SeaOtter-2
OPERATION MANUAL
JW FISHERS MFG INC

rev 61509

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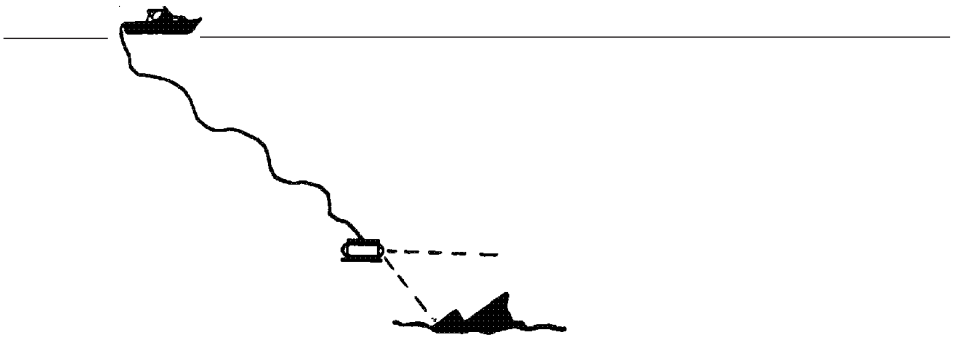
SeaOtter-2

Remote Operated Vehicle

OPERATION AND MAINTENANCE MANUAL



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1953 COUNTY STREET
EAST TAUNTON, MA 02718

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SeaOtter-2 Cautions

- ALWAYS PLUG THE CONTROL BOX INTO A GROUND FAULT BREAKER FOR SAFETY. IF AN ELECTRICAL LEAK OCCURS TO THE WATER, THE GROUND FAULT BREAKER WILL TRIP.

- NEVER PLUG THE CONTROL BOX POWER INTO ANY VOLTAGE OTHER THAN 120 VAC (NEVER 220 VAC). IF ONLY 220 VAC IS AVAILABLE A STEP DOWN TRANSFORMER IS NEEDED.

- 120 VAC IS DANGEROUS - DO NOT EXPOSE CONTROL BOX OR ELECTRICAL CONNECTIONS TO WATER.

- AVOID UNNECESSARY ROUGH HANDLING.

- PRIOR TO LAUNCH, CHECK ALL FITTINGS.

- PRIOR TO LAUNCH, AND WITH POWER OFF, ROTATE ALL PROPS ONE TURN BY HAND.

- PROTECT THE MONITOR AND CONTROL BOX FROM THE ELEMENTS.

- KEEP HANDS AND FINGERS CLEAR OF THE PROPELLERS AT ALL TIMES.

- MAKE ELECTRICAL CONNECTIONS ONLY AS SPECIFIED IN THIS MANUAL. DO NOT BYPASS ANY ELECTRICAL SAFETY CIRCUITS (GROUND FAULT).

- READ AND UNDERSTAND THE MANUAL BEFORE MAKING ANY REPAIRS TO THE SeaOtter.

- DO NOT OPERATE THE SeaOtter-2 OUT OF THE WATER, EXCEPT AS PROVIDED IN THIS MANUAL.

- IF THE LEAK DETECTOR INDICATES A LEAK, REMOVE UNIT FROM THE WATER AS QUICKLY AS POSSIBLE.

- DO NOT LIFT THE UNIT BY ITS UMBILICAL CABLE, LIFT AND LOWER THE SeaOtter-2 BY MEANS OF THE HANDLE.

- DO NOT BEND THE UMBILICAL CABLE SHARPLY, A SHARP BEND COULD BREAK AN INTERNAL WIRE IN THE CABLE.

- PLUG CONTROL BOX AND MONITOR INTO A GROUND FAULT OUTLET (ON SHIP).

- BE SURE TO UNPLUG MONITOR FROM CONTROL PANEL BEFORE CLOSING COVER.

SPECIFICATIONS

DIMENSIONS/WEIGHTS:

SeaOtter ..... 23L x 16W x 12H inches ..... 43 lbs.
Control Box ..... 19L x 16W x 8.5H inches ..... 15 lbs.
Cable ..... .5 inches Dia x 250 to 500 feet ..... 30/60 lbs.
Monitor (built into case) ..... 15 inches

PERFORMANCE/DESCRIPTIONS:

Cameras/Lens ..... CCD color cameras/4mm 50 deg wide angle lens, 90 degree pan and tilt, auto iris.
Monitor ..... 10.4 inches, high resolution, ultra bright, color.
Lighting ..... Two 50w tungsten halogen (front).
..... Ultra bright LED ring (rear).
Motors ..... Four DC PM type, reversible, variable speed, proportional controlled, 6+lbs. thrust each motor, 3 knots.
Operating Depth ..... 500 feet.
Color ..... Yellow/black.
Sealing ..... Five separate housings, O-ring sealed, a leak detector in each housing, motors use “no maintenance” rotary seals.
Power Req ..... 120 vac, 5 amps, 600w max.

OPTIONS:

- Up to 500 foot cable
- Spare parts kit
- DVD recorder
- Manipulator arm
- On screen display (time, date, heading, depth, GPS)
- Scan-650 scanning sonar
- Attached metal detector (RMD-1)
- PAL camera and monitor (Europe)
- 220vac (Europe)

System Components

ROV

Cable

Control Box

The SeaOtter-2 system comes complete with the ROV, neutrally buoyant cable, and a control box with a built-in color monitor and PS2 controller.

System Operation

ROV:

The SeaOtter-2 ROV contains two color CCD cameras (one front and one rear) with 4mm (wide angle) lens. The viewing area is 50 degrees. The cameras can be panned and tilted 90 degrees for a total viewing area of 140 degrees horizontal and vertical. Depending on the amount of light, the iris will automatically open and close as required. The cameras have a wide range fixed focus lens. A switch on the control panel selects either front or rear camera, but not both at the same time. The cameras pan and tilt is controlled by buttons on the PS2 controller.

The SeaOtter-2 has four high performance motors that are variable speed and reversible. The horizontal and vertical motors are controlled by joysticks on the PS2 controller. Each motor housing is independently sealed from the main body and each of the five housings contain a leak detector that informs the operator if any moisture enters the housing.

Front lighting is provided by two 50 watt water cooled halogen bulbs. They are fully adjustable from 0 to 100 watts of lighting. Rear lighting is provided by a ring of Ultra Bright LEDs that are operator controlled for on/off.

ROV: (continued)

The two skids contain ballast weights that are used to adjust both the balance and buoyancy of the ROV in water. When properly adjusted, the ROV should sit level in the water and should be slightly positive, just positive enough so it does not sink (extra ballast weights are included.)

The ROV is pressure tested to a 1,000 foot depth prior to shipment. Operation of the SeaOtter-2 out of water is not recommended. If the **front** lights are operated out of the water for more than 10-15 seconds the water cooled halogen lights will overheat and burn the reflector. If the motors are operated out of the water for more that 5-10 seconds the motor seals will overheat and experience excessive wear. After cabling up the system a short pretest may be made of the lights and motors. The cameras and rear LED lights can or course be operated out of water. At all times caution is advised in handling the propellers.

Cable:

The umbilical cable connects the ROV to the control box. The cable is neutrally buoyant and has a connector on both ends. The system comes standard with a 250 foot cable. Additional cable can be ordered up to a total length of 500 feet (do not exceed this total length.) When additional cable is ordered it comes with a connector on both ends and performs as an extension cord. The additional cable installs between the 250 foot cable and the ROV.

The umbilical cable is approximately .5 inches in dia and contains nine wires: a coax for the video signal, two twisted pairs for transmitting and receiving control signals to the ROV, a twisted pair for power to the ROV and a spare twisted pair for options (metal detector, scanning sonar, etc). It is important that the cable be protected against damage.

Control Box:

The Control Box is the nerve center of the SeaOtter-2 system. The Control Panel (lower half) contains all the necessary switches and indicators to control and monitor the ROV. The umbilical cable to the ROV is connected to the control panel. Power and control signals are passed from the control panel through this cable to the ROV.

An off-the-shelf PS2 controller (supplied), plugs into the control panel and controls the ROV's: lights, motors, and camera movement. Wireless PS2 controllers can also be used.

The top half of the control panel contains the 10.4" ultra bright monitor which displays the live video feed from the front or rear ROV cameras (switch selectable on the control panel.)

The control box can be split apart at the hinge, by removing two pins, allowing the upper and lower parts of the control box to be separated by a short distance.

Control Box

Control Box Cover:

The control box cover contains the built-in 10.4" ultra bright monitor, a speaker, volume control, and monitor source switch.

