The Freedivers Recovery Vest Mark II-S
User Manual V6

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This manual and the accompanying on-line videos each complement the other. For a complete understanding of how to use your FRV, it is mandatory that you both read this manual and view the 6 video chapters. We suggest that you make a quick review of the manual so that the warnings can be placed into context when you study a second time. (http://www.youtube.com/user/OceanicRecoveryVests)
The Freedivers Recovery Vest Mark II-S
I. USER AGREEMENT AND WARRANTY FOR THE FREEDIVERS RECOVERY VEST

The FRV is designed to deliver the freediver, who exceeds self-set parameters, to the surface in a face-up position where recovery and rescue attempts may be possible. There is no guarantee that the diver will be able to surface, with or without the FRV. There could be obstructions in the path (e.g., overhead seaweed, other divers, or boats) that could prevent surfacing. The FRV is only intended to inflate when the user’s parameters are exceeded. There is no guarantee of survival.

A. You Assume Risks and Responsibilities

Freediving is an inherently dangerous and risky activity. Even with the best training, planning, and equipment, you may be injured or you may die. If you choose to participate in freediving, you accept the risk of injury or death on behalf of yourself, your heirs, beneficiaries, trustees, successors, assigns, partners and executors. It is your responsibility to take all necessary steps to reduce these risks. Therefore, it is your sole responsibility to obtain appropriate training, to conduct appropriate pre-dive tests, and obtain maintenance and check appropriate diving equipment, to dive only within your abilities and experience, and to always dive with a capable buddy.

Note about freediver blackout: It is important to understand that the FRV will NOT prevent freediver blackout (FB), nor is it designed to prevent FB. FB occurs when the level of oxygen in the brain decreases below the level necessary to support consciousness. Only good diving practices, fitness and good judgment will prevent FB. FB may occur under the water during any phase of the freedive and it may also occur on the surface immediately after ascent.

B. IMPORTANT NOTICE

THIS OCEANIC SAFETY SYSTEMS LLC (OSS) FRV USER AGREEMENT AND WARRANTY (“AGREEMENT”) IS AN AGREEMENT BETWEEN YOU AND OSS. YOUR USE OF THE FRV IS SUBJECT TO THE TERMS AND CONDITIONS SET OUT IN THIS AGREEMENT. THIS AGREEMENT ALSO SETS OUT OSS’S WARRANTY OF THE FRV, EXCLUSIONS AND LIMITATIONS OF OSS’S LIABILITY TO YOU, AND OTHER IMPORTANT PROVISIONS.

IF YOU DO NOT AGREE WITH ANY TERM OF THIS AGREEMENT, YOU MUST NOT USE THE FRV. YOU MUST READ THE ENTIRE FRV USER MANUAL AND VIEW THE TRAINING VIDEOS AT: http://www.youtube.com/user/OceanicRecoveryVests. INCORRECT USE OF THE FRV OR ITS ACCESSORIES WILL INVALIDATE THIS WARRANTY AND CAN CAUSE PERMANENT DAMAGE TO THE FRV AND/OR ITS ACCESSORIES AND CAN CAUSE YOU SERIOUS INJURY OR DEATH. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE AND COUNTRY.

C. Initial Return Policy

You may return the unused FRV within 30 days after the date you receive the FRV for a complete refund less shipping and handling. Before you use the FRV, you agree to thoroughly read and understand the User Agreement, the Warranty, and the User Manual and watch the YouTube Channel training videos at: http://www.youtube.com/user/OceanicRecoveryVests. When you use the FRV, you have agreed to the User Agreement and Warranty. Once used, the FRV may not be returned.
D. Warranty Information

NOTE: The original purchaser is automatically registered. If you are not the original purchaser, please consult the OSS website: www.oceanicss.com to validate your warranty and to update warranty registration information within 15 days of transfer. All warranty transactions must be accompanied by proof of original purchase. Be sure to save your sales receipt and present it whenever you return your FRV for warranty service or when selling your FRV to another person. The receipt contains the FRV’s serial number.

Limited Lifetime Warranty Limitations and Exclusions: The Warranty Is Subject to the Following Limitations and Exclusions:

1. Limited 5-year Warranty (Excludes Batteries and the Vest Soft Parts)

Your FRV must be used in accordance with the FRV User Manual. The Warranty does not apply to defects or damage caused by: (i) misuse, neglect or improper or rough handling (including punctures, bending, compressing or dropping of the FRV); (ii) any use of the FRV not in accordance with the FRV User Manual; (iii) using the FRV with or connecting the FRV to any product, accessory software and/or service not manufactured, supplied or approved by OSS; (iv) normal wear and tear; or (v) accidents, fire, power changes, other hazards, acts of God and other causes beyond the reasonable control of OSS. Cosmetic damage(s), such as scratches, nicks and fraying are not covered under warranty except when the product is new, out of the original packaging. This warranty does not extend to the FRV or its accessories used for rental, commercial or military purposes. The Warranty will be void if: (i) the FRV has been opened, modified or repaired by any person other than OSS; (ii) the FRV’s serial numbers have been removed, erased, defaced or altered in any way or is illegible, as determined by OSS in its sole discretion; or (iii) the FRV has been exposed to chemical products, including, but not limited to, solvents and insect repellents; (iv) This product has been used in excess of 100 meters (328 feet) or in unmanned submersions including, but not limited to, submersions in an unmanned vehicle or on a rope, (v) damaged by accidents, fire, power changes, other hazards, acts of God and other causes beyond the reasonable control of OSS. Only the FRV remote communicator, the actuator and the vest have been designed for underwater use. Never dive with the charger connected to the FRV. Doing so will damage the accessories and/or the FRV, and will also void the Warranty.

Warranty coverage on your FRV covers the product for 5 years subject to the conditions listed above and utilizes a prorated replacement policy below. OSS warrants to the purchaser for 5 years, from the date of shipping, that the product will be free from defects in materials and workmanship, provided that it is subjected to normal use, proper care and prescribed service subject to the limitations listed above. Some components may be replaced with another component with a different serial number. The replacement component will be either completely re-manufactured and tested like new, or at our option, we will make the replacement with new components.
1 a. FRV Components Replacement—Actuator and Remote

FRV products that malfunction due to material or manufacturing defects will be replaced by OSS. In fulfillment of the Warranty, OSS may, at its sole discretion, use parts that are new, equivalent to new or reconditioned, or may provide a new, equivalent to new or reconditioned FRV in replacement of the FRV you have returned.

1 b. FRV Lithium Ion Battery Warranty Limitations and Exclusions 2-year limited Warranty

The Lithium Ion Battery Warranty is subject to the following limitations and exclusions:

(i) The Battery Warranty does not apply if the FRV is recharged while in direct sunlight or while exposed to temperatures in excess of 45°C (113°F) or while using a charger other than the charger supplied with the product.

(ii) The Battery Warranty does not apply to battery failure caused by: (a) misuse, neglect or improper or rough handling (including punctures, bending, compressing or dropping of the FRV); (b) any use of the FRV not in accordance with the FRV User Manual; (c) use of the FRV with or connection of the FRV to any product, accessory, software and/or service not manufactured, supplied or approved by OSS; (d) accidents, fire, power changes, other hazards, acts of God and other causes beyond the reasonable control of OSS.

You are responsible for ensuring that the battery in your FRV is adequately charged before each dive. The Warranty Period is the two (2) year period commencing on the date of shipment of the FRV. In the event the battery fails, OSS’s sole liability and obligation to you, and your sole right and remedy against OSS, is for OSS, at its option, to replace the battery according to the prorated basis below. The condition of the battery for purposes of prorating replacement costs is to be determined solely by OSS. See page 12 for the optimal use and care of the battery.

Prorated values for the Lithium ion battery:

(i) Like new and less than 1 year old—OSS pays 100%, customer pays 0%.
(ii) Slightly used and less than 2 years old—OSS pays 50%, customer pays 50%.
(iii) More than 2 years old—customer pays 100% of replacement cost.

Out-of-Warranty Battery Replacement

The FRV battery can only be replaced or repaired by OSS. OSS offers a battery replacement service for a fee, which will be available for a period of a minimum of (10) years from the original date of purchase of the FRV.

1 c. FRV Vest soft parts: 2-year limited Warranty and Prorated values for replacement

The FRV soft parts, defined as actuator pouch, sleeve, straps and inflation bladder are the least durable and the most vulnerable parts subject to potential user abuse. Therefore, the warranty period is less than other FRV components. To extend the utility of the soft parts, be sure to carefully observe handling and cleaning of your FRV components. These parts will be replaced on a pro-rated basis as determined by the date of shipment of the FRV and the condition of the parts as determined solely by OSS.
Pro-rated value for Vest Soft Parts:

(i) Like new and less than 1 year old—OSS pays 100%, customer pays 0%.
(ii) Slightly used and less than 2 years old—OSS pays 50%, customer pays 50%.
(iii) Very used and less than 2 years old—OSS pays 25%, customer pays 75%.
(iv) After 2 years or when worn out—OSS pays 0%, customer pays 100%.

2. Warranty Procedure

If you believe you have a warranty claim with respect to the FRV, please consult the on-line help resources available at www.oceanicss.com or the FRV User Manual before submitting your warranty claim and seeking warranty service. OSS will perform its warranty obligations. You are responsible for prepaying all shipping costs (including insurance) incurred when sending the FRV to OSS and for returning your repaired or replacement FRV to you.

