stick to the neutral position (center) and the vent valve closes. The LPB remains dormant.
- As the sail submerges the snorkel head-valve float rises, causing the head-valve to isolate the induction line.
- The model is operated in submerged trim.

The snorkel head valve prevents water ingress when submerged.  
Allows Air in when surfaced.

### Snorkel Head Valve Assembly



- The Ballast Vent Valve (BVV) servo opens and closes the Vent valve on top of the ballast tank.
- Opening the valve releases the air trapped within the ballast tank, allowing water to flood in from the holes in the bottom of the ballast tank.
- The BVV Servo also has a special position that will open the Blow Valve on the optional GBB circuit. The optional BLM will actuate the BVV if the Radio Signal is lost or the Battery reaches a low point, forcing the sub to surface so it is not lost.

Radio Switches - two or three-way switch on the transmitter

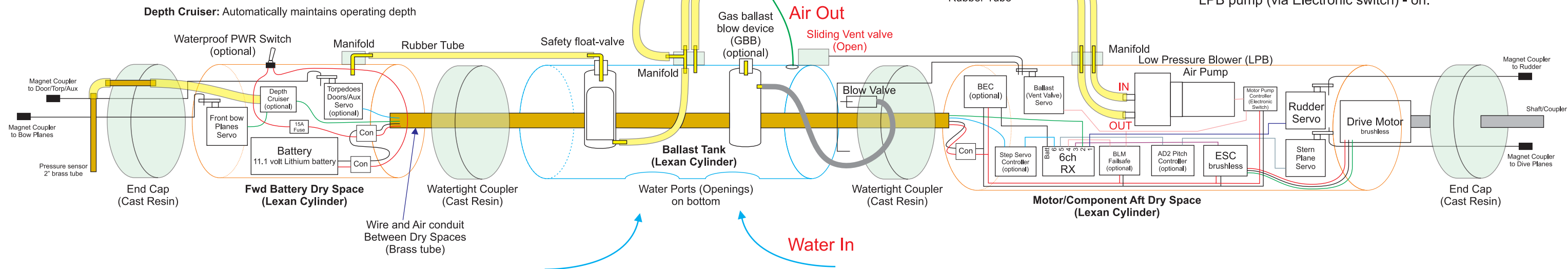
- A two-way switch will command the servo to go 100% in one direction and -100% in another. Or command an electronic switch to open or close.
- A three-way switch adds neutral, for 3 servo positions. 100%, 0%, -100%

For ballast control, you need three positions, neutral (0%), blow (100%) and vent (-100%). This is achieved via a 3-way sw (ch 5 or 6, radio dependant) or a Gimbal stick with a centering spring, (typ. ch4).

- Neutral, a 3-way sw is centered, or a gimbal stick is centered.
- Vent Valve (via servo) - closed
- LPB pump (via Electronic switch) - off.

- Vent, a 3-way sw is flipped down, or a gimbal stick is pushed all the way to the left.
- Vent Valve (via servo) - open
- LPB pump (via Electronic switch) - off.

- Blow, a 3-way sw is flipped up, or a gimbal stick is pushed all the way to the right.
- Vent Valve (via servo) - closed
- LPB pump (via Electronic switch) - on.



**Diving:** ballast tank vent valve opens, air escapes, water enters.

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used to operate sub submerged

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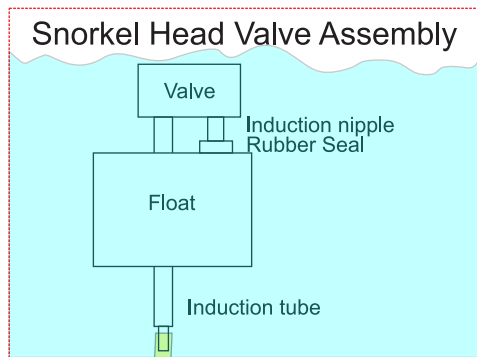
Bow planes: Control depth, either manually or in conjunction with a DC module.

Stern planes: Control pitch (horizontal bow/stern angle) manually or autonomously via AD2.

With AD2 installed, it autonomously keeps the boat level, by constantly fine tuning the Stern plane angle.

For an "emergency dive" or "emergency ascent", you can override the AD2 by commanding full down or full up on the planes. A proportional channel with trim allows adjustment of the neutral position of the planes for perfectly level operation but this is not normally required. Therefore, an analog 3-way switch is adequate to command the stern planes full up or full down.