Monitor Source Switch - A two position switch (ROV or Recorder) that selects the source of what is displayed by the monitor.

- In the ROV position the video from the ROV's cameras are displayed.
- In the Recorder position the video is from an external recorder.

Control Box Cover

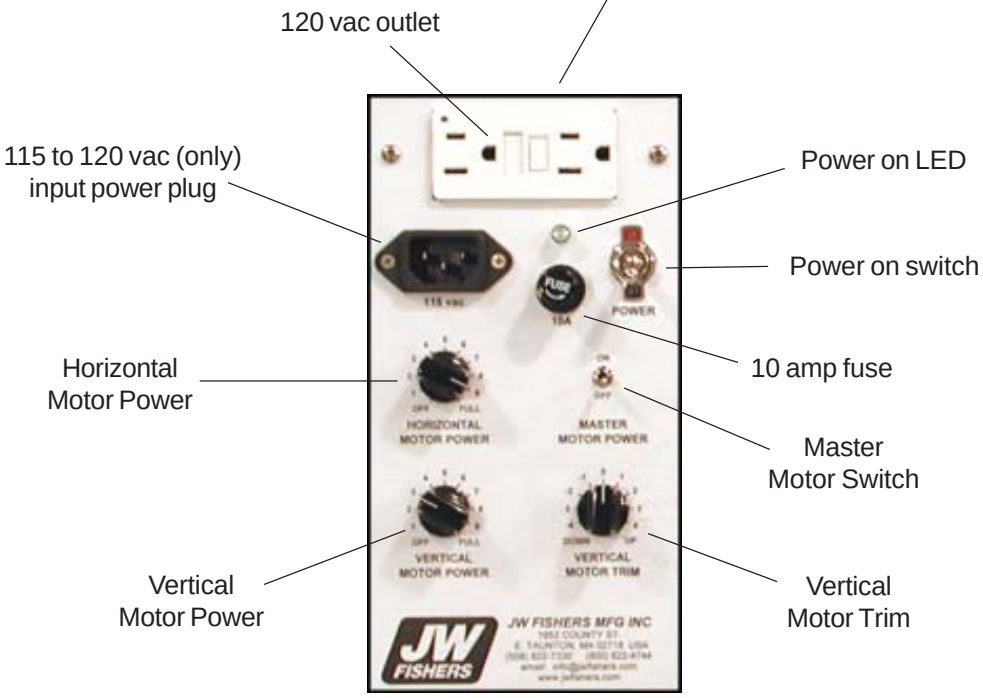
Volume Control - Adjusts the volume level from the speaker (playing a video on the monitor from an external recorder.)

Speaker - Audio, during playback, from an external recorder that is playing back a video on the monitor

Control Box: **(continued)**

Control Box Control Panel:

The Control Panel contains all the necessary switches and indicators to control and monitor the SeaOtter-2.



Power Area:

115-120 vac input power - from generator or ships power. For safety, be sure to plug into a “ground fault breaker”. If operating from for 220 vac, be sure to use a stepdown transformer (220 to 120 vac).

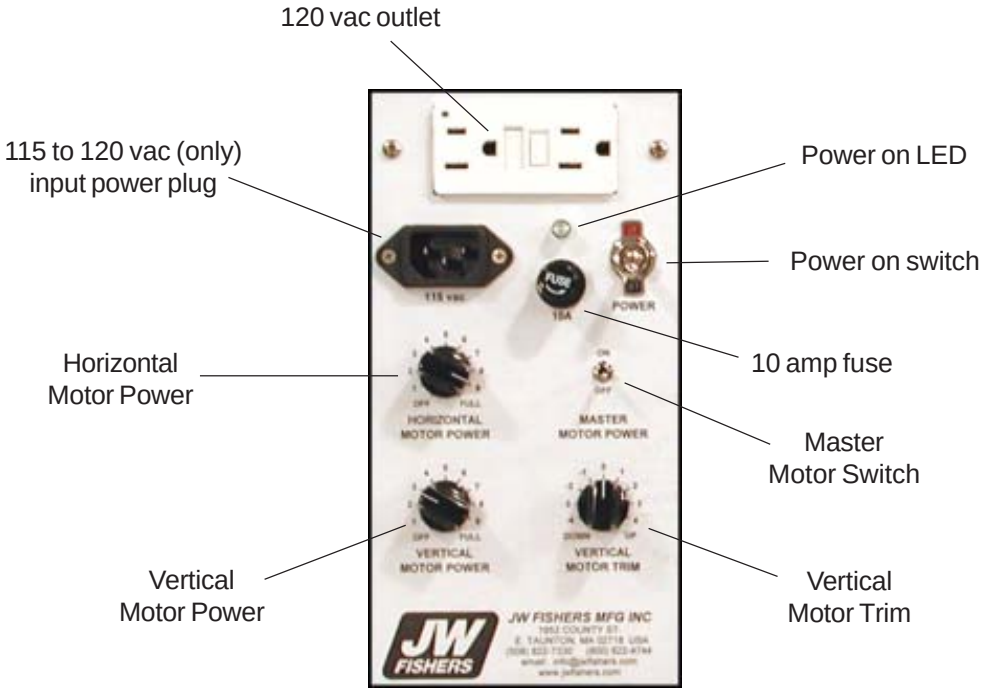
- **Fuse** - 10 amp main fuse. All power goes through this fuse. When open removes power from the system.

- **Power on switch** - Applies power to the system. All power goes through this switch.

- **Power on LED** - Illuminates when power is on.

- **120 vac outlets** - Can be used to power a second monitor or recorder.

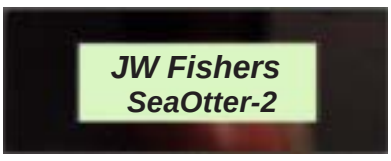
- **120 vac input power plug** - Power cord (supplied) plugs into this connector and power is supplied to the system.



Power Area: (continued)
115-120 vac input power - from generator or ships power. For safety, be sure to plug into a "ground fault breaker". If operating from for 220 vac, be sure to use a stepdown transformer (220 to 120 vac).

- **Horizontal Motor Power** - this adjustment controls the amount of power that the horizontal motor joystick can send down to the ROV. The adjustment goes from 0 to Full power. In most cases this control is set to Full. However there are times when this control should be set to a reduced power setting (operating in a small area, training in a pool, operating very close to a object).
- **Vertical Motor Power** - this adjustment controls the amount of power that the vertical motor joystick can send down to the ROV. The adjustment goes from 0 to Full power. In most cases this control is set to Full. However there are times when this control should be set to a reduced power setting (operating in a small area, training in a pool, operating very close to a object).
- **Vertical Motor Trim** - this adjustment provides trim to the vertical motors so even if the vertical joystick is centered (not being used) the motors can be set to run (up or down slowly). The adjustment goes from 0 to +/- 4. Commonly used to hold vertical position or when sitting on the bottom (vertical joystick not needed).
- **Master Motor Power** - an on/off switch that when in the off position removes all power from both vertical and horizontal motors. Normally this switch is left on. When working on the system out of water the Master Motor Power switch should be turned off for safety reasons.

LCD Readout:
The LCD readout displays data regarding the status of the system including: moisture in any housing, pan and tilt angles of the cameras, any motor overcurrent problems, and any error or communication problem.



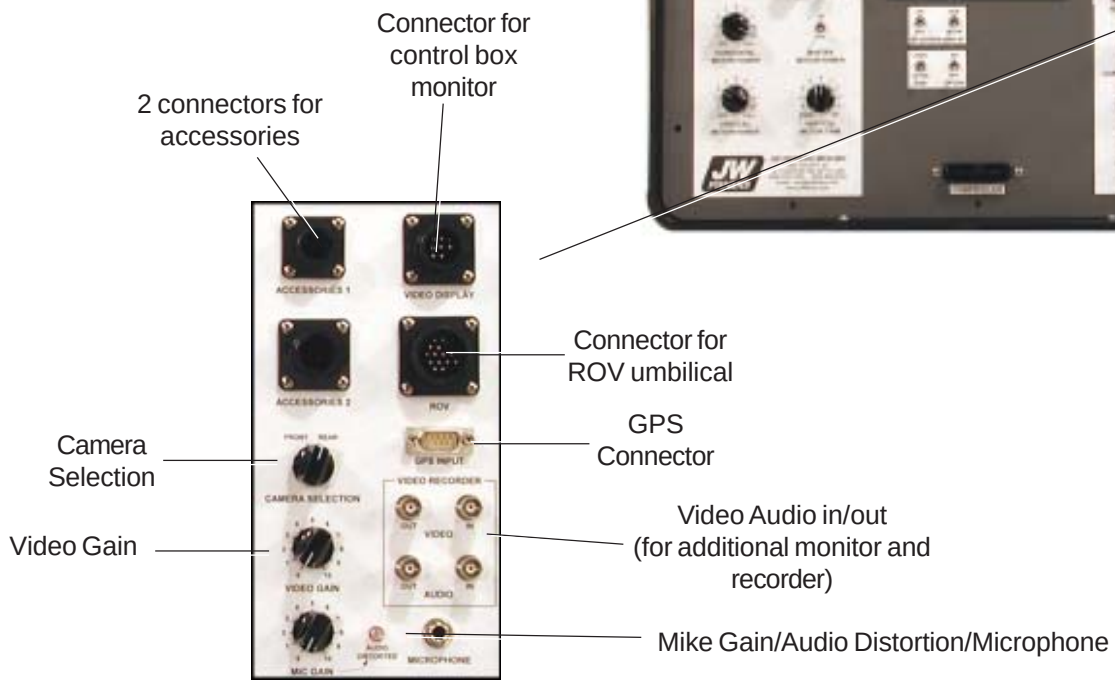
LCD Readout

Left Blank

Control Box: (continued)