3. Transfer of Your FRV

You agree not to sell, give, or lend your FRV, or otherwise permit any person to use your FRV, unless that person has agreed to this User Agreement and Warranty, read the User Manual and watched the on-line training videos. You may sell, give, or lend your FRV to another person, provided that you give that person this Agreement at the same time and notify them that by using the FRV, they agree to be bound by this User Agreement and Warranty. You also agree to give any person to whom you give or sell your FRV, simultaneously with the FRV, proof of your date of purchase of your FRV, without which they will not be entitled to submit a claim under the Warranty. It is important to have the purchaser register their ownership with OSS so that OSS may communicate directly with them regarding offers, upgrades and safety information regarding the FRV and so that we can record the FRV serial numbers for the current owner. This information is important for communication for such things as product updates, notices or for recalls.

4. Terms of Warranty and User Agreement Apply to Borrowers, Transferees, Assigns, Users

The terms of this User Agreement and Warranty are binding on all transferees, buyers, assigns, users and borrowers of the FRV, their heirs, successors, executors, trustees, and beneficiaries.

5. Personal Injury or Death

YOU AGREE THAT YOU UNDERSTAND AND ACCEPT ALL RISKS ASSOCIATED WITH FREEDIVING, AND THAT OSS, ITS OWNERS, MANAGERS, PARTNERS, AGENTS, REPRESENTATIVES, HEIRS, SUCCESSORS, BENEFICIARIES, ASSIGNS, EXECUTORS, TRUSTEES AND OFFICERS ARE NOT LIABLE TO YOU OR ANY OTHER PERSON, INCLUDING, BUT NOT LIMITED TO, YOUR HEIRS, BENEFICIARIES, TRUSTEES, SUCCESSORS, ASSIGNS, PARTNERS, EXECUTORS, AND PERSONAL REPRESENTATIVES, FOR ANY LOSS, DAMAGE, COST, EXPENSE OR CLAIM ARISING OUT OF, CAUSED BY OR RELATING TO PERSONAL INJURY OR DEATH WHILE DIVING, EVEN IF THE PERSONAL INJURY OR DEATH IS CAUSED IN WHOLE OR IN PART, OR DIRECTLY OR INDIRECTLY BY THE FRV, AND REGARDLESS OF WHETHER OR NOT THE FRV FUNCTIONED PROPERLY OR WAS DEFECTIVE IN ANY WAY.
YOU HEREBY IRREVOCABLY WAIVE AND RELEASE AND AGREE TO INDEMNIFY OSS, ITS OWNERS, MANAGERS, PARTNERS, AGENTS, REPRESENTATIVES HEIRS, SUCCESSORS, BENEFICIARIES, ASSIGNES, EXECUTIVE TRUSTEES, AND OFFICERS FROM ANY AND ALL LIABILITIES OR OBLIGATION TO YOU OR YOUR HEIRS, BENEFICIARIES, TRUSTEES, SUCCESSORS, ASSIGNS, EXECUTORS AND PERSONAL REPRESENTATIVES FOR ANY LOSS, DAMAGE, COST, EXPENSE OR CLAIM ARISING OUT OF, CAUSED BY OR RELATING TO YOUR PERSONAL INJURY OR DEATH WHILE DIVING, EVEN IF YOUR PERSONAL INJURY OR DEATH IS CAUSED IN WHOLE OR IN PART, DIRECTLY OR INDIRECTLY, BY THE FRV, REGARDLESS OF WHETHER OR NOT THE FRV FUNCTIONED PROPERLY OR WAS DEFECTIVE IN ANY WAY.

6. NOTICE

This warranty gives you specific legal rights. You may have rights which vary from state to state and country to country.

OCEANIC SAFETY SYSTEMS LLC. DISCLAIMS AND EXCLUDES ANY LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES. SOME STATES IN THE U.S. AND CERTAIN FOREIGN COUNTRIES DO NOT ALLOW EXCLUSIONS OR LIMITATIONS OF LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THIS MAY NOT APPLY TO YOU.

Acronyms used in this manual:
Oceanic Safety Systems LLC is OSS; and Freedivers Recovery Vest is FRV; and Overpressure Valve is OPV.
II. SAFETY INFORMATION

Symbols for Warnings, Cautions, and Notes

Pay special attention to information provided in warnings, cautions and notes that are accompanied by one of these symbols:

- **Warnings**: indicate a procedure or situation that may result in serious injury or death if instructions are not followed correctly.

- **Cautions**: indicate any situation or technique that will result in potential damage to the FRV, or render the FRV unsafe if instructions are not followed correctly.

- **Notes**: are used to emphasize important points, tips and reminders.

**General Precautions & Warnings**

**Warning**: This manual provides essential instruction for the proper fitting, adjustment, inspection and care of your new FRV. Because OSS utilizes patented and patents pending technology, it is very important to take the time to read these instruction in order to fully understand the features of this product made specifically for freedivers. Improper use of this FRV could result in serious injury or death.

**Warning**: Although this manual provides some basic guidelines for certain aspects of freediving, it is not a substitute for training from a professional diving instructor. Do not dive until you have obtained the necessary instruction from a diving instructor.

**Warning**: Before using this FRV, you must review this agreement, the user manual and the training videos on the YouTube channel and have had basic instruction in freediving. Use of the FRV by untrained persons is dangerous and can result in injury or death.

**Warning**: Study the contents of this manual and accompanying YouTube videos and become familiar with the FRV first in a controlled environment, such as a deep swimming pool or in shallow, clear water, in order to weight yourself properly and to become comfortable with using the FRV’s many features and adjustments.
**Warning** The FRV is manufactured to utilize CO2 cylinders, which could result in explosion hazards if mistreated. Please review the special warning and use section dealing with carbon dioxide cylinders.

**Warning** The FRV is not to be used for duration and/or depth diving, which exceed the FRV’s specifications. The FRV should not be used when it is not being worn by the diver, such as sending the unit down under the water on a rope line.

**Warning** The FRV is not for use in environments with overhead hazards, or line or net entrapment environments, which might trap the diver under the water when the vest inflates.

**Warning** The FRV is not a substitute for safe freediving practices, including but not limited to: sufficient surface intervals between freedives, diving within the freediver’s physical ability, and diving with a dedicated partner.

**Warning** The FRV is not intended to replace a freediver’s dedicated partner who is capable of monitoring the user’s progress and assisting in an emergency. Use of the FRV in the presence of other divers may lead to collision with them should the other divers be positioned above the user when the user’s vest deploys.

**Warning** The FRV will not protect the unconscious diver from avoiding a collision with any hazard, including, but not limited to, oncoming boats, kelp beds, oil rigs, or sea life.

**Warning** Never use this device while scuba diving and be very careful about combining freediving activities with scuba diving. Conducting freedives within a 24-hour period after conducting scuba dives, combined with the effects of multiple rapid freedive ascents, increases your risk of decompression sickness, which may cause serious injury or death.

**Warning** The FRV is intended for use with the standard weight belt worn around the waist or on the back below the vest collar. Any other items worn over the FRV will compromise its effectiveness and could be hazardous. Divers should always apply their weight belt last so that it can be ditched easily if needed.

**Caution** Do not place the FRV in microwave ovens, high-pressure containers, or on induction cookware.

**Caution** Your usual breath hold-time may be cut in half by factors including, but not limited to, your physical condition, the surface interval from your last dive, the depth of the dive, anxiety or excitement, and the amount of work during the dive, as well as many other factors. Consider this carefully when you set your maximum time and depth triggers.
**Warning** Before every dive day, perform a complete pre-dive inspection according to the procedure prescribed in this manual to ensure that all components are functioning properly and no signs of damage or leaks are present. If you find that your FRV is not functioning properly or is damaged, remove it from service until it can be repaired by OSS.

**Warning** Your FRV is not a lift bag. DO NOT use it to bring heavy objects to the surface. Doing so may cause permanent damage to the FRV.

**Warning** DO NOT inhale from your oral inflater. The FRV is not a breathing apparatus or a source for emergency air. Air in the FRV may contain harmful contaminants or gases, which could cause suffocation or air embolism injuries.

**Warning** Factory prescribed service for this FRV must be performed any time the FRV malfunctions. Disassembly of the hard and soft goods may only be accomplished by OSS. Unauthorized service will render the warranty null and void.

**Warning** This FRV is designed for use with carbon dioxide cylinders only. Any use of other gas mixtures may cause corrosion, deterioration, and/or premature aging of the FRV leading to component failure of the metal and rubber parts. The component failures could lead to a loss of buoyancy control and/or pressure integrity of the FRV resulting in injury or death.

**Warning** You must not use the FRV to extend your dive profile. Using the FRV can never be an excuse for unsafe practices. Don’t exceed your safe dive profile and don’t depend on the FRV to protect you from unsafe dive practices.

**Specific Warnings Regarding Carbon Dioxide (CO2) cylinders Precautions for use in freezing temperatures:**

CO2 gas expands in hot weather, and contracts in cold weather. At -30 degrees °F (-33 degrees °C, the bladder fill is just 87% of the volume created at 70 degrees °F (22 degrees C.) Under freezing conditions, the CO2 gas charge fills the bladder more slowly and less completely.

