HR2 RECEIVER AND SOFTWARE USER GUIDE

VERSION 2.3.0

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> 🟠 For the latest versions of user guides and software, visit our [website](#).

> ⚠️ **WARNING:** If the HR2 is not used in the manner specified in this manual, then the manufacturer's warranty protection may be voided.

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chapters start on right (odd number) pages.

What's New in this Release

Fathom 2.3 provides fixes to known issues in the previous version, along with the following **new and updated** features. Topics that are related to new or updated features are marked with a red asterisk ※ in the Online Help Table of Contents.

New Features for version 2.3

Support For VR2Tx, VR2AR, And VR4-UWM Receiver Log Files

Support has been added for viewing (using the Visualize Data application) and exporting data (using the Export Data application) from VR2Tx, VR2AR, and VR4-UWM receiver log files. Note that communication with, and configuration of VR2Tx, VR2AR, and VR4-UWM receivers still requires the VUEsoftware.

Sensor Values In Live Detections Display

When watching live detection data in the **Live Detections** tab, sensor tag detections will now be accompanied by a sensor reading in ADC units.

Updated/Enhanced Features

[Status Tab detections breakdown](#) (HR2 receivers only)

The **Data** box in the receiver **Status** tab now shows detections broken down into *self* (detections of the receiver's own built-in transmitter) and *external* (non-self) detections.

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chapters start on right (odd number) pages.

Introduction

The **Fathom** software has been developed to aid in preparing your HR2 receivers for deployment, retrieving data from your HR2 receivers, and in visualizing and exporting data from your HR2, VR2W, VR2AR, VR2Tx, and VR4-UWM receivers when your study is complete.

Fathom software key features

- Initializing, configuring and uploading data from VEMCO HR2 Receivers
- Viewing live detection data in real time (great for testing and troubleshooting)
- Integrated easy-to-search help (for both the Fathom software and the HR2 Receiver)
- Export receiver data to CSV format for inspection and manipulation in a program of your choice

The HR2 Receiver

The new, feature-rich HR2 (High Residence) receiver is an excellent choice for tracking many fish with higher accuracy than ever before using our smallest fish tags (V4, V5, and V9). The High Residence telemetry system was designed specifically to allow researchers to monitor or position many tagged animals with sub-meter accuracy. The **HR2** receiver detects both **PPM**[1] (VEMCO's traditional coding system) and **HR**[2] (VEMCO's new High Residence coding system) transmissions from 180 kHz tags (transmitters).

This Section Contains Information On The Following:

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[1]Pulse Position Modulation (PPM) is a signal modulation technique that allows computers to share data by measuring the time each data packet takes to reach the computer (transmitter to receiver).

[2]High Residence (HR) is a VEMCO technology that allows for the reliable detection of hundreds of animals in a particular location at one time. Each transmitter carries a unique ID and can be programmed to transmit as quickly as once per second while keeping transmission collision rates to a minimum. HR transmitters can also be programmed with traditional PPM coding, and are thus compatible with both VEMCO HR2 receivers and 180 kHz VR2Ws.

1.1 HR2 Receiver - Overview

The 180kHz **HR2 Receiver** is a submersible and autonomous or cabled receiver capable of decoding two different methods of transmitting IDs to satisfy different study design objectives. To remain compatible with VR2W receivers, the HR2 can detect tags transmitting our traditional PPM (pulse position modulation) and the new HR transmissions at the same time.

This means that you can use the HR2 with your existing VR2W-180 receivers in collaboration with other researchers in a large scale monitoring network or you can use HR2 receivers to set up a small scale positioning experiment. HR2s are currently being used to monitor and position migrating salmon in rivers, eels migrating to sea and non-native predator impacts on native fish.

Common uses for HR2 receivers

- Monitoring hundreds of fish moving quickly through acoustic gates
- Ultra-fine scale positioning for behavioural studies including fish passage, spawning, and habitat selection
- High residence studies of hundreds of tagged animals
- Frequent and precise positioning of fish (i.e. sub-meter every second depending on tag transmission rate)
- Monitoring migration survival
- Monitoring predator and prey behavior

Advantages

- The HR system provides highest possible resolution data (high spatial resolution for positioning studies (~1m) and frequent animal positions (of the order of seconds)
- Autonomously deployed HR receivers can easily be moved to different areas
- Add as many tagged animals to the system as desired without affecting the frequency with which positions are calculated
- Connect a cable to any receiver at any time to view detections in real time
- Compatible with VR2W-180 kHz receivers; detects two transmission systems simultaneously (PPM & HR) to support high residence and long term monitoring studies
- Communicate diagnostic information (for example, receiver health, tilt, ambient noise level, temperature, detection counts) to a surface VR100-200 through a transponding link
- Detects VEMCO's family of high frequency tags (weighing 0.42g to 2.0g) making it ideal for juvenile to large fish (20g+ weight)

Transponding

Rather than employing a diver to check your receivers, you can communicate with the receivers remotely from the surface to learn about their status (*tilt*, *battery level*, *number of detections*, and *number of detections of IDs* of interest). Having transponding capability adds tremendous value in numerous scenarios including VPS studies, range testing and knowing if fish have passed a receiver gate.