Control Box Control Panel: (continued)

The Control Panel contains all the necessary switches and indicators to control and monitor the SeaOtter-2.



Cabling and Video Area:

- **Monitor** - a short cable connecting the control panel to the built in monitor in the cover. The cable carries the video signal and monitor power.

- **ROV** - the umbilical cable from the ROV.

- **Accessories**- many different accessories can be added to the ROV. The accessory connectors enable the operator to interface with the add-on accessory. The remote metal detector (RMD-1) and scanning sonar (Scan-650) are two examples.

- **Camera Selection** - a four position switch which selects which camera is to be displayed on the monitor and controlled by the joysticks.
  - Front...Turns on the front camera.
  - Rear...Turns on the rear camera.

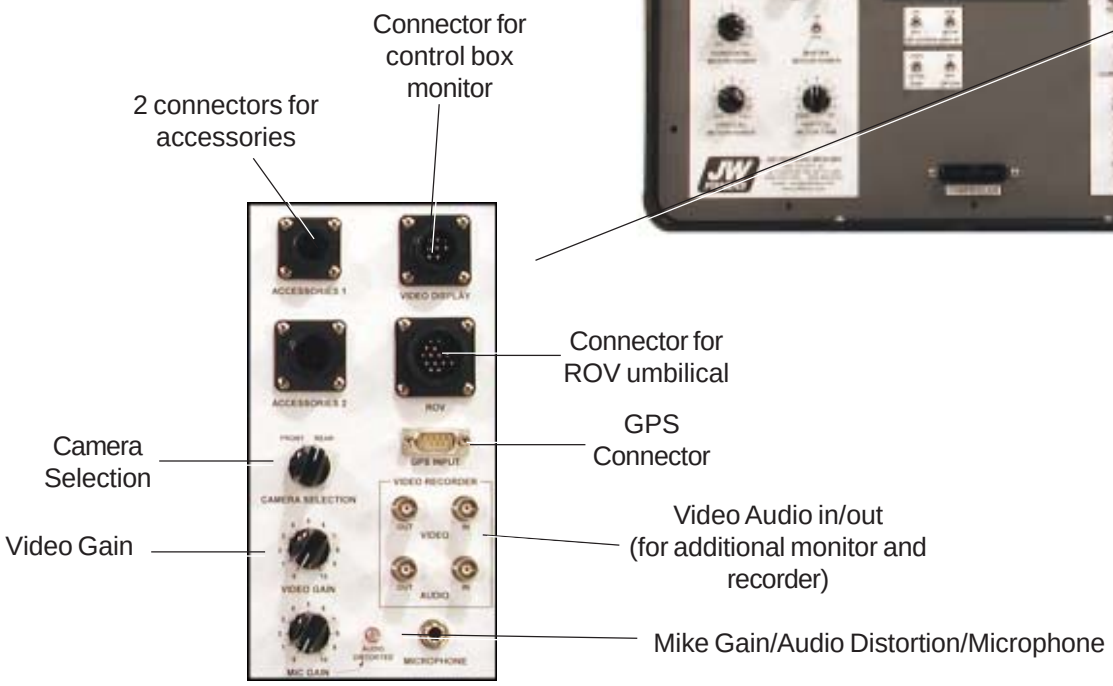
- **Video Gain** - before the video signal is sent to the monitor(s) it goes through a video amplifier. The gain is adjustable. When the water clarity is poor, adjusting the gain of the signal can have a significant impact on the quality of the displayed image.

- **Mike Gain/Audio Distortion/Microphone** - If you are recording the video from the ROV you can also record audio with the video. The loudness of the recorded audio is controlled by the Mike Gain knob. If the mike gain is set too high the audio Distortion led will flash while you are talking into the microphone. The microphone (not supplied) plugs into the microphone connector.

Control Box: (continued)

Control Box Control Panel: (continued)

The Control Panel contains all the necessary switches and indicators to control and monitor the SeaOtter-2.



Cabling and Video Area: (continued)

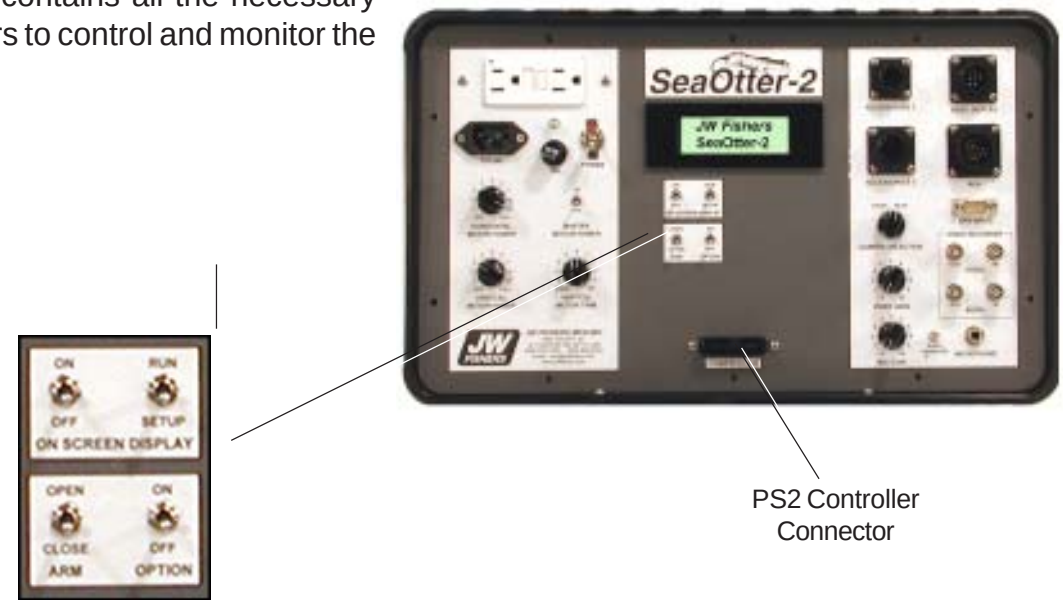
- **Audio and Video in/out** - These connectors are not used unless you are recording (recorder not supplied) or have an additional monitor.
  - Video and audio out....use these two connectors to cable to an external recorder or to a second monitor.
  - Video and audio in...use these two connectors to cable to an external recorder to play back a previously recorded video. The video will be displayed on the SeaOtters's monitor.

- **GPS** - The boat's GPS connects to the connector if the On Screen Display option was purchased. The boat's GPS position will be overlaid on the video.

Control Box: **(continued)**

Control Box Control Panel: **(continued)**

The Control Panel contains all the necessary switches and indicators to control and monitor the Seaotter-2.



Option Area:

The option area contains switches and indicators for some options.

- **On Screen Display** - When the switch is turned on; time, date, water temperature at ROV, depth, and compass heading is overlaid on video. If the video is being recorded the overlay is recorded with the video. A second switch "setup" is used to customize the overlay.
  Note: how much of the above information is displayed depends on the option purchased.

- **Arm**- a manipulator arm is available. The switch controls the open or close position of the arm.

- **Option** - spare switch for future option.

PS2 Controller Connector:

An off-the-shelf PS2 controller (supplied) plugs into the control panel and controls many of the operations of the ROV including: motors, lights, and camera movement. Wireless PS2 controllers are available and can also be used.