**Confirm that each cylinder is full:**

Never assume the CO2 inflation gas is in the cylinder. The burden of inspection of the cylinder is yours. In order to know if the gas is in the cylinder, the first step is to remove the cylinder from the inflation system or package and look at the narrow end; the puncture surface. This surface is where the inflation system penetrates and allows the gas to fill your FRV. If this surface has any puncture marks, holes, or any sign that is has been pushed in, DISCARD THE CYLINDER IMMEDIATELY.

Every CO2 cylinder has a ‘Minimum gross weight’ marked on the side of the cylinder. This marking is the sum of the empty steel cylinder AND the weight of CO2 that is supposed to be contained in the cylinder. Ultimately, weighing is the only accurate method known to ensure that the full CO2 charge is in the cylinder. A scale, such as a digital postage scale, may be used if it is accurate enough for the intended measurement. For example: A cylinder with a marked minimum gross weight of 68g MUST weigh 68g OR GREATER, never less. If you weigh a cylinder and the actual weight is less than the marked weight, remove it from service and discard it. Typically, CO2-filled cylinders do not lose their charge unless they are punctured, rusted, crushed, overheated, or altered.
Use only “low force” piercing cylinders designed specifically for automatic life vests, which are generally recognized by the inset dimple. The flat top cylinders designed for life vests are more difficult to pierce and will not reliably cause inflation when the actuator is fired.

**Warning** Always install **TWO** cylinders in your FRV actuator. Leaving one out will not allow the bladder to fill, and it will allow salt water to enter the system causing internal corrosion.
Handling and storage of cylinders
CO2 cylinders are single use; dispose and recycle spent cylinders. Handle cylinders carefully. Do not modify or erase marks or other items on cylinders. Store cylinders in a dry and well ventilated area. Keep cylinders away from corrosive fluid. Keep cylinders away from direct sunlight and at an ambient temperature of 0 to 40 degrees C (32 to 104 degrees F).

CO2 Cylinder DOs and DON'Ts

**DO**
- Weigh and confirm contents
- Handle cylinders carefully to avoid damage, especially to threads, which could prevent proper connection to mating parts.
- Hand tighten the cylinder only. Do not over-tighten or use a wrench.
- Always carry the FRV in a manner which protects the actuator in the event it is unexpectedly dropped.

**DO NOT**
- Don't store cylinders exposed to the sun, or allow them in hot environments.
- Don't store used and unused cylinders together.
- Don't use cylinders with no commodity label identifying its contents.
- Don't strike or drop cylinders.
- Don't touch cylinders recently emptied in air. The cylinder will become so cold that it may cause frostbite.

**Warning** DO NOT force the CO2 cylinders into or out of the actuator. Excessive force may damage the threads. To help loosen the threads, try soaking the apparatus in a 1-1 solution of warm water and vinegar for 3 hours.

Specific Warnings and Cautions regarding batteries while being used. Because the battery is sealed into the actuator, it must not be accessed or tampered with by the user.

**Warnings**
- Do not place the battery in fire or heat the battery.
- Do not disassemble or modify the battery. The battery (Lithium Ion in the back unit only) contains safety and protection devices which, if damaged, may cause the battery to generate heat, rupture, or ignite.
- Do not place the battery on or near fires, stoves, or other high-temperature locations.
- Do not place the battery in direct sunlight, or use or store the battery inside cars in hot weather. Doing so may cause the battery to generate heat, rupture, or ignite. Using the battery in this manner may also result in a loss of performance and a shortened life expectancy.

**Caution** Immediately discontinue use of the battery if while using, charging, or storing the battery, the battery emits an unusual smell, feels hot, changes color, changes shape, or appears abnormal in any other way. Contact OSS if any of these problems are observed.

**Caution** In the event the battery leaks and the fluid gets into one’s eye, do not rub the eye. Flush for 15 minutes with water and immediately seek medical attention. If left untreated, the battery fluid could cause damage.
Specific Warnings and Cautions regarding the charging of Lithium Ion batteries.

**Warnings**
- When charging the battery, use only the specified charger supplied by OSS.
- Do not attach the batteries to a power supply plug or directly to a car’s cigarette lighter.
- Do not place the batteries in or near fire, or into direct sunlight. When the battery becomes hot, the built-in safety equipment is activated, preventing the battery from charging further. Heating the battery can destroy the safety equipment and cause additional heating, breaking, or ignition of the battery.
- Do not continue charging the battery if it does not recharge within the specified charging time of 4 to 8 hours. Doing so may cause the battery to become hot, rupture and ignite.

**Caution** The temperature range over which the battery can be charged is 32 °F (0 °C) to 114 °F (45 °C.) Charging outside of this range may cause excessive heating, breakage or may reduce battery performance.

**Specific Warnings and Cautions regarding batteries while being discharged.**

**Warning** Do not discharge the battery using any device except the FRV. When the battery is used in devices aside from the FRV, it may damage the performance of the battery or reduce its life expectancy. If the device causes an abnormal current to flow, it may cause the battery to become hot, rupture, or ignite and cause serious injury.

**Caution** The temperature range over which the battery can be discharged is - 4 °F (-20 °C) to +140 °F (+60 °C.) Use of the battery outside of this temperature range may damage the performance of the battery or may reduce its life expectancy.

**LITHIUM ION BATTERY INFORMATION TO HELP PROLONG THE LIFE OF YOUR BATTERY**

Since the battery pack will discharge over time in storage, it must be partially charged every few months to extend cycle capacity or else it may fail to charge or hold power in the future. The battery is best stored at charge levels between 20% through 80%. Do not allow the battery to remain in a fully discharged state and do not continually charge the battery. Check the battery level after a dive trip. If the level is 40% or more, put the FRV away. After 2 to 3 months of disuse, recharge the battery for an hour and recheck that the charge level is between 40% and 80%—do not fully charge. Of course, the day before a dive trip, always fully charge the battery.

The battery typically has a lifespan of between 300 and 500 cycles under normal usage and operating conditions. Using the FRV in a higher or lower ambient temperature affects the total number of cycles in the battery’s service life.

Lithium Ion batteries are less efficient with age and in near-freezing temperatures. Batteries age naturally over time and will not retain as much energy. After several years, a normal battery may have a decreased charge capacity of 60% of new. Additionally, Lithium Ion batteries do not perform optimally at temperatures nearing freezing levels. **For both reasons listed above, we recommend you do not use the FRV in freezing temperatures with a battery charge indication of 50% or less.**

**DO**
- Store battery with a charge level between 20% and 80%
- Partially charge the battery every 2 to 3 months.
DO NOT
- Continually charge the battery to 100% when not being used.
- Use the FRV with a battery charge less than 50% in freezing conditions.
- Allow the battery to remain in a fully-discharged state.
- Do not store the battery in very high or low ambient temperatures.

**CHARGING THE FRV BATTERY:** The FRV is equipped with a powerful battery capable of driving the unit for more than 30, 8-hour days. The level-of-battery-charge screen alternates between “Batt” and the charge percentage. To charge the unit, use a quarter to remove the charge port screw. Connect the battery charger provided with this unit where the battery charger green light turns red. A fully discharged battery will take 4-8 hours to charge. When the battery is fully charged, the light on the wall charger will change from red to green. The charger will shut off automatically when the battery is full. Be sure to replace the charge plug or the unit will flood. Take care not to strip the threads. Removing the charger from the wall socket, but leaving it attached to the actuator drains the battery.

**Caution.** Be sure and screw the plug back in. If not, the unit will flood and be ruined. Wrap the charge plug around the charge wire so you don’t forget it.

**WEAR PROPER WEIGHTS FOR YOUR CURRENT DIVE PROFILE**
Experts agree that you are properly weighted at the surface when you will not sink even if you fully exhale. Successful use of the FRV calls for another criterion.

**You must not be more than 3 lbs (1-kilo) negative weight at your trigger depth.** It is entirely possible for the diver to overweight and thus defeat the lift values at the trigger depth. Take for example the diver who dives deep for grouper, who routinely wears 10 kilos (22 lbs) of weights to be neutral at 2 meters (6 feet) and who is also wearing a 7-mm wetsuit. Suppose he sets his trigger depth to 41 meters (135 feet) and has installed two 38-gram cylinders, which together will provide 8 kilos (18 lbs) of lift at that depth. (See table on page 14. Should the diver descend to 41 meters (135 feet), it is entirely possible that because of the wetsuit compression and his excessive weights, his combined negative weight will exceed 8 kilos (18 lbs), which will render the FRV useless. For proper use of the FRV, it is critical that you do not overweight so that you are more than 1 kilo (2.2 lbs) negative at your trigger depth. In the above example, the diver should remove extra weight and/or decrease his trigger depth to a level that will support a higher lift value, or use larger cylinders.
III. HAVING SUFFICIENT CO2 IS ESSENTIAL

Warning  Do not use with less than 66 grams total of CO2.

Note  Some international travelers have found CO2 cylinders at marine stores and sailing shops.

For CO2 weights of 136 gms or less, just divide the total by 2 to arrive at a value in meters. For example, if you are using two 38 gm cylinders, you would add their weights together and divide by two \((38+38)/2 = 38\) to arrive at the depth providing 8 kilos (18 pounds) of lift. For equal-weight cylinders use the weight of one cylinder as the maximum depth in meters to provide 8 kilos (18 pounds) of lift. Note the chart at the right, where two 38 gram cylinders provide 18 kilos (18 pounds) of lift at 41 meters.

