# VR2W

# USER

# MANUAL

*How to use the VR2W family of receivers.*

vemco

# Summary of Manual

This manual is intended to provide VEMCO users with the information they require to use the VR2W receivers. VEMCO highly recommends that the user fully read the manual before using the equipment or the VUE software.

## Section 1: Introduction
Getting to know the VR2W receivers

## Section 2: Getting started
Getting the VR2W ready, including powering the VR2W, opening and closing the case, and initial tests

## Section 3: Communication
Talking to the VUE software, and how to use VUE with a VR2W

## Section 4: Deployment
Important points to consider in a deployment plan and the most common attachment method

## Section 5: Maintenance
How to care for the equipment and prepare it for storage, including removing the battery

## Section 6: Additional Information
Additional information about the VR2W that is good to know but not mandatory for basic operations

## Section 7: Common Questions
Answers to frequently asked questions related to using the VR2W receivers

## Section 8: Troubleshooting
Solutions to common issues that may arise

## Section 9: Appendix

For the latest versions of user manuals and software, visit www.vemco.com.

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## *Regulatory Compliance Information*

The VR2W-xxxx-110/111 complies with Part 15 of the FCC Rules.  Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation

The VR2W-xxxx-110/111 has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules.  These limits are designed to provide reasonable protection against harmful interference in a residential installation.  This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.  However, there is no guarantee that interference will not occur in a particular installation.  If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

**Warning:**  Changes or modification not expressly approved by AMIRIX Systems Inc. could void the user's authority to operate the equipment.

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### WARNING

If the VR2W is not used in the manner specified in this manual then the manufacturer's warranty protection may be voided.

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# 1   Introduction

## 1.1 System Overview

The VR2W is a submersible, single-channel acoustic receiver capable of identifying VEMCO coded transmitters.  The receiver operates on a factory set frequency of either 69 kHz or 180 kHz.  VR2W receivers can decode uniquely coded pingers and sensor transmitters that operate on the same frequency as the VR2W.

The VR2W is housed in a corrosion resistant cylindrical plastic high pressure case, and incorporates an integral hydrophone at the tapered end of the case.  The VR2W features include *Bluetooth*® wireless technology, a Smart LED, 16 megabytes of data storage, record mode, and a replaceable battery (single Lithium cell).

The VR2W records the tag code number, the date/time of valid detections, and sensor data if the tag received is equipped with a sensor.  This information is stored in the VR2W memory until it is downloaded from the receiver using *Bluetooth* wireless communication and a PC running VUE software.

Some common uses for VR2W receivers are:

- Monitoring fish movements using acoustic gates across shorelines

- VEMCO Positioning System (VPS) arrays to track animals within a specific area

| VR2W Quick Facts | |
|---|---|
| Dimensions | 308 mm (12.125") x 73 mm (2.875") diameter |
| Weight | 1190 g in air; 50 g in water |
| Receive Frequency | VR2W-69kHz:  69.0 kHz<br>VR2W-180kHz:  180.0 kHz |
| Battery Life | VR2W-69kHz:  typically 15 months<br>VR2W-180kHz:  typically 8 months |
| Memory | 8 MB (~0.8 million detections) or<br>16 MB (~1.6 million detections) |
| Operating temperature | -5°C to +40 °C; Water *must not freeze*. |
| Maximum Depth | 500 meters (730 psi) |
| Software | VEMCO User Environment (VUE) software |

**WARNING**

The VR2W pressure case and seal have a maximum static depth rating of **500 meters** (730 psi). Physical shocks to the receiver, such as bumping into a solid object, when it is at any depth can result in a considerably higher pressure on the casing than just the depth pressure and water may enter the VR2W case.  If the O-rings or their mating surfaces are dirty or damaged, then water may also enter the receiver case.  If you are suspicious that water has entered the receiver, then follow the suggestions in section 8.2.2 for troubleshooting a pressurized case.

## 1.2 VR2W Case

The VR2W receiver is housed in the black plastic high pressure case. The case consists of an outer cylinder that is removed to install the D-cell Lithium battery, and the endcap which houses the hydrophone and connects to the plastic internal casing. When the outer cylinder is removed, the internal casing protecting the electronics can be seen. There are two types of internal casing, the older metal/PVC casing and the current plastic casing. This manual focuses on the current case type; instructions for the older case are found in the appendix (section 9.1).

A crucial part of the VR2W is the hydrophone, located at the top of the receiver. The hydrophone is similar to a microphone – it "listens" for sounds and transfers them to the electronics inside the receiver. Be very careful not to bump the hydrophone or damage may occur that may prevent the receiver from detecting tags.

The VR2W is only capable of listening to one frequency so that frequency must be selected at the time of ordering. The frequency chosen is based on the coded tags that will be used and can be either 69 kHz or 180 kHz. The frequency is reflected in the name of the receiver, the VR2W-69kHz or the VR2W-180kHz.

Externally there are physical differences between the VR2W-69kHz and the VR2W-180kHz which make it easier to identify the operating frequency at a glance. The VR2W-180kHz has a smaller hydrophone than the VR2W-69kHz, and the identification band around the middle of the VR2W-180kHz receiver has green text while the VR2W-69kHz has blue text. The dimensions of the two cases are slightly different – diagrams are found in section 6.5.

The cases operate in the same manor so they'll be described simply as a VR2W in this manual.

**Visible External Differences:**

1. Hydrophones are different sizes
2. Serial Number label is a different colour.
     Blue = 69 kHz
     Green = 180 kHz

**VR2W-69kHz**      **VR2W-180kHz**

# 1.3 Case parts

The VR2W is shipped closed, as shown below.  The battery may be installed in the case but not connected.  The case only needs to be opened when the battery must be connected or replaced.  Connecting the battery is explained in Section 2, along with opening and closing the receiver case.  Replacing the battery is explained in Section 5.1.

**Hydrophone:** the receiver's "microphone" and most delicate part.

**Do not bump the hydrophone** or the receiver may be damaged and unable to detect transmitters.

**Comm Key Hole:** Place the narrow end of the Comm Key in here to prepare for communication.  Section 2 has more information on the Comm Key.

**Status Light (LED)/Release Valve:** The light flashes red to indicate the receiver's status. Section 6.2 has the full description.

The Release Valve will open _if_ the internal pressure is greater than the external pressure (see section 8.2.2).  ***Never cover this valve.***

**Cable Tie Groove:** These grooves (there are two) are used to attach the VR2W to a line – see section 4.2.

**Identification Label:** Contains product name and number, contact information, serial number, and important warnings.

At a glance, the blue text indicates receiver is a VR2W-69kHz and green text a VR2W-180kHz.

**Cable Tie Groove:** This is the second of the two grooves.

**Attachment Hole:** This hole, which is almost 10 mm in diameter, is used with the Cable Tie Grooves to secure the VR2W while it is deployed.  Section 4.2 has more attachment details.

### Status Light (LED) Meanings:

No flashes =
no power

2 quick flashes every 5 sec =
Recording Mode

2 quick flashes every 10 sec =
Memory Full

1 quick flash =
acoustic ping received

1 bright, long flash =
detection written to memory

1 long flash per sec =
Ready for _Bluetooth_ communication

On (solid) =
communicating with VUE

# 2 Getting Started

Before the VR2W can begin recording detections, it must be powered. VR2W receivers are either shipped with the D-cell Lithium battery inside the case but not connected to the receiver, or with no battery inside the case. In either case, the VR2W case must be opened to power the receiver.

## 2.1 Open the VR2W Case

Two steel rods are necessary to properly open and close the VR2W case. Every shipment of new VR2W receivers includes a pair of steel rods.

The procedure for opening a VR2W case is the same regardless of the operating frequency of the receiver.

Want to watch this? Go to www.vemco.com/products/vr2w-69khz/?tutorials-and-tools to see the video.

**STEP 1**

Make sure there is **absolutely no water** on or near the VR2W case. Water, even in a small quantity, can damage the VR2W internal circuits beyond repair. If the VR2W is attached to a wet rope, remove the receiver from the rope before opening the case.

This also means the electronics cannot be exposed to a **sudden change in temperature and humidity** that will cause condensation to develop on the electronics and destroy the receiver.

**WARNING**

It is vitally important that the electronics inside the receiver case **do not come in contact with any water** or the receiver will be damaged. For this reason, VEMCO recommends the VR2W be opened in a controlled environment and *not* in the field or on the deck of a boat.

**STEP 2**

Place the VR2W on a clean, flat surface so the hydrophone (tapered end) is hanging over the edge enough that the large hole is past the edge of the surface. DO NOT let the receiver fall off the surface.

TIP: A non-slip surface, such as a rubber mat, helps keep the VR2W in place while opening it.

*Continued...*

## STEP 3

Insert one steel rod into the hole that runs through the diameter of the case near the flat end of the VR2W. Position it so most of the rod is on the left side of the receiver as shown.

Place a hand on the back of the receiver to hold it in place. The back of the receiver often "jumps" during Step 4 so be prepared.
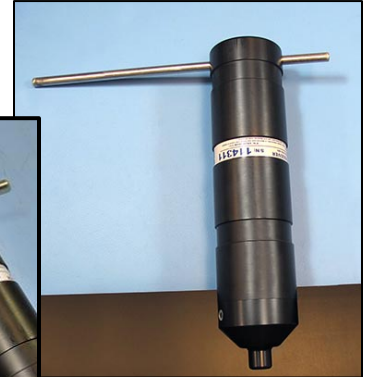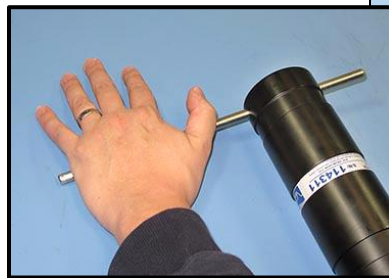
## STEP 4

Insert the other steel rod into the hole in the Comm Key Hole on the end-cap of the receiver and hold on to the rod – it will slide right through the hole and potentially damage something below. Make sure the rod is fully inserted into the hole or damage may occur to the Comm Key Hole.

Apply pressure to the rod in the COMM Key hole to turn it in a counter-clockwise direction when you are facing the hydrophone. The rod at the back of the receiver acts as a brace while you apply pressure, but be careful of it "jumping" off the flat surface.

Continue to rotate the rod, and therefore the end-cap, until turning become easier.

## STEP 5

Remove the steel rods from the VR2W case and set them aside. Be careful not to let the one in the Comm Key slide through the hole and cause damage below.

Continue by hand twisting the end-cap in a counter-clockwise direction until the end-cap and outer cylinder separate.

*Continued...*

> **WARNING**
> DO NOT impact the threads on the end-cap or they will dent and prevent the VR2W case from closing. See section 8.2.1 for tips on thread care.

Slide the end-cap and cylinder apart until the battery compartment has cleared the cylinder.  Be very careful not to damage the threads on the end-cap or the VR2W won't close and seal properly.



*Outer Cylinder*

End-cap

*Battery Compartment*

Plastic Internal Casing

Threads

If the VR2W has a metal and PVC internal casing instead of the plastic internal casing shown, instructions are found in section 9.1.

**WARNING**
The internal casing surrounding the electronics is not waterproof.  Water, even condensation from a humid environment, will enter the case and damage the electronics.

# 2.2 Install Battery

With the case open, you can install the new battery. If there is a used battery in the receiver, use the instructions found in Section 5.1.1 to remove the battery before inserting the new one.

Some VR2W receivers are shipped with the battery inside the receiver but not connected. If this is the case for your receiver, then move to Step 7 in the instructions below to power your VR2W.

Want to watch this? Go to http://vemco.com/products/vr2w-69khz/?tutorials-and-tools to see the video.

### STEP 1

Verify that the O-ring inside the battery cavity is still at the back of the cavity.
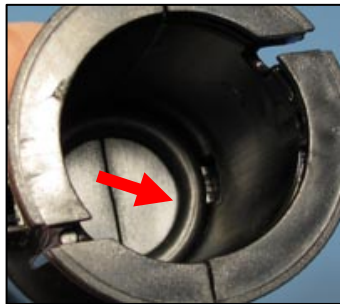
### STEP 2

Slide the Lithium D-cell battery into the battery section at the end of the receiver so the battery's wires are outside the case.

### STEP 3

Insert the battery pin into one of the holes in the edge around the battery cavity and slide the pin across the end of the battery until the ends of the pin are both in the receiver case.
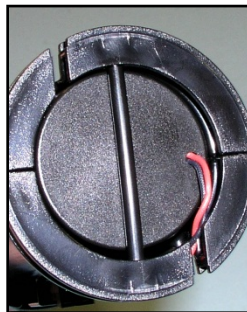
Downward force (see red arrow) may be required on battery end to get the pin started.
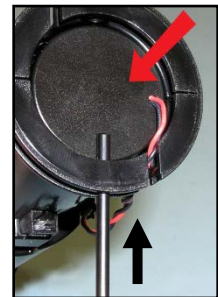
### STEP 4

Check that both ends of the pin are flush with the case.