Control Box: **(continued)**

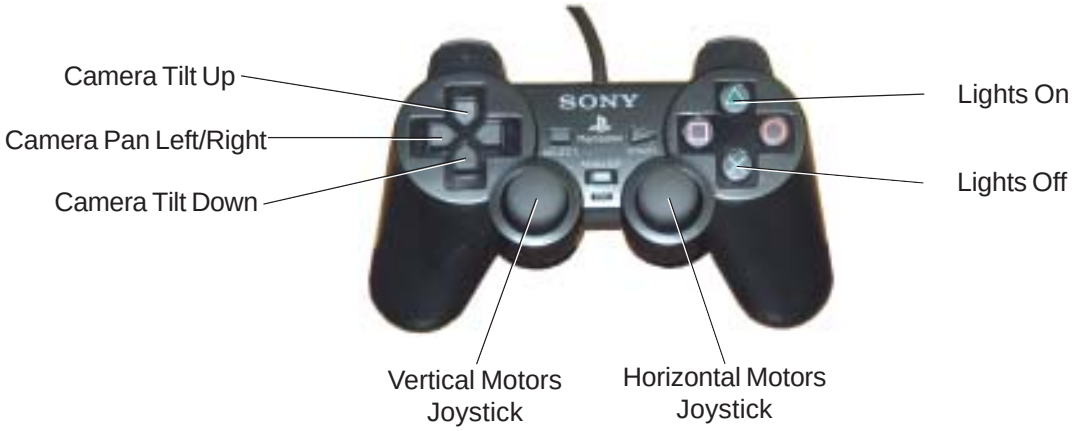
Control Box Control Panel: **(continued)**

The Control Panel contains all the necessary switches and indicators to control and monitor the SeaOtter-2.

PS2 Controller:

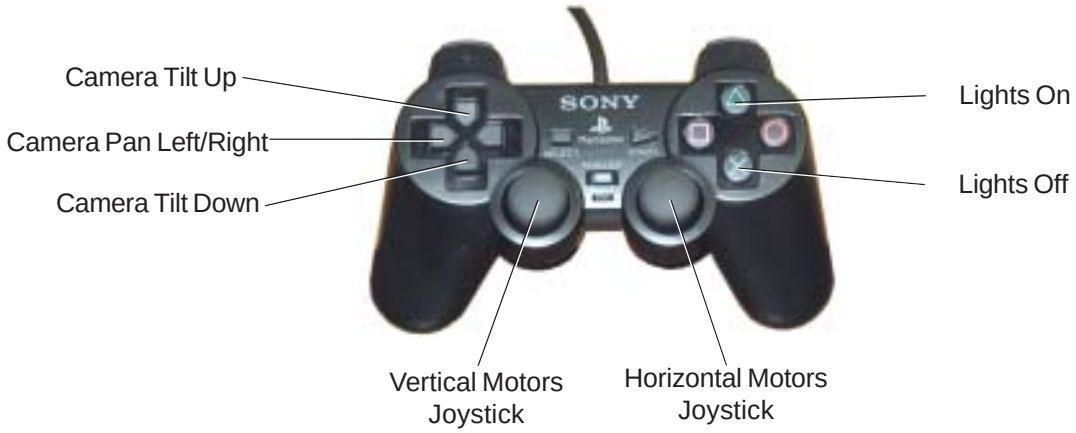
An off-the-shelf PS2 controller (supplied), plugs into the control panel and controls the ROV's: lights, motors, and camera movement. Wireless PS2 controllers can also be used.

PS2 Controller



PS2 Back View

Control Box: (continued)



PS2 Controller: (continued)

An off-the-shelf PS2 controller (supplied), plugs into the control panel and controls the ROV's: lights, motors, and camera movement. Wireless PS2 controllers can also be used

- **Camera Pan and Tilt -** two buttons control the cameras up/down movement and two buttons control the left right movement. If the button is held down the camera will continue to move until it reaches its limit in that direction.
- **Lights -** two buttons control the lights. The top button turns on the lights and the bottom button turns off the light. (**caution** - do not leave front lights on out of water, a quick test is ok). If the rear camera has been selected, the buttons turn the LED light cluster on/off.
- **Horizontal Motor Joystick -** controls the horizontal motors. Push straight forward and both motors drive the ROV forward (proportional to the amount of forward movement of the joystick.) The maximum drive available is controlled by the Horizontal Motor Control knob setting on the control panel. If the joystick is moved forward and to the left or right then motor power is reduced in one motor so that the ROV will turn in the direction of the joystick movement.

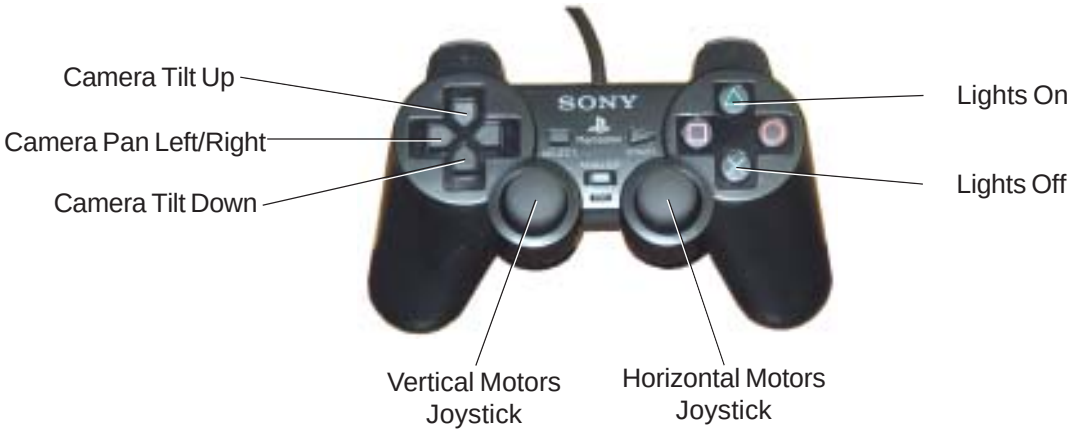
  If the joystick is pulled back, then the motors go in reverse and the ROV goes backwards and can go left or right as it is backing up.

  If the joystick is moved directly left or right, the horizontal motors go in opposite directions which causes the ROV rotate left or right.
- **Vertical Motor Joystick -** controls the vertical motors. Push straight forward and both motors drive forward (proportional to the amount of forward movement of the joystick.) The maximum drive available is controlled by the Vertical Motor Control knob setting on the control panel. If the joystick is moved forward and to the left or right then motor power is reduced in one motor so that the ROV will continue up, but will also move sideward in the direction of the joystick movement.

  If the joystick is pulled back, then the motors go in reverse and the ROV goes down and can go left or right as it is going down.

  If the joystick is moved directly left or right, the vertical motors go in opposite directions which causes the ROV to move left or right with little change in depth.

Control Box: (continued)



PS2 Back View

PS2 Controller: (continued)

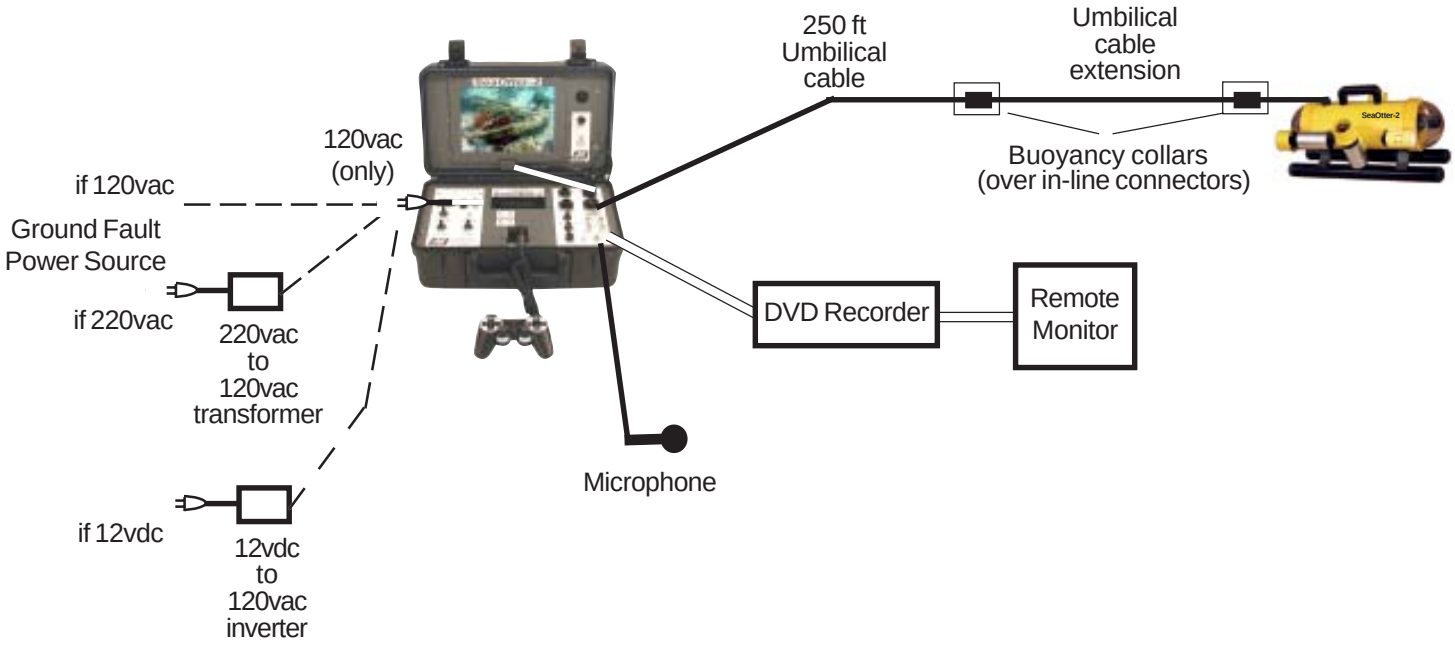
An off-the-shelf PS2 controller (supplied), plugs into the control panel and controls the ROV's: lights, motors, and camera movement. Wireless PS2 controllers can also be used