For CO2 weights of 136 gms or more, add the combined weights of the cylinders and divide by two. Then add 10% of the combined weight for the total depth in meters to provide 8 kilos (18 pounds) of lift. For example, with two 68 gram CO2 cylinders, the combined weight of CO2 is 136 grams \((2 \times 68)\). 10% of 136 is 14. Add 68 plus 14 to arrive at 82. See the lower arrow in the chart to the right.
IV. FRV COMPONENTS

ACTUATOR COMPONENTS

- BUTTONS
- LEDs
- LCD SCREEN SHOWING DEPTH TRIGGER
- WIRE TO REMOTE COMMUNICATOR
- CORD FOR MANUAL PULL INFLATION
- COMPRESSION SPRING CAP
- CONNECTION TO INFLATION BLADDER

REMOTE COMMUNICATOR

REMOTE BUTTON

CHARGING PORT PLUG

ACTUATOR BACK

SPANNER WRENCH
Used to assist cocking the trigger spring
A. The Actuator
The actuator is the heart of the system. Connected to it is the inflation vest, the manual inflation pull cord, CO2 inflation cylinders, and the remote communicator. The actuator is built from anodized aluminum and polycarbonate plastic on the outside, and the internal trigger components are made from high-grade stainless steel—all low-corrosion components. The unit is controlled with 3 buttons and supplies the user feedback with 3 LEDs and a LCD screen. It can also be partially controlled with the remote communicator.

The LEDs provide the following feedback
Green: the unit is on.
Blue: designates the unit is in setting mode.
Red: Indicates trouble with the actuator.

To conserve battery, after 20 seconds of inactivity, the LEDs and screen automatically turn off.

3 Buttons turn the unit on and provide user input and feedback
ON button: Used to turn the unit on—requires a 3-second push. To turn the unit off, press the ON button continuously for 7 seconds. To prevent accidental pressing, this button is positioned in a well.
Mode button: Used to cycle through the various screens and to set the Surface Minder option. After 20 seconds, when the LEDs and screens turn off, pressing the mode button for 5 seconds will again wake up the blue LED and allow you to cycle through the screens by pressing the mode button.
Set button: Used to increase trigger time and trigger depth in the trigger screens in concert with the Mode.

The LCD screen messages the cause for inflation When inflation is due to pressing the remote button 4 times, the screen will read “SOS.” When inflation is due to exceeding the time trigger, it will display the time trigger, for example “t 1:30”; exceeding the depth trigger will display the depth trigger for example, “d 10.” If inflation is due to ignoring or forgetting to press the remote button when Surface Minder is on, the LCD will display “Surf” as the cause of inflation; and it will display “Pre” for inflation when the diver fails to press the blinking remote button during a premature dive.

Resetting the actuator after inflation: In addition to providing messages, Inflation causes the 3 LEDs to blink. To make your FRV ready again, press the ON button for 7 seconds to shut off the unit and then press the ON button for 3 seconds to restart the FRV actuator. It will remember your previous settings.

B. The remote communicator
The remote communicator is used to relay information to the diver. Normally, it is dark. Pressing the button for two seconds will light the button, which informs the user the unit is on. When the light is blinking, the unit is set to Surface Minder mode. When the light is steady, the unit is not in Surface Minder mode.

To inflate the bladder, press the button 4 times quickly.

NOT SURE IF THE UNIT IS ON? Press the remote and it will light. This tells you the unit is on, and which mode it is in. Pressing the mode button will do the same. The actuator turns itself off in 24 hours.

C. The manual inflation cord
The manual inflation cord runs in the left lapel to the pull handle and is used to inflate the inflation bladder manually. To inflate the bladder manually, give the cord a brisk tug with about 15-pounds of force or more. To avoid accidental manual inflation, do not carry the unit by the manual pull cord.

D. The inflation vest and actuator pouch
A pouch under the collar of the OSS vest houses the actuator and provides a route for the remote wire and the manual inflation cord into the left lapel. In the right lapel is an oral inflater hose. At the bottom of the right lapel is the over-pressure valve (OPV), which appears when the bladder is inflated and is used to vent pressure from the vest. The valve automatically vents excess pressure during inflation. Using the manual inflation pull cord, the user may also manually vent gas, used most commonly during repacking after deployment.
E. Overpressure Valve (OPV)/Dump Valve
The OPV’s primary function is to relieve excess air pressure inside the bladder. The OPV can also be opened manually by pulling on the ball-and-cord assembly to quickly dump air, which might be required if you are exiting a confined space and when you want to repack and rearm the FRV. Do not tamper with this valve. The valve spring continually presses against the rubber gasket, which presses against the plastic valve seat. It is possible for the plastic and rubber to stick so tightly the resulting internal pressure upon inflation exceeds the burst strength of the bladder material. You must lubricate the valve seat at a minimum of every three months. Pull the valve spring to unseat the gasket and spray rubber-safe silicone spray into the valve. Open and close the valve several times to work the lubricant thoroughly through the valve. Two suitable silicone sprays are 3-In-One Silicone Spray and M Essentials Silicone spray. Always pull your over-pressure valve cord to test its function as part of your pre-dive inspection.

**Warnings**  The proper function of the OPV is vital to prevent damage to the inflation bladder. Do not tamper with this valve and test it monthly by inflating the vest and checking for retention and release of gas. Return a malfunctioning FRV to OSS. Unauthorized service or tampering may render these valves inoperable, and could cause the bladder to leak or burst. This type of damage is not repairable.

**Note**  Avoid opening the OPV in the water while testing your FRV because this will allow water to enter the bladder, which will later require cleaning by rinsing with fresh water at the end of the day.

F. Oral inflation hose
You may inflate your FRV orally with the oral inflation hose found packed with the bladder near your biceps area of your right lapel. To operate this valve, unsnap the lapel cover, then unscrew the retainer to allow full depression of the valve, then depress the end and blow. When not in use, the valve retainer should be screwed closed to prevent accidental opening of the valve.

**Note**  While rinsing the FRV at the end of the day, be sure to screw the retainer in and out to keep it functioning smoothly and to prevent it from corrosion or excess salt build up.
V. CUSTOM FITTING THE VEST.

Your FRV is equipped with multiple custom fitting location points.

1. Start by putting on your FRV, over your wetsuit if you use one.
2. Check and adjust the arm holes as necessary with the strap adjustments.
3. Position the chest lapel pads to your side. Loosen the back straps if needed.
4. Make the front adjustments so that lapels in the upper chest angle inward giving your arms freedom.
5. Work from the front to back to achieve a snug fit that does not hinder movement or deep breathing.
6. Adjust the crotch strap by bending over.
7. In general, make the FRV fit **snugly**, but again so that it does not hinder movement or deep breathing.
8. For most divers, there will be an excess of strap material. To enhance streamlining, we suggest you cut the excess webbing, sear the end with a lighter and then sew the end in position with nylon thread.

**Note**, the FRV vest will fit most sizes from medium to extra large. Adjust the back center strap to the mid-back center.

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**BUBBLING NOISE?** To avoid making bubbles, the FRV is designed to shed excess and trapped air as you descend through its mesh cover. However, if there is air **IN** the bladder it will make a bubbling sound. To completely remove all air, dunk the unit in the water leaving just the over-pressure valve above water and pull the OPV cord to vent the air.
SURFACE MINDER ON

LAPEL PLACEMENT IS CRITICAL TO OPERATION IN THE SURFACE MINDER ON OPTION:
The theory for the Surface Minder option is if you come to the surface and are disabled, after the
30-second surface interval is exceeded (15-seconds steady light, 15-seconds blinking) the vest
will inflate and tip you over on to your back—face up. If you choose to use this option, it is your
responsibility to confirm the vest will turn you face up. To confirm the overturn, activate the FRV while
floating relaxed on the surface. You should roll onto your back. Because the bladders deploy to the
center, the vest should flip you over. If the bladder configuration does not flip you promptly, bring
the lapels closer together over your chest. Test the new configuration several times to confirm the
distance is adequate. CONFIRM IT!
FOLDING AND PACKING THE BLADDER
While the bladder can be packed into the vest pouches without much care to folding, it is more esthetically pleasing and easier to snap the edges if the bladder is tucked in while it is packed into the vest pouches. Start by removing all of the gas from the bladder. Gather the two lapels and the collar portion of the bladder together and squeeze all of the air out, while simultaneously holding open the over pressure valve cord.