The HR2 communicates to the surface through our VR100-200 active tracking receiver. It is compatible with all VR100-200 models sold since January 2013.

You will require a **180 kHz transponding hydrophone** to attach to the VR100-200 to communicate with the HR2. HR2 receiver information that can be accessed through the VR100-200 includes:

- Unit health
- Number of detections on the receiver
- Tilt, noise and temperature
- Battery life and memory usage
- Distance to the receiver (to aid in locating the HR2)
- Transmitter configuration options

1.1.1 HR2 Receiver Quick Specifications

HR2 Quick Specifications	
Dimensions	40 cm (15.9") x 10 cm (3.9") diameter
Weight (in-air)	w **Lithium-metal** battery: 2.88 kg w **Alkaline** battery: 3.16 kg
Receiver Frequency	180 kHz
Battery Life	**Lithium-metal**: Approximately 6 months **Alkaline**: Approximately 2 months
Data Capacity and Type	PPM/HR: (170,000,000 detections)
Operating Temperature	-5°C to +40 °C; Water must not freeze.
Maximum Depth	300 meters (440 psi)
PC Software	**Fathom**
Communication	Cable (RS-485 up to 12 Mbps)
External power supply (optional)	10-30 VDC

For additional information, see

1.2 HR2 Case and Parts

The **HR2** receiver is housed in a corrosion resistant black plastic high pressure case. The case consists of two main parts:

- the **end cap** which houses the hydrophone and **internal battery tray** that holds the battery, and
- an **outer cylinder** that is unscrewed to install the *lithium* or *alkaline* battery pack.

The HR2 is shipped closed, with the battery **installed and connected**. It is shipped with a *dummy plug* connected to the communications port on the bottom of the receiver.

The only time the case needs to be opened is when *replacing the battery* or *preparing the unit for long-term storage (6 months or more)*.

> **ⓘ** **IMPORTANT: The receiver is NOT ready to record data yet, as it is shipped in Suspend Mode.**
> Your first task is to connect it to a computer and the **Fathom** software and place it in **Record Mode**.
> For more information, see "Getting Started", on page 15.
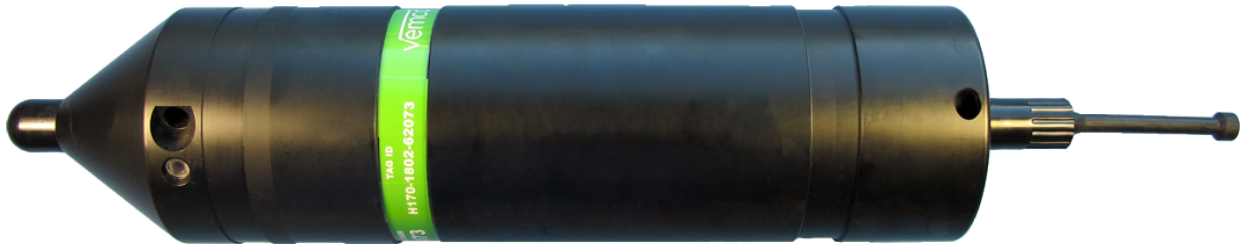
Figure 1-1: HR2 Receiver with external Dummy Plug installed

> **⚠** **WARNING:** The HR2 pressure case and seal have a **maximum** static depth rating of **300 meters (440 psi)**. Physical shocks to the receiver, such as bumping into a solid object when it is at any depth, can result in a considerably higher pressure on the casing than just the depth pressure and water may enter the HR2 case.
> If the **O-rings or their mating surfaces** are dirty or damaged, then water may also enter the case. If you are suspicious that water has entered the case, then follow the suggestions in "I Think The Case Might Be Pressurized", on page 176.

1.2.1 HR2 Case Parts

Here's a quick tour of the **HR2** receiver's **external** and **internal** case parts.