- **Horizontal and Vertical Motor Low Power Buttons -** when depressed, and held depressed, reduces the power available to the motors by 50%. Very useful when the ROV is working close to an object. If the power was already reduced by the control panel knob, then these buttons reduce the power available even further.

We are ready to cable up the system

Cabling the SeaOtter-2

The drawing below shows the cable connections for the SeaOtter-2.



Step 1.
After opening the control box cover, plug the cable from the cover into the Video Display connector on the control panel. Be careful the cover does not fall forward (closed) after the cables have been plugged into the control panel. The cover can be removed by removing (pull out) the two pins in the hinge.

Step 2.
Attach the umbilical cable to the ROV and to the control box. Be careful while handling the connectors. The pins or internal wiring can be broken if twisted or bent sharply. An umbilical extension cable can be ordered if needed, the total length cannot exceed 500. A buoyancy collar goes over the connectors.

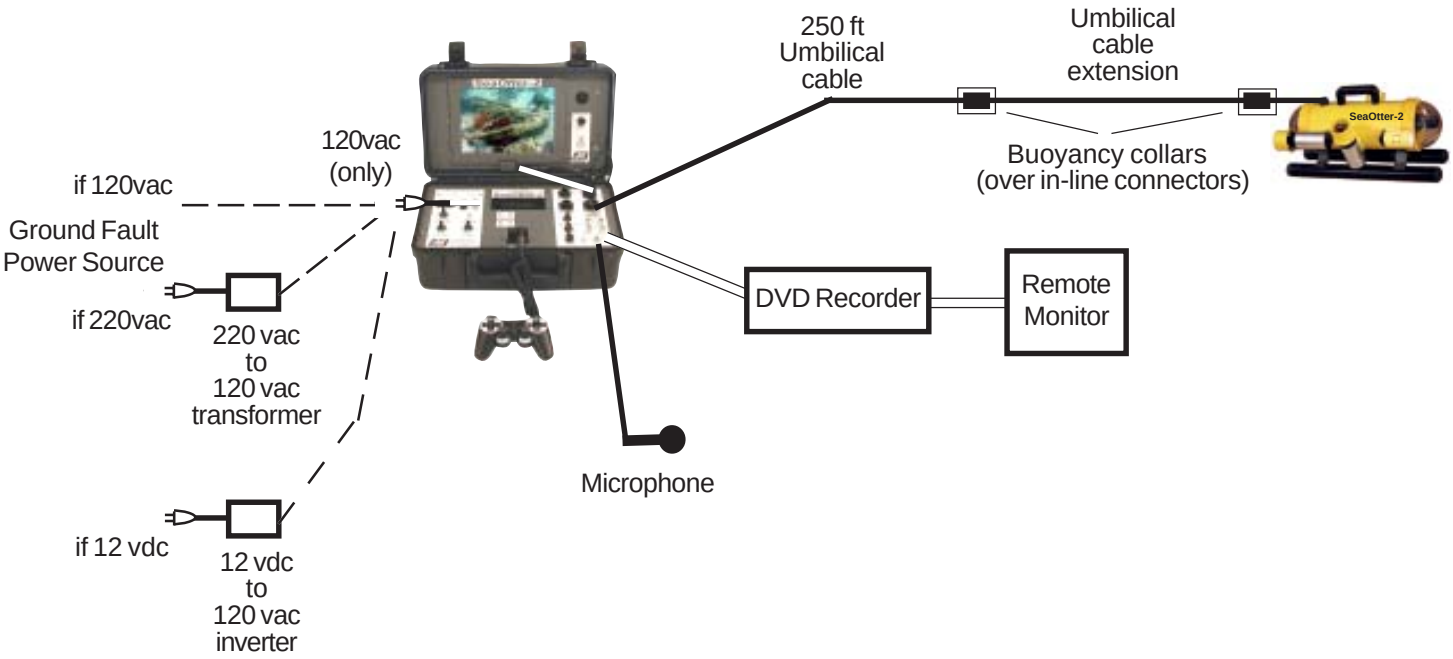
Step 3.
If the video is going to be recorded, then connect the recorder (not supplied by JWF) to the Video Out connector on the control panel. Also include a cable between the recorder and Audio Out connector on the control panel if a microphone (not supplied by JWF) is being used. The microphone has it's own connector on the control panel.

Step 4.
If a remote monitor is being used, connect the monitors cable to the Video Out connector on the control panel. Monitor power can be plugged into control panel outlet (120 vac).

If both a recorder and a remote monitor is being used, then connect the recorder cable to the Video Out connector (use both the video and audio cables) and connect the monitor to the DVD output connectors. Monitor and recorder power can be plugged into control panel outlet (120 vac).

Cabling the SeaOtter-2 (continued)

The drawing below shows the cable connections for the SeaOtter-2.



Step 5.

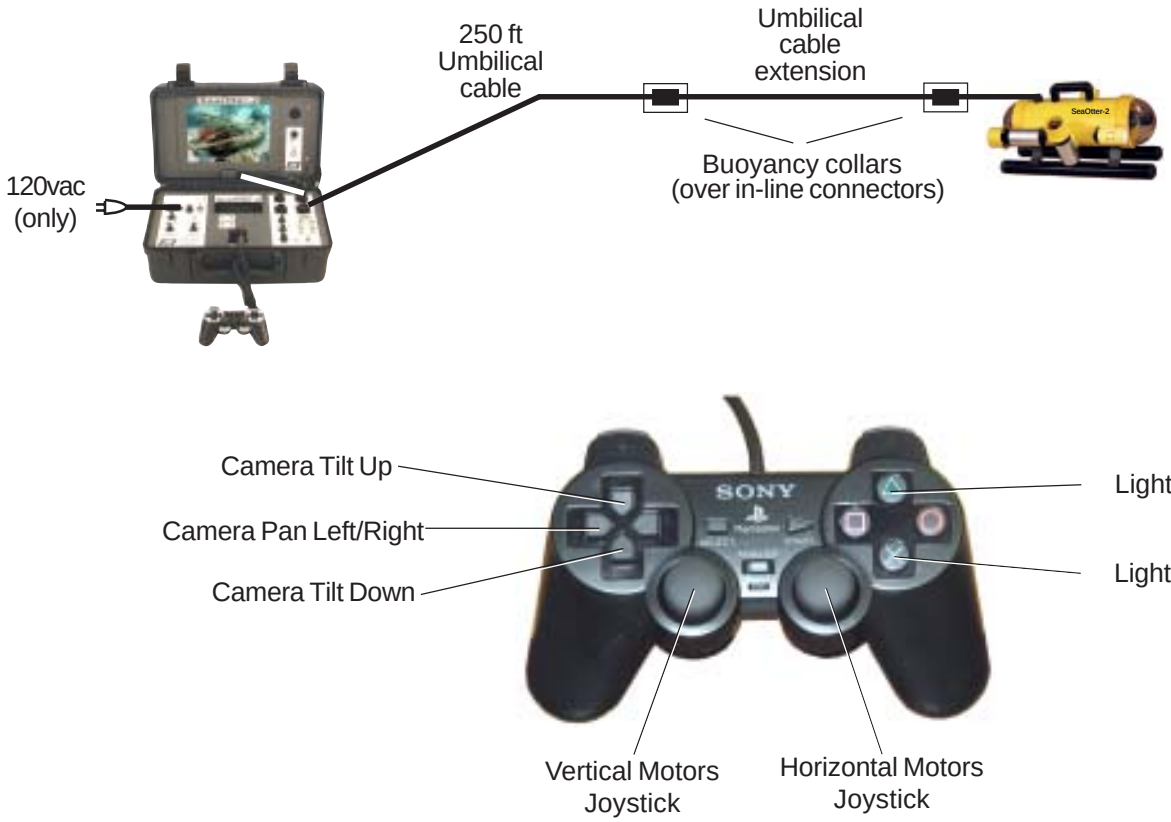
Connecting power (be sure Main Power Switch on control panel is turned off) :

