

VR100 RECEIVER
OPERATING MANUAL

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VEMCO, a Division of AMIRIX Systems Inc.

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ATTENTION

It has come to VEMCO's attention that in rare instances it is possible for the USB interface chips in certain computers to experience permanent component failure when connected to a USB device. These failures, which may relate to electric static discharge damage, are not related to the specific USB device connected to the computer and have been reported to occur with cameras, scanners, printers, pocket PC handheld devices, and MP3 players.

To reduce the risk of damage to the computer, some computer manufacturers have recommended connecting USB devices through a powered hub, rather than directly to the computer. We have confirmed that the Dlink DUB-H4 USB 2.0 powered hub will allow the VR100 to operate correctly.

We hope this information is helpful.

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1 INTRODUCTION

1.1 ABOUT VEMCO

VEMCO, a division of AMIRIX Systems Incorporated, is a leader in the design and manufacture of oceanographic research tools and systems since 1979. VEMCO's product line ranges from miniature acoustic transmitters and data loggers to large tracking, positioning, and monitoring systems. Data communication methods include acoustic telemetry, radio modem, and under-water modem.

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1.2 SYSTEM REVIEW

The VR100 is a general-purpose ultrasonic, splash-resistant, receiver designed for manual tracking of aquatic animals from small boats or for recording laboratory data. Its hardware architecture has been developed to support a wide range of applications and transmitter types. It replaces the VR60 receiver.

All the VR100's Digital Processing and Controller Functionality is software based and can be updated in the field from a laptop. This allows new features, such as specialized tag detection algorithms and support for new tag types, to be added during the life of the product and without the product having to return to the factory.

The VR100 can detect continuous and coded tags on eight separate frequencies and at the same time. It can also store the detections, along with the date/time and GPS location of the receiver at the time of the detection, to be loaded to a computer for viewing or analysis. The communication between the computer software and the VR100 travels through a supplied USB cable.

The internal gel-cell rechargeable battery can operate for approximately 12 hours with the backlight off under normal operating conditions. Operating time with the backlight on is shorter. The VR100 can also be operated while the battery is being charged from the supplied AC adapter or an external DC source, allowing the receiver to continue to operate during the charging process. However, for the absolute best noise performance, the VR100 should be disconnected from the PC and charger as these devices can sometimes add unwanted noise to the receiver.

The VR100 receiver is designed to operate with a hydrophone containing a high gain, low noise pre-amplifier powered by the receiver. An omni-directional hydrophone is provided as a standard accessory (VH165). The optional VH110 directional hydrophone enables the VR100 receiver to locate and track a transmitter (see Applications, section 2).

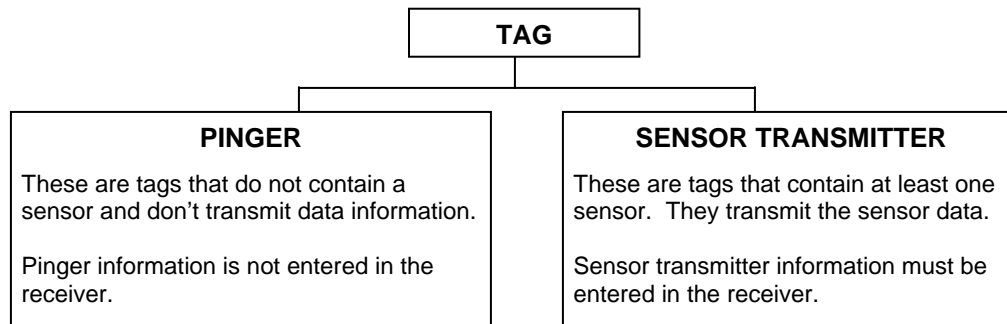
1.3 USING THIS MANUAL

This manual, the VR100 Operating Manual, contains the necessary information to care for the VR100 receiver and use it as a stand-alone unit. The receiver can be connected to a computer running the VR100 software and the necessary details are contained in the VR100 Software manual.

This manual is broken into major sections for easier use of the information found in the manual. These sections, and a brief explanation, are listed in Table 1.3-1.

Section	Description
Introduction	Introduction to the VR100 and this manual.
Applications	Information on how to use the VR100 receiver.
Hardware	The VR100 case and attachments.
Operation	Information on how to use the buttons and LCD display.
Appendix	A glossary and additional information.

The manual refers to tags, pingers, and sensor transmitters. The relationship these three terms have with each other is shown in the diagram below. A tag can be either a pinger or a sensor transmitter.



2 APPLICATIONS

2.1 QUICK SETUP

The list below gives the order of actions needed to set up and use the VR100 receiver. The steps may reference sections in this manual that contain more details about that step.

1. Open the lid of the VR100 case (see section 3.1.1).
2. Verify that the receiver is off by pressing the OFF button (see section 3.1.3).
3. Connect the hydrophone to the bulkhead connector on the side of the case (see section 3.1.2).
4. Power the VR100 receiver by pressing the ON button (see section 3.1.3).
5. Wait for the VR100 to boot up and display the Main screen (see section 4.1).
6. Set the units to be used with temperature and depth data (see section 4.3.2.5).
7. Enter information for sensor transmitters (see section 4.3.4).
8. Configure channels for use during monitoring or tracking (see section 4.3.1.2).
9. Turn on the channels to be used (see section 4.3.1.1).
10. Make sure the backlight is in the Smart Mode (see section 4.3.2.3).
11. Adjust the Backlight contrast; if necessary (see section 4.3.2.2).
12. Deploy the hydrophone.
13. Monitor the deployed tags:
 - a. Set the gain to automatic or to a “reasonable” value (e.g. 12 dB) (see section 4.2).
 - b. Select a channel to monitor (see section 4.2).
 - c. Select the desired detection parameter level (see section 4.2).
 - d. Turn the audio on or off as desired (see section 4.2), and adjust the volume (see section 4.2).
14. Retrieve hydrophone.
15. Upload data to a computer if desired (see Software manual).
16. Turn the VR100 off when session is complete.
17. Disconnect the hydrophone from the VR100 case and replace the connector’s protective cap (see section 3.1.2).
18. Charge the battery for next deployment (see section 3.3.1).

2.2 COMMON APPLICATIONS

This section contains steps needed to perform common tasks on the VR100 receiver. The steps are referenced to sections in the manual that contain more information on the topic.

2.2.1 Set up a channel to monitor a continuous pinger

A channel can be set up to monitor continuous pingers operating on the same frequency. All pingers operating on that frequency will be detected, so normally an experiment uses a single continuous pinger per frequency. Continuous pingers on other frequencies can be monitored on other channels. More detail is given in section 4.3.1.2.

From the Main menu:

1. Press the right selection button to enter the “Config” menu.
2. Press “1” on the keypad.
3. Select the desired channel number on the keypad, or use the arrow buttons to move through the list of channels until the cursor is over the desired channel.
4. Press the right selection button to select “Configure”.
5. Press the left selection button to “Edit” this channel, or press the right button to “Accept” the channel configuration.
6. Use the arrow buttons to select “Cont pinger” and press the right selection button for “Next”.
7. Enter the desired frequency in kilohertz and select “Next”.
8. Enter the desired Blanking Interval and select “Next”. If the chosen blanking interval is outside the recommended range, a confirmation screen appears to verify the blanking interval is the desired value.
9. Review the information on the screen.
10. Press the right selection button to “Accept” the configuration, or press the left selection button to repeat the configuration process.
11. Verify that the cursor is over the channel you just set up. If it isn’t, use the up/down arrows until the cursor is in position or press the corresponding number on the keypad.
12. Press the left selection button for “Set on” to turn this channel on. If you don’t want to turn the channel on at this time, perform steps 11 and 12 at a future time.

2.2.2 Set up a channel to monitor a continuous sensor transmitter

A channel can be set up to monitor one continuous sensor transmitter. Other continuous sensor transmitters are monitored on other channels. More detail is given in section 4.3.1.2.

From the Main menu:

1. Press the right selection button to enter the “Config” menu.
2. Press “1” on the keypad.
3. Select the desired channel number on the keypad, or use the arrow buttons to move through the list of channels until the cursor is over the desired channel.

4. Press the right selection button for “Configure”. The current channel configuration is displayed in a summary screen.
5. Use the arrow buttons to select the type of continuous sensor transmitter to be monitored, either “Cont 1 Sensor” or “Cont 2 Sensor”.
6. Press the right selection button for “Next”.
7. Enter the serial number of the desired tag, or use the arrows to select it from the list, and select “Next”.
NOTE: The tag must be set up in the receiver before it can be monitored. See section 4.3.4.2 or 4.3.4.3 for how to set up a continuous sensor transmitter in the VR100 receiver.
8. Review the summary screen to verify that the information is correct.
9. Press the right selection button for “Accept”.
10. Select the channel to be set up by either using the up/down arrows or pressing the corresponding number on the keypad.
11. Press the left selection button for “Set on” to turn this channel on. If you don’t want to turn the channel on at this time, perform steps 9 and 10 at a future time.

2.2.3 Set up a channel to monitor a coded tag

A channel can be set up to monitor a large number of coded tags on one frequency. The coded tags may use a factory map or a custom map (see section 4.3.3 for more information on coded maps). More detail is given in section 4.3.1.2.

1. Select Config (right selection button).
2. Press “1” on the keypad.
3. Select the desired channel number on the keypad, or use the arrow buttons to move through the list of channels until the cursor is over the desired channel.
4. Press the right selection button for “Configure”. The channel’s configuration is displayed in a summary screen.
5. Select “Edit” with the left selection button to change the channel’s configuration or “Accept” with the right selection button to return to the channel screen.
6. Use the up and down arrows to cycle through the four tag types until “coded” is displayed and then select “Next”.
7. Enter the frequency (in kHz) on the key pad and select “Next”. NOTE: If you make an error, keep pressing the first number until the cursor returns to the first digit place.
8. Select the coded map (see section 4.3.3) to be used on this channel by pressing the arrow buttons to scroll through the list of coded maps. NOTE: To use a custom map, the map must be imported using the PC software before a channel can be configured to use that map.
9. Press the right selection button to select “Next”.
10. Review the summary screen to verify that the information is correct.
11. Press the right selection button for “Accept”.
12. Verify that the cursor is over the channel you just set up. If it isn’t, use the up/down arrows until the cursor is in position or press the corresponding number on the keypad.
13. Press the left selection button for “Set on” to turn this channel on. If you don’t want to turn the channel on at this time, perform steps 12 and 13 at a future time.

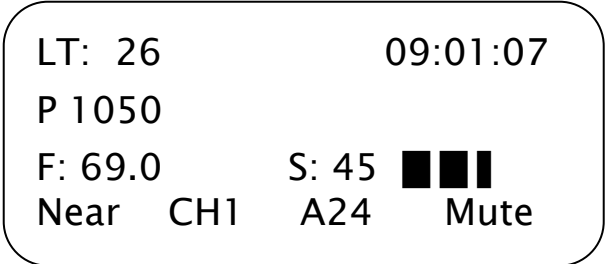
2.2.4 Manually tracking a continuous pinger

After a channel in the VR100 has been setup to detect the continuous pinger (see section 4.3.1.2.1) and the pinger has been deployed, use the steps below to use the VR100 to track the pinger.

Tracking a tagged marine animal requires a directional hydrophone. The VR100 receiver uses the VH110 directional hydrophone. The directional hydrophone must be mounted on the end of a pole so it can be rotated. It's also helpful to mark which section of pole is facing in the same direction as the black section of the VH110 hydrophone. This black section is the signal sensitive section of the hydrophone.

From the Main menu:

1. Select Monitor by pressing the left selection button. A screen on the VR100 will appear similar to the sample below.
2. Press the channel number on the keypad to select the channel to be monitored.
3. Use the left selection button to select the desired level of Detection Parameter (see section 4.2). The sample below has been set to Near. This setting is based on the channel so a channel must be selected before this step can be performed.
4. Press the AGC button on the front panel so the gain is in automatic mode (AGC) and the "A" appears next to the gain level. In the sample below, that's "A24".
5. Verify that the frequency shown is the desired frequency. If it isn't, then the channel setup must be edited (see section 4.3.1.2).
6. Deploy the directional hydrophone.
7. Use the audio output from either the speaker or the headphones to listen for the deployed pinger. You may need to rotate the hydrophone.
8. Press the AGC button when you hear the pinger to switch the receiver to manual gain (the "A" is replaced with "M"). The gain level (the number shown) will remain the same.
9. Watch the second line for the tag's ping period (in milliseconds). The "P" indicates that the received ping was from a continuous pinger. The time in seconds since the last ping was received is shown in the top left corner. If the length of time is very large, the display will show 999 to indicate there haven't been any recent detections.
10. Slowly rotate the hydrophone rod in one direction. If the signal gets louder and stronger (the signal strength level and bar graph increase) then continue to rotate the hydrophone in that direction. If the signal gets softer and decreases, then reverse the rotation. When the signal is its strongest, the hydrophone is pointing in the direction of the tag.
11. Move in the direction the hydrophone is pointing and watch/listen to the signal strength. If the signal strength decreases, repeat step 10 until it increases again.
12. Decrease the manual gain by pressing the negative GAIN button once when the signal strength is strong enough. This is to prevent the signal from saturating the receiver.
Note: The gain setting is not critical and in most circumstances satisfactory performance can be achieved without frequent gain changes.
13. Continue this process of following the signal strength and decreasing the gain until the signal strength is strong in all directions (rotating the hydrophone doesn't change the signal strength). The tag is below the hydrophone.