### STEP 5

Place the battery wires into the gap in the end of the receiver case closest to the battery connector on the case. There are two gaps in the end of the case.

*Continued...*

## STEP 6

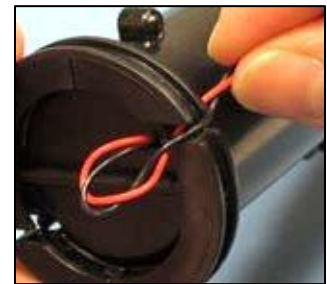Place the O-ring in the O-ring groove around the end of the case so the battery wires are inside the O-ring. This also holds the battery pin in place.



## STEP 7

Position the receiver so you can see the LED light.

Connect the two battery connector halves together until a "click" is heard and the VR2W receiver's light begins flashing.

**NOTE**: If the VR2W was in Recording mode (i.e. as Study had been initialized) when the battery was disconnected, then it will immediately return to recording detections after the battery has been replaced. Settings are not lost when the power is disconnected.



## STEP 8

Gather any excess battery wire into the area at the end of the battery cavity (circled in yellow) and not along the side of the receiver casing. This reduces the chance of damage to the battery wires.
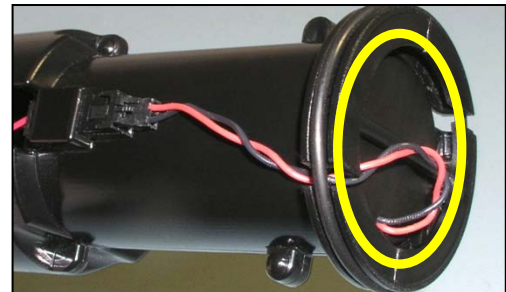
## 2.3 Close the VR2W Case

Before deploying or storing a VR2W receiver, the case must be properly closed and sealed to prevent damage to the electronics. Even humidity in the air can, over time, cause damage to the electronics so it's very important to keep the case sealed, with a functioning desiccant pack inside, as much as possible. Important information about storing a VR2W is found in section 5.3.

> Want to watch this? Go to www.vemco.com/products/vr2w-69khz/?tutorials-and-tools to see the video.

### STEP 1

Make sure the serial number around the outer cylinder matches the serial number on the internal casing. This is particularly important when more than one VR2W receiver is open at the same time.

### STEP 2

If this is the first time closing the VR2W case, then make a visual inspection of the O-rings and the O-ring surface inside the outer cylinder to be sure they are clean, properly greased, undamaged, and debris free. Details are found in section 5.2.

If the VR2W has been deployed previously, then follow the O-ring inspection/replacement instructions in section 5.2 to improve the seal in the case.

### STEP 3

Place a new desiccant pack (if the existing one has been deployed) in the bottom of the Outer Cylinder so both ends of the pack are touching opposite sides of the cylinder's wall.

A desiccant pack has been included in the bottom of the VR2W to reduce the occurrence of condensation in the VR2W. One of these packs should remain in the receiver case during storage and deployment.

We recommend that you replace the desiccant pack with each deployment and with each battery replacement cycle.

More information on the availability and usage of these packs is located on our website, www.vemco.com.

*Continued...*

## STEP 4

Slide the plastic internal casing into the Outer Cylinder, battery end first, until the first threads are inside the outer cylinder. Ensure that the O-rings remain properly seated in their grooves as the end-cap is moved into the outer cylinder.



## STEP 5

Turn the end-cap in a clockwise direction (when looking at the hydrophone) until it becomes too hard to turn by hand.



## STEP 6

Place the VR2W on a clean, flat surface so the hydrophone (tapered end) is hanging over the edge enough that the large hole is past the edge of the surface. DO NOT let the receiver fall off the surface. TIP: A non-slip surface, such as a rubber mat, helps keep the VR2W in place while closing it.

Insert one steel rod into the hole that runs through the diameter of the case near the flat end of the VR2W. Position the rod so the majority of the rod is on the right side of the case. This helps brace the receiver while the case is being closed.



## STEP 7

Insert the other steel rod into the Comm Key Hole on the end-cap and hold on to the rod – it will slide through the case and potentially damage something below. Make sure the rod is fully inserted or damage may occur to the Comm Key Hole.

Place a hand on the back of the receiver to hold it in place.

Apply pressure to the rod in the endcap so it turns in a clockwise direction when you are facing the hydrophone.

Continue moving the rod until the end cap touches the edge of the outer cylinder. Don't over-tighten the case pieces together or they may be damaged.

Remove the steel rods from the VR2W case.

# 2.4 Testing

Before deploying a VR2W, it is wise to test it with a tag to verify that it is operating properly.  This test also creates a VRL file containing all the configuration information for this receiver – handy to keep as a record of the receiver's configuration.

Perform air tests away from electrical noise sources such as motors, PC screens, or fluorescent lights.

Tests can, and should, be done in both air and water.

## 2.4.1 In-Air Test

The VR2W can detect coded pingers in air, but at a much reduced range compared to their range capabilities in water.  Perform air tests away from electrical noise sources such as motors, PC screens, or fluorescent lights.

To perform an in-air test, follow the steps below.

1. Activate the *Bluetooth* feature on the VR2W (section 3.2).
2. Establish communication between the VR2W and VUE software (section 3.3).
3. Begin a Study.  Section 3.4.1 has the details of how to begin a study, also known as initializing a receiver.
4. Disconnect the wireless communication with the VR2W (click the red box with the "X" in the receiver ribbon).
5. Activate a tag that operates on the same frequency that the VR2W operates and place it near the hydrophone.  For 69 kHz equipment, place the tag less than 30 cm (12") away from the VR2W-69kHz hydrophone; for 180 kHz, place the tags less than 8 cm (3") from the VR2W-180kHz hydrophone.  Position the tag so the side of the tag is facing the side of the VR2W hydrophone.
6. Wait while the VR2W records the tag(s) near it.  You can watch the flash patterns as the tag is detected and the data is stored in memory.  Each faint flash of the Status Light (LED) is a received ping and a long, bring flash is a stored detection.  If the flash patterns are different, compare it to the Status Light Meanings chart (section 6.2).
7. Communicate, using VUE, with the VR2W again.  Before continuing, take a quick look at the number of detections and pings received listed in the receiver status information.
8. Offload the data that was collected during the test (section 3.5), creating a VRL file.
9. View the data to verify that the data was stored and retrieved without problems. Instructions for viewing data are found in the VUE manual.
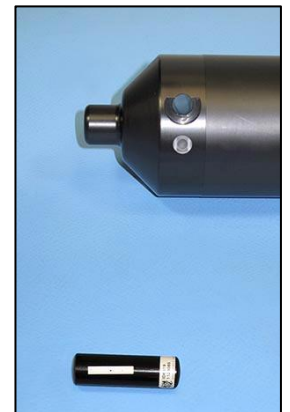
## 2.4.2 In-Water Test

Tests performed in water are almost identical to the in-air test explained above.  The only difference is that the tags should be positioned farther from the receivers – 5 meters is suggested.  In-water tests are often performed to establish an ideal range for the VR2W receivers in the environment in which they are moored.  Details of conducting a Range Test are found at www.vemco.com/customer-service/?cs-tutorials.

# 3  Communication

The VR2W uses *Bluetooth* communication between the receiver and the VUE software.  This feature dramatically increases data offload speed compared to the cabled communication of the retired VR2 receiver.  For example, to offload 2 MB of data requires 3.3 minutes for the VR2W to accomplish but it would have taken the VR2 more than 75 minutes. A comparison table is located in section 6.1.2 for more information.

*Bluetooth* is still a relatively new standard and we have observed that not all *Bluetooth* devices are created equally or work reliably. To ensure successful operation with the VEMCO VR2W, we provide our users with a *Bluetooth* USB adapter in the VR2W Communications Package that we are confident will provide reliable functionality.

**NOTE:**
Due to *Bluetooth* characteristics in water, the VR2W must communicate with the *Bluetooth* USB adapter **through air** (typical range is 10 meters).

## 3.1 Install VUE software

VUE software is used to communicate with the VR2W family of receivers, allowing studies to be setup and data to be offloaded.  The software requires Windows XP SP2, Windows VISTA, Windows 7, or Windows 8.

The *Bluetooth* USB adapter is required for operation with the VR2W receivers because they use *Bluetooth* communication.  Others receivers may not use *Bluetooth* communication and therefore would not need the USB adapter.

**STEP 1**

Attach the VEMCO supplied *Bluetooth*® USB adapter (may not appear as shown) to any USB port on your PC.  If the "Found New Hardware Wizard" window opens, which may happen if your PC uses Windows XP or Vista, then select "Cancel" and continue with these instructions.

If you are using Windows XP or Vista, then you must install VUE 2.0.6 or greater for the proper adapter drivers.  Windows 7 and greater have the necessary drivers installed.
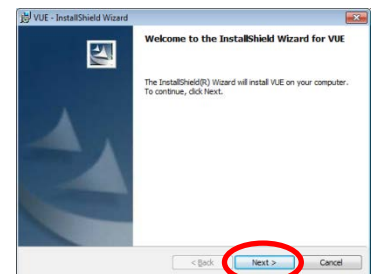
**STEP 2**

Run the latest "Install_VUE" application file.  The latest file is always available from our website, www.vemco.com.
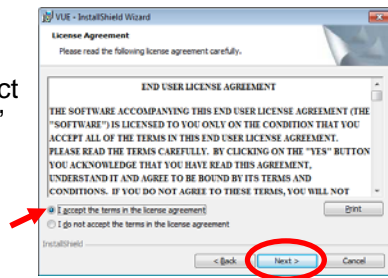
**STEP 3**

Click "Next" when the Install Shield Wizard begins.
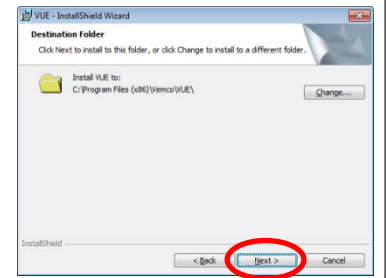
*Continued...*

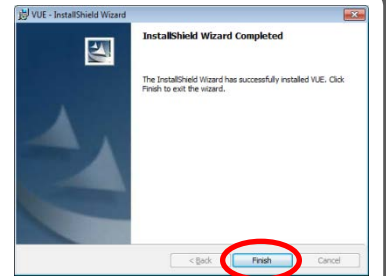| **STEP 4** | | **STEP 5** | |
|---|---|---|---|
| Read the license agreement and select "I accept" and "Next" if you agree to the terms. | | Click "Next" to install VUE in the folder shown, or click "Change" to select a difference folder. | |

| **STEP 6** | | **STEP 7** | |
|---|---|---|---|
| Wait while the VUE software is installed. Click "Next" when it becomes enabled. | | Click "Finished" to exit the setup wizard. | |
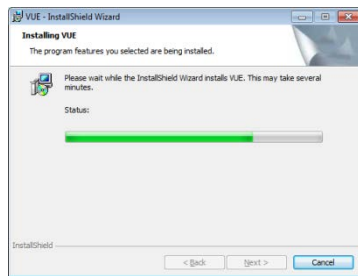
If you are opening a database created by an earlier version of VUE (version 1.4.4 or older), you will receive a warning that the database will be converted to the new version of VUE and will no longer be compatible with older versions of the software.

# 3.2 Activate Wireless feature

The *Bluetooth* feature in a VR2W receiver must be activated before the VUE software will be able to find and connect to the VR2W. Activation requires a specially designed Communications Key (also referred to as "Comm Key").

The Communications Key is a stepped cylinder made of black plastic material. A strong magnet is contained in the smaller end of the Comm Key and should be kept away from any magnetically sensitive materials. An orange float is attached to the Com Key case for easier handling and locating of the key. This key functions with other VEMCO receivers that use a Comm Key, such as the VR4-UWM.

FLOAT

**COMM KEY**

MAGNET

**WARNING**
The Communication Key contains a **strong magnet**. Do not put it near magnet-sensitive materials, such as CRT computer monitors or magnetic stripes, as they could be seriously damaged.

**STEP 1**

Slide the smaller end of the Comm Key in the Comm Key Hole on the VR2W, near the hydrophone.

**STEP 2**

Wait until the VR2W's LED begins flashing a bright, long, steady flash once a second. The wait time is less than five seconds.