- Never connect any voltage other than 115 - 120 vac to the control box.
- The best source of 120 vac is a generator (1,000 watt or higher).
- If only 220 is available use a 220 to 120vac step down transformer (1,000 watt, JWF can supply).
- If only 12 vdc is available use an 12 vdc to 120 vac inverter (1,000 watt, JWF can supply).
- For safety reasons, a ground fault outlet should be used.

We are ready to power up the system

Powering up the SeaOtter-2

The first power up and checkout will be done out of water (do not turn on front lights or run motors for more than a second or two.)



First test run (out of water):

1) Turn off the Master Motor Switch on the control panel.

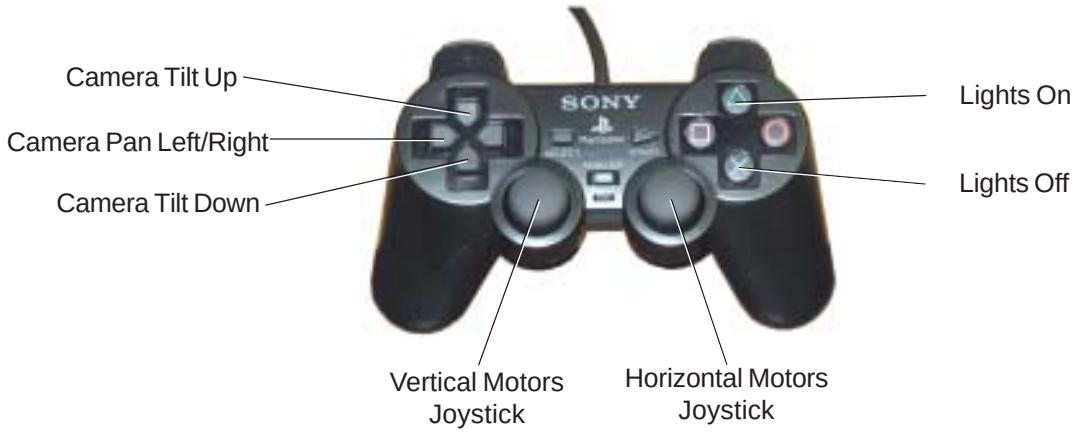
2) Rock each propeller back and fourth (1/4 turn) a few times to insure motors are free to turn (if the ROV has been in storage the seals can stick, this rocking frees the seals.)

3) Turn on the Power On Switch on the control panel.

4) The monitor will be blank and the control panel readout will display: **JW Fishers SeaOtter-2**

5) After 5-10sec delay (internal self check), the monitor will display the video from the selected camera. The System in ready to go.
Note: if the video does not display, check the Monitor Source switch on the control box cover. It should have ROV selected as the source.

First test run (out of water): continued



6) Select the rear camera (camera switch on control panel).

7) Using the pan and tilt buttons on the PS2 controller (left set of buttons), move the camera left/ right and up/down. Note that the control panel readout displays the position of the camera.

8) Turn on/off the LED light ring by pressing the on and off buttons on the PS2 controller (the right set of buttons).

9) Select the front camera (switch on control panel). Using the pan and tilt buttons on the PS2 controller (left set of buttons), move the camera left/right and up/down. Note that the control panel readout displays the position of the camera.

10) Select the front camera (camera switch on control panel).

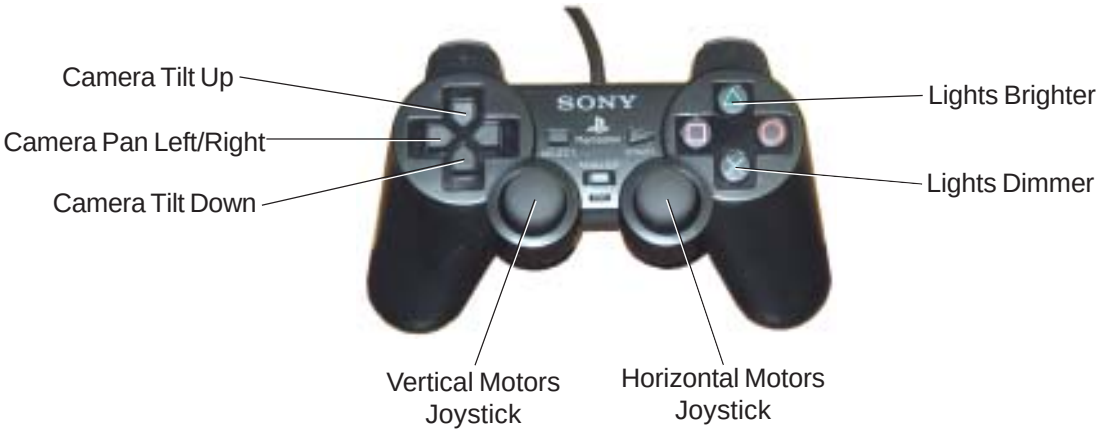
11) Using the pan and tilt buttons on the PS2 controller (left set of buttons), move the camera left/ right and up/down. Note that the control panel readout displays the position of the camera.

CAREFUL WITH THE NEXT STEP

(heat can damage the light housings if lights are left on for more than 5-10 seconds out of water)

12) Momentarily turn on the front lights, and then off, by pressing the on and off buttons on the PS2 controller (the right set of buttons).

First test run (out of water): continued



13) On the control panel, set the Horizontal and Vertical motor power controls to half power (5).

14) Set the Vertical Motor Trim control to midway (0).

KEEP HANDS/FINGERS AWAY FROM MOTORS

15) Turn on the Master Motor Switch (allows power to the motors).

CAREFUL WITH THE NEXT STEP

(motor seals can be damaged if the motors are left on for more than 5-10 seconds out of water)

16) Move the horizontal and vertical joysticks (for a few seconds) to insure the motors are running.

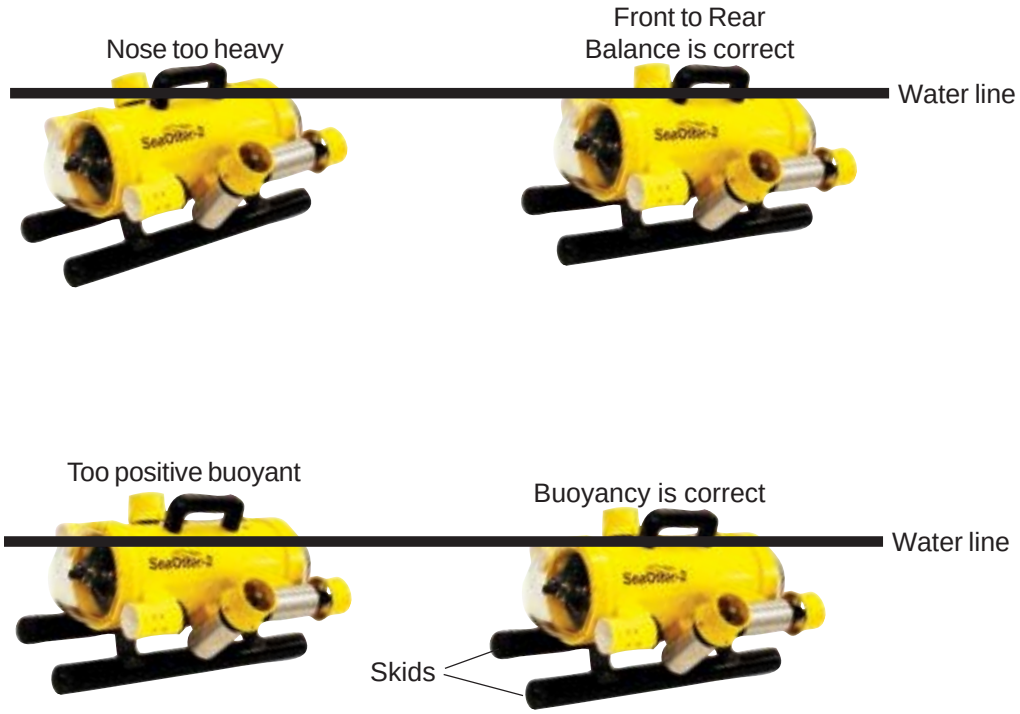
17) Turn off the Master Motor Switch.