External Case Parts
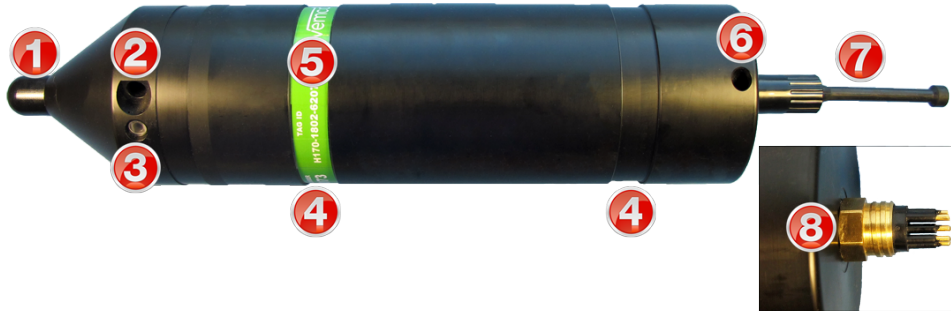
Figure 1-2: HR2 Receiver EXTERNAL case parts

Item	Name	Description
1	**Hydrophone**	The receiver's "microphone" and most delicate part.
2	**End Cap Hole**	End Cap steel rod remover tool hole (top).
3	**Status light (LED)/** **Pressure release valve**	The **light** flashes red, green, or blue to indicate the receiver's **status**. For more information, see "Status Light Flashes", on page 165. The **release valve** will open if the internal pressure is greater than the external pressure (see section 8.2.2). **Never cover this valve** (with tape or paint, for example).
4	**Cable Tie grooves**	These grooves (top and bottom of receiver) are used to attach the HR2 to a mooring line. For more information, see "Mooring Line Attachment", on page 78.
5	**Identification Label**	The VEMCO product label contains the *product name*, *serial number*, *contact information*, and *important warnings*.
6	**Outer Case Hole**	Outer Case steel rod remover tool hole (bottom).
7	**Dummy Plug**	A locking collar covers and protects the HR2's external 8-pin cable connector. Used for storage and transport, the plug is replaced by the RS-485 cable when communicating with the receiver, using the Fathom software.
8	**RS-485 connector**	To connect the receiver to the RS-485 cable for communication.

Internal Case Parts
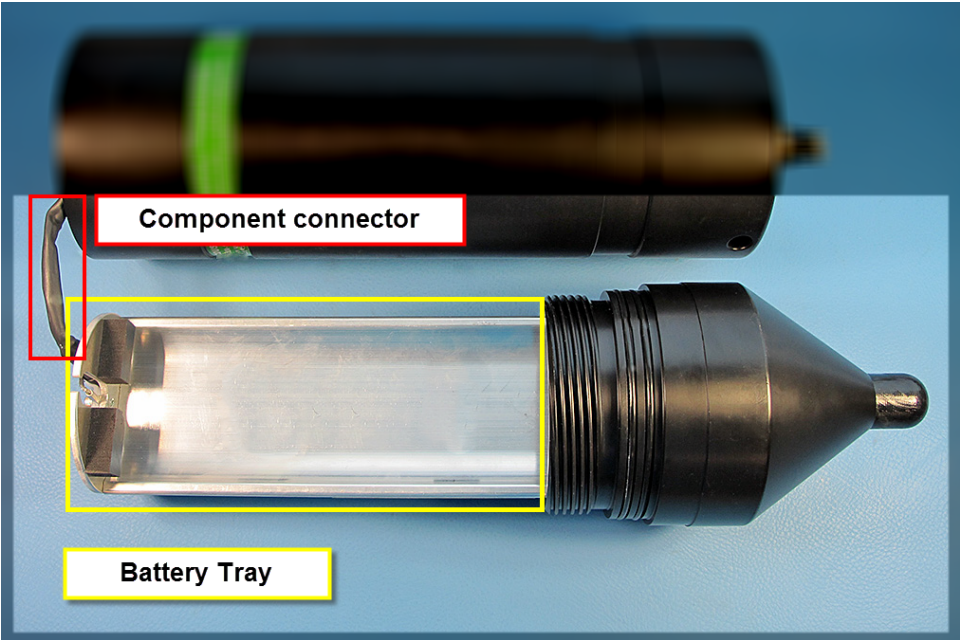
Figure 1-3: Opened HR2 Receiver INTERNAL parts (without battery pack)

1.3 VEMCO High Speed Offload Cable (HSOC)

To communicate with the **HR2** receiver, Fathom uses a VEMCO high speed communication cable. The cable consists of two parts:

- the **main cable** (black) which connects to the receiver, and
- the **interface box with USB cable** (white) that connects to the computer.