Remove the Comm key.

**Bright flash every second**

The flash pattern in a VR2W indicates the mode (state) the receiver is in at the time. A bright, long flash once a second indicates that the VR2W is now ready for wireless communication but is not yet in communication with VUE.

The Comm Key can be removed from the VR2W once the light is flashing.

**TIP**
It's helpful to place the VR2W **within 10 meters** (32 feet) of the operating *Bluetooth®* USB adapter **before** activating the VR2W.

# 3.3 Establish communication

After the VR2W has been activated (section 3.2), it is ready for wireless communication with the VUE software. The VR2W must be within communication range of the *Bluetooth* USB adapter, which is typically 10 meters (32 feet) but can vary based on physical and wireless obstructions/interference. Due to Bluetooth® wireless technology characteristics in water, the VR2W must communicate to the *Bluetooth*® USB adapter through air.

VR2W communication range:

**10 meters** (32 feet) through air from *Bluetooth®* USB adapter.

## STEP 1

Open the VUE software. The software will scan for any active devices within communication range.

Wait while the software searches for receivers.

**TIP:** If VUE can't find your receiver(s), try again. It's not uncommon for a Bluetooth scan to miss devices, especially if other wireless devices are in the area.

When the software finds the receiver, a VR2W icon will be displayed in the "Bluetooth Devices" section of the Home tab with the receiver's serial number for identification. It will display all *Bluetooth®* activated receivers (LED is flashing bright, long, steady flashes) within communication range, which is approximately 10 meters.

If wireless communication has not been activated on the VR2W, then activate communication (section 3.2) and click "Device Scan" on the VUE software's Home tab.

Wait while the software searches for receivers.

**All** *Bluetooth®* activated VEMCO receivers within communication range will be displayed when a Device Scan is performed.
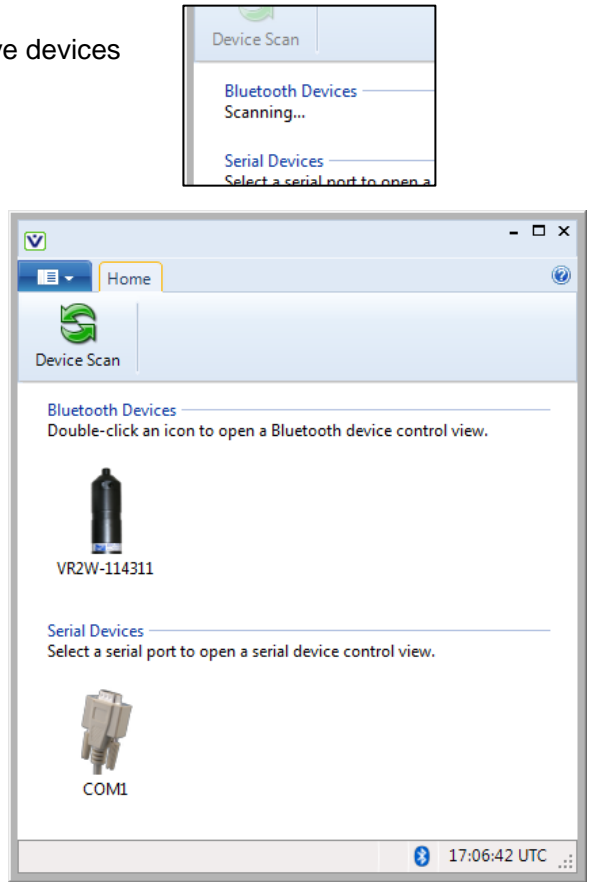
## STEP 2

Double-click on the receiver icon of the desired VR2W (serial number is listed under the icon) and wait while communication is established. You'll know communication was successfully established when information pertaining to this receiver is displayed and the receiver's LED is on continuously. The "Link Status" in the VUE window also changes to "Connected".

**TIP:** VUE can communicate with up to seven wireless receivers simultaneously.

## The Receiver Tab

Each receiver currently in communication with VUE has a tab at the top of the VUE window. This tab identifies the type and serial number of the receiver. Click on a tab to bring it to the front of all the tabs, making the receiver's information visible.

Receiver type and serial number

The ribbon section contains tasks and advanced options, including offloading data, firmware upgrades, recording (initializing) and ending communication.

**VR2W 69kHz**
Ross River Study

| | | |
|---|---|---|
| Serial Number: 114311 | Clock: 2013-02-14 17:07:55 | Receiver Status: Recording |
| Firmware Version: 3.0.4 | Battery: 3.53 V | Study Start: 2013-02-12 17:39:36 |
| Bootloader Version: 3.0.1 | Detection Log Size: 15.9 kB (0.2%) | Station: None |
| Hardware Version: 5 | New Data: 15.9 kB | 69 kHz map: MAP-113 |
| Memory Size: 8.19 MB | 69 kHz: 1429 detections, 16190 pings | |
| Link: Bluetooth | | |
| Link Status: Connected | | |

Receiver information specific to this VR2W is contained in the center of the window.

**Detection Monitor**

*VR2W detections will be displayed here as they arrive...*
2013-02-13 17:57:24 A69-9001-1025
2013-02-13 17:57:39 A69-9001-1025
2013-02-13 17:57:54 A69-9001-1025
2013-02-13 17:58:09 A69-9001-1025
2013-02-13 17:58:24 A69-9001-1025

☐ Disable Timeout
☐ Save to File

Clear

17:07:54 UTC

The **Detection Monitor** section displays detections that are received by the VR2W while it is connected to VUE. These detections are saved in the VR2W memory. They can immediately be saved to the PC once "Save to File" is selected (see box at right).

A checkmark at "**Save to file**" will begin a file to save all detections received from that point forward. The file name appears in the Detection Monitor and the file is saved to the selected directory (see VUE user manual).

The received detections visible in the Detection Monitor are not automatically saved.

Selecting "**Disable Timeout**" will keep the VR2W "awake" (*Bluetooth* communication is active) until the VUE software is closed. This is helpful when doing in-air testing. Leaving the Timeout in place (no checkmark) allows the *Bluetooth* communication to eventually timeout and close.

**CAUTION:** Verify the receiver you are communicating with is **the intended unit**, particularly before initializing and erasing receiver memory files, or data could be lost. Communication can occur with any VR2W with *Bluetooth®* wireless technology activated within a 10 meter range (typical range in air).

# 3.4 Record mode

The default operating mode of the VR2W is to record received pings and detections, even while connected to VUE software. The VR2W enters Record Mode when any of the following events occur:

- The battery is installed
- A study is started in the VUE software
- Bluetooth communication is closed while recording is paused

Bluetooth communication can close when any of the following events occur:

- The VR2W has received no communication from VUE for 10 minutes
- The Receiver Tab in VUE software is closed by the user
- VUE closes communication automatically after 30 minutes of inactivity from the user (unless the VUE option is disabled)

These events were chosen so that a VR2W receiver would always be deployed in Record Mode. The only way a VR2W wouldn't be in Record Mode is if the memory was full or the battery was removed (see section 5.1).

## 3.4.1 Start a Study

Setting up a study allows you to enter information in the VR2W that will aid you in identifying its deployment location and even a description of the study, such as the study's title or other information. This information is stored in the VR2W and offloaded with the data. It can be very useful when data is being organized in the VUE software.

> Always backup previously offloaded data *before* initializing a new study. Internal memory is erased.

---

**STEP 1**

Click the red and blue "Start Recording" button found in the receiver tab's ribbon. This button is not available if communication between receiver and VUE software is not present.



---
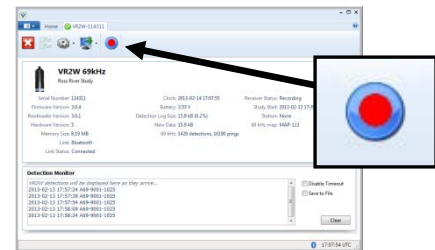
**STEP 2**

Review the PC clock time listed in the dialogue box that opens. The receiver will be set to UTC time based on the current time of the PC so the PC time and the UTC offset must be correct. If the time or UTC offset are not correct, then click "Cancel" and make the necessary corrections before returning to start the study. If the time and UTC offset are correct, then click the "OK" button to continue.



> ⚠ **CAUTION:** It is vital that the PC clock be correctly set to your local time, including time zone, *before the VR2W is initialized*.
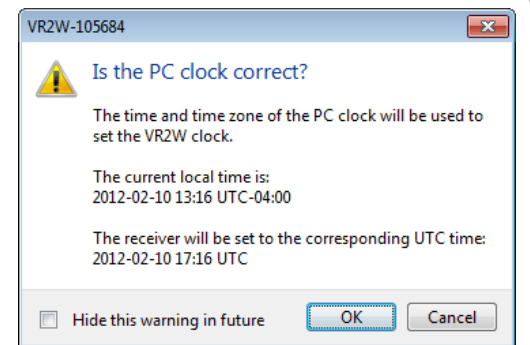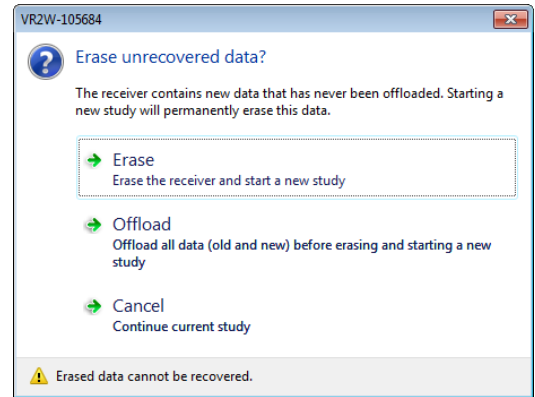
*Continued...*

---

## STEP 3

Select one of the three options displayed.

- **ERASE:** when the data stored in the VR2W has already been offloaded and you wish to erase the data and begin a new study.

- **OFFLOAD:** when the data has not been offloaded from the VR2W or if there is any uncertainty about the data being offloaded.

- **CANCEL**: when you wish to continue the study that is currently running in the VR2W receiver. No changes to the study will be made.

**VR2W-105684**

❓ **Erase unrecovered data?**

The receiver contains new data that has never been offloaded. Starting a new study will permanently erase this data.

➔ **Erase**
Erase the receiver and start a new study

➔ **Offload**
Offload all data (old and new) before erasing and starting a new study

➔ **Cancel**
Continue current study

⚠️ Erased data cannot be recovered.

**CAUTION:** Verify the receiver you are communicating with is **the intended unit**, particularly before initializing and erasing receiver memory files, or data could be lost. Communication can occur with any VR2W with *Bluetooth®* wireless technology activated within a 10 meter range (typical range in air).

**WARNING**
Initializing the VR2W will erase the receiver's memory. *Retrieve all detection logs before the VR2W is initialized.*

## STEP 4

Enter a description of the study in the Study Configuration window. The station name is optional and can be selected from a list of existing stations (if a database is open) or by simply typing in the "Station Name" line to create a new station. If this station is a fixed position, then click a check mark in the "Fixed Station Position" box and enter the latitude and Longitude. If the fixed location information is already entered for an existing station, then the lat/long data will appear as soon as the station name is selected from the drop-down list.

Enter a description/title for this study.

Select Fix Station to enter lat/long location of VR2W.

Advanced Settings includes changing the map and blanking interval.

**Study Configuration**

Description  Study2012

Station Name  BigRock

☑ Fixed Station Position

Latitude  44.64047°  ⦿ N  ○ S

Longitude  063.67085°  ○ E  ⦿ W

☐ Show Advanced Settings  [ OK ]  [ Cancel ]

Select or enter a station name.

Create a new station by entering the name in the Station Name line.

Choose unique station names for each deployment location.

Click OK to put the VR2W in Recorder Mode and begin the study.

**WARNING**
Incorrectly changing the Advanced Settings can prevent the VR2W from hearing your tags. Only do so under VEMCO's direction.

**How do I know the VR2W is recording?**

Watch the red Status Light (LED). Two quick, bright flashes every 5 seconds indicate the VR2W is in Record Mode.

# 3.5 Offload Data

After data has been collected by a VR2W, either during testing while in air or while in the water, that data must be offloaded to be accessed and viewed. Data can only be offloaded from a VR2W receiver while it is in communication with the VUE software through *Bluetooth®*. Follow the steps below to offload data.

**STEP 1**

Activate the wireless feature on the VR2W receiver (section 3.2)

**STEP 2**

Establish communication between the VR2W and the VUE software (section 3.3).