TIME TO GET THE ROV WET

Water Operation:

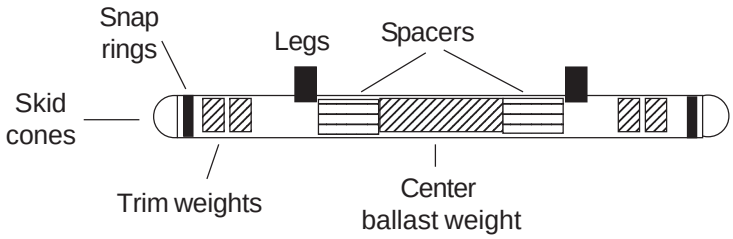
Balancing the SeaOtter-2

The SeaOtter-2 was designed for ease of operation, however, prior to its use it must be balanced and it's buoyancy adjusted for it to perform correctly. Proper balance is very important in order to insure proper flight characteristics. If the SeaOtter-2 is nose heavy, it will dive as it goes forward; and if it has a heavy side, it will exhibit unstable side motion characteristics. If it's buoyancy is too positive it will be difficult to drive underwater without it coming to the surface. If it's balance is correct, it will float level in the water. If it's buoyancy is correct, the water line will be just above the top of the body..



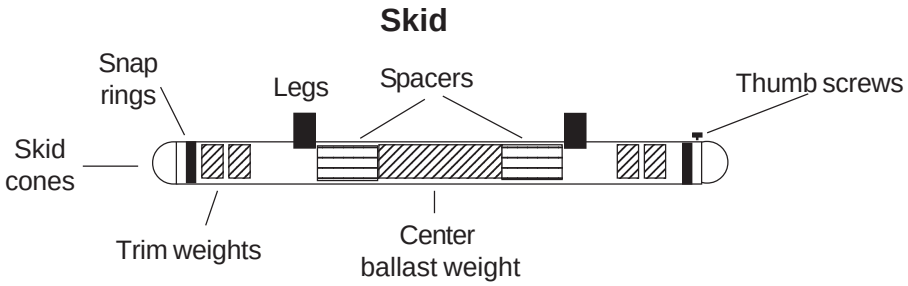
The SeaOtter-2 comes equipped with ballast lead installed in the skids. Additional small "fine balancing" weights are also included in the SeaOtter's shipping box. In order to properly "fine tune" the balance and buoyancy of the SeaOtter, you must first place it in the water with the cable attached and the buoyancy collar over the in-line connector. Be sure to be in the same kind of water (fresh/salt) as where you will be operating it. The SeaOtter-2 should submerge to an almost neutrally buoyant state, evenly balanced from side to side, and front to rear. When properly balanced, the SeaOtter-2 should be slightly positive buoyant.

Skid



Water Operation (continued):

Balancing the SeaOtter-2 (continued)



To change the weight for "fine balancing" the SeaOtter-2. Remove the small thumb screw holding the skid cone on, and remove the cone. Inside the skid is a plastic snap ring that holds the weights that are already in place. If it is necessary to reduce the weight, pull out the plastic snap ring and remove some of the internal weights. If additional weight is necessary, slide one of the fine trim weights into each end of each skid. Be sure to install the cones back into the skids to observe the total effect of the added weight. Any type of weight may be used to balance the SeaOtter-2.

When the SeaOtter-2 is properly balanced, a slight downward push in the center area of the ROV sends the unit down and it very slowly comes back to the surface. A few extra minutes performing this procedure will insure impressive trouble-free flying.

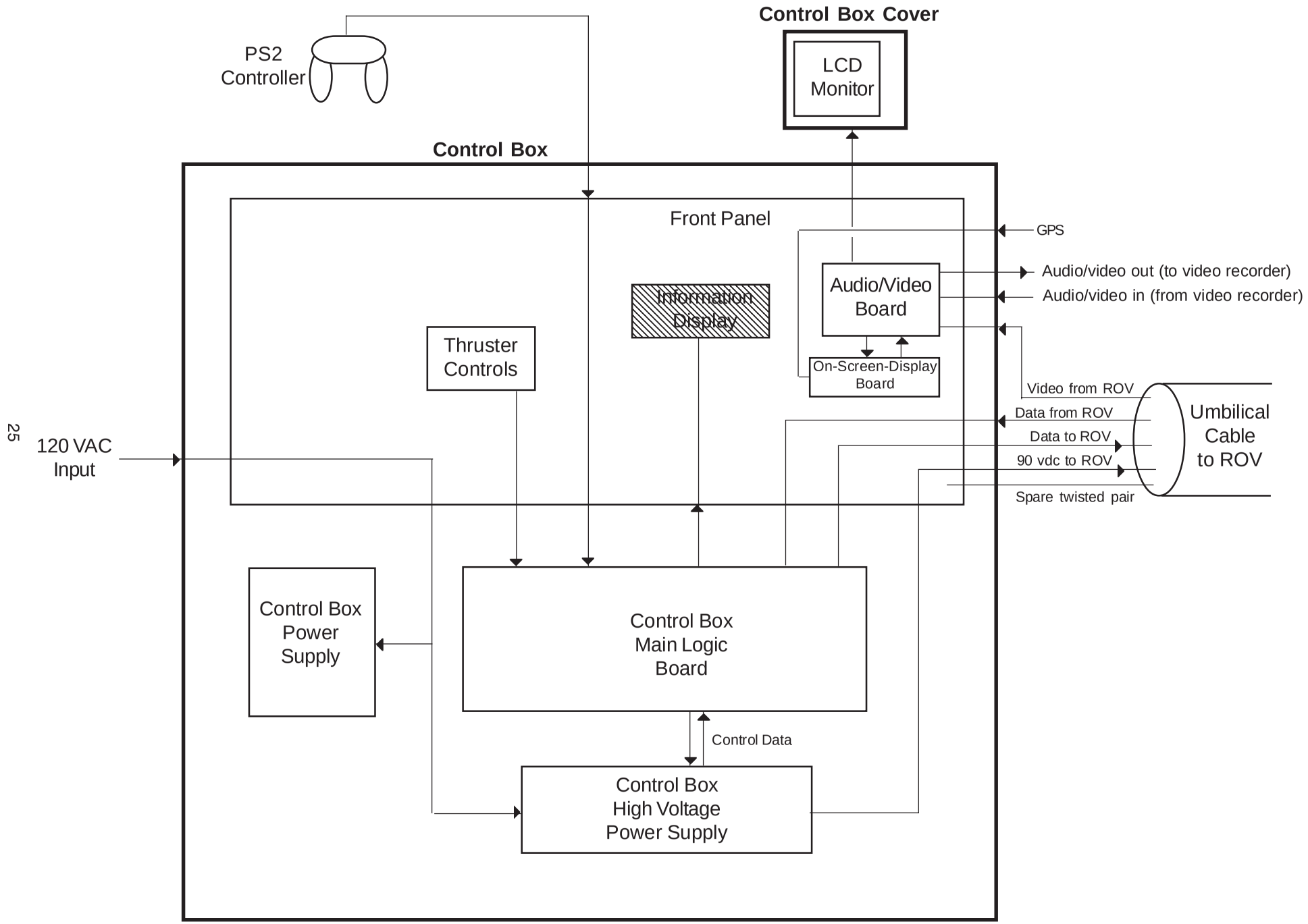
It is recommended that before going into open water with the ROV, that several hours be spent at a local pool or at a body of water that has good visibility, so that you can watch the ROV while you work the joysticks.