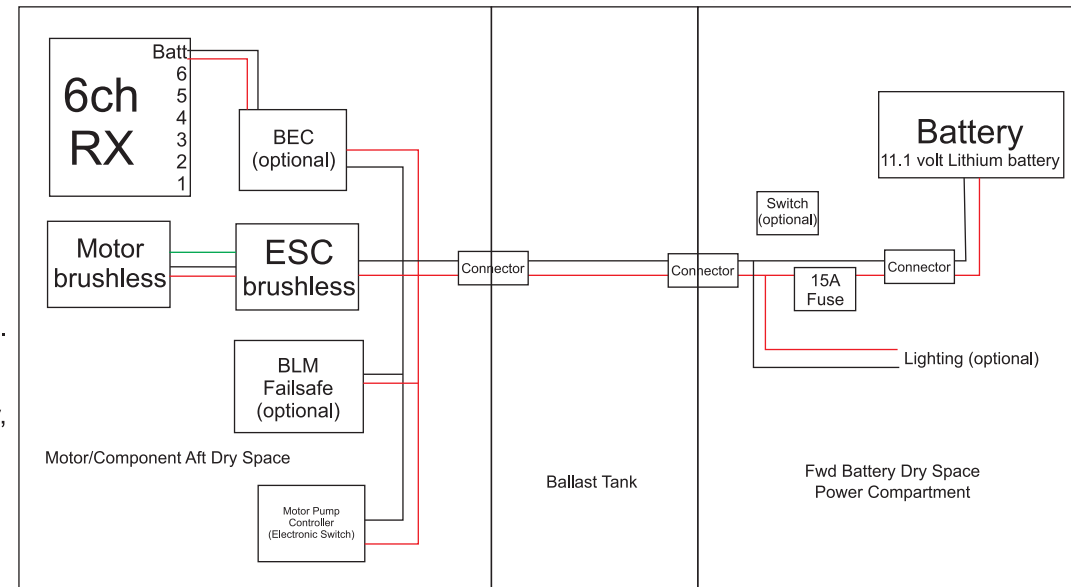
With no AD2, the stern planes respond to command inputs. full up or full down via 3-way switch OR proportional control from a gimbal stick



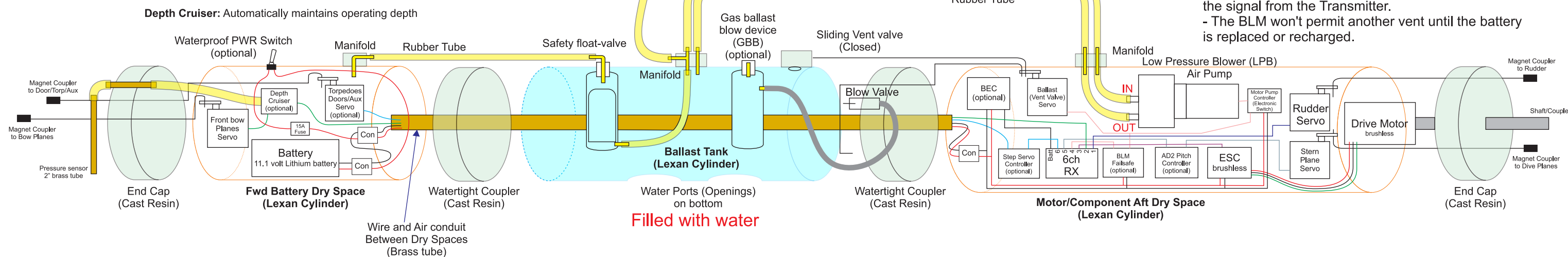
When submerged, the float seal presses against the induction nipple and prevents water ingress.

In the event that water gets past the Snorkel Head Valve Assembly, the safety float-valve will prevent water from entering the dry space with electronic components.

## Power Wiring



- The KML Battery Link Monitor (BLM) provides loss-of-signal fail-safe function, as well as battery protection.
- The BLM will automatically blow ballast if the voltage drops to a pre-set critical value or the Receiver loses the signal from the Transmitter.
- The BLM won't permit another vent until the battery is replaced or recharged.



**Submerged:** ballast tank filled with water, sub is at or near Neutral buoyancy.  
Depth is controlled by bow and stern planes, and Optional AD2 and DC.

# Modular Sub-Driver (MSD) Semi-Aspirated System (SAS)

### Radio Controls

used to operate sub to surface

Ch 5 and 6 Switches may be 2 or 3 position depending on Radio

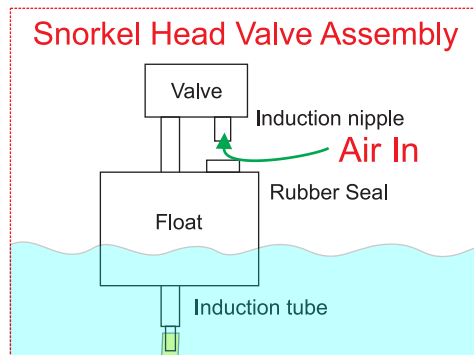
Auto Dn Up

1 - Rudder  
2 - Bow Planes  
3 - Throttle  
4 - Ballast Vent/Blow  
5 - Rear dive plane override  
6 - Spare/Torp