Figure 1-4: VEMCO High Speed Offload Cable

1.3.1 Communication Cable Information

Make note of the following **capabilities** and **limitations** in the use of the HSOC cable:

- The HSOC is powered by a PC USB port or USB bus that can provide *500 milliamps*. It can offload data from an HR2 receiver that has an expired internal battery or if the battery has been removed.
- The HSOC **should not be used** with a USB bus that does not have 500 mA available (e.g. USB bus not powered externally).
- If the internal battery is dead/missing, and you plug in the HSOC, you'll have to wait for the HR2 receiver to **boot** before you can "talk" to it.
- The HSOC supports **data transfer rates** up to 12 million bits per second (12Mbps). Speed is *reduced* if used with cables greater than 10m in length.

1.4 Operation Modes

The HR2 receiver has two operating modes: **Suspend** and **Record** Mode.

1.4.1 Suspend Mode

Suspend Mode is a *low power* state used when the HR2 is being *shipped* or *in storage* for an extended period of time. When in **Suspend** Mode, the receiver will not detect transmitters.

> **NOTE:** In **Suspend** Mode, the status LED **does not flash**.

For details on how to place the HR2 in **Suspend** mode using the **Fathom** software, see "Suspend Mode (not recording)", on page 73.

> ⚠️ **CAUTION:** The HR2 is shipped in **Suspend** mode, with the internal battery connected. Always put the receiver in **Record** mode (start a study) before deployment.

1.4.2 Record Mode

During testing and deployment, using the **Record** Mode allows the receiver to detect transmitters and record tag information. Because the receiver is shipped and stored in **Suspend** Mode, it must be put in **Record** Mode before it can detect tags.

> **NOTE:** In **Record** Mode, the receiver Status LED will flash 2 quick red flashes every 5 seconds.

For information about entering **Record** Mode using **Fathom**, see "Record Mode", on page 66.

1.5 Fathom Software - Overview

The **Fathom** software has been developed to aid in preparing your HR2 receivers for deployment, retrieving data from your HR2 receivers, and in visualizing and exporting data from your HR2, VR2W, VR2AR, VR2Tx, and VR4-UWM receivers when your study is complete.

With HR2 receivers, **Fathom** performs such tasks as setting the receiver's clock, configuring the built-in transmitter, configuring sensor (noise, tilt, temperature) logging, setting up a watch table, retrieving receiver data files, visualizing detection and diagnostic data, and exporting receiver data to CSV format. The visualization and data export features may also be used with VRL files (offloaded using the VUE software) from VR2W, VR2AR, VR2Tx, and VR4-UWM receivers.

We advise that HR2 users **always update to the latest version of Fathom** on your entire suite of PC's and laptops. By always using the latest version of **Fathom** everywhere, you can be assured of compatibility with the newest HR2 receiver.

1.5.1 Fathom Software Requirements

The **Fathom** software requires either of the following operating systems:

- Windows 10
- Windows 8
- Windows 7

1.5.2 What Can Fathom Do?

Through a cabled connection from your receiver to your computer, you can perform tasks such as:

- starting a new study
- configuring a receiver's built-in transmitter
- viewing detection and diagnostic data in real time
- offloading receiver data and
- exporting offloaded data to CSV format

Information on using **Fathom** to perform these tasks can be found throughout the User Guide.

1.6 Tour of the Fathom User Interface

The **Fathom** User Interface (UI) provides quick access to all the tools you need to manage your **HR2** receiver and the data it collects.