LT: 26 09:01:07
P 1050
F: 69.0 S: 45 ■■■
Near CH1 A24 Mute

TIP: If the animal being tracked is operating in deeper water, then adjust the angle of the directional hydrophone so it's pointing downward as you get closer to the tag. If you don't adjust the angle, you might miss the animal because the hydrophone is looking at the surface of the water instead into its depth.

2.2.5 Manually tracking a coded tag

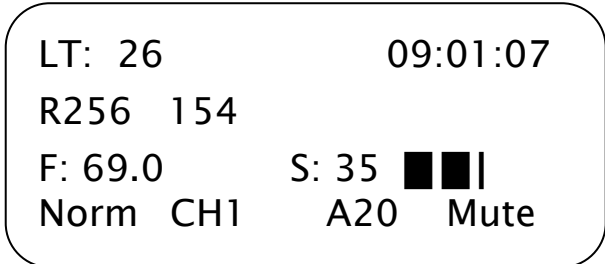
After a channel in the VR100 has been setup to detect the coded pinger (see section 4.3.1.2.2) and the pinger has been deployed, use the steps below to use the VR100 to track the pinger.

Tracking a tagged marine animal requires a directional hydrophone. The VR100 receiver uses the VH110 directional hydrophone. The directional hydrophone must be mounted on the end of a pole so it can be rotated. It's also helpful to mark which section of pole is facing in the same direction as the black section of the VH110 hydrophone. This black section is the signal sensitive section of the hydrophone.

Tracking a coded tag is more difficult than tracking a continuous tag because coded tags transmit in ping trains. A ping train is a burst of pings lasting 3-4 seconds followed with a delay that can be a minute long (the delay length is determined by the customer at the time the tag is ordered). There is often more than one tag in area so you must determine which tag you're tracking based on its ID number.

From the Main menu:

1. Select Monitor by pressing the left selection button. A screen on the VR100 will appear similar to the sample below.
2. Press the channel number on the keypad to select the channel to be monitored.
3. Use the left selection button to select the desired level of Detection Parameter (see section 4.2). The sample below has been set to Norm.
4. Press the AGC button on the front panel so the gain is in automatic mode (AGC) and the "A" appears next to the gain level. In the sample below, that's "A20".
5. Verify that the frequency shown is the desired frequency. If it isn't, then the channel setup must be edited (see section 4.3.1.2).
6. Deploy the omni-directional VH165 hydrophone and listen for coded tags in the area. Make note of the code numbers and types that are identified and displayed in the second line on the screen. In the sample screen on the previous page, the R256 code type with ID number 154 was identified.
7. Remove the omni-directional hydrophone from the water and deploy the directional hydrophone.
8. Use the audio output from either the speaker or the headphones to listen for the deployed pinger.
9. Press the AGC button when you hear the pinger to switch the receiver to manual gain (the "A" is replaced with "M"). The gain level (the number shown) will remain the same.
10. The length of time since the last ping was received is shown in the top left corner. If the length of time is very large, the display will show 999 to indicate there haven't been any recent detections.
11. Slowly rotate the hydrophone rod in one direction. If the signal gets louder and stronger (the signal strength level and bar graph increase) then continue to rotate the hydrophone in that direction. If the signal gets softer and decreases, then reverse the rotation. When the signal is its strongest, the hydrophone is pointing in the direction of the tag.
12. Move in the direction the hydrophone is pointing and watch/listen to the signal strength. If the signal strength decreases, repeat step 11 until it increases again.
13. Decrease the manual gain by pressing the negative GAIN button once when the signal strength is strong enough. This is to prevent the signal from saturating the receiver.



14. Continue this process of following the signal strength and decreasing the gain until the signal strength is strong in all directions (rotating the hydrophone doesn't change the signal strength). The tag is below the hydrophone.

NOTE: If the animal is operating in deeper water, then adjust the angle of the directional hydrophone so it's pointing downward as you get closer to the tag. If you don't adjust the angle, you might miss the animal because the hydrophone is looking at the surface of the water instead into its depth.

2.2.6 Enter slope and intercept for a continuous one-sensor transmitter

The tag's information that must be entered in the VR100 is found in the Transmitter Specification manual shipped with the tags. See section 4.3.4 for more details.

From the Main menu:

1. Select Config (right selection button).
2. Press "4" on the keypad.
3. Press "2" on the keypad.
4. If a list of serial numbers appears, press the left selection button to select "New". Otherwise, go to Step 5.
5. Enter the serial number of the tag and press "Next".
6. Enter the tag's operating frequency.
7. Enter the tag's slope value.
8. Enter the tag's intercept value.
9. Select the data type, either depth or temperature.
10. Enter the Minimum Period value.
11. Enter the Maximum Period value.
12. Press the right selection button to "Accept" this tag.
13. If more tags are to be entered, repeat steps 3 to 12.
14. Press the Menu button until the Main screen appears.

2.2.7 Enter slope and intercept for a continuous two-sensor transmitter

The tag's information that must be entered in the VR100 is found in the Transmitter Specification manual shipped with the tags. See section 4.3.4 for more details.

From the Main menu:

1. Select Config (right selection button).
2. Press "4" on the keypad.
3. Press "3" on the keypad.
4. If a list of serial numbers appears, press the left selection button to select "New". Otherwise, go to Step 5.
5. Enter the serial number of the tag and press "Next".
6. Enter the tag's operating frequency.
7. Enter the tag's sync value (1150 is the default value).

8. Enter the tag's first slope value.
9. Enter the tag's first intercept value.
10. Select the data type for the first sensor (usually temperature).
11. Enter the tag's second slope value.
12. Enter the tag's second intercept value.
13. Select the data type for the second sensor (usually depth).
14. Enter the Minimum Period value.
15. Enter the Maximum Period value.
16. Press the right selection button to "Accept" this tag.
17. If more tags are to be entered, repeat steps 3 to 16.
18. Press the Menu button until the Main screen appears.

2.2.8 Enter slope and intercept for a coded tag

The tag's information that must be entered in the VR100 is found in the Transmitter Specification manual shipped with the tags. See section 4.3.4.1 for more details.

From the Main menu:

1. Select Config (right selection button).
2. Press "4" on the keypad.
3. Press "1" on the keypad.
4. If a list of serial numbers appears, press the left selection button to select "New". Otherwise, go to Step 5.
5. Enter the serial number of the tag and press "Next".
6. Enter the tag's operating frequency.
7. Enter the coded ID number.
8. Select the code space from the list provided by pressing the up or down arrow until the correct code space name is shown on the display.
9. Enter the tag's slope value.
10. Enter the tag's intercept value.
11. Select the data type, either depth or temperature.
12. Press the right selection button to "Accept" this tag.
13. If more tags are to be entered, repeat steps 3 to 13.
14. Press the Menu button until the Main screen appears.

2.2.9 Take a GPS reading

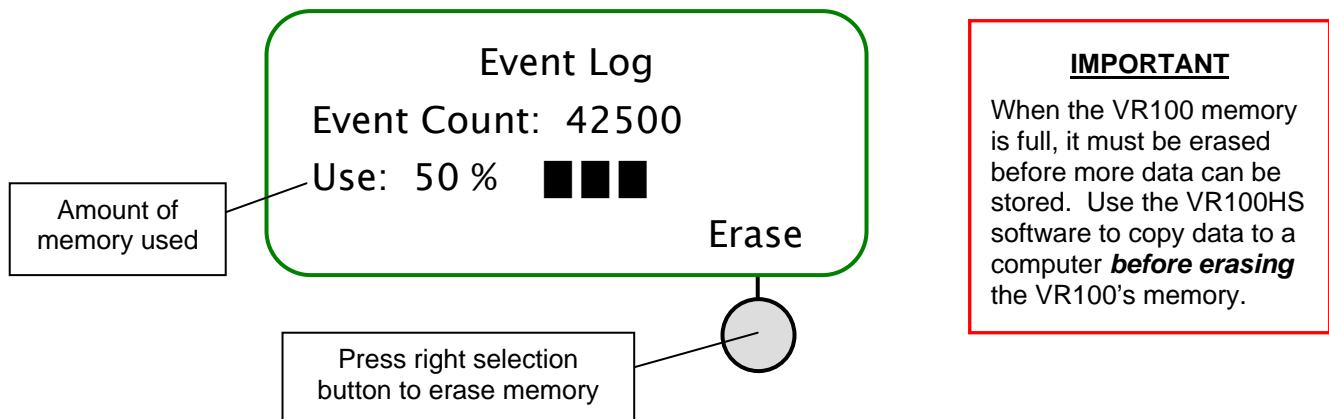
1. A GPS reading is automatically stored in the VR100's memory with each detection, if the the GPS receiver is "locked" (see section 5.1). Manual GPS readings can be taken while in the Monitor screen (see section 4.2) and stored to memory by pressing the LOG GPS button on the front panel of the receiver (see section 3.1.3).

2.2.10 View Used Memory Level

The Use line in the Event Log screen shows the percentage of log memory used in the VR100 receiver, both numerically and graphically. **When 100 % of the log memory is full, the memory must be erased before more events can be logged; old data are not deleted, but new data will not be stored until the memory is erased. To prevent loss of data, upload the VR100's memory to your PC before erasing the memory.**

To erase memory using the VR100, from the Main menu on the VR100:

1. Select Config (right selection button).
2. Press “5” on the keypad.



2.2.11 Clear VR100 Memory

When 100 % of the log memory is full, the memory must be erased before more events can be logged. The memory is erased from either the Event Log screen (described below) or from within the PC software, but the *memory should only be erased after the log has been copied to a computer* (see the software manual for details).

To erase memory using the VR100, from the Main menu on the VR100:

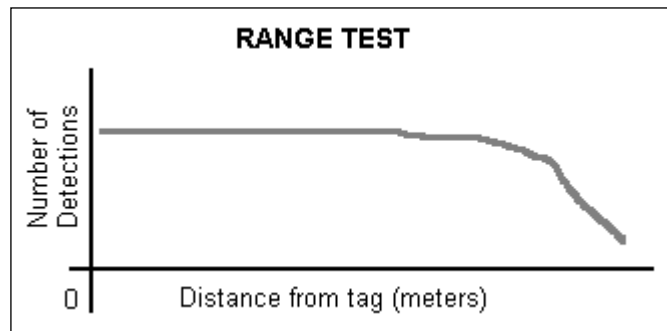
1. Select Config (right selection button).
2. Press “5” on the keypad.
3. Press the right selection button to erase the data. It's strongly suggested that data be loaded to a computer using the VR100HS software **before** the memory is erased.
4. Confirm the erasure of the data by pressing the button identified in the confirmation window.

Erasing the event log will only erase the events that have occurred to the VR100 receiver and not the channel settings or the sensor tag information.

2.2.12 Perform a Range Test

There are times when it's important to know the range at which the VR100 can detect different transmitter types. These ranges change depending on different environmental conditions so it's suggested that a number of different range tests be performed. Acoustic properties differ dramatically with the environmental conditions, such as the weather or current speed. It's also suggested that two range tests be performed, one while moving towards the transmitter and one while moving away from the transmitter.

1. Suspend an activated transmitter from a deployed, stationary buoy in the area.
2. Hang an omni-directional hydrophone from a boat. The hydrophone must be attached to a VR100 receiver.
3. Turn the VR100 on and select the channel matching the deployed transmitter.
4. Position the VR100 so it is near the deployed transmitter and press the "GPS" button on the front panel of the receiver. This is to determine the position of the transmitter so the closer you can get to the transmitter without the possibly of damaging the receiver (like dropping it in the water), the more accurate the range test will be.
5. Slowly drift either away or towards the pinger and press the LOG GPS button periodically to track the boat's drift. Use drag to slow the boat if necessary, but don't use the motor if possible. Try to keep the hydrophone vertical and in the same relative position to the boat for the duration of the test.
6. Stop drifting when the transmitter can no longer be heard if you're drifting away from it, or you've reached the transmitter if you're drifting towards it.
7. Load the data from the VR100 to a computer using the software (see the Software manual).
8. Plot the number of detections verses the distance (in meters) from the transmitter. A sample graph is shown below. The graph shows the range of the receiver under those environmental conditions and with the type of transmitter used.