Begin with the lapels:

1. Lay the bladder flat, remove all air—roll up the bladders, kneel on them while pulling the cord on the over-pressure-valve
2. Tuck under the bladder with your thumbs to fold within itself
3. Use the oral tube to expel the last bit of gas.
4. Seal the ends with the Velcro
5. Tuck in the over pressure cord behind the Velcro
6. Seat the actuator with new cylinders and Velcro to place
VI. PREPARING THE ACTUATOR FOR SERVICE

1. Unscrew the compression cap until the trigger clicks into place.
2. Visually confirm engagement of the trigger (see picture next page).
3. Screw in the compression cap 3.5 revolutions using the dimple on the cap as a guide until the green indicator is exposed. Do not leave cap fully screwed in, back it off 1/4 turn otherwise the cap will stick tight.
4. Remove old CO2 cartridges.
5. Screw in, hand tight, two NEW CO2 cylinders. Start with the cylinder farthest from the screen.
6. BE SURE TO TURN THE UNIT ON!
7. Operate both the OPV and the oral filling valve and test for spring movement and make sure nothing sticks. Inspect the cord and spring for normal movement. Check that the cord moves about 1/8-inch (~3mm).
8. Inspect the electrical connection from the actuator to the remote communicator for tightness and condition of the wire—it should be intact and not frayed or damaged.
9. Inspect the actuator for leaks. We purposely designed the actuator cover with clear plastic for inspection. Do not use if there is water intrusion. Evidence of water can be as obvious as a fluid level to as subtle as small droplets visible, or the blue water indicator paper becoming damp and changed in color to white. Note, the blue indicator paper becomes lighter blue with time and does not indicate a leak.

PRE-DIVE CHECKLIST. Before each use of the FRV, you must make a thorough visual inspection. NEVER dive with a FRV that shows signs of damage to its bladder or actuator until it has received a complete inspection and service from OSS. Use the Inspection Checklist and tests. A checklist is sewn into the back of your vest.

Turn the unit on and set it
1. Press the On/Off button for 3 seconds and observe three actuator and one remote lights light up.
2. Use the Mode button to advance between menu-setting screens. The battery-level screen alternates between the “Batt” indication and the level of charge. Do not use at levels 10% or below when the red light blinks and when the LCD messages “batt” - “LO.”.
3. To set Surface Minder mode to on, leave the “Surf” screen visible and wait for the lights and menu to shut off.
4. To set Surface Minder mode to off, let the unit shut off with any screen other than “Surf” visible.
5. To set the trigger time, go to the set-time screen and use the Set button to advance the time in seconds. To set a smaller number, continually press the Set button until the numbers loop back to “0.” The number changes will accelerate quickly.
6. Set the depth similarly with the depth-trigger screen and where depth is measured in meters.
7. After the blue mode light goes out, press the remote and confirm the mode you selected—blinking light for Surface Minder on, solid light for Surface Minder off.

DESCRIPTION OF MENU SCREENS:

Battery level: The battery level screens alternate, batt and the percentage of charge. When the charge level dips to 10%, the screen will read “lo” Trigger time:

Trigger depth: Error screens:

Surface Minder:
LOADING THE ACTUATOR SPRING

In order to load the spring with enough force to pierce the dual cartridges, you need to screw down the spring-loading cap with considerable force. After the actuator has fired, first unscrew the cap until the trigger is cocked. You can see and hear when this occurs. When the trigger is loaded, you must screw down the cap until the green band appears as shown below. **The actuator is not properly loaded unless the green band is exposed!**

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**UNLOADED—NO GREEN SHOWING**

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**UNSCREW THE SPRING COMPRESSION KNOB**

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**UNSCREW UNTIL TRIGGER SNAPS INTO PLACE**

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**TRIGGER UNLOADED**

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**SCREW DOWN UNTIL APPEARANCE OF THE GREEN RING CONFIRMS THE ACTUATOR IS BOTH COCKED AND THE SPRING IS FULLY LOADED. IF YOU SCREW THE SCREW CAP FULLY, BE SURE TO BACK IT OFF 1/4 TURN, OTHERWISE IT WILL STICK TIGHT.**

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**TRIGGER LOADED**
VISUAL REARMING SEQUENCE CONTINUED

1. SOLID GREEN BAND EXPOSED

SCREW DOWN THE COMPRESSION TO EXPOSE THE GREEN BAND. **THE UNIT IS NOT COCKED IF THE GREEN BAND IS NOT VISIBLE**

2. REMOVE USED CYLINDERS.

3. REPLACE WITH TWO NEW CYLINDERS.
YOU DECIDE HOW TO PROGRAM YOUR FRV.

You have the option of setting your maximum depth and time. This will take some fine-tuning for those who do not know their precise diving envelope—that is, how deep you can safely dive and for how long. We advise that you give some thought to your dive profile when you set your triggers. Keep in mind your normal depth and time. Setting these parameters too far outside your safe envelope will limit the value of the FRV to you. If you set them too conservatively, for example setting the time at 1:00 minute when you frequently dive for one minute and 30 seconds (1:30), you will be frustrated and inefficient and you will find yourself on the surface having to repack and recharge the unit. Along with choosing your time and depth triggers, you have the option of having the FRV monitor you at the surface following a dive by your choice of settings in the Surface Minder options. You may change your trigger settings on the surface between dives. We believe, a very important feature of the trigger settings is that you MAY NOT change them once a dive has started. The idea is that divers make the most rational trigger settings while fully oxygenated on the surface. Once a dive starts, these settings are non-negotiable.

TIME AND DEPTH TRIGGERS.

The FRV allows you to program an envelope in which you expect to dive without deployment of the FRV. In other words, you will set your own limits for depth and duration for the dive. The following example represents a depth of 9 meters (30 feet) and a time setting of 1:00 minute. As long as you do not dive deeper than 30 feet or exceed 1:00 minutes under the water, the FRV does not deploy. It will deploy, however, if you exceed 30 feet in depth or stay more than 1:00 minute under the water. Typically, you will set the time trigger 5 or 10 seconds past your personal longest reasonable dive. But you are free, of course, to set your own time buffer. Another way to view these selections is to ask yourself, what is the duration of the dive that you never want to exceed and at what depth do you desire the FRV to inflate? For your depth setting, consider selecting a depth that is 2 to 3 meters deeper than the deepest dive you plan to make during this dive session. Keep in mind that if you set the maximum depth deeper than the bottom you are diving over, this trigger will be useless. We will discuss the importance of proper weighting later in this chapter.

You may change these settings any time you are on the surface. For example, you might want the FRV to fire if you ever find yourself deeper than 15 meters or submerged for more than one minute and 45 seconds (1:45 minutes.)

DIVING WITH THE FRV

DIVE START: The FRV starts recording a dive when you descend below 2 meters (6 feet) and only after the FRV has been cleared from the previous dive. The FRV is in the cleared state when it is first turned on for the day or when you clear it after a dive as described below.

DIVE ENDS: When you ascend to within 1 meter (3 feet) of the surface, the dive ends.

CLEARING THE FRV: The FRV is cleared with a press of the remote communicator button. Depending on the mode, Surface Minder On, or Surface Minder Off, the method of clearing is different. In either case, when the FRV is cleared, the remote light does not show.

NOTE ON THE SURFACE INTERVAL: Freediving instructors agree that your buddy should observe you for 30 seconds after surfacing. We encourage this practice. However, after comments from early FRV users, we have reduced the surface interval from 30 seconds to 15. Instructors we consulted felt it unlikely for a diver to pass out at the end of a 15-second surface interval—when recovery breaths are complete—and after locating and pressing the remote as required in the surface minder ON option. We all agree, however, that a diver’s buddy should observe his newly-surfaced buddy for at least 30 seconds.
SURFACE MINDER ON: When you choose this option, you obligate yourself to clear the FRV after every dive when you return to the surface. For the first 15 seconds after you surface, the remote LED is on with a steady light. After 15 seconds the LED starts blinking. During the next 15 seconds you must press the remote button, which will extinguish the light, otherwise the FRV will deploy.

An important consideration when using the Surface Minder ON option is the configuration of the front vest strap lengths (SEE PAGE 19). To be assured the vest will turn you face up upon inflation on the surface, the lapels must be very close together in the front. Because of different weight belt and wetsuit combinations, this is something you need to test yourself. Become limp and then fire the vest, if the lapels are close enough together, you should flip over.

SURFACE MINDER OFF: With the Surface Minder Off, if you do not dive within the first 15 seconds after surfacing, you do not need to clear the FRV; after 15 seconds, the FRV automatically clears itself. You will know the FRV is cleared when the remote light turns off. However, if you wish to make a new dive after 10 seconds and before the FRV automatically clears in 15 seconds, you must press the remote button to clear the FRV. Note: the first 10 seconds after a dive is considered a particularly vulnerable time and you may not clear the FRV even with the Surface Minder Off mode. If you dive within the first 10 seconds after surfacing, you start a “Premature Dive.” (described below)

DIFFERENCE BETWEEN SURFACE MINDER ON AND OFF: With Surface Minder On, you are obligated to clear the FRV after every dive. With Surface Minder OFF, you are not required to clear the FRV at the end of the 15-second surface interval AND you may clear the FRV for immediate diving after the first 10 seconds of the surface interval have elapsed. One disadvantage of the Surface Minder OFF choice is that should you become disabled and remain on the surface, the FRV will not respond. With no button input from you, the FRV cannot determine if you have lost consciousness. An advantage of Surface Minder Off is that you are not required to clear the FRV—many experienced divers find that the FRV soon “disappears” from their consciousness and they then forget to clear the FRV. With Surface Minder ON, if you forget to clear the FRV at the end of 30 seconds (15 seconds on the surface—steady light added to 15 seconds of blinking light,) you will find yourself flipped over on your back in a comfortable lounge chair position after the FRV deploys. Again, the FRV offers many choices and this is an important one. Choose the option that best suits your preference.
PREMATURE DIVE: To cover the situation where the diver needs to dive early, for example, when the diver has dropped something or sees a fish (before 15 seconds have elapsed), we have programmed the FRV with a Premature Dive State. A Premature Dive occurs when you descend below 3 meters (10 feet) BEFORE the FRV is cleared. (Even with Surface Minder Off, you cannot clear the FRV for the first 10 seconds.) Upon reaching 3 meters, the remote light will begin to blink. You then have 15 seconds to acknowledge that this dive is intentional by pressing the remote button, which will TEMPORARILY clear the FRV for 15 seconds (perhaps enough time to catch some sinking gear or fish or avoid a boat.) After 15 seconds, the LED again resumes blinking. A premature dive may be continually extended but will end either if you fail to respond, in which case the FRV will deploy, or you ascend above 1 meter, at which time a new surface interval is started, complete with the 15-second surface timer. The premature dive only occurs before you clear the FRV. In the case of Surface Minder On, any dive made before the end of the 15-second surface interval AND before you have cleared the FRV, will cause a premature dive. With Surface Minder Off, as soon as you clear the FRV, or after it has automatically cleared, you are free to dive and the premature dive will not occur.