Here's a quick look at the interface.
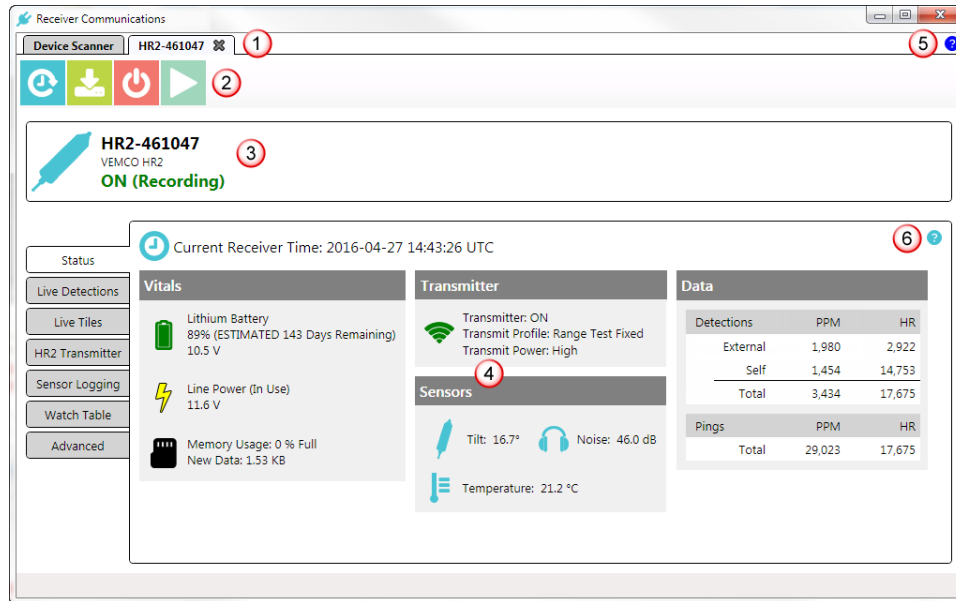
Figure 1-5: Fathom main UI view

1 - Hardware Tabs - The **Hardware Tabs** provide access to communication ports and receivers (when a receiver is connected and identified). For more information, see "Hardware Tabs", on the facing page.

2 - Receiver Operation buttons - The **Receiver Operation buttons** provide access to various receiver functions such as Offloading Data and Starting a study. For more information, see " Receiver Tab", on page 28.

3 - Receiver Information - The **Receiver Information** section provides basic information about your connected receiver (serial number and if the receiver is **ON-Recording**, or **OFF-NOT Recording**.

4 - Software Tabs and Panels - The **Software Tabs and Panels** provide information on receiver status and configuration options. For more information, see "Software Tabs", on page 12.

5 - Help - The **Help** icon provides access to the Help system, for **Fathom** and your **HR2** receiver. For more information, see "More About Help", on page 189.

6 - Context-Sensitive Help - The **Context-Sensitive Help**[1] icon provides access to help for the specific section you are currently using, such as the **Status** tab (in the example above). For more information, see "More About Help", on page 189.

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[1]Context-sensitive help (CSH) provides information for the specific feature that you are currently using.

1.7 Hardware Tabs

Fathom hardware tabs provide access to communication ports and receivers (when a receiver is connected and identified).
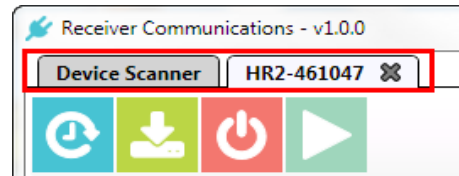
Figure 1-6: Device Scanner and Receiver hardware tabs

1.7.1 The Device Scanner Tab

The **Device Scanner** tab is the initial, or start-up tab. When you connect a receiver, the software attempts to identify it. For more information, see " Device Scanner Tab", on page 23.

- **If a receiver is identified**, a receiver icon is displayed; double-clicking this icon will open a hardware communication tab for that receiver (a Receiver tab).
- **If Fathom is unable to identify the connected receiver**, you must perform a *manual* connection to open a communication tab for that receiver. For more information, see "If no receiver is detected", on page 25

1.7.2 The Receiver Tab (s)

A **Receiver** tab is used, and only available, when Fathom is connected and communicating with an **HR2** receiver. For more information, see " Receiver Tab", on page 28.

> **NOTE:** Each connected receiver gets its own tab.

1.8 Software Tabs

Fathom has a number of **software operations tabs** allowing access to critical information and settings for your connected receiver.