**STEP 3**

Click the "Offload data" icon in VUE's receiver ribbon and choose to either offload all the data stored in the VR2W, which will duplicate the data already offloaded, or offload just the data that was stored since the last offload was performed.
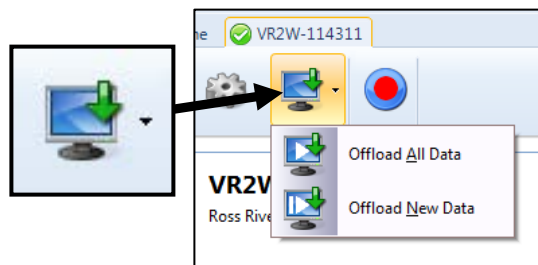
**STEP 4**

Verify that the PC clock is correct. If it is, then click "OK" to continue. If not, then correct the PC clock time and return to VUE to offload the data.
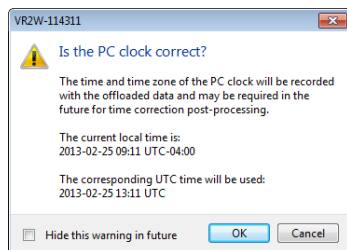
**STEP 5**

Wait while the data is offloaded. Progress is shown at the bottom of the VUE window. The name of the file created is displayed when the data has successfully been offloaded.
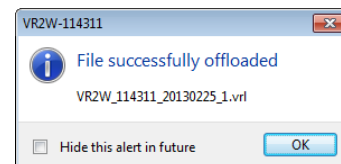
If a database is open in VUE when data is about to be offloaded, an additional dialog box appears asking if the offloaded data should be imported directly into the open database. If "NO" is selected, then the file(s) will be saved to the directory and in the format selected in the Offload tab of the *Options* window (see VUE manual for details) and will not be imported to the database. The created file choices are:

- VRL files only
- VRL files and CSV file
- VRL files and legacy VR2 files

The offloaded data will be stored in the selected file type(s) and location regardless of if the data is directly imported in to the VUE database or not.
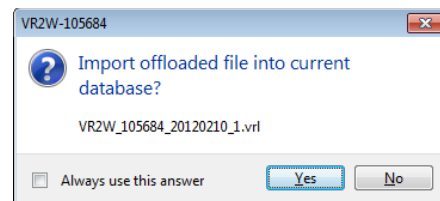
If a database is not open when data are offloaded, then the data will automatically be saved in the file format(s) and directory selected in the *Options* window.

### 3.5.1 Disconnect communication with receiver

Click the "Close View" button (red box with white X) to disconnect the communication between the VR2W and the VUE software. A window will appear to confirm that you want to close the VR2 View window.

When the communication is disconnected, the VR2W resumes recording with the last study that was initialized. Ending communication does not re-initialize the receiver.

# 4   Deployment

How a VR2W is deployed is driven by the environment it is being deployed in and the type of study being performed.  Some important points to keep in mind when designing a deployment plan for your VR2W receivers are explained here.  The common method for attaching a VR2W to a mooring line is also given, along with the dimensions of the VR2W cases.

## 4.1 Deployment Facts/Tips

### 4.1.1  Mooring

VR2W receivers are moored in many configurations often reflecting the bathymetry and oceanographic/weather conditions. A simple mooring design generally works well. However, in rougher conditions, heavier weights and mooring lines are usually required. If a bottom mooring is desired, the VR2W should be positioned above the floor such that it has an unobstructed "view" of tagged animals within their expected acoustic range. Ensure the VR2W's hydrophone is unblocked (e.g. do not position an air filled buoy directly above the hydrophone) and free of any biofouling. In high flow locations, you may consider using hydro dynamically shaped buoys and low profile anchors.

For the best horizontal range, mount the VR2W receiver in a vertical position.  If the VR2W is deployed close to the bottom of the water, mount the VR2W with the hydrophone pointing up to the surface.  If the VR2W is deployed close to the surface of the water, then position the VR2W so the hydrophone is pointing down.

> **CAUTION:** The hydrophone must be kept *free of mooring lines and obstructions*. Objects around the hydrophone will adversely affect the detection range of the VR2W receiver.

### 4.1.2  Spacing

Receiver spacing is generally determined based on range testing and historical acoustic data. Our position is that you should try to space receivers such that you achieve good detection probability in most or all weather conditions. It is not always necessary to have 100% coverage if you have several other locations where you know the animals will be passing through.  However, if you wish to accurately quantify the passing of animals through receiver locations then you should strive for 100% detection probability.  Typical spacing is usually between 100 and 1,000 meters.

> See the Gate Design tutorial at www.vemco.com

### 4.1.3  Biofouling

Some customers use a rubber shrink tape, such as DAFLEX ST250 Cold Shrink Tape, available from Digikey (W211-ND), to prevent biofouling on the VR2W receiver.  It can be used to cover the entire receiver case or just the Comm Key Hole and does not leave a glue residue when it's removed.  Another option is to use an antifouling paint, such as Interlux Micron CSC.

> **Never cover the Status Light (LED)/Release Valve.**
> The release valve _must_ be able to pop open if needed and must not be blocked by tape or paint.

# 4.2 Mooring Line Attachment

The common method used to attach a VR2W receiver to a mooring line is to use five cable ties (zip tie or tie-wrap) with the following characteristics:

**Non-reusable lashing cable ties**
- 388 mm (15.25") long
- 7.5 mm (0.3") wide
- UV protected
- 120 lb tensile strength

**Suggested minimum:**
3/8" diameter
nylon rope

A set of five cable ties is shipped with each new VR2W receiver and more may be purchased from VEMCO (product number HWE 507450).

Follow the instructions listed below to attach the VR2W receiver to the rope used as the mooring line. A minimum rope size of 3/8" diameter nylon rope is suggested.

## STEP 1

Identify the location on the rope where the bottom of the VR2W receiver will be attached.



## STEP 2

Twist the rope so the strands of the rope separate from each other and an opening in the rope is seen. This is referred to as opening the "warp in the rope".
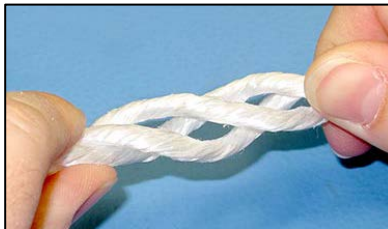


## STEP 3

Slide one of the cable ties through the center of the rope and the Attachment Hole.



## STEP 4

Latch and tighten the cable tie so the head of the cable tie is next to the rope.



## STEP 5

Open the warp in the rope again and slide another cable tie through rope so it lines up with the bottom half of the lower groove around the body of the VR2W.

Tighten the cable tie so the tie's head is next to the rope.

**STEP 6**

Wrap a third cable tie around the VR2W receiver and the rope so the cable tie occupies the top half of the lower groove in the VR2W body. The bottom half of the groove is already occupied by the cable tie from Step 5

Latch the cable tie so the head of the cable tie is over the rope.

**STEP 7**

Open the warp in the rope next to the groove closest to the hydrophone and slide another cable tie through rope so it lines up with the top half of that groove.

Tighten the cable tie so the tie's head is next to the rope.

**STEP 8**

Wrap a fifth cable tie around the VR2W receiver and the rope so the cable tie occupies the bottom half of the groove used in Step 7. Latch the cable tie so the head of the cable tie is over the rope.
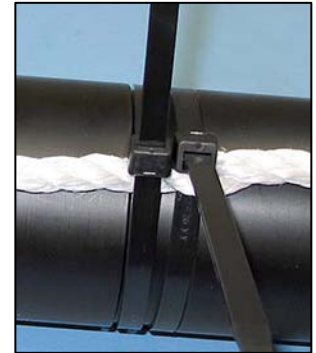
**STEP 9**

Trim the cable ties so there is no excess cable tie material and no sharp edges.

Through Rope    Around Rope    Around Rope    Through Rope

## 5.1 Battery Replacement

Replacing a battery in the VR2W requires four basic steps:
1. Opening the case (section 2.1)
2. Removing the battery
3. Inserting the battery (section 2.2)
4. Closing the case (section 2.3)

Most of these topics were covered when we first setup the receiver. The only remaining topic to cover is how to disconnect and remove the battery.

### 5.1.1 Disconnecting and Removing Battery

**STEP 1**

Open the case as explained in section 2.1 and set the Outer Cylinder aside.



**STEP 2**

Press the release lever on the battery connector and pull the connector apart. The connector is small and a small flat screw driver may be helpful.
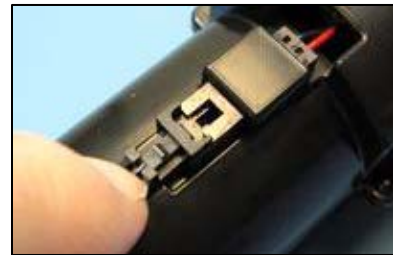


**STEP 3**

Remove the O-ring from around the end of the battery section of the receiver.
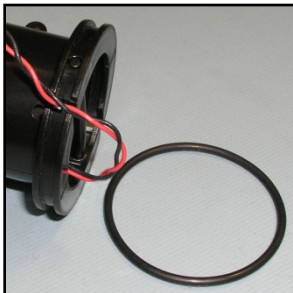


**STEP 4**

Slide the pin along its long axis until it exits the receiver case.

**TIP:** Apply pressure (see arrow) on the battery end while pushing pin forwards.



**STEP 5**

Slide battery out of case and dispose of it according to local regulations.

# 5.2 O-ring Care

O-rings located in the end-cap of the VR2W case are crucial to the watertight seal of the receiver. Each time an O-ring is disturbed, for any reason, it *must* be checked before the unit is sealed again. Something as simple as a stray hair could be the difference between a successful study and a damaged receiver.

Just as the O-rings are vital to a good seal, so are the O-ring surfaces. These surfaces hold the O-ring in position and must also be clean and damage free or the VR2W case could flood with water.

> ⚠️ Improper care of the O-rings and their mating surfaces can result in water leaking into the receiver casing, destroying the electronics.

> ⚠️ Each time an O-ring is disturbed, for any reason, it **must be checked** before the unit is sealed again.

## 5.2.1 Remove O-rings

The O-rings must be removed from their grooves to allow the O-rings and the grooves to be inspected and cleaned. Don't use a sharp object, which may damage the groove surface, when removing the O-rings.

> ⚠️ **Do not use a sharp object near O-ring surfaces.** The surface could be damaged.

### STEP 1

Use a lint-free cloth to grip two points on the O-ring with your thumb and finger, approximately 5 cm apart. It's best to start with the O-ring farthest from the case threads.
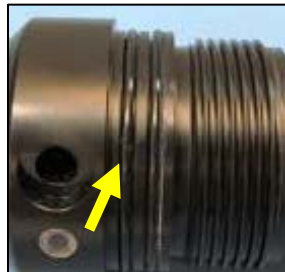
### STEP 2

Pull your thumb and finger towards each other while maintaining your grip on the O-ring. This requires pressure against the O-ring and should produce a loop of exposed O-ring.

### STEP 3

Grab the exposed O-ring and pull it away from the end cap, so it moves along the body of the receiver.

### STEP 4

Repeat Steps 1 -3 for the other O-ring.

### STEP 5

Clean any O-ring grease on the plastic casing.

## 5.2.2 Clean O-ring Surfaces

The O-ring surfaces must be clear of all debris and dirt. Any debris could cause water to enter the case and destroy the receiver.

An O-ring surface is any surface the O-ring touches. The VR2W has three, the two grooves the O-rings sit in and the smooth area inside the Outer Cylinder that sits between the threads and the end of the cylinder.

---

**O-Ring Surfaces**

An O-ring surface is any surface the O-ring touches. The VR2W has three, the two grooves between the threads and the LED on the end cap and the first flat section inside the Outer Cylinder (2 cm).



---
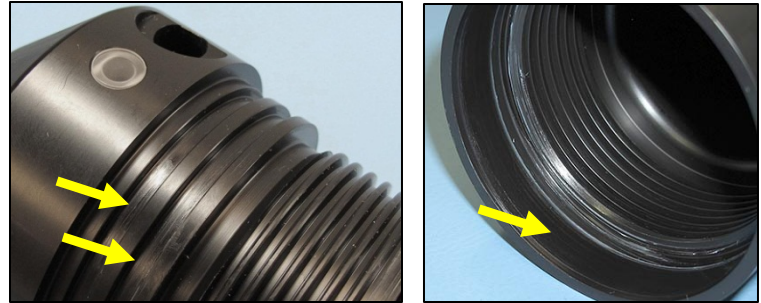
It is vital that all O-ring surfaces are clean and damage free or water may work its way inside the case and destroy the electronics within the VR2W receiver.

---

**STEP 1**

Use a lint-free cloth to clean the old grease and any debris from the O-rings and the O-ring surfaces. A lint-free swab is very helpful for cleaning inside the grooves.