2.2.13 Using Signal Strength and Gain when tracking

When tracking a tag using the VR100 and a directional hydrophone (the VH110), the signal strength will increase as the hydrophone approaches the tag. The gain must be set to manual (a "G" appears in the Monitor screen – see section 4.2) during this procedure.

When the signal strength bar graph is near full scale, the manual gain should be reduced so meter variations will indicate transmitter direction as the hydrophone is turned. If the signal level indicator is at the bottom of the scale, the gain should be increased to detect meter variations.

3 HARDWARE

3.1 CASE

The VR100 receiver is housed in a strong, sealed, splash-resistant case, as shown in the photo here. The cover of the case must be opened to access the receiver's front panel (see section 3.1.3) with the LCD display and the soft-touch controls. A gel cell battery is housed in the case to supply stand-alone power to the receiver. There are connectors on the right side of the case for the hydrophone, the USB computer connection, the battery charger, and audio headphones (see section 3.2.2). The case should always be latched closed while the receiver is being transported.



The VR100 receiver can be used during a light rain as long as the hydrophone is connected to the case and the remaining three protective caps are in place (see section 3.1.2.2). Water should be wiped from the front panel with a dry cloth before it accumulates. The USB cable, battery charger, and headphones should only be used when the receiver is safe from exposure to water.

The case has a pressure relief vent to allow any pressure build-up in the case to release before the case is opened. This vent is located between the latches on the side of the case, as seen in the photo below. A manufacture's tag is attached to the vent and should not be removed. Removing the tag may damage the vent.

3.1.1 Opening Case

To open the VR100 case, follow the steps below.

1. Place the case on a stable, flat, horizontal surface so the VR100 label is on the top (facing up).
2. Lift one of the latches (see photo below) until it is horizontal. The latch will separate slightly as it is moved, as the right latch shows in the photo below.
3. Lift the remaining latch until it is horizontal. Both latches can be raised together.
4. Lift the lid of the case so it is in the position shown in the photo above.



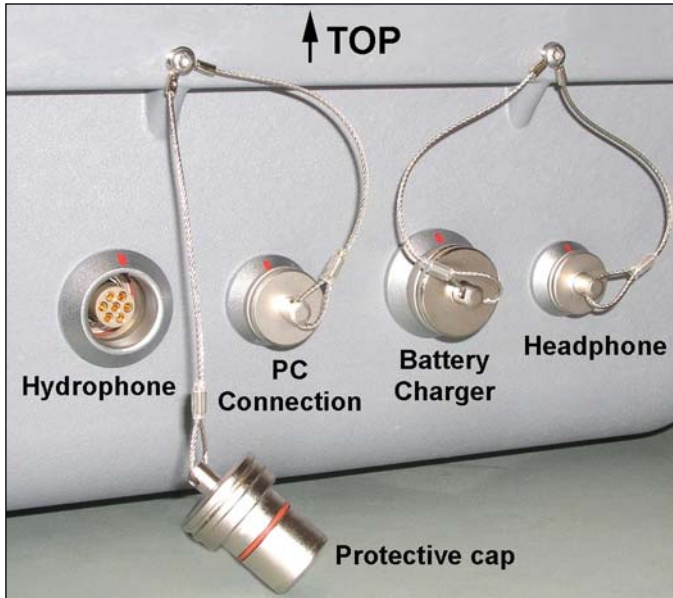
Latches and pressure relief vent on VR100

WARNING

Never remove the receiver's front panel from the case or the internal components could be irrevocably damaged. ***There are no user-serviceable parts inside.*** Opening the unit will void your warranty.

3.1.2 Connectors

There are four bulkhead connectors on the right side of the VR100 case for connecting the different components of the VR100 system to the receiver (see photo below, on the left). The connectors are, from left to right: hydrophone, PC connection, battery charger, and headphone.



Connectors and protective caps.



Protective caps joined when not in use.

Each bulkhead connector has a cap to protect the connector from contact with water. The protective cap from the receiver's hydrophone connector should be joined to the protective cap attached to the hydrophone cable when the caps are not in use, as shown in the photo above and on the right.

WARNING: DO NOT get water in the connectors that attach to the VR100 receiver, such as the PC connection cable or the headphone cable. Water will enter the connector to damage the cabling and potentially damage the receiver.

3.1.2.1 Using connectors

The red dot on the end of the connector must line up with the red line on the VR100's connector, as shown in the photo on the right. The connectors have unique grooves to prevent the wrong connector halves from being placed together.



Connector halves properly lined up.

3.1.2.2 Using protective caps

The connector's protective cap is used to prevent water from entering the connector and damaging the connector and possibly the receiver. With the cap properly in place, the VR100 is extremely splash-resistant.

To properly install a connector protective cap:

1. Select the proper cap. The caps are in two sizes, small and large. The small caps are for the PC communication connector and the headphone connector. The large caps are for the hydrophones and the battery charger.
2. Check that the O-ring on the cap is clean and undamaged. The O-ring is identified by the arrow in the photo below and on the left.
3. Insert the cap into the connector on the side of the VR100 case.
4. Press the cap into the connector until the lip of the cap is in contact with the connector ring on the VR100 case. This is shown in the photo below and on the right.



Connector protective cap – **not** properly inserted in connector.



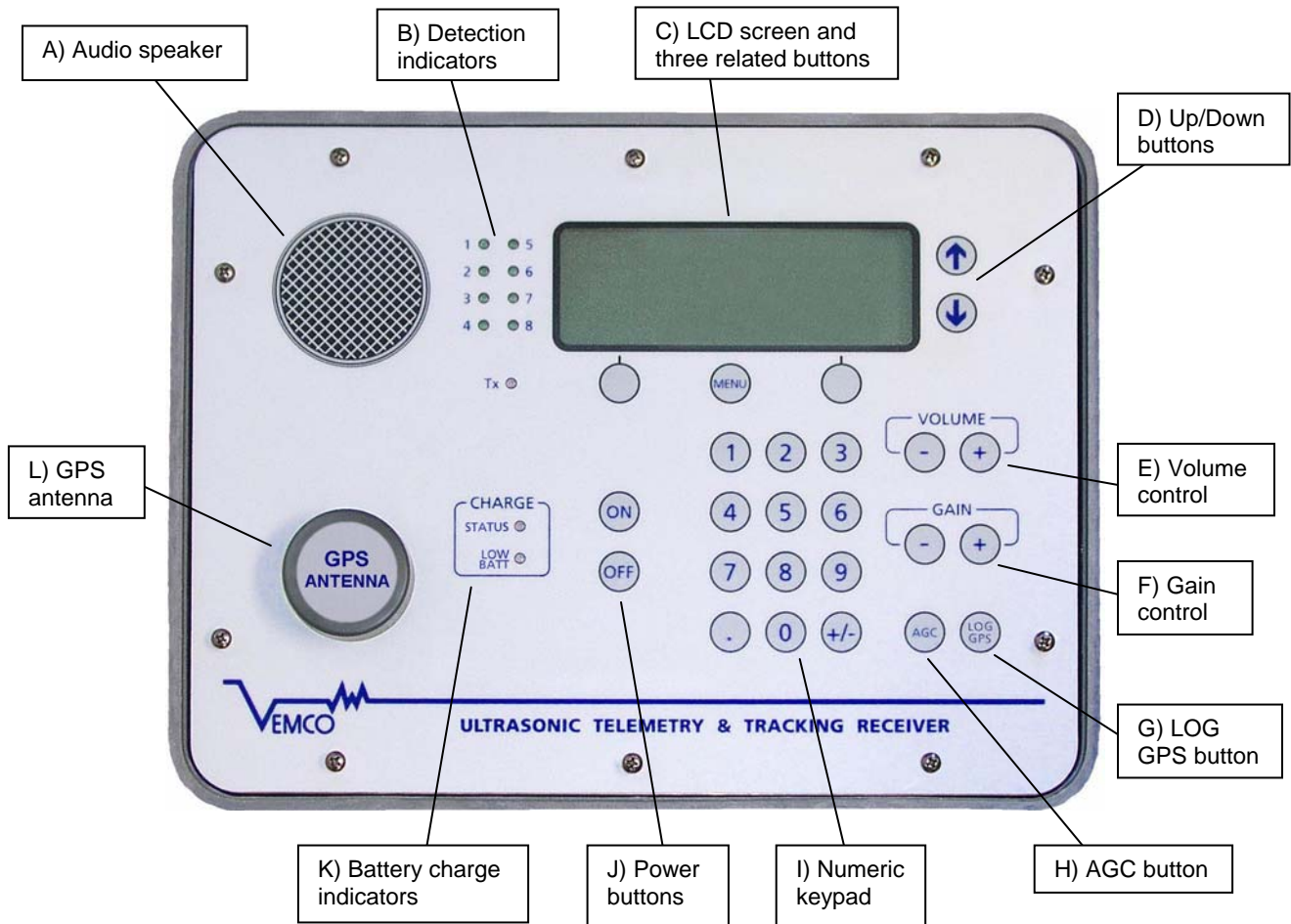
Connector protective cap – properly inserted in connector.

WARNING: The *protective caps must be in place* on the receiver when a cable isn't connected to the bulkhead connectors. Water that comes in contact with exposed bulkhead connectors can damage the receiver.

3.1.3 VR100 Front panel

The VR100 receiver’s front panel allows the VR100 to be configured and allows deployed tags to be monitored. The panel uses soft press keys for all its data entry and controls, increasing the receiver’s ability to operate in a moist environment. The soft buttons are easy to wipe clean but still give the user a “click” that can be both heard and felt to verify the button has been pressed. The different aspects of the VR100 front panel are identified in the photo below with brief explanations in the following sections.

WARNING: *Never remove the VR100’s front panel.* There are no user-serviceable parts inside.



3.1.3.1 VR100 Front panel Explanations

The explanations given below correspond with the photo of the VR100 face plate.

A) **Audio speaker:**

The speaker allows the pings received from acoustic tags **on the active channel** to be heard when the VR100 is in Monitor mode (see section 4.2); when the VR100 is not in monitor mode, the audio is muted. The sound can be muted within the Monitor screen (see section 4.2) and can be adjusted with the volume buttons.

B) **Detection indicators:**

A detection indicator flashes a green light each time a ping is detected by the receiver. Each detection indicator is numbered and corresponds to a receiver channel (see section 4.3.1). When a ping is received on a channel, the corresponding detection indicator light will flash. For example, if the indicator marked 2 flashes then we know that channel 2 received a ping.

NOTE: More than one detection indicator can flash at the same time if more than one channel is active (turned on) and pings are simultaneously received on those channels. For example, if channels 1 through 3 are set up for different continuous tag types on 60 kHz then all three detection indicators will flash when a ping is received on 60 kHz.

C) **LCD screen and three related buttons:**

The LCD screen is used to monitor tags and to configure the VR100. The use of the screen and the three buttons immediately below it is explained in section 4.

D) **Up/Down buttons:**

The up and down buttons are used to move a cursor through a list displayed on the LCD screen (see section 4.3).

E) **Volume control:**

The volume control will increase or decrease the volume of the audio signal heard from either the speaker or the headphones (see section 3.2.3). The button marked with a plus symbol (+) increases the volume and the button with the negative symbol (-) decreases the volume. The buttons can be held down or pressed repeatedly for a larger change in volume. The Monitor screen (see section 4.2) displays the volume level as “VOLXX” where the XX represents a numeric volume level.

F) **Gain Control:**

The gain control buttons will increase or decrease the gain level in steps of six decibels (6 dB). The button marked with a plus symbol (+) increases the gain by 6 dB and the button with the negative symbol (-) decreases the gain by 6 dB.

G) **LOG GPS button:**

The LOG GPS button is used for manual GPS recordings. Pressing the LOG GPS button while in the Monitor screen will cause the next valid GPS position to be recorded to the VR100's memory. If the GPS is locked at the time the button is pressed, then the position will be recorded within 1 second. If the GPS is not locked, then it could be much longer before the position is recorded. See section 5.1.1 for more information of GPS. NOTE: Manual GPS readings can only be taken while in the Monitor screen (see section 4.2).

H) **AGC button:**

The AGC (Automatic Gain Control) button toggles the gain level between automatic (AGC) and manual. Use of the button is explained in section 4.2. AGC is explained in the Glossary (section 5.3).

I) **Numeric keypad:**

The numeric keypad is used to enter numbers while configuring the receiver (see section 4.3) or to select specific channels while monitoring tags (see section 4.2).

J) **Power buttons:**

The power buttons turn on and off the VR100 receiver. The ON button will turn the VR100 on and display the welcome screens while the receiver is booting up. The OFF button will begin the VR100's shut-down procedure.

K) **Battery charge indicators:**

The battery charge indicators show the status of the battery charging process and indicate when the battery charge is low. More details about charging the battery are found in section 3.3.1.