See the descriptions below for quick details on each item displayed.
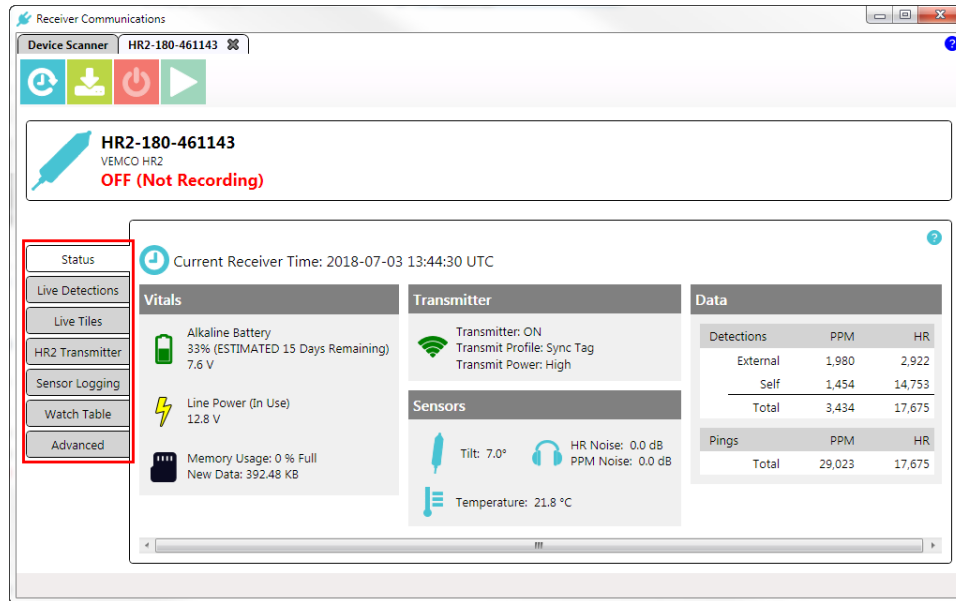
Figure 1-7: Software operation tabs

- **Status tab** - The **Status** tab provides you with a snapshot of the current status of your receiver. For more information, see "Status Tab", on page 34.
- **Live Detections tab** - The **Live Detections Tab** displays the **Live Detection Monitor**, which lists detections as they arrive in real time. For more information, see "Live Detections Tab", on page 36.
- **Live Tiles tab** - The **Live Tiles** displays summary data about incoming detections of each transmitter (as **Tiles**), in real time. For more information, see "Live Tiles Tab", on page 39.
- **HR2 Transmitter tab** - The **HR2 Transmitter Tab** provides transmitter **identification information** and **configuration options**. For more information, see "HR2 Transmitter Tab", on page 44.
- **Sensor Logging tab** - The **Sensor Logging Tab** displays the **Sensor Data Logging Options**, which are configuration options for logging data from the receiver's built-in sensors (temperature, tilt, and noise). For more information, see "Sensor Logging Tab", on page 49.
- **Watch Table tab** - The **Watch Table Tab** displays a list of tags of interest and is extremely helpful in identifying if a particular tag was in the area surrounding a receiver..For more information, see "Watch Table Tab", on page 51.
- **Advanced tab** - The **Advanced Tab** displays **Hardware Configuration** information, and options for **Serial Communication** settings for your selected receiver. For more information, see "Advanced Tab", on page 55.

1.9 Getting Help

Multiple help options are available for your **Fathom** software and **HR2** receiver:

Help System (within the software)

To access Help for **Fathom** and your **HR2** receiver, click the **Help icon** ❓ near the top right corner of the Fathom window. Other help icons appear throughout the software, providing context-sensitive help (CSH).

> 💡 The Help System is installed with the Fathom software. **You do NOT need to be connected to the Internet to access the Help**.

For more information about the available Help and how to use it, see "More About Help", on page 189.

Downloadable and printable User Guide (PDF format)

A **printable** copy of the HR2 User Guide (PDF format) is available in the HR2 folder on the USB Stick that was shipped with your receiver.

You can also **download** a printable User Guide in PDF format on the HR2 product page, at www.vemco.com.

> 💡 The **Fathom** Help and PDF Guide content was current when the software was compiled. For the latest available version of the Help and User Guides, visit www.vemco.com.

Contacting Customer Service

You can contact Customer Service at www.vemco.com/customer-service.

> **NOTE:** You can also find this link at the bottom right of every topic, in the **Help System**.

Contacting Support

You can contact (product) Support by:

- **Email:** Click on the **Support button** at the top right corner of any page of our website at www.vemco.com, and use the **Quick Contact** section.

  🔧 SUPPORT
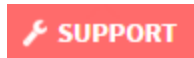
- **Phone:** 902-450-1700 extension 268 or 242.

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Getting Started

After the HR2 has been removed from the packaging and inspected to ensure no damage occurred during shipping, power and test the unit to verify that you can communicate with the receiver, and that it is working properly. To verify proper receiver operation upon first receipt, consult the **HR2 Quick Startup Guide** checklist.

NOTE: The HR2 receiver was shipped with the battery installed and connected.

Before the HR2 can begin recording data, it must be connected to computer and switched from **Suspend Mode** to **Record Mode**.

This Section Contains Information On The Following:

2.1 Installing the Fathom Software

Fathom requires a computer running Windows 7, Windows 8, OR Windows 10.

Connect the **VEMCO Product USB stick** (may not be exactly as shown) to any USB port on your PC.