---
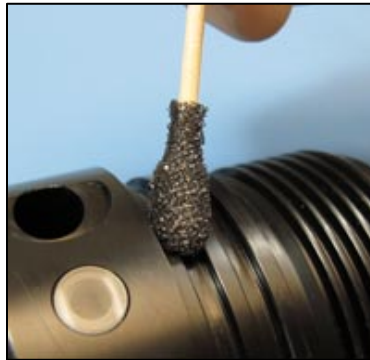
**STEP 2**

Inspect the O-ring surfaces for any scratches or debris – use a magnifying glass and a bright light. Scratches in the O-ring groove would allow water to bypass the O-ring, potentially flooding the receiver and destroying the internal electronics. If you find debris (dirt, dust, hair, etc) inside a groove, then use a lint-free swab to remove it. If you find a scratch in any of the O-ring surfaces, then contact our Support department.

## STEP 3

Inspect the O-rings for debris and for any damage. If there is any question about the condition of an O-ring, we recommend it be replaced rather than risk damage to the receiver and therefore your data. O-rings can be purchased for VEMCO or locally. The replacement O-rings must be PARKER #2-143 O-RING, 70 Bn NITRILE.
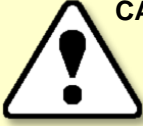
> ⚠ **CAUTION:** O-rings can stretch with continued handling. We advise that undamaged O-rings not be used for more than three deployments.



## STEP 4

Use your gloved fingers to evenly spread O-ring grease (we suggest Molykote 55) over the entire surface of the O-ring until the O-ring is slippery but doesn't have clumps of grease on it. Too much grease can cause an O-ring to "pop" out of the groove while the case is being closed, giving little protection from water entering the VR2W.
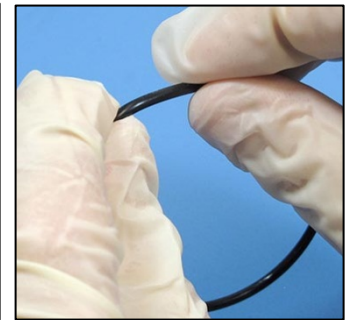


## STEP 5

While you have grease on your glove, spread a very thin layer of the grease – enough to make the area appear shinny – around the O-ring surface on the inside of the Outer Cylinder (the smooth area between the threads and the end of the case). You shouldn't be able to see grease globs or streaks. This thin layer of grease will make screwing the two pieces together again much easier and will also help to create a better seal.
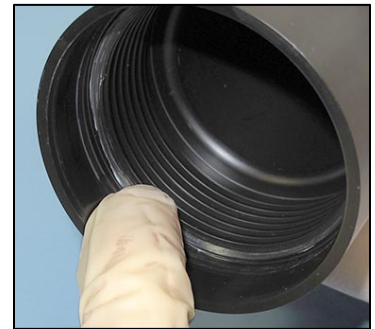
### 5.2.3 Install O-ring

Now that the O-rings and O-ring surfaces are clean and prepared, we're ready to install the new O-rings into the case.

---

**STEP 1**

Slowly move one of the O-rings along the body of the VR2W to the end cap and carefully lift it over the threads.

---

**STEP 2**

Push the O-ring into the first O-ring groove and check the circumference of the receiver to make sure the entire O-ring is in the groove.

---

**STEP 3**

Slowly move the second O-ring over the VR2W's body, over the threads, and into the remaining groove. Check that it's entirely in the groove.

---

**STEP 4**

Clean any grease that may have gotten on the body of the receiver.

Place the receiver on a clean surface so the O-rings remain debris and damage free.

---

# 5.3 Storage

When a receiver will not be deployed for an extended period of time, remove the battery from the receiver (section 5.1.1) to stop the VR2W from recording. This will prevent the possibility of recording pings from noise sources during storage and also saves battery life.

Be sure to store the VR2W in a safe location where the case will not be damaged. Also be sure the temperature of the receiver during storage does not exceed the operating temperature specified in section 9.4.

It is strongly suggested that the VR2W is not initialized prior to storage (data is not erased) and a backup of all offloaded data is made immediately.

Put a fresh desiccant pack in the VR2W (see section 2.3) before placing it in storage to protect from humidity.

## 6.1 Flash Memory

The VR2W receiver uses a non-volatile Flash Memory (memory that can retain stored information even when not powered) to store valid detections of coded transmitters and the date/time at which the detection was recorded.  The VR2W will not continue to record received data once the memory is full.

A VR2W receiver contains either 8 MB or 16 MB of memory depending on when it was manufactured.  To know the memory capacity of your receiver, communicate with the receiver and check the "Memory Size" value in the receiver information.
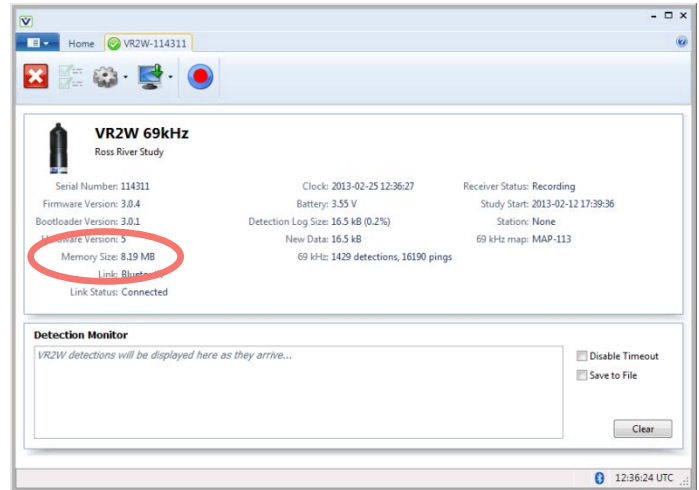


### 6.1.1 Time required to fill memory

A VR2W receiver with 8MB of memory is capable of storing more than 0.8 million valid detections while the 16 MB model can store more than 1.6 million detections.  How long it takes to fill the memory depends on how frequently the data is received.  For example, if a valid detection is received every 20 seconds then it will require approximately 365 days to fill the 16 MB VR2W memory.  It will take less time if the detections are received more frequently, as illustrated in the table below.

| Time required to fill VR2W memory based on various detection time. | | |
| --- | --- | --- |
| **Valid detection every…** | **Time to fill 8 MB memory** | **Time to fill 16 MB memory** |
| 10 Sec | 3 months | 6 months |
| 20 Sec | 6 months | 12 months* |
| 30 Sec | 9 months* | 18 months** |
| 40 Sec | 12 months* | 24 months** |
| 50 Sec | 15 months* | 30 months** |
| 60 Sec | 18 months** | 36 months** |

*Exceeds battery life of the VR2W-180kHz receiver*

*\*\* Exceeds battery life of both the VR2W-69kHz and the VR2W-180kHz receivers*

## 6.1.2 Time required to offload memory

The time required to offload the data from a VR2W depends on how much data is stored in the memory. Table 6-2 below lists the approximate times required to offload data from a VR2W based on the amount of data stored in memory. These times are approximations only – actual offload times can vary on a number of factors, including the distance between the receiver and PC, the number of connected Bluetooth devices, and any obstacles between the receiver and the PC that can cause interference. Offload times can also vary if a Vemco-supplied Bluetooth dongle is not being used (i.e. built-in Bluetooth radios in laptops).

| Time required offloading data from VR2W to PC based on various amounts of data. | |
| --- | --- |
| **Amount of Memory Used (MB)** | **Time to offload from VR2W (minutes)** |
| 1 | 1.6 |
| 2 | 3.3 |
| 4 | 6.6 |
| 6 | 9.8 |

# 6.2 LED Flashes

The red Status Light on the side of the VR2W case flashes based on the task being performed or the status of the receiver. The flashes can be interpreted using the table below. The Status Light is an LED (Light Emitting Diode) and has been referred to as such in past documentation.

| Status Light Flash (LED) meanings | |
| --- | --- |
| **VR2W LED Flashes** | **Interpretation of Flashes** |
| No flash | Battery is disconnected or has depleted |
| Two quick flashes every 5 seconds | VR2W is in record mode (records any received pings) |
| Two quick flashes every 10 seconds | The VR2W memory full |
| One short flash | An acoustic ping was received |
| One long flash | A complete detection was written to memory |
| Continuous long flashes (1 per second) | The VR2W is ready for *Bluetooth* wireless technology communication |
| LED on constantly | Communicating with VUE software using *Bluetooth* wireless technology |

When the VR2W is first powered, it will flash four times to indicate that it has successfully completed the start-up process. After the four flashes, the Status Light will begin flashing based on its status. The most

common flash pattern is two quick flashes every 5 seconds to indicate the receiver is recording. If the receiver's Status Light flashes anything other than what is explained in this section, then contact VEMCO's Customer Support team for assistance.

# 6.3 Set Local options

The local options feature (icon shown at right) allows you to change which suppressed pop-up queries are visible. This feature is only enabled on the ribbon if there are queries that have been suppressed. To enable a query, select "Always Ask" and that query will be enabled the next time that feature is used. For example, if "Confirm before closing VR2W" is selected, then a query will open the next time a VR2W is closed.
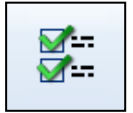
Changing an action is also possible in the Control Setting window, without enabling the query. For example, if "No" was selected when the "Import offloaded files into database" was disabled and you now want to import the data without being queried each time, then click the drop-down menu next to the answer and select "Yes" from the list.

Be sure to select "OK" to apply the changes.
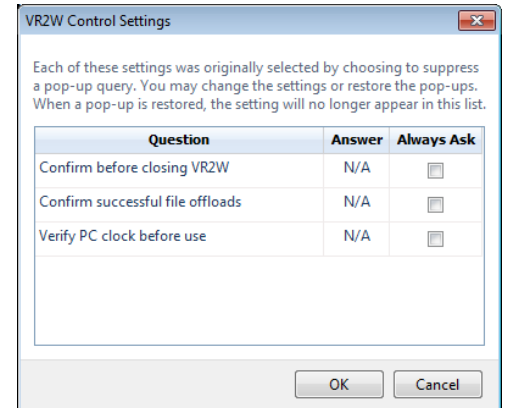
# 6.4 Battery

The VR2W receiver is powered by a single "D" size 3.6 Volt Lithium battery with a connector attached – the Tadiran TL-5930/F. Specifications for the Tadiran battery are found in section 9.4 (Appendix). Other battery options, including a non-dangerous goods battery option, are available directly from VEMCO. Contact VEMCO if you are interested in more information on these alternatives.

An important feature of the approved lithium batteries is their voltage discharge characteristics. These batteries provide a consistent voltage for most of the life of the battery, as demonstrated with the blue line in the graph below. This characteristic allows the receiver to operate at the necessary voltage levels longer than a battery with a more gradual voltage fall-off. This can be seen by comparing when the blue and green lines in the graph below cross the red "cut-off voltage" line.

As the graph illustrates, the battery voltage reported by a receiver may be at the correct level for proper operation even when the battery is close to the end of its life. The voltage value reported by a VR2W indicates the battery is at the proper voltage at the moment but does not give any indication of the remaining life of the battery. For that reason, we suggest you write the date on the battery when it is installed in the receiver.
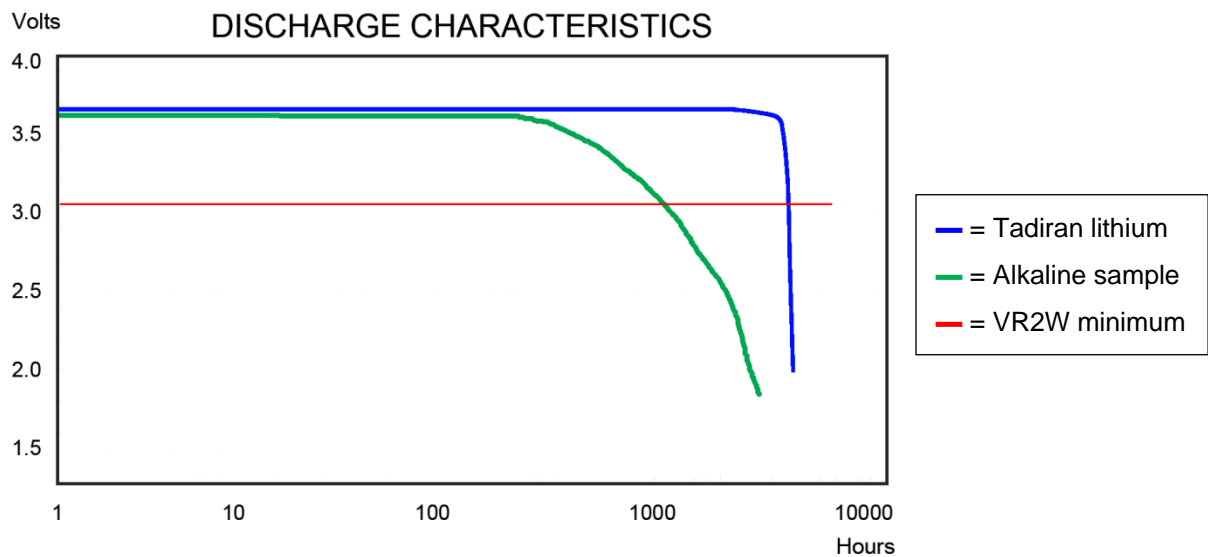
The VR2W is usually shipped with the battery inside the VR2W but not connected – the VR2W is not shipped powered. Battery life is consumed from the time the battery is connected so always disconnect the battery when the receiver is not being used for an extended period of time. The battery must be connected before the VR2W can be initialized.