If you have problems or questions at any time please fax, call, or email the factory

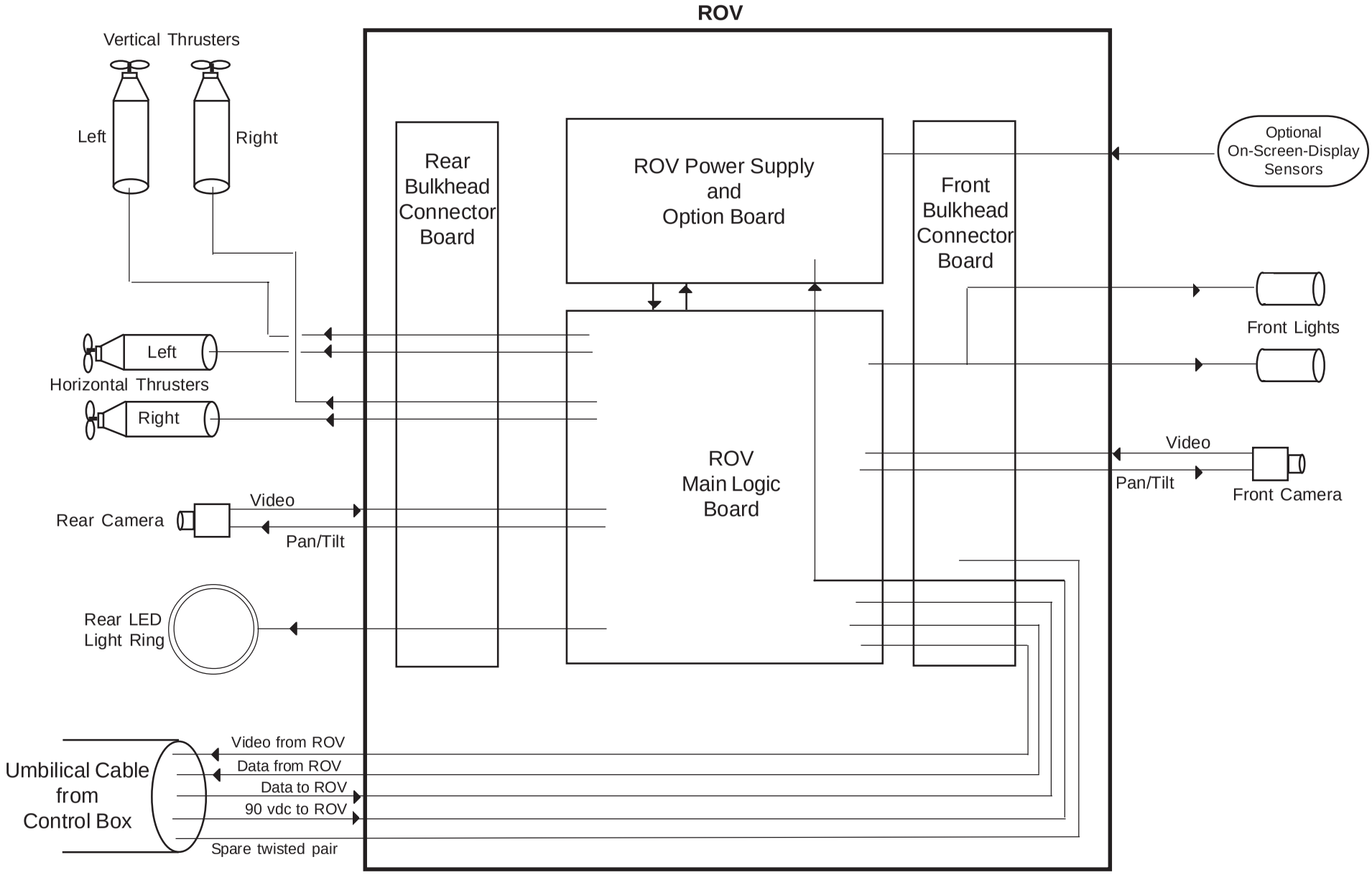
Launching and retrieving the SeaOtter-2

The SeaOtter-2 is a rugged piece of equipment, however, it should be treated with care. Use the handle, not the motors or lights, to lift or lower the SeaOtter-2. Never try to lift or lower the unit by holding it by the umbilical cord, this may result in damage to the signal or power cable. For safety reasons, insure that all electrical connections are not exposed to water and that the control box is plugged into a ground fault outlet.

SeaOtter-2 Control Box Block Diagram



SeaOtter-2 ROV Block Diagram



MAINTENANCE

Your SeaOtter-2 was designed to be maintenance free. The ROV, cable, and control box are constructed of corrosive resistant materials. After operating in salt water the ROV should be rinsed off in fresh water. If the ROV has not been used for awhile; move the props back and forth to insure the seals are not sticking (be sure power is turned off and the unit is unplugged). The equipment should be stored in a cool, dry place. Do not allow equipment to sit in the hot sun.

LIMITED WARRANTY

Your SeaOtter-2 underwent constant inspection during assembly to insure many years of trouble free performance. The system is warranted for TWO FULL YEARS from the date of purchase. During this period the SeaOtter-2 will be repaired free of charge should a failure occur due to materials or workmanship under normal use.

The warranty does not cover lost equipment, broken cables or connectors, or damage due to dropping or general misuse. The warranty covers JW Fishers equipment only. JW Fishers will not be liable outside of the remedies stated above.

Should service be required, write or phone us explaining the nature of the problem. Most problems can be isolated over the phone and the correct replacement parts sent to you. The system is field repairable at the board level. Do not attempt to troubleshoot or repair the board. We will swap boards; we will not send out schematics or parts for the boards.

RETURNING EQUIPMENT FOR REPAIR

If your SeaOtter-2 should need service, please call, fax, write, or e-mail: info@jwfishers.com, phone (508) 822-7330, or fax (508) 880-8949 the factory for instructions. We do not require authorization for the return of equipment. If you have a problem with your ROV and would like to have it checked out and repaired at the factory, simply pack it well and return it with a brief note describing the problem. Customer pays shipping costs.

Be sure to include your return address and telephone number on the note. When returning equipment from outside of the US, to avoid Custom problems when arriving in the USA, contact the factory for specific instructions regarding shipping.

Contact the factory for instructions should you encounter any problems.

JW FISHERS MFG INC
1953 COUNTY ST.
E. TAUNTON, MA 02718 USA

(508) 822-7330; (800) 822-4744; FAX (508) 880-8949
Email: jwfishers@aol.com WEB: www.jwfishers.com

SeaOtter-2 Spare Parts Option

The SeaOtter shipped with an assortment of O-rings and hardware. Additional spare parts, which are listed below, are available by calling or writing the factory. There is a Basic Spare Parts and an Enhanced Spare Parts kit available.

Basic Spare Parts Kit:

1. (1) Dome
2. (2) Dome O-rings
3. (6) Dome screws 6-32 x 3/4" AH
4. (2) Motor housing O-rings
5. (1) Complete Motor, Cone, Seal, Kort nozzle, Prop.
6. (4) Motor housing screws 4-40 x 1/4" PH
7. (2) Lamps & Sealant
8. (1) Lamp housing with cap
9. (1) Light housing holder
10. Light housing screws; (2) 10-32 x 3/4" AH and (2) 10-32 x 3/4" FH
11. (1) End leg (drilled for On-Screen Display)
12. (2) End leg screws 10-32 x 1/2" AH
13. (4) #10 Flat washers
14. (4) #10 Lock washers

Enhanced Spare Parts Kit:

ALL THE ITEMS IN THE BASIC KIT PLUS:

15. A second complete Motor, Cone, Seal, Kort nozzle, Prop.
16. (2) More lamps for a total of four.
17. (2) Rotary seals
18. (8) 1/16" x 1/2" Spring pins

Connection to the Optional Sony VRD-MC10 DVD Recorder

SeaOtter-2 Control Box

Top Panel

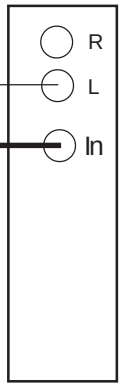
Side Panel

Sony DVD Recorder

To Record to DVD

Video Out

Audio Out



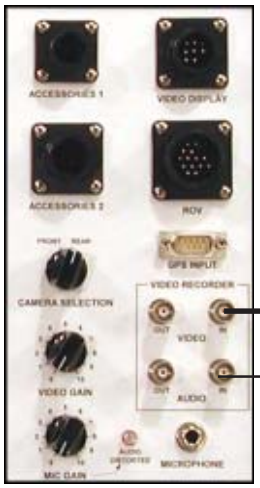
Audio in

Video in

Side Panel of DVD Recorder

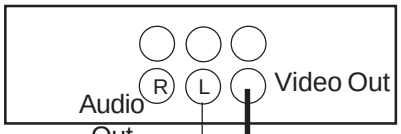
NOTE:

1) Audio Record and Playback is from Left (L) Channel Only
2) If you are not using a microphone, there is no need to connect the audio cable.



To Play Back from DVD
(Be sure to put SeaOtter-2 Monitor Source Switch on "Recorder")

Top Panel of DVD Recorder



Video

Audio

See Sony manual for operation of the DVD Recorder