Figure 2-1: VEMCO Product USB stick

> **NOTE:** If the **Found New Hardware Wizard** window opens, click **Cancel** and continue with these instructions.

To install the Fathom software

1. Run the latest **Install_Fathom...** application file. The latest file is always available from our website, www.vemco.com. When the **Fathom Installer Welcome screen** appears, click **Next**.

2. Read the **End User License Agreement** (EULA), check the **I accept** box, and click **Next**.

3. Choose the **Destination Folder**. To install in the default location (recommended), click **Next**. To select a different folder, click **Change** navigate to a different folder, or create a new one, then click **OK**.

4. At the **Ready to Install** screen, click **Install**.

5. The **Fathom** software installer starts the installation (**Installing Fathom** progress screen).

6. Once the installation is complete, the **Completed Fathom Setup wizard** screen appears.

7. To exit the setup wizard, click **Finish**. You are now ready to access the Fathom software.

2.2 HR2 Dummy Plug and Locking Collar

The **Dummy Plug** is used to protect the external connector from moisture and damage while it is not connected to the cable. The dummy plug is held in place on the HR2 with a threaded **Locking Collar**.

The HR2 is shipped with the locking collar attached to the external connector to give the pins additional protection during shipping. When the HR2 is stored, the dummy plug and locking collar should be in place and will need to be removed before communicating with Fathom. The dummy plug should be returned to the external connector when a cable is not connected to the receiver.

Removing/installing the Dummy Plug and Locking Collar

Follow the instructions below to remove, and reverse the steps to re-install.

Step 1 - Twist and unscrew the Locking Collar

Twist the Locking Collar (see arrow) counter-clockwise until it separates from the receiver. Slide it away from the connector.

(Dummy Plug on VR2C receiver example shown)

Step 2 - Gently pull connector off

Grasp the dummy plug at the connector and pull straight back to remove it from the HR2 case. Grip the connector rather than the ball end of the dummy plug to reduce the chance of damage occurring to the plug.

(Dummy Plug on VR2C receiver example shown)

2.3 Connecting an HR2 Receiver to a computer

The HR2 Receiver connect to a computer using the VEMCO provided communication cable.

After removing the **Dummy Plug** used to protect the external connector, connect the supplied cable to the HR2 receiver and to a computer, as described below.

Step 1 - Get your receiver communication cable

Take out the communication cable provided by VEMCO.

(cable may not be exactly as shown)

Step 2 - Line up the connector and cable end

Line up the gap on the cable's connector with the gap on the HR2's external cable connector.
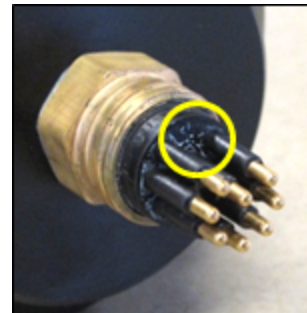
Step 3 - Push connector in

Grasp the cable at the connector and push straight in until the gap between the two connectors is closed.

> (i) **IMPORTANT:** Grip the connector rather than the cable. This reduces damage-causing strain on the cable.

(Dummy Plug on VR2C receiver example shown)

Step 4 - Screw Lock Collar on

Slide the **Locking Collar** located on the external cable over the connector and **twist it clock-wise** until it stops. There shouldn't be a gap between the metal connector and the edge of the Locking Collar.

(Dummy Plug on VR2C receiver example shown)

Step 5 - Connect to Computer USB port

Connect the USB end of the cable to a USB port on your computer.

2.4 Launch Fathom

After connecting your HR2 receiver to a computer with the communication cable, you must launch Fathom to establish communication.

To launch the Fathom software

Click the **Taskbar shortcut** for the **Launcher** (below) to start the **Fathom** software, and then click on the **Connect** icon. (see right).