> ⚠️ Lithium metal D-cell batteries are classified as **Dangerous Goods** and must be handled according to UN Recommendations on the Transport of Dangerous Goods (UN3090 for batteries alone; UN3091 for batteries contained in equipment or packed with it). See the MSDS from the battery company for more information.

## 6.4.1  Battery Life

A new Lithium D-cell battery (complying to the specs listed in section 9.4) will typically last 15 months in a VR2W-69kHz and 8 months in a VR2W-180kHz receiver.

> **Typical Battery Life Consumption**
>
> VR2W-69kHz = 15 months
> VR2W-180kHz = 8 months

Larger amounts of battery life are consumed while the VR2W is ready for *Bluetooth* communication or is communicating with the PC than during the receiver's Record mode. For this reason, the VR2W exits *Bluetooth* mode as soon as the Receiver tab in the VUE software is closed (section 3.5.1). If the tab is left open for 30 minutes, the PC will automatically terminate the *Bluetooth* link and the receiver will enter the lower power consuming Record mode. This auto-disconnect feature, which conserves battery life, will only occur if "Automatically close inactive receiver connections" is enabled in the *Devices* section (tab) of the *Options* window in VUE (see VUE manual for details).

If the study is not continuing (i.e. the last download of data for this study has occurred), then remove the battery and store it separately. The used battery may be marked with the amount of life used for future reference or use.

> **NOTE**
> Battery life is consumed from the time the battery is ***installed***, even if the VR2W is not detecting tags.

> **NOTE**
> Always remove the battery when the receiver is not being used for an extended period of time.

# 6.5 Case External Dimensions

The dimensions of the VR2W case can be useful when designing a mooring plan or mooring equipment. The dimensions, in inches, of the two case types are shown in the drawings below.



VR2W-69kHz

7.375
4.375
1.375
0.391" diameter attachment hole
.825
2.750
3 x.750
.450
12.125

*Dimensions are in inches*



VR2W-180kHz

7.375
4.375
1.375
0.391" diameter attachment hole
.500
2.750
3 x.750
.450
11.913

*Dimensions are in inches*
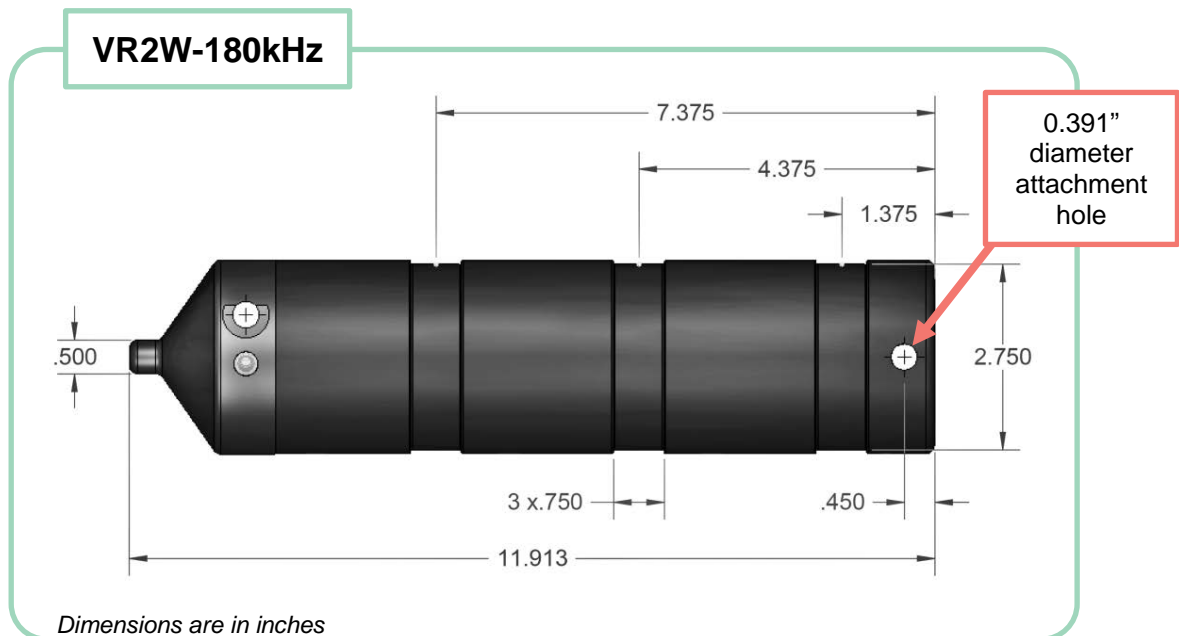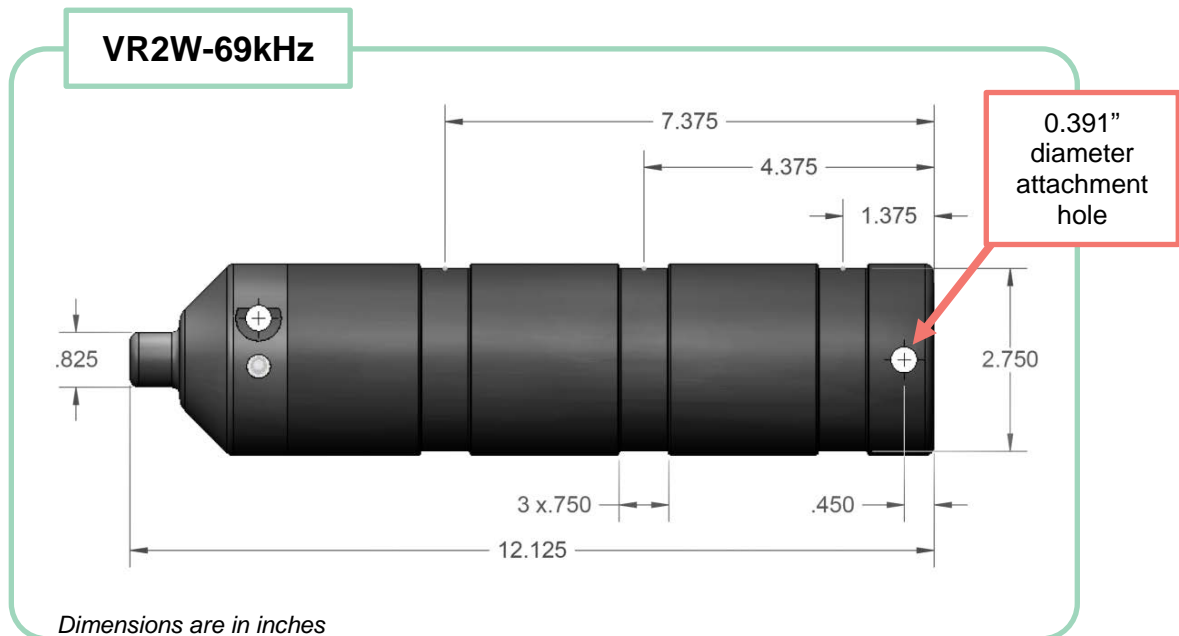
# 6.6 Update Firmware

Firmware refers to the internal software that operates a VR2W receiver. It is not to be confused with VUE, the PC software used to communicate with the receiver. Firmware updates are rare and will occur to either deal with a hardware change or occasionally for a significant addition to functionality. VUE 2.0.10 and greater has the ability to alert you if there is a new firmware update (feature can be disabled in the "Releases" tab of the Options window).

## How to Update Firmware Using Automated Notification:

If when you establish communication with the VR2W (see section 3.3 in the VR2W user manual) you receive a message indicating VUE has detected there is a firmware update, then use the instructions below to update your firmware. To learn what caused the firmware upgrade, use the "Click here to see more" option in the notice window.

### STEP 1

Decide if this is the right time to update the VR2W firmware by answering the following questions:

1. Does the VR2W's battery have enough power to perform an update? If there is any doubt, then replace the battery before proceeding. **The VR2W could be damaged if power fails during the update.**

2. Has all the data been offloaded from the VR2W? If you are updating from a firmware version older than 3.0, then all the data in the receiver will be erased. Updating from a version more recent than 3.0 should not erase the data, but please take the precaution of offloading all data before updating.

If you answered "No" to either of these questions, then click the "No" button in the notice window and either replace the battery (see section 5.1 in the VR2W user manual) or offload the data (see section 3.5 in the VR2W user manual), or both if necessary. The notice window will appear again the next time you connect to this VR2W, or use the instructions for manually updating the firmware found in the next section.

If you answered "Yes" to both of these questions, then click the "Yes" button and continue with these instructions.

---
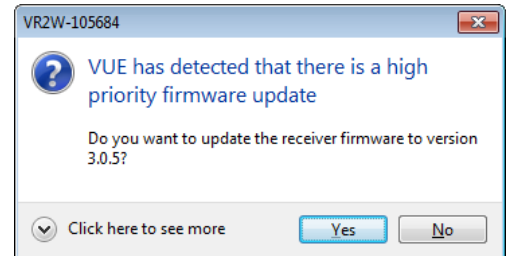
### STEP 2

Assuming all data has been offloaded from the VR2W and is safely stored on your PC, click "OK" to acknowledge this warning and continue.
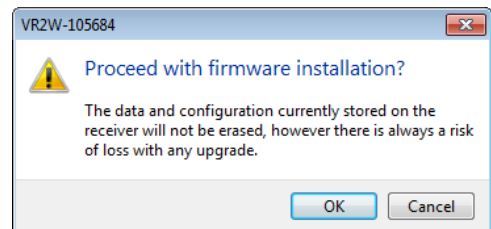
*Continued...*

## STEP 3

Verify that the Bluetooth activation key is still in the receiver, or place it in the receiver if it had been removed. This is important as the VR2W will require it to be in place to re-establish communication during the procedure.

Keep Bluetooth Activation Key in VR2W.

VUE

⚠ Insert Bluetooth activation key

The Bluetooth activation key must remain inserted during the installation procedure.

OK
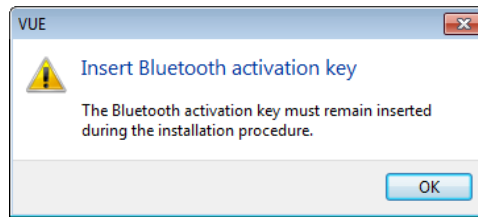
## STEP 4

Wait while the firmware is loaded into the VR2W. The status of the update is shown at the bottom of the screen.

Click "OK" when the firmware is installed (see below).

VR2W-105684

ⓘ Firmware successfully installed

OK

VR2W 69kHz
Fish Release 1

Serial Number: 105684
Firmware Version: 3.0.5
Bootloader Version: 3.0.1
Hardware Version: 1
Memory Size: 8.45 MB
Link: Bluetooth
Link Status:

Detection Monitor
VR2W detections will be displayed here as they arrive...
☐ Disable Timeout
☐ Save to File
Clear

Waiting for VR2W reply
Abort   🔵 16:23:44 UTC
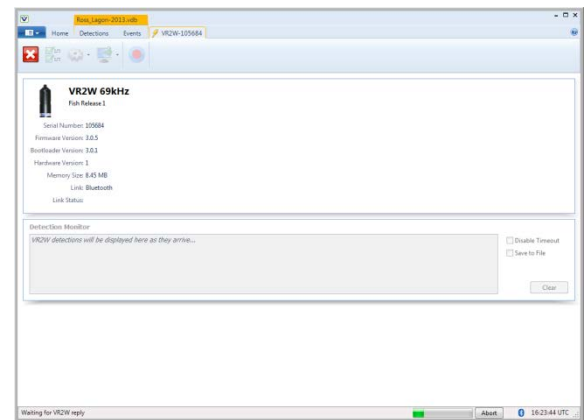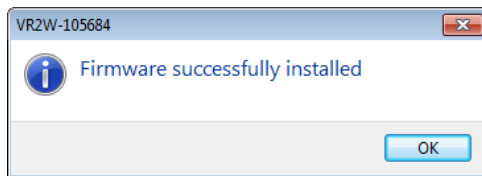
## STEP 5

Confirm that the VR2W has updated to the new firmware by checking that the firmware version number listed in the Receiver tab is correct.