L) **GPS antenna:**

The GPS antenna is contained inside the grey PVC "puck" for protection and attached to the front panel. The GPS antenna is able to receive the GPS signals when the VR100 is outdoors, even with the case lid closed. More information about the GPS is located in section 5.1.1.

3.2 ATTACHMENTS

3.2.1 Hydrophone

The hydrophone can be compared to a human ear where the VR100 is the human brain. Our ear hears the noises around us and transfers them to the brain where the noises are analyzed and identified. The hydrophone hears pings from acoustic tags in the water, as well as other noises in the environment such as current flow, marine animals, and ship engines. It transfers all these noises to the VR100 receiver where the pings are separated from the other noises using electronic filters. The pings are then identified and recorded. The VR100 can't function without a hydrophone.

The VR100 uses either the omni-directional VH165 hydrophone or the directional VH110 hydrophone. The hydrophone is connected to the VR100 through the bulkhead connector on the side of the receiver (see section 3.1.2).

WARNING: DO NOT connect a hydrophone to the VR100 while the receiver is powered.

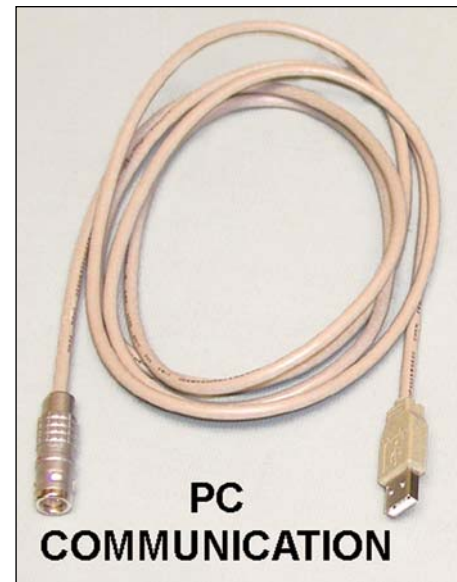
The protective cap attached to the hydrophone cable should be on the cable's connector when the hydrophone is not connected to the VR100 to prevent water from entering the hydrophone's connector. Water in the connector may enter the cabling and cause damage.

3.2.2 USB Cable

The VR100 receiver is connected to a computer through an adapted USB cable, shown in the photo here. The marine grade connector, shown on the left in the photo, is connected to the second connector from the left on the VR100 case (see section 3.1.2) and the USB connector, shown on the right in the photo, is connected to a USB port on the computer.

WARNING: Keep the USB cable dry when it is not in use. Water could enter the connectors and damage the cable, which could potentially damage the VR100 receiver.

Please pay attention to the USB warning at the front of the manual



3.2.3 Headphones

A marine grade headphone jack is located on the side of the VR100 case (see section 3.1.2). A pair of headphones with a matching jack is supplied by VEMCO.

WARNING: Do not allow the headphone connector to come in contact with water. Water could enter the back of the connector and damage the headphone cable, which could potentially damage the VR100 receiver.

3.3 MAINTENANCE

3.3.1 Charging Battery

When the internal gel-cell battery is fully charged, it will power the VR100 receiver for approximately 12 hours with the backlight off and under normal operating conditions. Operating time with the backlight on is shorter. The VR100 can also be powered while the battery is being charged, allowing the receiver to continue to operate during the charging process.

Follow the steps listed below to charge the VR100's battery:

1. Place the receiver away from direct heat sources (including direct sunlight) and in a horizontal position so the front panel is facing up.
2. Select a battery charger based on the power supply type, either AC or DC. Both chargers are pictured on this page. The AC charger may require an adapter plug.
3. Plug the metal connector on the supplied battery charger into the Power connector on the side of the VR100 case (see section 3.1.2). The connector on the charger cable will only fit the Power connector on the receiver and only in the correct orientation.
4. Plug the other end of the battery charger into an appropriate power source, either a 47 to 63 Hz, 100 to 240V AC source or a 12V DC source.



AC Battery Charger

The VR100 receiver is equipped with internal sensors that determine its position and internal temperature. These sensors prevent the charging process if the receiver is positioned at a steep angle or upside down, or if the internal temperature of the receiver is excessive. If either of these conditions is present, the STATUS and LOW BATT lights (also called LEDs) on the front panel will both flash and charging will not occur. To charge the battery when both lights are flashing, unplug the VR100 charger, reposition the VR100 and place it in a cooler location before plugging the charger back into the power supply (see section 3.3.1.1).

The VR100 battery charges in two stages, namely Fast and Float. The Fast Charge mode quickly charges the battery most of the way, and the Float Charge mode slowly charges it the rest of the way. The battery can be left in Float Charge mode for an extended period without damaging the battery. When the "STATUS" light is on steady, the unit is in Fast Charge mode. When the light begins flashing, the unit is mostly charged and is in Float Charge mode. The unit can be used as soon as it enters Float Charge mode, but it will not necessarily last the entire 12 hour battery life. To achieve the 12 hour battery life, the unit should be charged for 14 hours or more.

NOTE: The VR100 battery can be left in Float Charge mode for an extended period of time without causing damage to the battery, but the receiver's front panel **must be facing up**. A sensor is included in the VR100 that prevents the receiver from being charged while the receiver is at a steep angle or upside down.



DC Battery Charger

The VR100 battery fully charges in 14 hours.

3.3.1.1 Charge Indicator Lights

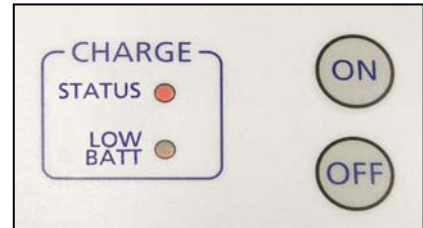
The “Charge” indicator lights (also called LED – “Light Emitting Diode”) on the VR100’s front panel are the “STATUS” light and the “LOW BATT” light. These lights are to the left of the ON and OFF buttons (see photo below). The meaning of these lights is explained in Table 3.3-1.

STATUS light	LOW BATT light	Description
Flashing	Off	Battery is mostly charged and is in Float Charge mode
On Steady	Off	Battery is charging.
Off	Flashing	Battery is nearing discharge.
Off	On Steady	Battery is discharged and the VR100 is about to shut shown. External power is required.
Flashing	Flashing	A Power System Fault has occurred – see paragraph below.

NOTE: The battery can be left in Float Charge mode for an extended period without damaging the battery.

If a Power System Fault occurs, follow the steps below to clear the fault and resume normal battery charging operation.

1. Ensure that the front panel of the VR100 is facing up.
2. Ensure that a proper power supply is connected to the VR100.
3. Place the VR100 away from direct sources of heat (including direct sunlight) and allow it to cool.
4. Unplug the external power supply and wait for the lights to stop flashing



When these conditions have been met, plug the external power supply into the VR100 again. If both lights continue to flash, unplug everything from the VR100 case (power supply, hydrophone, USB cable, and headphones) and call VEMCO support at +1-902-852-3047 or email to support@vemco.com.

The VR100 can be safely used in a vertical position (front panel is perpendicular to the floor) with an external power source connected but the battery WILL NOT CHARGE under this condition. The “STATUS” and “LOW BATT” lights will both flash as long as the unit is vertical and an external power source is connected. In this situation, the unit is being powered from the external supply, and thus can be used indefinitely, regardless of the level of battery charge.

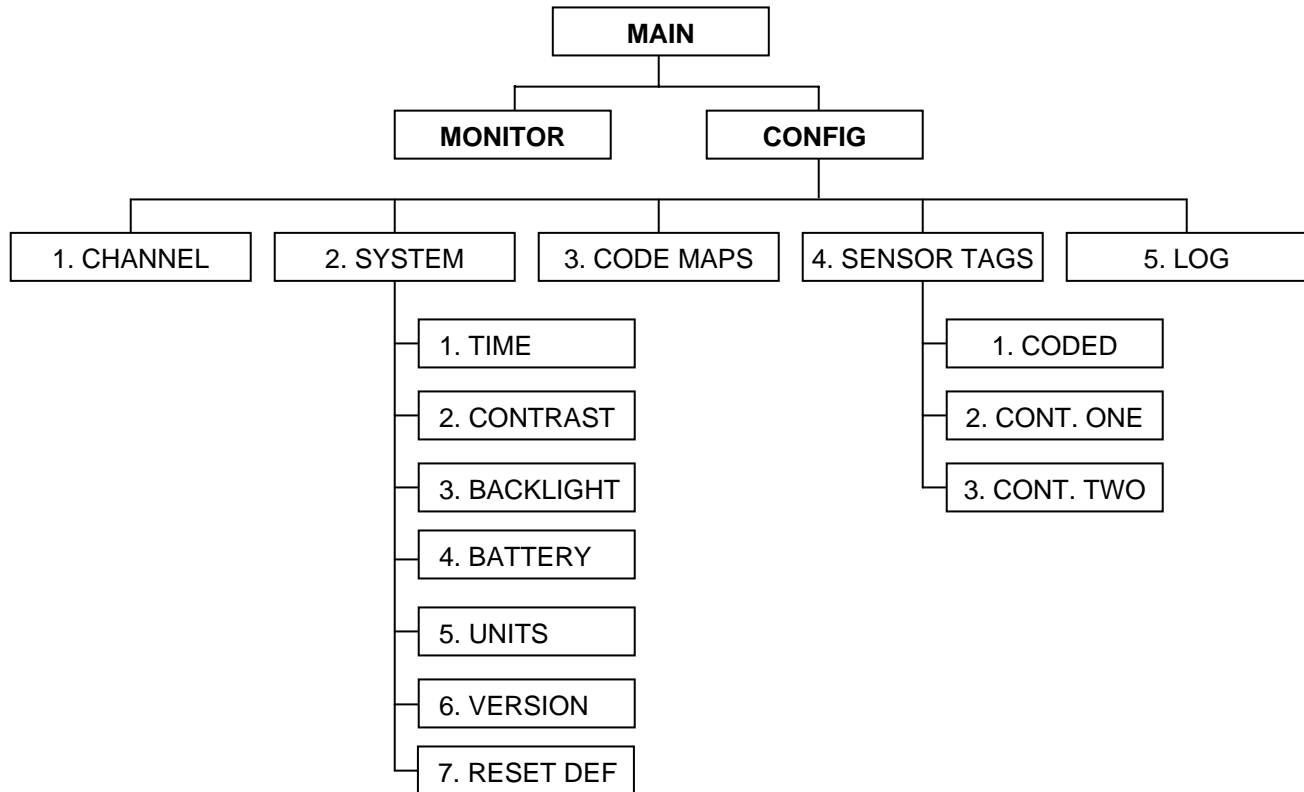
3.3.2 Long-Term Storage

The VR100’s battery slowly discharges during storage and will become discharged during long-term storage. Storage over one year is considered long-term storage. If the VR100 is to be stored long-term, then protect the battery by following one of the suggestions listed below.

1. Store the VR100 with the charger plugged in to an external power supply; OR
2. Charge the VR100 overnight at least once a year.

4 OPERATION

After the hardware is set-up as described in the Hardware section of this manual, the receiver is ready for use. The VR100 receiver is menu-driven, beginning at the Main display. The menu options are mapped out below and explained in detail in the sections to come.



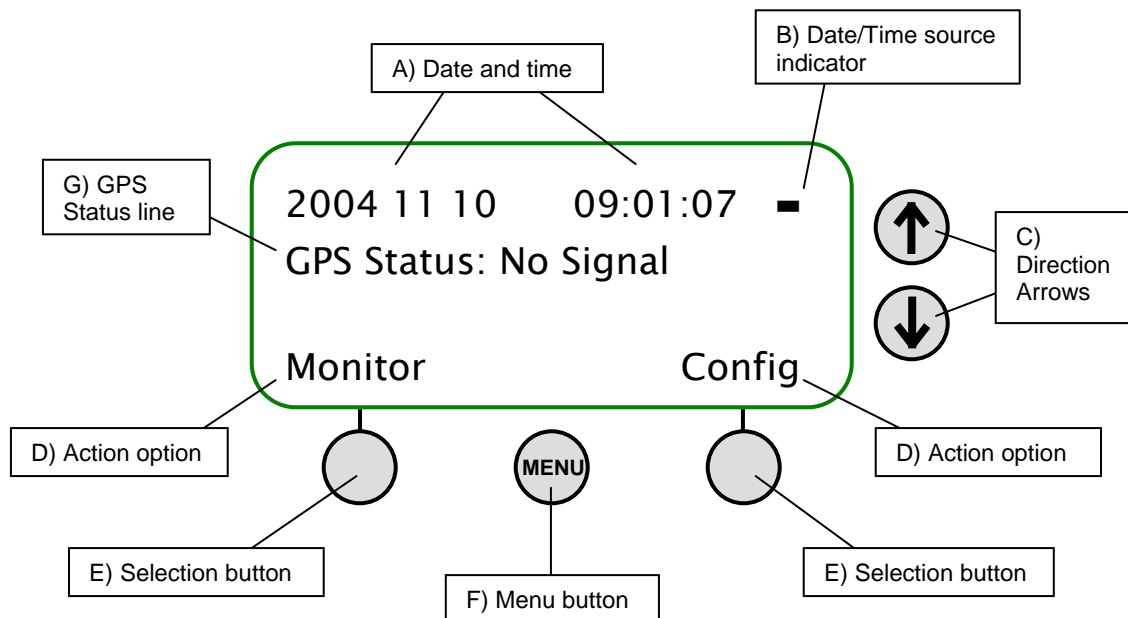
When the VR100 is powered, the welcome screens appear while the receiver is booting up. After the booting up process is complete, the Main menu appears in the LCD screen. From the Main menu, there are two selection options, Monitor and Configure (Config). Monitor is used to track and monitor acoustic tags. Its features are described in the Monitor section (section 4.2). The Configure selection is used to configure the VR100 receiver. This includes setting up tags, selecting coded maps, turning channels on and off, adjusting the contrast, turning on the backlight, and other features. The features are listed and explained in the Configure section (see section 4.3).

