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# VEMCO VR3 Field Guide

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## Section 1: Introduction

This manual is designed to provide tips on how to upload data from the VR3 when in the field and using the on-board acoustic modem.

We assume that you have already read the VR3 hardware and software manuals before communicating with the VR3. To upload the VR3 hardware and software manuals please visit our website at [http://www.vemco.com/support/vr3\\_support.php](http://www.vemco.com/support/vr3_support.php).

### 1.1 Overview of How the VR3 Works

The VR3 is a receiver that detects the presence of VEMCO's coded transmitters and records them in its non-volatile memory. Data in the VR3 can be uploaded remotely via the high speed acoustic modem (white tube). In its typical operating state, the VR3 continuously listens for transmitters. For approximately 2 seconds every 1-2 minutes, depending on the programmed modem sleep cycle, the modem wakes and listens for acoustic communication signals from a top side acoustic modem within acoustic range (i.e. 200-350 meters (350 max.)).

If a signal is recognized, the VR3 then wakes the acoustic modem for 10 minutes. Ten minutes was chosen to provide researchers with enough time to initiate communications and upload data. If the VR3 modem loses contact with the top side modem after 10 minutes, it then reverts back to its sleep cycle (1-2 minutes off and 2 seconds on). This means that once you have established contact with the VR3, you have 10 minutes to setup a data link before the cycle starts over again. This duty cycle was created as a balance between reliable field operation and long battery life.

The acoustic modem communicates using a complex channel equalization technique that employs spread spectrum technology. You can hear these signals on a VR100 or VR60 tracking receiver. However, these receivers were never designed to decode the VR3 signals. Further in this guide, I will explain how you can use a VR100 or VR60 to monitor VR3 communications.

### 1.2 Required Equipment

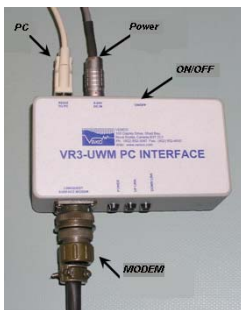
- PC with serial port or USB-Serial adapter Power Box
- RS232 cable
- 12 V DC battery
- Power cable
- VR3 surface modem
- GPS receiver
- Field Notebook,
- (Optional) VR100, VH165, VH110 hydrophones

## Section 2: Preparation, Setup and Data Uploading

### 2.1 Verify Receivers and Tags (in Air Tests)

#### Connections:

- Connect the POWER box to 12 volts DC.
- Turn ON and look for the Green light.
- Turn OFF POWER box, connect the Surface Modem to the box, connect the Serial Cable (RS232) to PC and turn ON POWER box again.
- Synchronize the PC clock time to an accurate source (handheld GPS or VR100 with GPS connection).



#### VR3 Host Software (VR3HS):

Open the VR3 PC host software (VR3HS). Refer to VR3 software manual to learn more about the software features.

#### COMMunications Port:

Select the COMMunications Port (RS232). Port 1, is the most common port, however, you may need to select other values to before communications begins. If the port number is wrong, you will not be able to proceed further.

Most new laptops do not come with RS232 ports but you can purchase an inexpensive USB-RS232 converter. This device must be installed properly. Contact Vemco for support if you have difficulty.

### The Importance of ID & Depth:

Enter the correct ID number of your moored VR3 unit and the correct depth as accurately as possible. The ID is a value in the range of 1 to 65,536 and is displayed on a label on the top of the VR3 base.

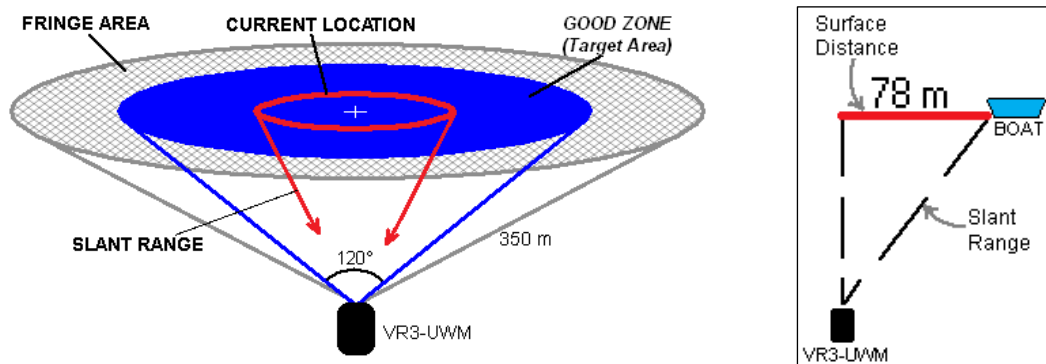
If an incorrect ID is entered then you will NOT be able to communicate with the VR3. If you suspect that this may be the case then you should conduct a GLOBAL search and enter a range of IDs in the VR3 software. While it is always best to enter the correct ID number, errors can occur and it may be possible that a VR3 with a different serial number was placed in the wrong location.

Depth is used by the VR3HS PC software to calculate the meters distance of the surface modem (you) to the surface location above the moored VR3. If you enter an incorrect depth then the surface distance value will be incorrect as well. Incorrect values might affect your ability to locate and communicate optimally with the VR3. The magnitude of the error depends on the geometry (slant range and depth).