VR2W 69kHz
Fish Release 1

Serial Number: 105684                    C
Firmware Version: 3.0.5                   Bat
Bootloader Version: 3.0.1                 Detection Log
Hardware Version: 5                       New

## How to Update Firmware Using Manual Procedure:

If the automatic notification doesn't appear, then you can manually update the firmware. Contact support.team@vemco.com for detailed instructions.

# 6.7 Map Updating

Occasionally, VEMCO releases a new coded map. Updating the map in the VR2W is as simple as starting a new study with the new map selected. Follow the basic steps below to start a study with the new map. More details on how to initialize the receiver is found in section 3.4.1.

**WARNING**

Setting up a receiver with an incorrect map may result in no detection data.

1. Download the latest VUE software from www.vemco.com/downloads/.

2. Communicate with the VR2W receiver (sections 3.2 and 3.3).

3. Click the red and blue "Start Recording" button found in the receiver tab's ribbon. If you have more than one receiver connected to VUE, then make sure you have the tab of the desired receiver selected.

4. Verify that the PC clock is correct. The receiver will be set to UTC time based on the current time of the PC. The PC time *and the UTC offset* must be correct.
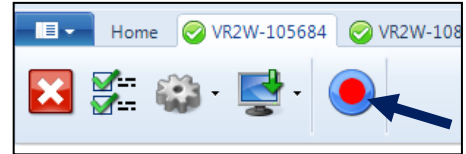
> It is vital that the PC clock be correctly set to your local time, including time zone, *before the VR2W is initialized*.

5. Select to erase the old data and begin the study – only select this option if the data has already been offloaded to the computer.

> Retrieve all detection logs *before* the VR2W is initialized; receiver's memory will be erased.

6. Select "Show Advanced Settings" in the Study Configuration window.
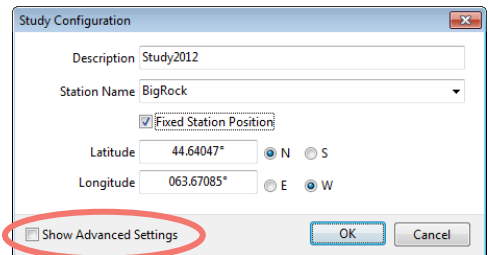
7. Click on the down-arrow to the right of the Map name (MAP-112 in this case) and select the new map (MAP-113).

8. Click the "OK" button to begin the study.
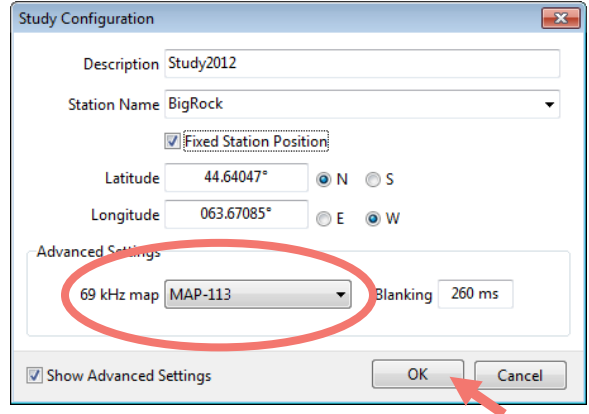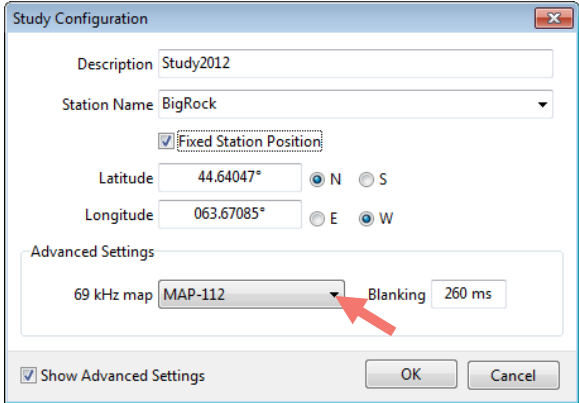


9. Verify that the Status light on the VR2W is flashing two quick flashes every five seconds.

10. Verify that the map listed in the receiver information is the new MAP-113.



11. Close the communication connection with the VR2W by clicking the red box with the white "X" (Close View) on the left side of the receiver ribbon.
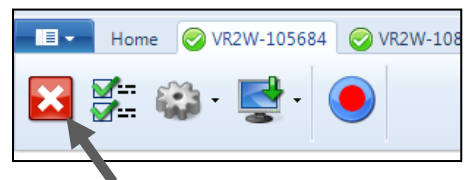
# 7    Common Questions

## 7.1 VUE related questions

### 7.1.1  How/when do I change my receiver code map?

Receivers must be configured with a Code Map that defines which type of tags the receiver can detect.  Check www.vemco.com for details on currently supported Code Maps and choosing the proper map for your study.

Changing a receiver map is not done often and should be done with careful attention.  Setting up a receiver with an incorrect map may result in no detection data, which would not be discovered until you retrieve the receiver and offload your data.

When a receiver is configured with a new map, the data logs are automatically erased as they are no longer valid in the presence of a different code map. Please offload stored data prior to installing a new code map.

> **WARNING**
>
> Setting up a receiver with an incorrect map may result in no detection data.

Detailed instructions on configuring your receiver with a new code map are located in section 6.7.

### 7.1.2  What is initialization?

Initialization, which is also referred to as starting a study, is an important step required to configure your receiver correctly. During initialization, you can input the station name (location) where the VR2W will be deployed and set the receiver clock based on your computer clock.  The receiver clock is always updated based on your PC clock during the initialization process. This information will be resident with the VR2W and will be available during offload, regardless of whether you use the same computer or not.  Initialization also erases the receiver log files so be sure to offload data from your receiver _before_ initializing it.  When data is offloaded from a receiver, the VRL file created contains information about how the receiver was initialized.

> **WARNING**
>
> **_Offload your data first!_**
> Initializing a receiver will ERASE all data!

If a VR2W receiver is deployed without being initialized, the receiver will detect tags but the receiver will not necessarily have the correct clock setting or map configuration required for proper data detection.

### 7.1.3  Why does VUE create two .vrl file types?

When a VR2W is offloaded, VUE creates a detection file and an RLD data file.  Both files have the ".vrl" extension.  VUE only imports the detection vrl file (e.g., VR2W180_300000_20120120_1.vrl or VR2W_300000_20120120_1.vrl ).  The RLD data file (VR2W180-RLD_300000_20120120_1.vrl or VR2W-RLD_300000_20120120_1.vrl) is used by VEMCO for diagnostic purposes and should be archived in case it is required by our Support Department.  The RLD data files have the letters "RLD" in the filename.

### 7.1.4 What Date/Time format is my data stored in the receiver and displayed in VUE?

All detection data and events are stored in the receiver in UTC (Coordinated Universal Time). UTC time is calculated by your PC and stored in your receiver during initialization. Provided your computer time and the Time Zone settings are correct and match, i.e. your computer time is correct for the time zone you have selected, then your detection data will be stored in the correct UTC format at the time of initialization and data offload.

In VUE, your data is also stored in UTC format in the database. You can choose to display your detections in UTC, your local time or in a different time zone. It is important to know that regardless of whatever display format you choose VUE maintains the detection data in UTC.

Export: All detection data is exported only in UTC unless specified otherwise in VUE by selecting OPTIONS – EXPORT – CUSTOM

Important: If you are importing detection data from an older format detection file (e.g., VR2*.000) you must specify the time zone offset used when the receiver was initialized. Earlier VR2 receivers were most often initialized with the current PC local time unless the PC local time was set to UTC. Please contact us if you need assistance. Once these older files are imported into VUE, a new .vrl file will be created and all timestamps will be in UTC.

### 7.1.5 What does the "Hide this (window) in future" mean?

There are a number of pop-up windows that appear while using the VUE software. These windows are wonderful when you're just learning the software or when you've been away from it for an extended period of time, but they can be very annoying when you're in the middle of a big study. A number of these pop-up windows have a selection box in the bottom left corner that say something along the lines of "Hide this alert in future." Selecting this option means that this window will not appear the next time the task is performed. The pop-up windows can be returned by altering the local options or selecting "Restore All Hidden Dialogs" in the *Options* window (see section 6.3). All hidden dialogs are restored automatically if one week elapses without VUE being opened.
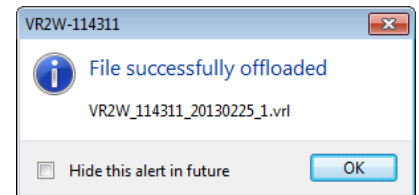
### 7.1.6 How do I open the *Options* window?

The *Options* window is accessed by selecting the *VUE* menu (circled in picture at right) and clicking the "Options" button at the bottom of the menu box (see arrow in picture at right). The *Options* window contains the following tabs: Display, Offload, Export, Devices, and Other. These are described in detail in the VUE manual.
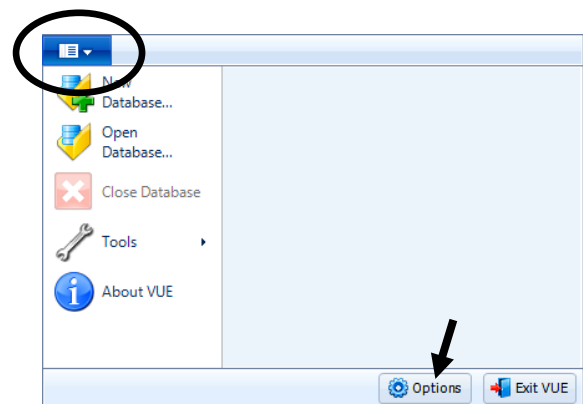
# 7.2 VR2W related questions

## 7.2.1 How much detection range can I expect from my tags and receivers?

Detection range depends on so many factors that it is difficult to estimate without knowledge of the environment and prior experience with telemetry. Range depends on transmission power, signal absorption, line of sight, reflection/refraction, multipath and environmental noise (man-made & natural), and the receiving quality of the receiver/hydrophone. Typically areas that have clear water, sand or silt flat bottoms and low current exhibit the greatest ranges. Conversely, areas with turbid water, complex rocky bottom topography and high current exhibit low ranges. In all cases, extreme weather events and periods of high wind (waves) may significantly reduce range.

In most cases greater transmission power output (dB) results in greater range. For example, in good conditions a V7-VR2W range test could yield a range of 300-400 m and a V16-VR2W test could yield ranges of 800-1200 m. There are some exceptions where high power and a reflective and low noise environment may cause detection breakdowns.

Please try our range calculator at www.vemco.com/customer-service/?cs-tutorials, but only use the results as a guide. One should always perform range testing to determine appropriate receiver spacing. For the enthusiast who wants to learn more about sound propagation try the widely accepted reference on underwater sound by Urick (1983). (Urick, Robert J. Principles of Underwater Sound, 3rd Edition. New York. McGraw-Hill, 1983.).

## 7.2.2 How long will my VR2W battery last?

The VR2W-69kHz receiver will typically last 15 months on a single, new Tadiran lithium battery (model TL-5930/F). The VR2W-180kHz receiver will typically last 8 months.

TIP: Write the installation date on the battery so you know how long the battery has been in use.

## 7.2.3 Does receiver orientation matter?

Generally, in most cases we recommend that a VR2W should be orientated with the hydrophone looking upwards. This is typically because receivers are commonly moored closer to the seafloor than the surface. In some situations it may be beneficial to mount the receiver with the hydrophone pointing towards the sea floor. If a receiver is mounted near the surface or a considerable distance from the sea floor and if the researcher is monitoring benthic creatures a bottom looking receiver may perform better because your tagged animals will not be in a shadow zone (under the receiver). If receiver orientation is a concern we recommend that you perform range tests using both orientations.

## 7.2.4 At low tide my VR2W receiver will be exposed to direct sunlight, does this matter?

The VR2W receiver has a recommended operating temperature of between -5 to 40°C. If there is a chance that your receiver will exceed either of these temperatures please consider another location for the receiver. Keep in mind that direct sunlight on the black case can cause the receiver's internal temperature to be much higher than the ambient temperature.