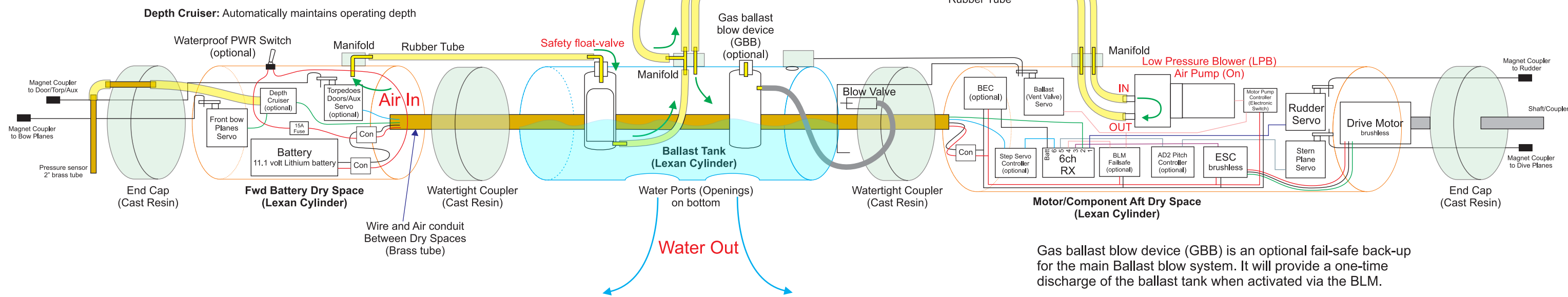
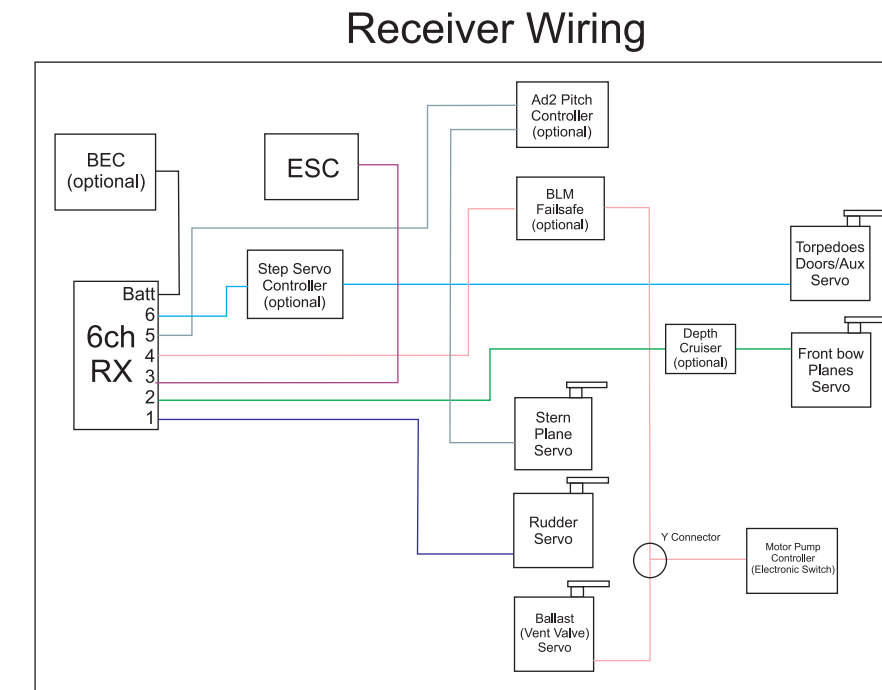
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To Surface:

- Command full rise on the stern and bow/fairwater planes
- When the sail broaches the surface, move the left stick all the way to the right and hold it.
- The MPC runs the LPB motor and air is drawn in through the open snorkel head-valve and the open induction line to the SA's interior from the forward and after dry spaces.
- The air is compressed by the LPB pump and discharged into the ballast tank, blowing out the water.



At the surface, the Snorkel valve opens, equalizing air pressure within the MSD and the LPB can finish blowing the ballast tank dry, placing the sub at the surface waterline.



Gas ballast blow device (GBB) is an optional fail-safe back-up for the main Ballast blow system. It will provide a one-time discharge of the ballast tank when activated via the BLM.

**Surfacing:** The air pump (LPB) moves air from the dry compartments and Snorkel into the ballast tank. Air pushes water out, sub becomes more buoyant and rises.

# Basic Modular Sub-Driver (MSD) Semi-Aspirated System (SAS) (no optional components)