COMMAND INFLATION BY PRESSING THE REMOTE BUTTON: Any time while diving, or when the FRV is cleared, you may command your FRV to inflate. Simply press the remote button 4 times rapidly. To prevent the buttons from “accumulating” or storing pushes throughout the dive (for example, bumping something and pushing a button), this sequence must be completed in 5 seconds.

COMMAND INFLATION BY PULLING THE MANUAL CORD: A pull handle, located on the left lapel, connects to the manual activation cord. A quick pull on this cord, with a force of about 10-20 pounds, will trigger inflation by manually tripping the actuator trigger.

ORAL INFLATION: While you are on the surface, you may also inflate the FRV by using the oral inflation tube behind the right lapel. To manually inflate the FRV, open the right lapel pouch by unsnapping it to expose the oral inflation tube. Rotate the lock cap several times counterclockwise to allow downward movement and then blow into the hose while at the same time pressing down against the spring-loaded valve.
VIII.  CARE AND CLEANING

Rinse the FRV with clear water at the end of every day. Flush salt water from crevices and threads that if left, will either promote corrosion of the parts, or leave abrasive salt crystals behind.

**CAREFULLY CLEANING AND DRYING YOUR FRV IS THE SINGLE MOST IMPORTANT THING YOU CAN DO TO PROTECT YOUR INVESTMENT AND TO ENSURE RELIABLE FUTURE PERFORMANCE AND YOUR SAFETY. PAY SPECIAL ATTENTION TO THE SPRING CHAMBER.**

Partially remove the actuator from its pouch, and do the following:

- Direct a spray of water into the water pressure sensor hole and into the spring hole.
- With the unit under water, press each actuator and remote button several times to help clear salt from the mechanism.
- Unscrew the threads on the oral inflation fitting and depress the end several times then re-tighten.
- Flush the OPV.

**Warning:** Simple flushing with fresh water is not enough to remove salt from the trigger spring chamber. Failure to carefully clean the chamber with salt removal products followed by the recommended anti-corrosion sprays will lead to internal corrosion and eventual actuator failure, leading to your death if the unit fails from corrosion/salt build up.

THE COCKING SPRING CHAMBER REQUIRES SPECIAL ATTENTION. IF THIS AREA IS NEGLECTED THE UNIT MAY BECOME INOPERABLE AND FAIL TO INFLATE.

At the end of a dive trip, soak the actuator making sure the spring chamber is completely immersed in one of these products: **Salt Away** (liquid) and **Bluethru** (tablets dissolved in water) for at least an hour—overnight will not hurt. (Note, each costs about $20 and each is highly concentrated so the diluted product will last for many years.) On multi-day boat trips where long soaking is impractical, use a small applicator to flush the chamber with anti-salt liquid and then set the actuator as shown so the fluid stays trapped in the bell of the spring chamber.

**SEQUENCE:**

- Remove the CO2 cylinders and dry them. Alternatively, they can be placed in a VOC bag to inhibit corrosion.
- Use the manual activation cord to fire the mechanism (you already removed the cylinders.)
- Unscrew the cocking handle until the trigger clicks into place, but do not screw it back in—this leaves the spring under less tension—desired, especially for long-term storage.
- Soak the unit and the whole vest, if it fits, in anti-salt solution.
- Dry the spring chamber and then lightly apply either **Boeshield T-9, or WD-40** to the chamber.

**Warning** Never repack the unit with used cartridges!
Cleaning the inflation bladder after water has entered it: It is critical that you clean the inside of the vest bladder if salt water or chlorinated water has entered it. Normally, water will not intrude into the bladder, but it will do so if the OPV was opened in the water. This is common when users partially deflate the vest while swimming back to their boat. A punctured bladder will also allow water to enter the bladder chamber and not inflate fully. If water enters the bladder, salt crystals will form, which will abrade and eventually damage the bladder. Chlorine water will degrade the bladder material. You can avoid having water enter your vest by only pulling the OPV cord when the OPV is in air.

To clean the inside effectively, you will have to dunk the bladder in a pail of fresh water and open the OPV to allow more water to enter the bladder. After a few cups have entered, slosh the water around and squeeze the vest to empty the water out while simultaneously pulling the OPV cord. You can suck the last remaining few drops from the oral inflation hose taking care not to swallow.

Preserving the life of your FRV soft goods: To extend the life of your FRV, you need to follow these preventative maintenance guidelines:

1. Store the FRV partially inflated, away from direct sunlight, and in a clean cool, dry area. Do not store the FRV in an enclosed space, such as a car trunk, where temperatures may fall below 0°F (-18°C) or rise above 120°F (49°C).
2. Avoid prolonged exposure to direct sunlight and extreme heat. Nylon fabric can quickly fade when exposed to the sun’s ultraviolet rays, and extreme heat may damage the welded bladder seams.
3. Avoid repeated or prolonged use in heavily chlorinated water, which can cause the FRV fabric to discolor and decay prematurely and will require more frequent maintenance.
4. Do not allow the FRV to chafe against any sharp objects or rough surfaces that could abrade or puncture the bladder. Do not set or drop heavy objects such as block weights on the FRV.
5. Avoid any contact with oil, gasoline, aerosols, or chemical solvents.
6. Whenever you travel, protect your FRV from falls from heights, as the weight of the activator could puncture the inflation bladder, or damage the actuator and render it unsafe.

Warning If you can hear any leaks, or if the bladder begins to deflate within 5 minutes, DO NOT attempt to use the FRV until it has received service by OSS.
COMPONENT TESTING:
Your FRV uses new technology in the trigger system, which has not been tested for longevity over one year. To test the trigger mechanism, every 6 months, use full cylinders and use 4 button pushes on the remote to activate the trigger mechanism. The actuator should perform normally.
Finally, once a month, completely inflate the vest by one of 3 methods, manual (pull cord), oral (oral inflater), or command (with remote communicator). Fully inflating the vest will allow you to inspect for leaks and test the competency of the OPV. Inspect the vest for leaks or worn areas, and make sure that the vest remains taut and fully inflated for 15 minutes and that the cylinder is exhausted. Test the OPV for movement by pulling and then releasing the dump cord. To deflate the vest, pull the cord on the OPV and push on the inflation bladder. Repack the vest by pressing the edges of the inflation bladder together to engage the plastic snaps. Observe that the OPV operates as it should. When you are ready to dive, be sure to remove all excess gas from the FRV. To clear the vest of any air, dunk the vest in a pail of water, hold the oral inflater above the water and depress the valve, while rotating the lapels so that any residual air will exit the oral inflater.

Long term storage and periodic maintenance: You should prepare your FRV for long-term storage when you do not plan to use the unit for a month or more. Remove the CO2 cylinders and unload the spring by pulling the manual-pull cord to release the trigger. Partially inflate the vest and store in a clean, cool, dry area. Avoid harsh environments like the trunk of a car in hot or cold weather. Remember to reinstall cartridges and screw in the spring when ready for re-use.

Three month schedule
1. Re-charge the battery every 3 months.
2. Lubricate the over-pressure valve with silicone spray

(Right) is an example of severe corrosion during tests for CO2 cartridge protection. While most CO2 cartridges are coated with an anti-rust layer, they will still corrode if not cared for.

Corrosion of the cylinder head as shown on the left is particularly dangerous because gas can be released suddenly, or it can be released undetected leaving the cylinder empty of its charge.

Note: To clean the activator LCD lens surface, use a light detergent solution with fresh water. Do not use any organic solvent. If the lens becomes scratched, you may try the Polycarbonate Rectification Kit available from Micro-Surface finishing products (http://www.micro-surface.com) to restore the finish.
IX. SUGGESTED GET-ACQUAINTED TRIAL DIVE SCHEDULE

We suggest that you make several trial dives to become familiar with the FRV’s functions. You should do this in shallow water or in a pool deeper than 2 meters (6 feet), and in either case, with a buddy diver attending to you. Because the FRV moves rapidly through the water after it inflates, make sure that there are no overhead obstructions such as a boat propeller that could injure you.

Before you enter the water, review your actuator screens. Toggle between the screens and look for and confirm the following:

- Trigger time
- Trigger depth
- Surface minder option
- Battery charge
- Absence of error messages, or a blinking red LED.