NOTE: The “Monitor” option is only displayed in the Main menu screen when at least one channel has been turned on. Setting up a channel and turning it on is explained in section 4.3.1.

4.1 MAIN MENU

The Main menu is the first display seen on the LCD screen after the receiver has booted up. It's from this point that the choice between monitoring tags and configuring the receiver is made.

The LCD screen on the VR100 receiver has four lines for text, and each line may contain more than one piece of information. The information found on the Main menu, and the buttons used with the screen, are identified in the sketch and described below. These buttons will be used throughout the menu architecture.



4.1.1 Main Menu Explanations

The explanations given below correspond with the diagram of the Main menu above.

A) **Date and time:**

The date and time are displayed on the VR100's screen in the format YYYY MM DD HH:MM:SS. Both the date and time can be manually set to any moment on any day, but as soon as the GPS locks the date and time will be corrected to the local time based on the Coordinated Universal Time (UTC) and the offset entered in the VR100 by the user (see section 4.3.2.1).

B) **Date/Time source indicator:**

This symbol indicates if the date and time are synchronous with the GPS. A negative symbol (-) indicates the date and time are not currently in sync. A positive symbol (+) indicates the date and time are in sync with the GPS, which is Coordinated Universal Time (UTC). Section 5.3 has more information on UTC.

C) **Direction arrows:**

The direction arrows allow you to move through a list. If a single-head arrow, such as ↑ or ↓, is found on the screen, then the list shown continues off the screen in the direction the arrow is pointing. Using the arrow buttons will move the cursor through the list so the additional items can be seen.

The double-head arrow symbol (↕) on a line indicates that that particular line has a list of choices associated with it. The list is viewed, one item at a time, by using the up or down arrow.

D) Action option:

Actions that can be performed are shown in one of these two locations, either the bottom left corner or the bottom right corner of the screen. Common options are “Next” and “Select”. The action is selected by pressing the soft selection button below the action word (labelled “E” in the diagram above). A line on the front panel links the selection button with the action above it. If there is no text in the action option location, then there is no action available.

E) Selection button:

Pressing a selection button will perform the action associated with the button. The action is displayed in one of the Action option locations, labelled “D” in the diagram above. A line on the front panel links the selection button with the action above it. The buttons are referred to as the left selection button, which is on the left, and the right selection button, which is on the right.

F) Menu button:

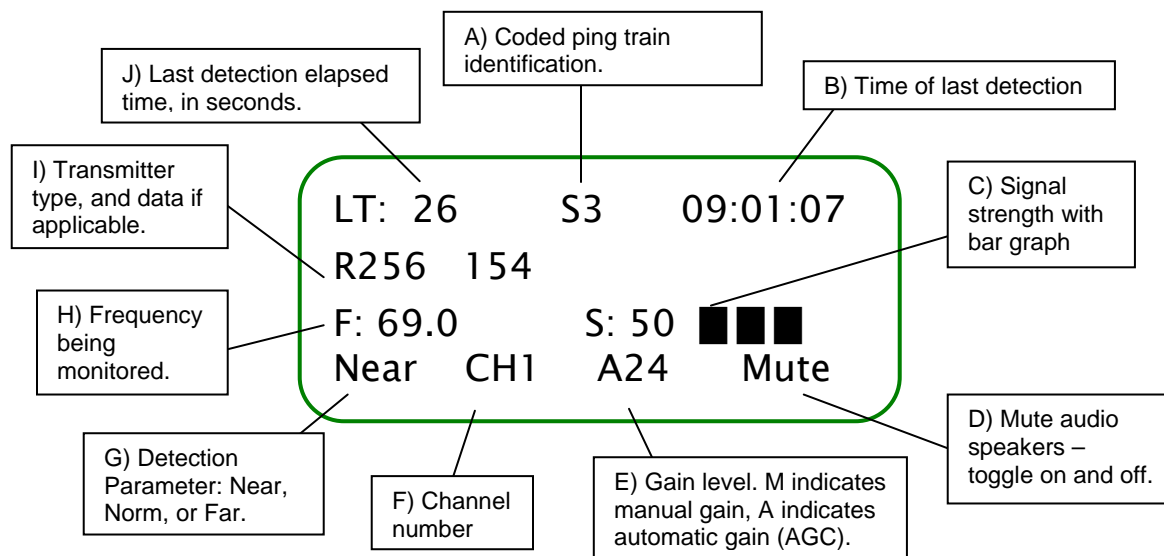
The menu button moves up through the menu hierarchy. It may need to be pressed more than once to get to the desired menu location. If “Next” or “Accept” are not displayed then the Menu button is used to accept (save) the settings on the screen and move up the menu hierarchy. If “Next” or “Accept” are displayed then pressing the Menu button will abandon the settings on the screen and move up the menu hierarchy.

G) GPS status line:

The GPS location information is displayed on this line when the GPS is locked. If the GPS is not locked then this line displays the GPS status. The different statuses are listed in the Appendix (section 5.1.1).

4.2 MONITOR

The Monitor feature displays real-time information, allowing active tags to be monitored or tracked. A sample of how the screen appears in Monitor mode is shown below with labels identifying the information shown on the screen. Explanations of the information are given in the section 4.2.1.



4.2.1 Monitor Screen Explanations

The explanations given below correspond with the diagram of the Monitor screen above.

A) Coded ping train identification:

This indicates which part of a coded ping train is being received. When the sync of a coded ping train is identified, which requires two pings, an “S” is displayed in the centre of the Monitor’s top line. With each additional ping, a number is added to the S to indicate how many pings were received in addition to the sync. For example, a ping train from a R256 pinger would show S, then S1, S2, S3, and S4. When the ping train is complete, the information in the second line (item I in the diagram above) and the time elapsed since the last detection is displayed (item J in the diagram above) are displayed.

B) Time of last detection:

The time, in hours, minutes, and seconds, of the last detection.

C) Signal strength:

The strength of the received signal, between 0 and 105 dB. The value is visually represented on the bar graph to the right of the numeric value. The signal strength is cleared if a signal hasn’t been received for more than 10 seconds.

D) Mute Audio:

The audio heard from either the speaker or headphones is muted by pressing the right selection button below the word “Mute” in the Monitor screen.. When the Mute button is pressed, the audio is muted and the word “Mute” briefly becomes “VOL00” to indicate that the volume is zero. The volume is

restored at the same level by pressing the Mute button again. The volume can be restored at a level above or below the muted volume level by pressing the volume buttons on the front panel (see section 3.1.3).

When the volume level is changed, the “Mute” will change to “VOLXX” for a moment to indicate the volume level. The XX in “VOLXX” is a numeric representation of the volume level.

E) Gain level:

The number shown indicates the amount of gain the receiver is using, in decibels (dB). The gain can be manually increased or decreased using the Gain buttons on the front panel (see section 3.1.3). The gain moves in steps of 6 dB (decibels) and can be changed either manually or automatically. A “M” next to the gain number indicates the gain is in manual mode while an “A” indicates it’s in automatic mode (AGC – Automatic Gain Control). The mode is toggled between automatic and manual by pressing the AGC button on the front panel of the receiver (see section 3.1.3).

NOTE: Since the VR100 receiver has a wide dynamic range, the gain setting is not critical in most situations. A good setting for general use is to set the gain manually to 12 dB. If the reported signal strength is consistently greater than 90 dB, reduce the manual gain setting. When working at extended ranges or if the reported signal strength is consistently weak, increase manual gain setting. In some adverse situations where the manual gain control does not provide adequate results, try using the AGC mode

F) Channel number:

The number next to the “CH” indicates the channel number being monitored. Press the number on the keypad that corresponds with the channel number to monitor that channel.

G) Detection Parameter:

The detection parameter determines what is identified as a received ping and what is considered background noise (see section 5.3). The three detection parameter settings available are listed in Table 4.2-1. A more detailed explanation is found in section 5.2.

Table 4.2-1: Detection Parameter levels.		
Parameter Name	Detection Level	When to Use It
Near	Background noise is almost never mistaken as a real ping (called a false detect), but some real pings may be mistaken as background noise and blocked.	Use when the VR100 is receiving too many echo signals on the Norm setting, such as when the tags are in an enclosed area like a tank.
Norm	Not as aggressive as Near and not as liberal as Far. Most real pings will be detected but some background noise may be mistaken as real pings.	Use this level for almost all applications.
Far	Nothing is blocked. This allows almost all real pings to be received but background noise will be mistaken as real pings.	Use when the tags are far from the hydrophone or the signal is weak. This could increase the range.

H) Frequency:

The frequency being monitored on this channel is shown in kilohertz (kHz). How the frequency is set is explained in section 4.3.1.2.

I) **Transmitter type:**

The type of transmitter is displayed as shown in Table 4.2-2. The sensor data received from a sensor transmitter is displayed in the applicable units. How to select the unit shown on the Transmitter Type line is explained in section 4.3.2.5. Continuous sensor transmitters must be set up in the receiver before they can be monitored (see sections 4.3.4.2 and 4.3.4.3). Data received from a coded sensor transmitter that has not been set up in the receiver will be displayed as raw data.

Table 4.2-2: Transmitter types as displayed on the second line of the Monitor screen.

Transmitter Type	Sample	Comments
Continuous pinger	P 1000	“P” indicates the detection is from a continuous pinger. The period is given in milliseconds (ms).
Continuous 1 sensor	S1 6.3°C	“S1” indicates the data is from a one-sensor continuous transmitter. The data is shown in the applicable units.
Continuous 2 sensor	S2 6.3°C 49.5m	“S2” indicates the data is from a two-sensor continuous transmitter. The data is shown in the applicable units.
Coded pinger	R64K 2156	The coded submap is given (R256, R04K, or R64K) with the ID number.
Coded sensor	S256 58 27m	The coded submap S256 is given followed by the ID number and the data with the applicable units.

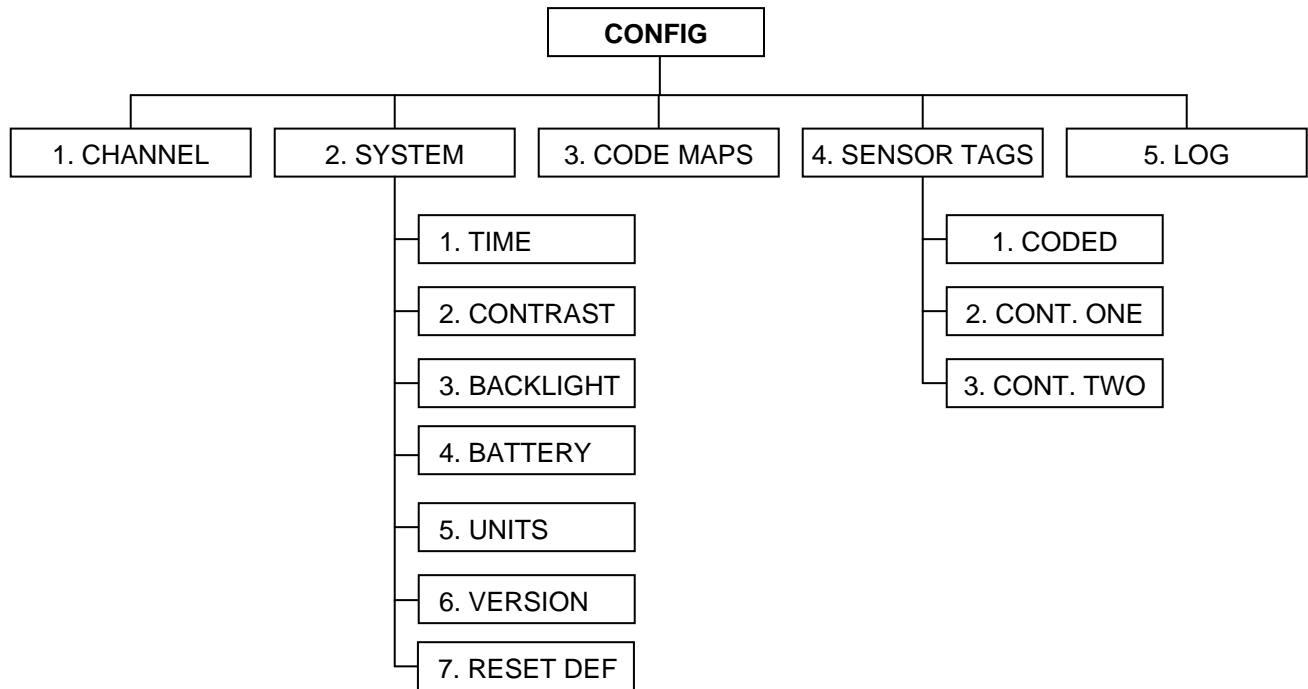
J) **Last detection elapsed time:**

The length of time elapsed (in seconds) since the last detection (“LT” stands for “Last Time”). If the time has been very long, the display will show 999 to indicate there haven’t been recent detections.