# 8   Troubleshooting

## 8.1 VUE related troubleshooting

### 8.1.1 Bluetooth Troubleshooting

Instructions and tips for using Bluetooth with the VUE software can be found at http://vemco.com/wp-content/uploads/2015/01/bluetooth-quick-guide.pdf.

### 8.1.2 I cannot connect to my VR2W receiver

First confirm that your *Bluetooth* connection between VUE and your VR2W receiver is functional.  If this *Bluetooth* connection is functioning correctly, try replacing the VR2W battery in the VR2W with a new battery.  If you are still unable to communicate with the unit, please contact VEMCO to receive RMA information and send the unit back to VEMCO for assessment/repair.

### 8.1.3 These detected ID's don't belong to me

We would be very pleased to help connect you with the owners of any unknown IDs.  Please send a list of the unknown ID's and all associated receiver .vrl files to the VEMCO support team.  VEMCO will first review the data to identify false detections and provide you with a false detection report. Then we'll contact the tag owners for all the valid detections and request that they contact you directly.  Please indicate if you are willing to release your email address.

# 8.2 VR2W case related troubleshooting

## 8.2.1 The threads have been damaged

It's very important that the threads on the end-cap are not dented or the outer cylinder will not thread onto the end-cap properly. If the threads on the end-cap are slightly dented, use a sharp knife, such as an X-Acto knife, to remove the deformed plastic until the sides of the thread are smooth and below the normal line of the thread. It is important that there is nothing sticking out of the thread to damage the thread on the outer cylinder or prevent the case from closing.

## 8.2.2 I think the case might be pressurized

When handled correctly, the VR2W pressure case and seal have a static depth rating of 500 meters (730 psi). If the receiver experiences a pressure greater than this, then water may enter the case. NOTE: Physical shocks to the receiver, such as bumping into a solid object, when it is at <u>any</u> depth can result in a considerably higher pressure on the casing than just the depth pressure. Also, if the O-rings or their mating surfaces are dirty or damaged, then water may enter the receiver case.

If water enters the receiver case under high pressure and the Release Valve was unable to open and equalize the pressures, then some water and compressed air may still be in the case when it is returned to the surface. This can be identified by its increased weight and a sloshing sound when the case is moved. The VR2W case will also be very difficult to open, if at all possible. If you are suspicious there is compressed air in the receiver case, then check for air or water leaking from seam in the case where the end-cap and outer cylinder meet.

| To check for... | then... |
|---|---|
| water leakage | dry the seam completely and watch for drops of water around the seam |
| air leakage | spread soapy water around the seam and watch for bubbles indicating air escaping |

If air and/or water are found leaking from the receiver case, do not attempt to remove the end-cap. Instead, place the receiver in a safe place and cover it with a protective layer of towels, tarpaulins, etc. until the leaking stops. If water is still in the case after the air and/or water have finished leaking from the case, then attempt to open the case with the steel rod kit. If it will open, do so very slowly to allow the compressed air to escape. If the case will not open using the steel rods, then it is under a greater pressure than will allow the case to open. Contact VEMCO for further instructions.

When the pressure has been released from the VR2W case, carefully unscrew the end-cap from the outer cylinder (section 2.1). Use fresh water to rinse the internal parts of the VR2W while avoiding skin contact with any battery electrolyte that may have escaped from the battery.

Do not attempt to re-use the VR2W receiver after water has been inside the case. The internal casing protecting the electronics is not waterproof and the electronics have been destroyed by contact with water.

# 9 Appendix

## 9.1 VR2W Metal/PVC Casing

The VR2W receiver is housed in a black plastic high pressure case as shown in the photo below. The outer cylinder is removed from the receiver to install the D-cell Lithium battery, revealing the internal casing protecting the electronics. The older black VR2W receivers have a metal/PVC internal casing, which is explained in this document. The metal/PVC internal casing has an O-ring between the metal internal casing and the PVC battery cup to reduce vibration and is not used for water protection. Do not grease this O-ring.

The procedure for opening a black VR2W is the same regardless of the type of internal casing so we will begin with an open VR2W, shown below. Details on how to open the receiver are found in section 2.1.
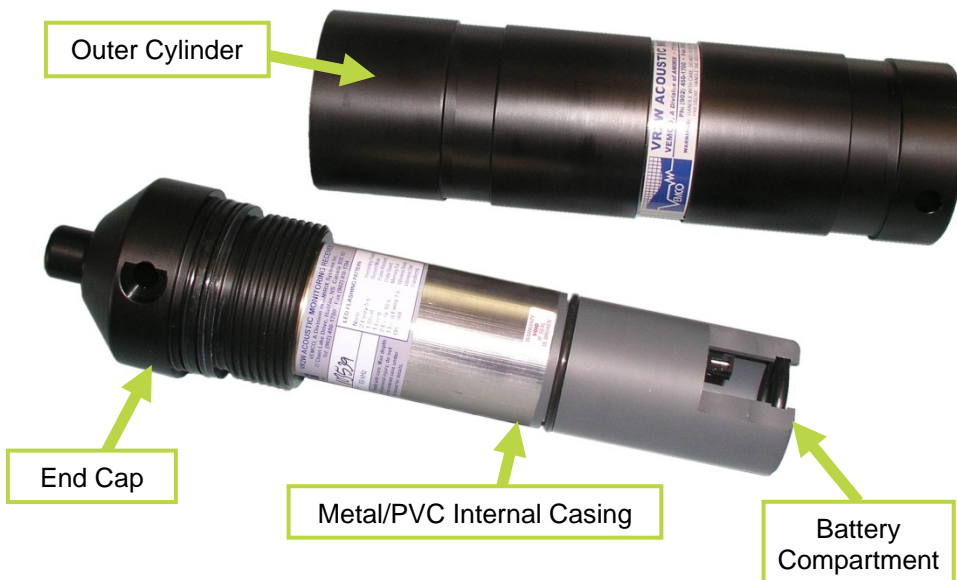


Outer Cylinder

End Cap

Metal/PVC Internal Casing

Battery Compartment

**WARNING**

The internal casing surrounding the electronics is not waterproof. Water, even condensation from a humid environment, will enter the case and damage the electronics.

### Remove Battery

1. Press the release lever on the battery connector and pull the connector apart. The connector is small and a small flat screw driver may help release the lever.
2. Press the back of the battery towards the body of the VR2W until the battery is not pressing against the O-ring. There is a spring at the other end of the battery cup so the battery will move.
3. Slip the O-ring from its groove as shown in the photo. The O-ring's purpose is to hold the battery from sliding out the end of the battery cup.
4. Slide the O-ring along the battery's connector wires so they are separated from each other.
5. Tip the VR2W so the battery slides out of the battery cup.

## Insert Battery

1. Remove the O-ring from the groove in the battery cup if it hasn't already been removed.
2. Slide the wire-free end of the new battery into the battery cup. The connector wires should stick out the battery cup.
3. Thread the connector wires through the O-ring.
4. Press on the battery until the end of the battery is below the O-ring groove.
5. Squeeze the O-ring into an oval shape and push it into the groove in the battery cup as shown in the photo. ***Do not grease this O-ring.***
6. Make sure the connector wires are not pinched in any way, especially between the O-ring and the battery or case. Pinched wires can break internally and disrupt power to the receiver.
7. Connect the Tadiran TL-5930/F battery to the VR2W connector in the proper orientation. The two connector halves should lock together with a little click.

## Close the VR2W Case

The procedure for closing the VR2W with metal/PVC internal casing is very similar to the procedure with a plastic internal casing. The only difference is the placement of the desiccant pack. That difference is covered here but the rest of the steps required to close the case are found in section 2.3.

1. Position the battery wire so it's away from the end of the battery cup as shown in the photo (at right).
2. Hold the receiver's inner casing so the hydrophone is pointing down.
3. Place a new desiccant pack on top of the battery compartment and fold the ends of the pack over onto itself.
4. Fold the battery wires over so they are lying on top of the desiccant pack. This is important to protect the wires from being pinched inside the tube.
5. Slide the cylinder down over the inner casing until the first threads are inside the outer cylinder.
6. Turn the end-cap in a counter-clockwise direction with your hand until it becomes too hard to turn.


*Battery wires*


*Desiccant pack in place*


*Sliding tube over inner casing*


*Hand tightening the case*

A desiccant pack has been included in the bottom of the VR2W to reduce the occurrence of condensation in the VR2W. This pack should remain in the receiver case during storage and deployment.

We recommend that you replace the desiccant pack with each deployment and with each battery replacement cycle.

More information on the availability and usage of these packs is located at www.vemco.com.

## 9.2 Cleaning Instructions

Clean the VR2W with a damp cloth and mild detergent.  Do not use solvents. Do not use a scraper or abrasive cleaner on the LED window or the seal surfaces.

## 9.3 Contact Information

Product manufactured by

**VEMCO Division**
**AMIRIX Systems Inc.**
20 Angus Morton Drive
Bedford, Nova Scotia
Canada   B4B 0L9

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# 9.4 VR2W Specifications

| | |
|---|---|
| Dimensions | 308 mm (12.125") overall length x 73 mm (2.875") diameter |
| Weight | 1190 g in air; 50 g in water |
| Receive Frequency | VR2W-69kHz:  69.0 kHz |
| | VR2W-180kHz:  180.0 kHz |
| Operating temperature | -5°C to +40 °C; Water in which VR2W is deployed *must not freeze.* |
| Shipping & storage temperature | -5°C to +50°C |
| Battery | 1 - Tadiran TL-5930/F Lithium Inorganic battery or equivalent, 3.6 Volts<br>• Nominal capacity @ 4 mA, to 2 V 19 Ah<br>• Rated voltage 3.6 V<br>• Maximum recommended continuous current 230 mA<br>• Maximum pulse current capability 500 mA<br>• Weight 105 g (3.7 oz)<br>• Li metal content approx. 5 g<br>U.L. Component Recognition, MH 12193 |
| Battery Life | VR2W-69kHz:  Typically 15 months (using Tadiran TL-5930/F) |
| | VR2W-180kHz:  Approximately 8 months (using Tadiran TL-5930/F) |
| Memory | VR2W-69kHz-110:  8 MB Flash memory (approx. 0.8 million detections)<br>VR2W-69kHz-111: 16 MB Flash memory (approx. 1.6 million detections) |
| | VR2W-180kHz-110:  8 MB Flash memory (approx. 0.8 million detections)<br>VR2W-180kHz-111:  16 MB Flash memory (approx. 1.6 million detections) |
| Static depth rating | 500 meters (730 psi) |
| Ingress Protection | IPX8 to rated depth |
| *Bluetooth* wireless certifications | Bluetooth ID: B012394<br>FCC ID: ED9LMX9838<br>Industry Canada ID: IC-1520A-LMX9838 |
| Attachment: | Standard method: 5 non-reusable lashing cable ties, 388 mm (15.25") long, 7.5 mm (0.3") wide, UV protected, 120 lb tensile strength (VEMCO number HWE 507450). |

## WARNING

The VR2W pressure case and seal have a static depth rating of **500 meters** (730 psi). Physical shocks to the receiver, such as bumping into a solid object, when it is at any depth can result in a considerably higher pressure on the casing than just the depth pressure and water may enter the VR2W case.  If the O-rings or their mating surfaces are dirty or damaged, then water may also enter the receiver case.  If you are suspicious that water has entered the receiver, then follow the suggestions in the Appendix for troubleshooting a pressurized case.

# 9.5 Warranty and Disclaimer

# 9.6 Glossary

*Bluetooth* **wireless technology:** A technology based on the *Bluetooth* standard which provides for fast wireless communication in air, typically over a 10 meter range.

*Bluetooth* **USB Adapter:** This is a physical device that attaches to the PC USB port and enables your PC to communicate wirelessly to the VR2W receiver.

**Code Map:** Collection of code spaces that define the types of transmitters the receiver can detect.

**Code Space:** Nomenclature for VEMCO tags which provides unambiguous description of the coding parameters for that tag type.

**Firmware:** A computer program that is contained as a read-only memory in a hardware device. This program controls the hardware device and may be able to be upgraded, depending on the design of the product.  The VR2W firmware can be upgraded if there is a design change.

**Offloading:** Retrieving data from a VEMCO receiver and storing it in a VRL file.

**Station Name:** Name for a specific deployment location including lat and long parameters.

**UTC:** Co-ordinated Universal Time is a worldwide standard for time, sometimes referred to as Greenwich Mean Time. VUE configures VEMCO receivers in UTC time.

**VRL files:** Binary file format for VEMCO Receiver data logs read from VEMCO receivers.

**VUE :** VEMCO User Environment PC Receiver software from VEMCO.

**VUE Database:** A collection of imported VRL files. VRL files are all that is needed to recreate a database or to create other databases.

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