Begin by making a shallow dive greater than 2 meters (6 feet) with Surface Minder OFF.

- Set Surface Minder to “Off” by bringing up the screens and NOT leaving the display with the Surface Minder (Surf) screen visible—any other screen will do.
- After you ascend, look for the steady remote communicator light.
- Watch the steady light go out at the end of 15 seconds.
- Repeat this dive, then return to the surface but this time, after 10 seconds, clear the FRV by pressing the remote button and confirm that the light goes out. At this point, you are cleared to make another dive without going into Premature Dive Mode.

Make a shallow dive greater than 2 meters (6 feet) with Surface Minder On.

- Set Surface Minder On, by leaving the actuator in the screen with the word “Surf.”
- After you surface and at the end of 15 seconds, the steady green remote light starts blinking.
- In the next 15 seconds, to prevent the FRV from deploying, press the remote button
- Watch for the blinking to go out.

In either Surface Minder Mode, make a shallow dive greater than 3 meters (10 feet), resurface and then dive again quickly as if you are trying to catch some falling gear. This will cause the FRV to enter the “Premature Dive State.” Observe the following:

- After achieving a depth of 3 meters (10 feet), the remote light blinks.
- By pressing the remote button within 15 seconds, the blinking light turns solid.
- When you return to the surface, a new surface interval begins.
- Failing to press the remote button within 15 seconds will cause the FRV to deploy.

Perform a dive that exceeds your trigger time setting and practice rescue maneuvers:

- Set your trigger time to a short interval, say 20 seconds and make a dive. Observe the remote light as it begins blinking the last 10 seconds before the FRV fires.
- When the FRV inflates, pretend to be disabled and be prepared for a brisk ride to the surface.
- On the surface, allow your body to remain limp and notice how your head is positioned well above the water.
- Have your buddy position himself for rescue breathing.
- Also have your buddy grab your vest in the shoulder areas to practice towing and guiding you through the water as if toward a rescue boat or the shore.

Note: To preserve cartridges during testing, consider changing only one. Be careful to install two full cartridges at the completion of testing.
Perform a test dive exceeding your depth setting:
Set your trigger depth to a shallow depth. Make a dive and observe:
• How the FRV fires at your exact trigger depth and note that a few feet before you reach your trigger depth setting, the remote begins to blink.
• During ascent, let yourself go limp and feel the FRV positioning you into the head-up position.

Practice the Command Inflation feature using the remote communicator: Make a dive and then press the remote button rapidly 4 times within 5 seconds.

Practice the Command Inflation feature using the manual pull cord: Make a dive and then quickly pull the manual activation cord with 15- to 20-pounds of force.

At this point, you should be familiar with each of the Actuator screens and the overall FRV function. Repeat any of the above exercises until you are completely comfortable with the FRV, its options, and functions. A little time spent in a safe, controlled environment, with a capable buddy, will go a long way toward making you a competent and confident FRV user.

WEARING PROPER WEIGHT IS A CRITICAL PART OF YOUR DIVE PROFILE AND ESSENTIAL TO THE SUCCESSFUL FUNCTION OF YOUR FRV.
Setting your maximum depth trigger: Before setting your maximum depth, refer the table on page 14, which provides flotation values at various depths for different cylinder volumes.

Warning: NEVER wear your weight belt under the FRV. ALWAYS attach your weight belt last so that it can be ditched without interference from the FRV.

Note: Many divers who use a back-mounted weight belt have found that they can successfully wear a belt in the waist location by wearing a modified back brace under their suit that spans the lower back to the buttocks, which takes pressure off of the lower back.
X. NEW USER ISSUES

UNINTENDED INFLATIONS:
New users often experience unintended inflations caused by:
1. Screwing in a cylinder before the actuator is cocked. While this is a common mistake, you’ll probably only do it once.
2. Forgetting to press the button after the 15-second surface interval while in Surface Minder Mode. This is very common, especially among experienced divers who forget they are wearing the FRV. A good way to avoid this is to get into the habit of observing the remote light after each dive, or simply do not use this mode.
3. Making a quick dive just after reaching the surface, generally while being excited after spotting fish. Even though the surface period is just 15 seconds, there are lots of times when you want to descend for a short dive immediately after re-surfacings. Again, if you get used to looking at the remote light just after surfacing, you can anticipate what to do—wait the light out, or descend and press the button when it starts blinking as you exceed 3 meters.

MY VEST MAKES A BUBBLING SOUND: The cause is trapped air within the inflation bladder, and in rare instances, an actual leak in the bladder. The cure to this problem is to remove all air or have the leak repaired. Normally, the FRV is silent and makes only very small bubbles while descending.

NOT SURE IF THE FRV IS ON OR OFF?: If the actuator is exposed, press the mode button for a few seconds, it will light up if the unit is on. While in the water, simply pressing the remote button for a few seconds will cause the light to come on and tell you the current mode—blinking = Surface Minder Mode, steady light = Surface Minder is Off.

BATTERY CONSERVATION ON LONG TRIPS: While your FRV automatically shuts off after 24 hours of inactivity, you can preserve the charge by shutting it off after the end of the dive day with a 7-second push on the ON button. Confirm it is off by pressing the Mode button.

I WANT TO REDUCE MY TRIGGER SETTING, BUT IT ONLY GOES UP: To set either the time or trigger setting to a lower number, like an alarm clock, continuously hold down the set button until the numbers return to “0.” The number values will gradually accelerate and advance quickly.

AFTER INFLATION, THE LCD IS FLASHING AND THE LEDs ARE BLINKING, IS THIS AN ERROR MESSAGE? No, the activation unit blinks the reason for inflation on the LCD and the LEDs blink. To reset the unit for your next dive, you must turn the unit off with a 7-second press of the ON button and then turn it back on again with a 3-second push on the ON button.

CAN I TEST MY FRV WITHOUT CYLINDERS, OR WITH USED CYLINDERS? Yes, just make sure if you are in the water to have used cylinders installed and have a safety diver close. On land you can test the manual pull and the 4-button press actuation without cylinders.

IS IT RUINED? Well, I took my FRV out today for the first time in a while and after about an hour in the water the green light stayed on. I got to wondering why that would happen and then it hit me, I left the charging port open after I charged it!! Sure enough, it’s full of water. We suggest you wrap your plug cord to the charge cord while charging so you don’t forget to reinstall it.

SOAKING ON A MULTI-DAY DIVE TRIP: As stated often, the most important thing you can do to extend the useful life of your PSLV is a careful cleaning after use. Bring along some salt remover and a small spray can of WD-40 and use them after the end of each dive. This is critical for the spring chamber.

LONG-TERM MAINTENANCE: To prevent over-discharge of the battery, the actuator should be charged every 3 months, when not in use. Lubricate and release the trigger spring by unscrewing the spring knob. Lubricate the over-pressure valve seat.

CAN YOU MAKE IT BEEP? We tried installing loud buzzers, however, the walls of the FRV do not allow sound passage. Users have found using a beeping surface timer such as found on the AERIS dive watch works well—set it to 15 seconds.
XI. TROUBLE SHOOTING

**WARNING ERROR MESSAGES**

<table>
<thead>
<tr>
<th>LOW BATTERY:</th>
<th>This warning begins when the battery level reaches 10% battery life remaining. At 10% the red LED blinks to draw your attention to the low battery level. At 0% battery life, the red LED is solid. Recharge the battery. Additionally, the red LED on the remote turns on, and blinks an “S-O-S” message. If the battery life is short, you should return to OSS for a replacement.</th>
</tr>
</thead>
<tbody>
<tr>
<td>WATER PRESSURE SENSOR FAILURE:</td>
<td>The water pressure sensor is reporting out-of-bounds readings. Return to OSS for service. The red LED turns on, and the remote blinks an “S-O-S” message.</td>
</tr>
<tr>
<td>MOTOR FAILURE:</td>
<td>The electronic trigger motor has failed, while the unit will still inflate manually, please return your FRV for immediate repair.</td>
</tr>
</tbody>
</table>

The “Send” screen: This message indicates that the internal motor has reached its useful life and needs to be replaced. This message does not appear until well over 100 firings of the FRV has occurred, which is highly unlikely in routine use. Return to OSS for service.

XI. TROUBLE SHOOTING

**Warning** UPON ENCOUNTERING ANY UNUSUAL BEHAVIOR OF YOUR FRV OR ANY OF THE PROBLEMS LISTED BELOW, DISCONTINUE THE USE OF THE FRV IMMEDIATELY AND FOLLOW THE INSTRUCTIONS FOR REPAIR OF EACH TYPE OF PROBLEM. DO NOT USE THE FRV UNTIL THE PROBLEM HAS BEEN RECTIFIED.

The actuator display locks up or makes a nonstandard display: Some symptoms you might see include a slow screen refresh, failure to respond to a button press, or any unusual response. Reset the system by turning off the unit for a second. Locking or freezing of the FRV is very unusual. If it continues, do not use the FRV and return the FRV for service with a brief description of the problems you observed.

The Actuator display is blank: This is the usual condition after the 20-second shut off is exceeded. Simply push the Mode switch to bring the LCD back. If the screen remains blank, either the unit is turned off, or the battery charge is exhausted. This condition may also indicate a serious problem such as an electrical failure possibly due to a water leak or a critical component failure. Return to OSS for repairs with an explanation of the problem.