4.3 CONFIGURE

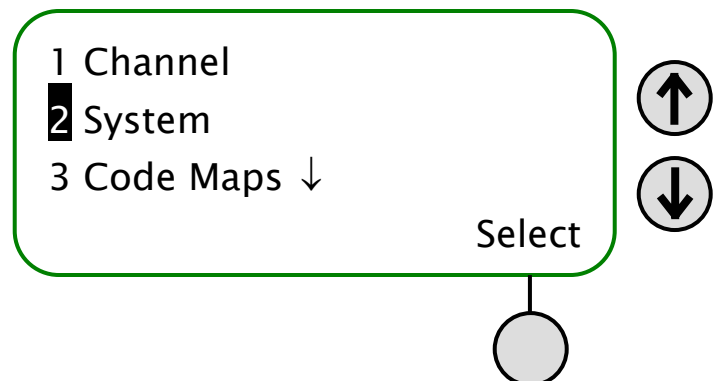
The Configure section of the VR100 receiver allows the receiver to be configured according to a user's needs. This includes setting up tags, selecting coded maps, setting up channels, turning channels on and off, adjusting the contrast, turning on the backlight, and setting the units. Each of these features is explained in the sections to follow.

The Configure section has the menu structure displayed in the map below.



Each sub-menu option is associated with a number shown on the screen to the left of the selection, as shown in the screen below. Selecting a sub-menu option can be performed by using the up and down arrows on the front panel to move the cursor to the desired sub-menu and then pressing the right selection button for the Select command. In the screen shown below, the System sub-menu is highlighted with a flashing cursor. The down arrow in the screen (next to “Code Maps”) indicates that the list extends downward. The remainder of the list can be accessed by using the down button. An up arrow will appear in the top line if the list extends upward.

It's also possible to select a sub-menu by pressing the corresponding number on the keypad. For example, the Backlight can be accessed from the Configure main menu by pressing the “2” button and then the “3” button on the keypad. The menu numbers are included in the previous map for easy reference.

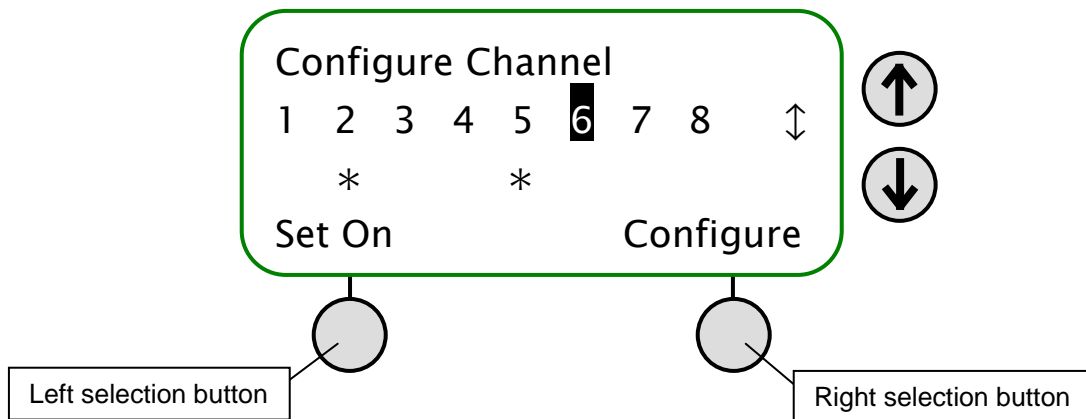


4.3.1 Channel (1)

A channel is a group of configuration settings used to listen to VEMCO tags. For example, a channel can be configured to listen for continuous pingers that operate at 60 kHz. Another channel can be configured to listen for coded tags operating at 69 kHz. There are eight channels in the VR100 receiver which means that the receiver can monitor eight different configurations at one time.

When the Channel sub-menu is selected, the screen shown below appears so the desired channel can be selected. Pressing the up or down arrow to the right of the screen will move the cursor through the list of channel numbers. When the cursor is on the desired channel, press the right selection button with either allow the channel's configuration to be either viewed or configured.

The desired channel can also be highlighted by pressing the channel number on the keypad. For example, press "2" on the keypad to highlight channel 2 and press the right selection button to configure the channel.



4.3.1.1 Turn A Channel On

A channel must be turned on before it can be monitored (see section 4.2). To turn a channel on, move the cursor to the desired channel and then select "Set On" by pressing the left selection button. An asterisk (*) below the channel number indicates that channel is on. In the screen shown above, channels 2 and 5 are on. A channel is also turned off by pressing the left selection button when the channel is highlighted.

4.3.1.2 Configure channel

A channel must be configured to monitor deployed tags. When Configure is selected in the “Configure Channel” screen (see previous page), a summary screen shows the current configuration of the selected channel. Edit must be selected (press the left selection button) to change the configuration of the channel.

How the channel is configured depends on the type of tag being monitored on this channel. The three methods are Continuous pingers, Coded, and Continuous sensor (1 or 2 sensors). The steps required for each of these are listed below.

4.3.1.2.1 To Configure a Channel for a Continuous Pinger:

From the Main screen:

1. Select Config (right selection button).
2. Press “1” on the keypad.
3. Highlight the desired channel number on the keypad by using either the arrow buttons or the numeric keypad.
4. Press the right selection button to select “Configure”. The channel’s configuration is displayed in a summary screen.
5. Select “Edit” with the left selection button.
6. Use the up and down arrows to cycle through the four tag types until “cont pinger” is displayed and then select “Next”.
7. Enter the frequency (in kHz) on the key pad and select “Next”. NOTE: If you make an error, keep pressing the first number of the desired frequency until the cursor returns to the first digit place.
8. Enter the Blanking Interval in milliseconds and then select “Next”. The standard value for a Blanking Interval is between 75 ms to 250 ms, but smaller or larger values can be used (minimum 50 ms). A value outside the standard value range must be confirmed on the screen before it will be accepted.

4.3.1.2.2 To Configure a Channel for Coded Tags:

From the Main screen:

1. Select Config (right selection button).
2. Press “1” on the keypad.
3. Highlight the desired channel number on the keypad by using either the arrow buttons or the numeric keypad.
4. Press the right selection button to select “Configure”. The channel’s configuration is displayed in a summary screen.
5. Select “Edit” with the left selection button.
6. Use the up and down arrows to cycle through the four tag types until “coded” is displayed and then select “Next”.
7. Enter the frequency (in kHz) on the keypad and select “Next”. NOTE: If you make an error, keep pressing the first number until the cursor returns to the first digit place.
8. Select the coded map (see section 4.3.3) to be used on this channel and then select “Next”. To use a custom map, the map must be imported using the PC software before a channel can be configured to use that map.

4.3.1.2.3 To Configure a Channel for Continuous Sensor transmitters (1 or 2 sensors):

From the Main screen:

1. Select Config (right selection button).
2. Press “1” on the keypad.
3. Highlight the desired channel number on the keypad by using either the arrow buttons or the numeric keypad.
4. Press the right selection button to select “Configure”. The channel’s configuration is displayed in a summary screen.
5. Select “Edit” with the left selection button. Use the up and down arrows to cycle through the four tag types until “Cont. 1 sensor” or “Cont. 2 sensor” is displayed, depending on the tag type, and then select “Next”.
6. Select the serial number of the tag by either using the arrows to move through the list of tags setup in the receiver, or by entering the serial number on the keypad and then select “Next”. If the serial number isn’t setup in the receiver, an “ERR” message appears and the serial number must be entered (see section 4.3.4.2 and 4.3.4.3).
7. Review the settings in the summary screen.
8. Select “Accept” to accept the configuration and return to the “Configure Channel” screen.

After the configuration settings have been entered, the summary screen displays the settings. The configuration isn’t saved in the receiver until the “Accept” in the bottom right corner is selected (press the right selection button). If the changes aren’t acceptable, then use the “Edit” option to repeat the configuring process or the Menu button to leave the configuration of the channel without saving the changes.

4.3.1.3 View Channel Configuration

The channel configuration can be either viewed or edited. How to edit the configuration is explained in section 4.3.1.2. How to view the configuration is described in the steps below.

From the Main screen:

1. Select Config (right selection button).
2. Press “1” on the keypad.
3. Select the desired channel number on the keypad and press the right selection button for “Configure”. The channel’s configuration is displayed in a summary screen.
4. Select “Accept” (right selection button) to return to the Channel window without making changes to the channel’s configuration.

4.3.2 System (2)

The System menu, a sub-menu of the Config menu, contains six sub-menus that allow changes to be made to (in order listed in VR100) Time, Contrast, Backlight, Units, Version, and Reset to Factory Defaults. Each sub-menu is associated with a number shown on the screen to the left of the selection.

Selecting a sub-menu option can be performed by using the up and down arrows on the front panel to move the cursor until the number associated with the desired sub-menu is highlighted and then use the “Select” command by pressing the right selection button. Another method to select a sub-menu is to press the corresponding number on the keypad.

4.3.2.1 Time (2-1)

The date and time are displayed on the VR100’s screen in the format YYYY MM DD HH:MM:SS. Both the date and time can be manually set to any moment on any day, but as soon as the GPS locks the date and time will be corrected to the local time based on the Coordinated Universal Time (UTC) and the offset entered in the VR100 by the user.

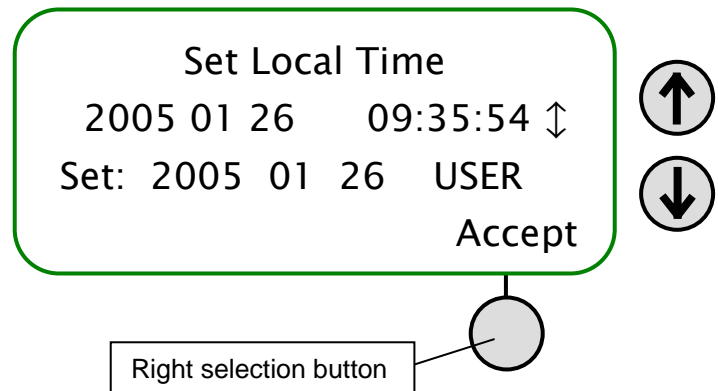
The GPS system uses Coordinated Universal Time (UTC), the international time standard (see Glossary for more information). The VR100 receiver will convert the UTC time to the local time as long as the correct offset has been entered in the receiver (see steps listed below). The offset is the number of hours behind (a negative value) or ahead (a positive value) of the UTC your local time zone is. For example, VEMCO is located in the Atlantic Standard Time zone, which is four hours behind UTC. The offset value “- 4” must be entered in the VR100 for the receiver to display the time at VEMCO. Samples of UTC conversions are listed in Table 4.3-1.

LOCAL TIME ZONES	CONVERSION
Pacific Standard Time	UTC – 8 hours
Mountain Standard Time	UTC – 7 hours
Central Standard Time	UTC – 6 hours
Eastern Standard Time	UTC – 5 hours
Atlantic Standard Time	UTC – 4 hours
Greenwich Mean Time	UTC
Central European Time	UTC + 1 hours
Eastern European Time	UTC + 2 hours
Moscow Time	UTC + 3 hours
Indian Standard Time	UTC + 5:30 hours
Australian Western Standard Time (China)	UTC + 8 hours
Japan/Korea Standard Time	UTC + 9 hours
Australian Eastern Standard Time	UTC + 10 hours

The UTC offset and the local date and time are set by following the steps below from the Main screen:

1. Select Config (right selection button).
2. Press “2” on the keypad.
3. Press “1” on the keypad.
4. Enter the UTC offset (see Table 4.3-1) on the keypad. This is a number between – 12.0 and 12.0. The negative, if needed, must be entered before the number or the number will be erased and have to be re-entered.
NOTE: One decimal place is available for time zones that have an offset of more than a multiple of an hour. For example, Newfoundland Standard Time (NST) is 3.5 hours behind UTC so the offset value “–3.5” would be entered.
5. Press the right selection button to accept the offset value. The screen shown below will appear for the date and time to be set.
6. Use the up and down arrow buttons to move the cursor horizontally to the desired component of the date/time.
7. Enter the new numbers on the keypad.
8. Repeat steps 6 and 7 until the date and time are entered as desired.
9. Press the right selection button to accept the changes.