### The Good Zone!

The “good zone” or target area is the area within the blue zone shown in the figure below. This is the surface area within the 120 degree angle that the VR3 modems can optimally communicate. The red ring signifies your boat position and is the surface distance to the vertical position over the VR3 (78m). This means that you are somewhere on the red ring but your compass direction to the VR3 position is unknown.

In the fringe area, communications may still work but may be intermittent and potentially fail. Communicating with the VR3 is more challenging in very shallow depths (i.e. <30 meters) because the surface area of good communications is much less than if the VR3 is in deep water. For example, in 10 m depth, the surface diameter for good communications is 34 m compared to 340 m if depth is 100 m.

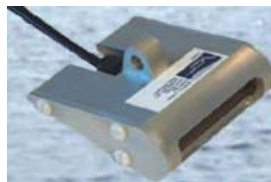


*(Slant Range = the calculated distance of the surface modem to the VR3)*

**VR100 Setup:**

The VR3 modem communicates in a frequency band of approx. 26-45 kHz. To listen to these signals:

- Program 1 of 8 VR100 channels to 27 kHz, continuous pinger and a Blanking Interval of 240 msec.
- The VR60 can also be programmed to 27 kHz by following the instructions in the VR60 manual.
- Modem signals are heard as bursts of acoustic energy ranging from short to long bursts depending on the origin and type of message. These messages cannot be decoded with the ear.
- Connect the VH165 or VH110 hydrophone to the VR100. You should use the VH165 omnidirectional hydrophone if you are using the VR100 to listen to the VR3 for the first time. If you are unfamiliar with this equipment, you should practise using the VR100 and VR3 in your lab, dock or small pond or lake before your scheduled data upload trials.

**Omni (VH165)****Directional (VH110)****VR100****Ready to Connect and Upload Data:**

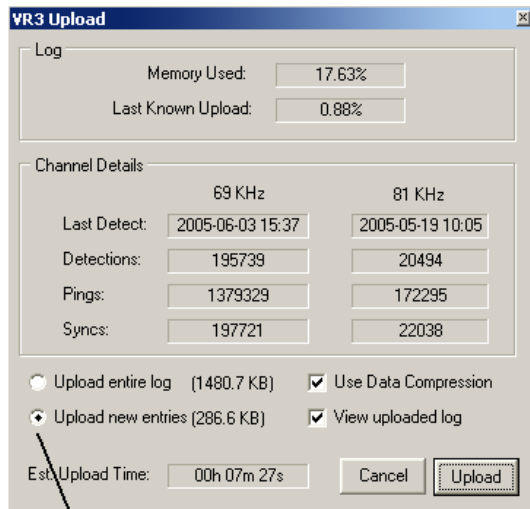
To communicate with a VR3 turn on the VR100:

- Lower the VH110 omnidirectional hydrophone under water
- Select MONITOR
- Select MANUAL GAIN = 0
- Choose an appropriate speaker volume.

- When ready click the CONNECT button in the software. The surface modem will transmit for 2 minutes. You will hear a constant “hum” on the VR100 speaker. This confirms that the surface modem is transmitting. The signal should be strong because the VR100 hydrophone is close to the surface transducer.
- After the 2 minute transmission the surface modem stops and listens for the VR3. The top side modem issues a synchronization command and waits for the bottom unit to reply indicating it woke up.
- If the VR3 wakes up AND the boat is within acoustic range of the VR3 (surface area) then you will hear a short response “blip” from the VR3. At this point the VR3 and surface modem are creating an acoustic link and the surface modem retrieves basic health/stats information from the VR3.
- Once they have established communication the VR3 Host software indicates that the 2 devices are connected.
- At this point you can proceed to upload your data. As data is being uploaded you will notice, on the VR100, that the pattern of acoustic messages between the surface modem and VR3 changes.
- The long messages will be blocks of data being uploaded by the VR3. These transmissions will be occasionally interrupted by short confirmation messages from the surface modem.
- These short messages are also automatic updates of TILT ( VR3 case angle) and SLANT RANGE (distance to VR3). These surface modem messages will always be louder.
- After a few data uploads you will become very familiar with these patterns and you will be able to diagnose transmission faults much easier with than without the VR100.

### **If I drift off station, will I lose my connection and data upload?**

If you drift outside the “good zone”, you may lose your connection. However, you have 10 minutes to get back into the “good zone” and continue with your data upload. If after 10 minutes the VR3 reverts back to its “sleep” mode, the VR3HS software will automatically issue the 2 minute wakeup call again. The VR3 maintains a record of the last memory block successfully uploaded to the surface modem. When you re-connect you will be able to retrieve your data from that point. It is important that you select UPLOAD NEW ENTRIES. If you select UPLOAD ENTIRE LOG, the upload could take over an hour and up to 14 hours if the VR3 memory is full (approximately 1,000,000 detections).



*continue where you left off!*

The VR100 can be used to assist you to stay on station near the VR3 simply by listening to the loudness or intensity of the VR3 signal as it is transmitted to the surface modem. As the boat moves further away from the VR3, its transmission becomes weaker. You can use either the VH165 omnidirectional or VH110 directional hydrophone. However the VH110 is better suited to determine a more precise bearing to the VR3. As you move back towards the VR3, you will notice the signal gaining strength. By gauging the wind strength, direction and tidal current direction, you can move past the VR3 while remaining in the good zone.

#### **VIEW the DATA:**

After you have finished uploading the data select FILE – DISPLAY LOGS to view the detection data. You can also import the file into VUE to graphically display the data. Once you are satisfied with the data you can move to the next VR3 location.