The Actuator fails to cause inflation: This is most likely due to a failed internal motor. Return to OSS for repair.

The FRV inflation bladder leaks air after inflation: Use the oral inflation hose to fill the vest then observe it submerged in a bucket of water. Possible leak points include the oral inflation adapter, the OPV, the connections on each end of the inflation hose, or a puncture of the inflation bladder. In most cases, you will need to return the FRV for service.

Only one cylinder discharges: Examine cartridges after activation to make sure both are pierced. A non-pierced cartridge indicates the cylinder was not screwed in all the way or there is a failure in the mechanism; return to OSS for repair.

The FRV inflates when you turn it on: This is due to a defective pressure sensor. The unit will usually message a timed inflation, return to OSS for repair.
**XII. PRODUCT SPECIFICATIONS**

**CHARGER:** Input: 120/240 V ac; Output 8.4 V dc at 1Amp. Charge time 4 to 8 hours.

**POWER:** Lithium Ion Battery nominal voltage 7.4 V; Factory replaceable battery, recommended every 5 years; Fully Charged Voltage: 8.4 V; Low Battery Message 67V; Battery life 30 8-hour days; Computer/Console circuit board 3.3 V dc. To help preserve battery charge, the actuator automatically turns off after 24 hours of inactivity—24 hours from last dive or button press.

**DISPLAY SCREENS SURFACE:** Battery level, Surface Minder option, Trigger time, Trigger depth and Error message screens.

**DISPLAY SCREENS DURING DIVING:** Alternating current time with current depth screens, which are not normally observed.

**OPERATIONAL ACCURACY:** Depth sensor: two centimeters; Timers: 1 second per day.

**ALTITUDE AND ATMOSPHERIC CALIBRATION:** The FRV computer automatically adjusts for altitude and atmospheric pressure changes each time the FRV is turned on.

**DIVE MODE ACTIVATION:** Dive starts when descends past 2 meters from 0; Dive ends when ascends past one meter.

**OPERATING TEMPERATURES:** Out of water—between 20 °F and 140 °F (-6 and 60 °C). In the water—28 °F and 95 °F (-2 and 35 °C) At extremely low temperatures, the LCD may become sluggish, but this will not affect its accuracy. If stored or transported in extremely low temperature areas (below freezing), you should warm the unit and its battery before diving; Storage Temperature: Out of the water (in storage bag) - between 14 °F and 158 °F (-8 and 70 °C). Because of variations in battery performance at low temperatures, we recommend that you do not use the unit in freezing conditions with less than a 50% indicated battery level.

**INFLATION VEST:** Overpressure valve spring opening pressure 2.5 lbs; Bladder material, Coast Guard approved, 1,000 denier. 34 to 35 pounds of inflation at the surface.

**MAXIMUM DEPTH:** 100 meters (328 feet).

**CO2 CARTRIDGES:** CO2 cylinders provide the inflation source. They must be 1/2-inch X 20 threads and sized appropriately for the bladder used for inflation.

**RoHS COMPLIANT MATERIALS USED (Lead Free electronics and solder):** RoHS regulations, a European Union Directive, restrict the use of more than mandated levels of lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyl (PBB) and polybrominated diphenyl ether (PBDE) flame retardants in electronic equipment.

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XIII. REQUIRED INSPECTION & SERVICE

1. Do not assume that the FRV is in good working condition because it has received little use since it was last serviced. Prolonged or improper storage can nonetheless result in internal corrosion and/or deterioration of O-ring seals and valve springs, as well as deterioration of the bladder seams.

2. Your FRV must be inspected and overhauled every 5 years, or after 100 activations, whichever comes first. Heavy use, for example in a training program, will shorten this interval.

**Warning** Except as described in this manual, DO NOT attempt to perform any disassembly or service on your FRV. The FRV contains no user-serviceable parts. Service requiring disassembly must only be performed by OSS. It is important to send your FRV to OSS for service at least every 5 years or after 100 activations, whichever comes first. Your personal safety depends on the mechanical integrity of this device.

FRVs used for rental or training purposes in salt, chlorinated, or silted fresh water, will require complete overhaul and factory prescribed service every year, or after 100 activations, whichever comes first, or whenever it is suspected that moisture has entered the system. Use in chlorinated swimming pool water will accelerate the deterioration of most rubber components, and require more frequent service than in other typical conditions.

**FOR PRODUCT SERVICE**

You may send your FRV to OSS for repair or service. It is mandatory that all returns, warranty or otherwise, be authorized in advance.

Our Product Return Form will assist you in completing your return. You will find this form at www.oceanicss.com/service. Please fill this form out before calling to request a Return Authorization (RA number). Please make a copy of this completed form and include one with your return. The RA number must be clearly printed on the outside of the box/package.

We can provide you with a RA number by the following methods:

- Calling or sending a Fax to: (805) 650-3014, or
- By Email: freedive.vest@gmail.com

Please make sure you remove any accessories from the product being returned that are not related to the service.

All items returned for service will receive a full factory service, be tested, and will be like new. No partial services are available. Most of our non-warranty services are charged at a flat rate per item and can be quoted in advance. Warranty service will be provided based on the warranty schedule found earlier in this manual. Please review the terms and requirements for warranty service.

Non-Warranty items serviced will receive a 6-month Warranty. If the service was completed under warranty, the original purchase date remains in force. A new warranty period does not begin when a warranty service is performed. California residents must add your local sales tax to all service charges.

We require prepayment for non-warranty service and for shipping charges to return your FRV to you for non-warranty work. Our preferred payment is by Visa or MasterCard. To process your order we need your account number, expiration date, name on the card, security code, and billing address. You may also prepay for your service with a cashier’s check or money order. Personal checks will delay the shipment a minimum of two (2) weeks. CODs are not accepted. A signature is required when shipping to an individual.

Return shipping will be by UPS Ground, if available, unless otherwise requested.
Shipping and handling charges to locations outside of the continental US will vary. Please advise how your area is best served.

Some components may be replaced with another component with a different serial number. The replacement component will be completely re-manufactured and tested like new. In some cases, we will make the replacement with new components. Estimates will be provided at no-charge when necessary or requested. In the United States, if you decline our service estimate, or if the product is not serviceable, we will return your FRV or component ground return freight at no charge.

When shipping, we recommend you use an insured, traceable shipping method. We will not be responsible for a non-traceable shipment, or if damage results from poor packaging. We will decline any shipments sent freight-collect.

**XIV IMPORTANT USER MANUAL UPDATES:**

In an effort to keep your user manual up to date, from time to time we update our Online manual to draw attention to new items, or to emphasize changes to existing items or uses.

**Lithium Ion battery:** Updated 5/26/13. Expands the discussion for optimal battery use. Page-12

**New user issues:** Updated 6/24/13. Added a page dedicated to new user issues. Page-33

**PAY CLOSE ATTENTION TO CLEANING THE SPRING CHAMBER AND SOAKING THE UNIT IN ANTI-SALT SOLUTION:** The spring chamber must be thoroughly treated with salt-remover after each dive. The spring chamber must be lubricated and the actuator manually fired, which confirms proper action and releases tension on the spring

See page 28

**Pre-dive Inspection and cocking sequence:** Remove and replace cylinders AFTER cocking and loading the spring—after the green is exposed. Check for leaks through the clear actuator cover. Page-22.

**Electronic motor test:** Tests the electronic motor when the unit is first turned on. If the motor is defective, the LCD messages “err 3.” Do not use the FRV, and return it for repair. Page 34.

**Wrap the charger plug cord:** Several users have forgotten to replace the charger plug and ruined their units when they flooded. To help prevent this, wrap the cord on the charger plug around the charge wire. When you are done charging, unwinding the cord will, hopefully, remind you to replace the plug at that moment. Page 13.

**Lubricate the over-pressure valve:** Updated 8/15/15 Because the OPV may stick, it should be lubricated with silicone spray every 3 months, and the valve should be tested before each dive trip. Pg-18
January 2014, The TSA updated its prohibited items brochure to make it easier for the public and TSA officials to identify items prohibited from flight. At the right is the detail allowing up to 4 cylinders, provided two are installed. We suggest you copy this link and print the brochure, laminate it and carry it with your FRV.

**Link:**
http://www.tsa.gov/sites/default/files/assets/prohibiteditems_brochure.pdf

Note, While OSS does not endorse or condone carrying more than 4 cartridges many of our customers report being able to throw a few extra cartridges in checked bags without a challenge.

**Note:** For civilian carry-on baggage, the Transportation Security Association (TSA) prefers that you separate the FRV from your bag and send it through the scanner separately, just like a computer. Be prepare with the printed brochure identified above. Sometimes, an agent will say the cartridges are not allowed. In this case politely ask to talk to a supervisor and have him refer to his “SOP manual on prohibited items.”
### TABLE 2.3.A
Provisions for Dangerous Goods Carried by Passengers or Crew
(Subsection 2.3)

Dangerous goods must not be carried in or as passengers or crew, checked or carry-on baggage, except as otherwise provided below.

<table>
<thead>
<tr>
<th>Permitted in or as carry-on baggage</th>
<th>Permitted in or as checked baggage</th>
<th>Permitted on one’s person</th>
<th>The approval of the operator(s) is required</th>
<th>The pilot-in-command must be informed of the location</th>
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