The Set Local Time screen also displays the date the time was last set and by whom, either the user (USER), the GPS (GPS), or the PC software (USB). If the display reads DFLT, then either the time has never been set or the time was lost if the battery was fully drained of power and recharged. The time is maintained as long as the battery is charged.



4.3.2.2 Contrast (2-2)

The contrast between the text and the background on the VR100’s screen can be adjusted. The contrast should be set so the text on the screen is clearly visible without any of the background lines being visible.

To adjust the contrast, follow the steps below.

From the Main screen:

1. Select Config (right selection button).
2. Press “2” on the keypad.
3. Press “2” on the keypad.
4. Use the left selection button to decrease the contrast (Less) or the right selection button to increase the contrast (More) to the desired level.
5. Press the MENU button to accept the changes.

The contrast setting returns to the default setting when the VR100 is powered down.

4.3.2.3 Backlight (2-3)

There are three options available for backlight operations, ON, OFF, and SMART. The ON option turns the backlight on and it remains on until it is turned off using the OFF option. The backlight should only be needed indoors and at night. Operating the VR100 with the backlight on will greatly reduce the operating time between battery charges. The SMART option leaves the backlight off if the keypad is inactive but will turn the backlight on for five seconds when a button is pressed on the keypad.

To change the backlight setting, from the Main screen:

1. Select Config (right selection button).
2. Press “2” on the keypad.
3. Press “3” on the keypad. The current backlight setting is displayed with an arrow symbol.
4. Press the up or down arrow button until the desired option is shown on the display.
5. Press the button attached to “Accept” to accept the change, or “Cancel” to exit the menu without changing the backlight setting.

4.3.2.4 Battery (2-4)

The battery voltage level can be viewed on the VR100 receiver display by following the steps listed below. NOTE: If an external power source is connected to the receiver, then the voltage reported by the VR100 is the voltage of the external power supply and not the internal battery. Turn off the receiver, unplug the external power supply, and turn the VR100 on to read the battery voltage with the steps below.

From the Main screen:

1. Select Config (right selection button).
2. Press “2” on the keypad.
3. Press “4” on the keypad. The leftmost number shown on the VR100 display is the battery voltage.

4.3.2.5 Units (2-5)

The temperature and depth units are selected on a global level. This means that all temperatures values on all screens will have the temperature units selected in the Units sub-menu, and all depth values on all screens will have the depth units selected in the Units sub-menu. The choices are listed in Table 4.3-2. Follow the steps below to select the units.

From the Main screen:

1. Select Config (right selection button).
2. Press “2” on the keypad.
3. Press “5” on the keypad.
4. Press “1” for temperature units or “2” for depth units.

5. Use the arrow buttons to move through the list of unit options (shown in Table 4.3-2) until the desired unit is seen on the screen, with the flashing cursor.
6. Press “Select” (right selection button).

Table 4.3-2: Units available for global setting.		
	SENSOR	
	Temperature	Depth
UNIT SELECTIONS	Degrees Centigrade (°C) Degrees Fahrenheit (°F)	Meters (m) Feet (ft) Pounds per square inch (PSI)

4.3.2.6 Version (2-6)

The version sub-menu contains information pertaining to this particular receiver, such as the serial number and the firmware version number. This information is only needed if it is requested during your communications with VEMCO.

4.3.2.7 Reset to Factory Defaults (2-7)

The Reset to Factory Defaults option will return the VR100 to the factory default settings, removing all sensor transmitters from the tag database and clearing the channel configurations. A confirmation window will appear to verify that this is the desired action before the receiver is reset. Do not perform other tasks on the VR100 while the settings are being returned to the factory default values (approximately eight seconds).

WARNING:

The Reset command removes all sensor transmitters from the tag database and clears the channel configurations.

4.3.3 Coded Maps (3)

4.3.3.1 Understanding Coded Maps

There are three default coded maps used with VEMCO coded tags. These maps are listed in Table 4.3-3 with their Code Spaces and submaps.

TABLE 4.3-3: Current VEMCO Coded Maps and submaps with Code Spaces.				
Map Name	Code Spaces¹	Blanking Interval	Submap	Description
MAP-110	A69-1008	240 ms	A	R256
	A69-1206		B	R04K
	A69-1105		C	S256
	A69-1303		D	R64K
MAP-210	A69-1303	240 ms	A	R64K
	A69-1206		B	R04K
	A69-1105		C	S256
	A69-1204		D	R04K
MAP-310	A69-1107	240 ms	A	S256
	A69-1206		B	R04K
	A69-1105		C	S256
	A69-1303		D	R64K

IMPORTANT: VEMCO tag datasheets will contain a Code Space name which fully defines the tag parameters necessary for the receiver. Ensure that your tags have a code space listed in the selected code map.

4.3.3.2 Viewing Coded Maps (Factory and Custom)

Coded maps 1 through 3 are set by the factory and can not be edited. To view any map (1 through 9), follow the steps listed below.

From the Main screen:

1. Select Config (right selection button).
2. Press “3” on the keypad.
3. Select the desired factory coded map number on the keypad.
4. Select “View” by pressing the right selection button.

¹ Code Space is new nomenclature for VEMCO tag types. It has been introduced to remove ambiguity over tag parameters. VEMCO tag datasheets will contain a code space name.

5. Use the arrow buttons to move through the submaps (A, B, C, and D). When the cursor is on a submap, the type of coded pinger associated with that submap is shown directly below the submap names.

4.3.3.3 Custom Coded Maps

Circumstances may arise that require a factory coded map to be altered. This is actually accomplished by creating a custom map. Custom maps can only be used with tags that have the same custom map. Only VEMCO can alter the coded map in the tags.

NOTE: Coded tags purchased from VEMCO that have the standard map settings should use the factory maps, not custom maps. Most users should use MAP-110 for coded tags. If unsure of the required map, contact your VEMCO sales representative.

Viewing, a coded map is the third sub-menu selection in the Config menu. Selecting it will display a screen with the nine coded map numbers listed. The first five maps are factory set. The remaining four maps can only be customized by using the PC software (See VR100 Host Software manual).

4.3.4 Sensor Transmitters (4)

The Sensor transmitters menu, a sub-menu of the Config menu, contains three sub-menus. Each sub-menu allows sensor transmitters to be set up in the receiver so the data will be displayed in the correct units. A total of 750 sensor transmitters may be set up in the receiver at one time. The sub-menus are (in order): Coded, Cont One, and Cont Two.

When the VR100 has 750 tags setup, meaning the tag storage capabilities are full, a new tag can't be entered until an existing tag is deleted. To delete a tag, first highlight the tag by either scrolling through the list of entered serial numbers or by entering the serial number on the keypad. When the desired tag is highlighted, select Delete in the bottom left corner of the screen (press the left selection button). A confirmation screen will appear to verify that you want to delete the tag.

<p>NOTE Only tags with sensors need to be entered in the receiver. Pingers don't need to be entered.</p>

Information must be entered for sensor transmitters for the data to be displayed in the correct units. Data received from coded sensor transmitters can be displayed without this information stored in the receiver, but it will be raw data and need to be converted manually. The necessary information is entered by following the steps below.

4.3.4.1 Setting Up Coded Sensor Transmitters (4-1)

From the Main screen:

1. Select Config (right selection button).
2. Press "4" on the keypad.
3. Select number 1 from the list of sub-menus.
NOTE: If there are no previously setup tags, then the receiver will go directly to the New tag screen and the process will begin with step 5.
4. Select sensor transmitter:

- a. If editing an existing sensor transmitter:
 - i. Highlight the desired tag by either scrolling through the list of entered serial numbers or entering the serial number on the keypad.
 - ii. Select “Edit” by pressing the right selection button.
- b. If entering a new sensor transmitter:
 - i. Select “New” by pressing the left selection button.
5. Enter the serial number.
6. Enter the frequency in kilohertz (kHz).
7. Enter the ID number.
8. Select the code space from the list provided by pressing the up or down arrow until the correct code space name is shown on the display.
9. Enter the slope from the Transmitter Specification manual. A negative symbol (if applicable) can be entered before or after the number is entered by pressing the “+/-” button on the keypad.
10. Enter the intercept from the Transmitter Specification manual. A negative symbol (if applicable) can be entered before or after the number is entered by pressing the “+/-” button on the keypad.
11. Select the data type, either depth or temperature.
12. Press the right selection button to select “Accept”.

4.3.4.2 Setting Up One-sensor Continuous Sensor Transmitters (4-2)

From the Main screen:

1. Select Config (right selection button).
2. Press “4” on the keypad.
3. Select number 2 from the list of sub-menus.
NOTE: If there are no previously setup tags, then the receiver will go directly to the New tag screen and the process will begin with step 5.
4. Select sensor transmitter:
 - a. If editing an existing sensor transmitter:
 - i. Highlight the desired tag by either scrolling through the list of entered serial numbers or entering the serial number on the keypad.
 - ii. Select “Edit” by pressing the right selection button.
 - b. If entering a new sensor transmitter:
 - i. Select “New” by pressing the left selection button.
5. Enter the serial number and press “Next”.
6. Enter the frequency in kilohertz (kHz) and press “Next”.
7. Enter the slope from the Transmitter Specification manual and press “Next”. A negative symbol (if applicable) can be entered before or after the number is entered by pressing the “+/-” button on the keypad.
8. Enter the intercept from the Transmitter Specification manual and press “Next”. A negative symbol (if applicable) can be entered before or after the number is entered by pressing the “+/-” button on the keypad.
9. Select the data type, either depth or temperature, and press “Next”.
10. Enter the Minimum Period value found in the Transmitter Specification manual and press “Next”. The default value is 200 ms.

11. Enter the Maximum Period value found in the Transmitter Specification manual and press “Next”. The default value is 2500 ms. NOTE: If the Maximum Period entered is not greater than the Minimum period then the settings will revert to the default values.
12. Press the MENU button to exit the coded sensor transmitter setup screen.

4.3.4.3 Setting Up Two-sensor Continuous Sensor Transmitters (4-3)

From the Main screen:

1. Select Config (right selection button).
2. Press “4” on the keypad.
3. Select number 3 from the list of sub-menus.
NOTE: If there are no previously setup tags, then the receiver will go directly to the New tag screen and the process will begin with step 5.
4. If editing an existing tag:
 - a. Highlight the desired tag by either scrolling through the list of entered serial numbers or entering the serial number on the keypad.
 - b. Select Edit in the bottom right corner.
 - c. Skip to Step 6.
5. If entering a new tag, select New in the bottom left corner.
6. Enter the serial number and press “Next”.
7. Enter the frequency in kilohertz (kHz) and press “Next”.
8. Press “Next” if the sync value is 1150 ms. Otherwise, enter the sync value and press “Next”. The sync value is found in the Transmitter Specification manual.
9. Enter the slope for sensor 1 from the Transmitter Specification manual and press “Next”. A negative symbol (if applicable) can be entered before or after the number is entered by pressing the “+/-” button on the keypad.
10. Enter the intercept for sensor 1 from the Transmitter Specification manual and press “Next”. A negative symbol (if applicable) can be entered before or after the number is entered by pressing the “+/-” button on the keypad.
11. Select the data type for sensor 1, usually temperature, and press “Next”.
12. Enter the slope for sensor 2 from the Transmitter Specification manual and press “Next”. A negative symbol (if applicable) can be entered before or after the number is entered by pressing the “+/-” button on the keypad.
13. Enter the intercept for sensor 2 from the Transmitter Specification manual and press “Next”. A negative symbol (if applicable) can be entered before or after the number is entered by pressing the “+/-” button on the keypad.
14. Select the data type for sensor 2, usually depth, and press “Next”.
15. Enter the Minimum Period value found in the Transmitter Specification manual and press “Next”. The default value is 200 ms is the default.
16. Enter the Maximum Period value found in the Transmitter Specification manual and press “Next”. The default value is 2500 ms. NOTE: If the Maximum Period entered is not greater than the Minimum period then the settings will revert to the default values.
17. Press the right selection button to select “Accept”.

4.3.5 Log (5)

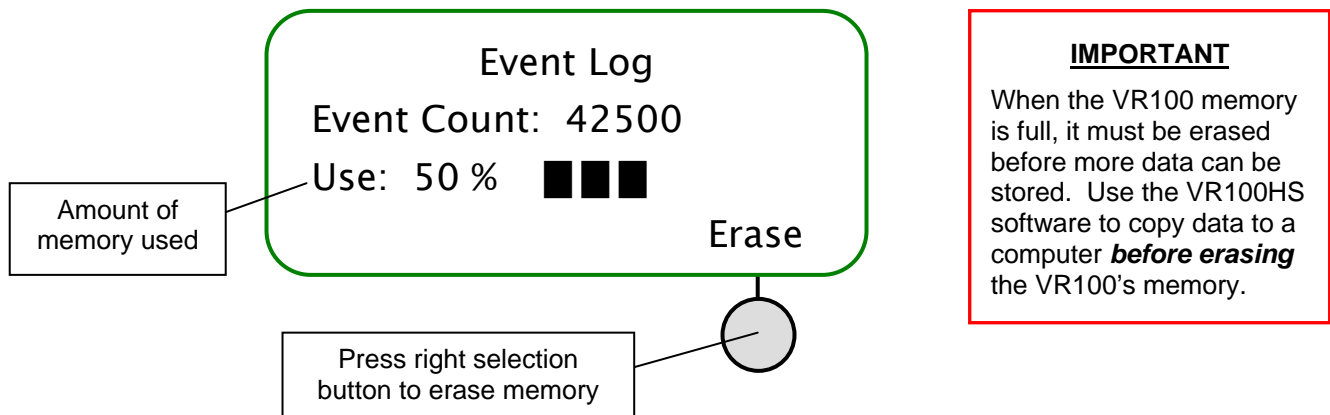
The Event Log screen contains the number of recorded events and the percentage of log memory used. It also contains the option to erase the event log.

The Event Count line reports the number of events stored to memory. An event is either a detected ping from a tag, a GPS position fix, or a system action (like a start up, a change to the receiver's configuration, etc.). The number of events increases until the memory is full at approximately 85000 events.

The Use line in the Event Log screen shows the percentage of log memory used in the VR100 receiver, both numerically and graphically. When 100 % of the log memory is full, the memory must be erased before more events can be logged.

The event log memory is erased by first pressing the right selection button. A confirmation window appears before the log is erased so the log can't be accidentally erased. Erasing the event log will only erase the events that have occurred to the VR100 receiver and not the channel settings or the sensor tag information.

The memory can be erased from either the Event Log screen or from within the PC software, but the memory should only be erased after the log has been copied to a computer (see the software manual for details).



5 APPENDIX

5.1 ADDITIONAL INFORMATION

5.1.1 GPS

The GPS (Global Positioning System) works by coordinating position information from multiple satellites. It needs to see three satellites to get a good position fix. Once it sees even one satellite, it can download an almanac from that satellite to get an idea of where to expect other satellites to be located, and therefore get its three satellites faster.

On the VR100 receiver screen, when the GPS is locked and getting position fixes then the longitude and latitude will be displayed on the second line of the main menu, in the form

XX.XXXXXA XXX.XXXXXB

where X is a digit (0-9), A is N (North) or S (South), and B is E (East) or W (West).

When the VR100 is not locked, the GPS message displayed will be one of those listed in Table 5.1-1. The status of the GPS is updated every 5 seconds.

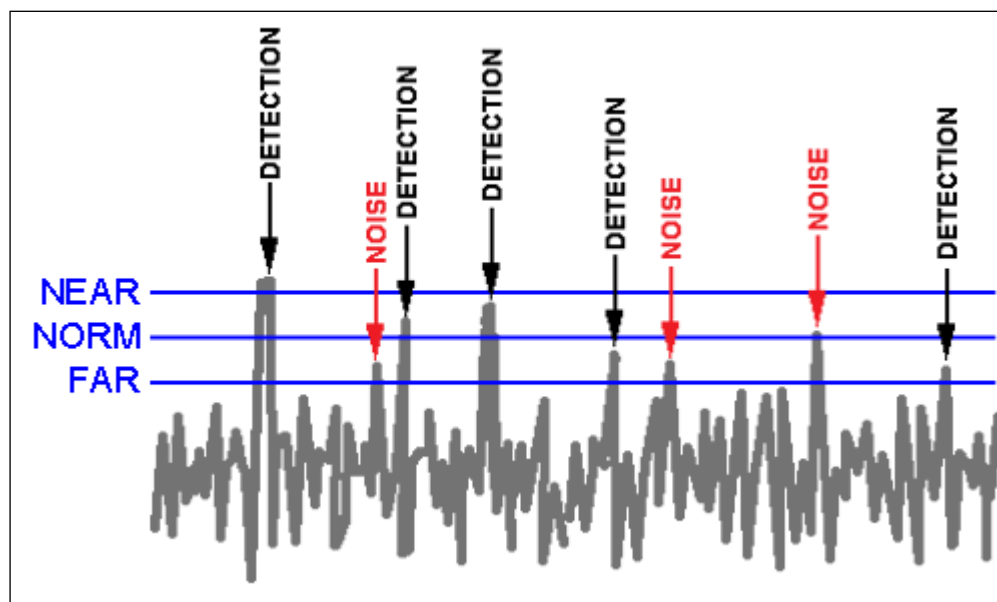
On startup, the GPS message reads “No Signal” until the GPS status is determined, which takes less than 30 seconds. If the “No Signal” message continues for more than 30 seconds, then no satellites have been seen since the VR100 was turned on.

Display	Meaning
No Signal	No satellites have been seen since startup
High PDOP	GPS sees at least 3 satellites, but cannot get fix because satellite PDOP is too high
0 SV	GPS has seen at least one satellite since startup, but does not see any now
1 SV	GPS sees 1 satellite
2 SV	GPS sees 2 satellites
Getting Fix	GPS sees 3 satellites. The GPS must see 3 satellites for a minimum of 15 seconds to begin giving position fixes, to ensure a stable signal. When this appears, position fixes will usually begin soon.
Rcvr Fault	GPS Antenna is broken; report to VEMCO for instructions

5.2 DETECTION PARAMETERS

The detection parameter levels are used to determine how a real signal, referred to as a detection, is distinguished from background noise. The VR100 constantly receives a signal similar to the one shown in the drawing below. This usually includes a large amount of background noise from sources such as noises in the hydrophone's environment, electronic components in the receiver, etc. A "cut-off" level must be selected to decide what is a genuine detection and what is a spike in the background noise. A spike in the background noise that is mistakenly identified as a detection is called a "false-detection". The VR100 allows the user to select one of three levels to be used to determine what is considered a genuine detection. These levels are Near, Norm, and Far.

1. **NEAR:** This is the "safest" detection level because it rejects anything that could be noise, nearly eliminating false-detections. Unfortunately, it may reject fainter signals that are real. In the sketch below, everything over the "Near" line is considered a genuine detection. In this case, only one signal (the first one) was accepted. The other four signals were incorrectly considered to be background noise and weren't included. Use the "Near" level when the "Norm" level is receiving too many echoes. This can happen when the tags are in an enclosed area like a tank.
2. **NORM:** This is the medium level. It rejects some noise but also allows some noise to be mistaken as detections (false-detections). This level will correctly accept more detections than the "Near" setting but will still mistake some genuine signal as background noise. In the sketch below, everything over the "Norm" line is considered a genuine detection. In this case, four signals were accepted – the first three were genuine detections and the last was noise. Use the "Norm" level for general use.
3. **FAR:** This level has more false detections. All genuine detections will be accepted, but a larger number of false-detections will also be accepted. In the sketch below, everything over the "Far" line is considered a genuine detection. In the sample below, eight detections were reported but only five of them were genuine detections. The other three detections were actually noise (false-detections). Use the "Far" level when the tags are far from the hydrophone and the signals received from the tags are weak.



NOTE: This example has been exaggerated for illustration purposes. In most cases there will be no false detections with Near or Norm, and very few with Far.

5.3 GLOSSARY

Automatic Gain Control (AGC): Automatic Gain Control changes the gain level as the VR100 deems necessary without input from the user. The VR100 uses signal strength to determine if the gain level should increase, decrease, or remain constant. In most conditions, the VR100 should be used in the manual gain mode. Section 4.2 explains how to switch between manual and automatic gain control.

Blanking Interval: The Blanking Interval is the length of time (in milliseconds) after an acoustic signal has been received in which the VR100 will ignore any subsequent signals. This is to eliminate the reception of echoes by the receiver.

Background noise: Background noise is the total noise from all sources other than the sound of interest.

Channel: A channel in the VR100 is a group of configuration settings used to listen to VEMCO tags. For example, a channel can be configured to listen for continuous pingers that operate at 60 kHz. Another channel can be configured to listen for coded tags operating at 69 kHz.

Coded Map: A coded map is a group of four submaps operating on the same frequency. There are currently three standard maps for use with VEMCO's coded tags. Table 5.3-1 is one of the standard coded maps.

Table 5.3-1: A coded map with submaps.				
Map Name	Code Type			
	Code Space	Submap	Abbreviation	# Pings
MAP-110	A69-1008	A	R256	6
	A69-1206	B	R04K	7
	A69-1105	C	S256	8
	A69-1303	D	R64K	8

Coded Submap or Code Space: A submap or Code Space is a portion of a coded map to which a coded tag type is assigned. In Table 5.3-1, the line shaded in grey is the submap named B within the coded map named MAP-110. When the VR100 receiver detects seven pings in a specific sequence, the receiver knows the pings have come from a 4K pinger and it can identify the pinger. A submap can be customized to correspond with customized transmitters. CAUTION: If a customized submap is used with VEMCO's standard coded tags, the VR100 can not identify the tags. Use factory set submaps for standard coded tags and custom submaps for custom coded tags.

Coded tags: Coded tags transmit a series of acoustic pings to form an ID (identity) number recognized by the receiver. The pings form a “ping train” that is usually followed by either a fixed or random delay. The type and length of the delay is set at the time the tag is ordered and can’t be changed once the tag is built.

Continuous tags: Continuous tags transmit the acoustic pings continuously, without delays between transmissions. Continuous tags are available with or without sensors.

Coordinated Universal Time (UTC): UTC is the international time standard. It is the current term for what was commonly referred to as Greenwich Mean Time (GMT). Zero (0) hours UTC is midnight in Greenwich, England, which lies on the zero longitudinal meridian. Samples of the conversion factor needed to convert from UTC to the local time zone are found in Table 4.3-1.

Decibel (dB): A decibel is a unit used for measuring the strength of a signal. A decibel is one tenth of a "bel".

Detection Parameters: The detection parameter determines what is identified as a received ping and what is considered background noise (see section 4.2.1).

Map: see Coded Map.

Pinger: A VEMCO tag that contains no sensors. It can have either a coded or continuous transmission schedule.

Position dilution of precision (PDOP): PDOP is a unitless measure that indicates when satellite geometry will provide the most accurate results. A low PDOP indicates the satellites are nicely arranged to give a good position. The PDOP may be improved by facing the VR100 GPS antenna towards the equator where more satellites are located.

Tag: A VEMCO tag is an acoustic transmitter that is attached to a marine creature and transmits an acoustic signal. The acoustic signal is received by a VEMCO receiver. VEMCO tags can transmit either a coded or continuous signal, with or without sensor data. After a tag is powered, it will continue to broadcast according to factory setup until powered down.

Sensor transmitter: A VEMCO tag that has at least one sensor. The type of sensor is usually included in the transmitter’s name. For example, a V16P has a pressure (depth) sensor and the V16T has a temperature sensor. A sensor transmitter can also have either a coded or continuous transmission schedule.

Submap: see Coded Submap.

5.4 TROUBLESHOOTING

Trouble	Possible Solution
Can't hear audio signal but detection indicator light is flashing.	<ol style="list-style-type: none"> 1. Volume is too low. 2. Audio is muted (see section 4.2.1). 3. Headphones are plugged into VR100.
Display blinks and receiver makes a repeated clicking sound.	Battery is low and needs to be re-charged (see section 3.3.1).
Receiver won't turn on after I turned it off.	The battery may need to be charged (see section. 3.3.1).
Computer does not see the receiver when the USB cable is plugged in.	<ol style="list-style-type: none"> 1. Turn VR100 off and then back on. 2. If using an external USB hub, as suggested (see front of manual), then check that the hub is powered.

5.5 SPECIFICATIONS

Product name:	VR100 Ultrasonic Telemetry & Tracking Receiver
Frequency Range:	12 to 101 kHz
Operating Temperature:	Best performance between 0°C and 40°C. Can operate to -20°C.
Battery Life:	Approximately 12 hours with backlight off, less with backlight on, when operating between 10°C and 40 °C.
Water Resistance:	Splash resistance – see section 3.1.
Physical Dimensions:	34 cm x 32 cm (with handle extended) x 15 cm
Physical Weight:	5.2 kg

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