More on "The Fathom Launcher", on the facing page.
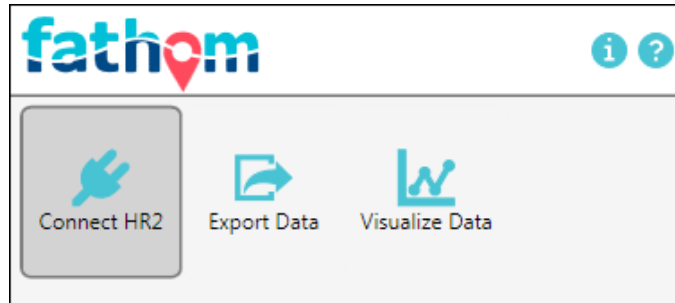
Good to know: When you launch Fathom, you may receive a **software update notification**. To install the update, click **An update for Fathom Software is available** and follow the instructions. To perform the update at another time, select an application to launch.
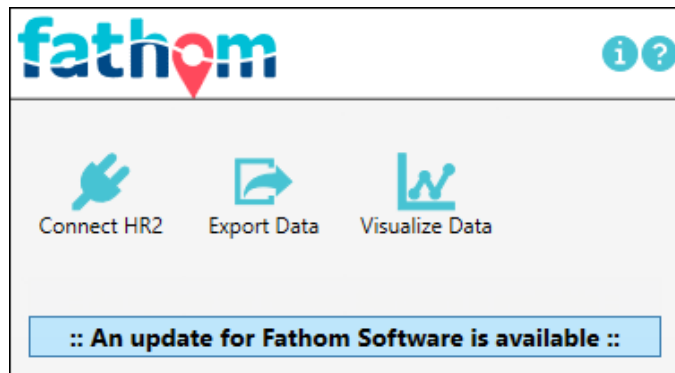
To check for updates manually, see "Checking for Updates", on page 22.

The **Receiver Communications** window appears. Available COM ports are automatically displayed.

When a VEMCO cable is detected, Fathom displays it as a **COM port** and automatically initiates a scan for devices connected to the cable.

While Fathom is scanning for receivers, the **Scan for Devices** button is temporarily unavailable for use. The device scan may take up to 6 seconds.
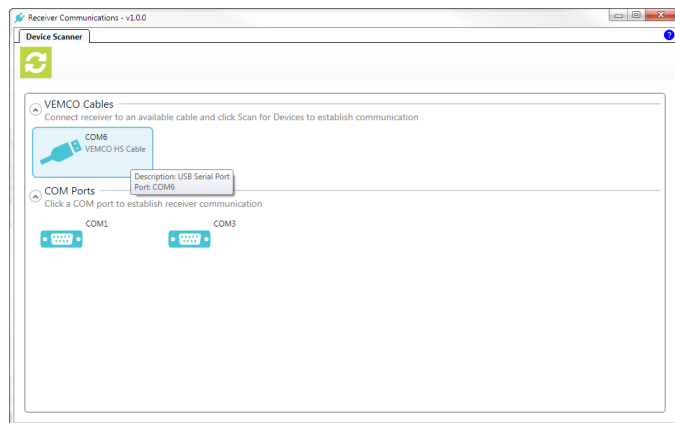
2.4.1 The Fathom Launcher

The **Fathom Launcher** is where you access the various functions available with **Fathom**.

Click the **Taskbar shortcut** for the **Launcher** (below) to start the **Fathom** software.

The main options are:

- Connecting to a receiver
- Exporting Data
- Visualizing Data
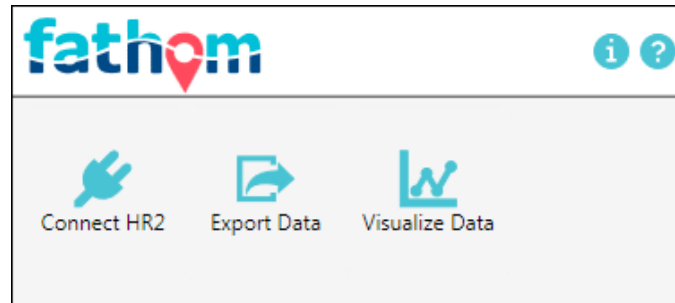
Other useful options are:

- Click the **Help** icon ❓ (top right) to open the Fathom Launcher Help (this topic).
- Click the **Information** icon ℹ (top right) to open the **About Fathom** window (see next).
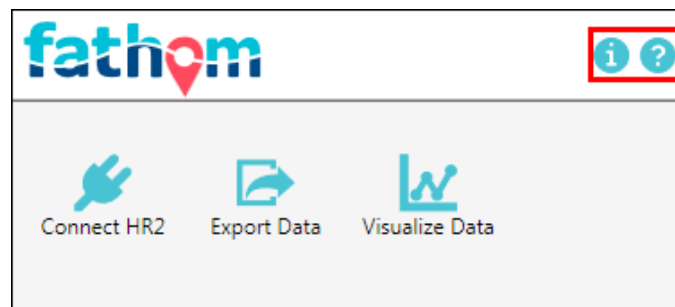
2.4.2 The About Fathom Window

The **About Fathom** window displays the Fathom software version (and its components) that you are currently using. It also offers links to:

- **A** - the **What's New in this Release** topic in Help
- **A** - the **Fathom web page** on the VEMCO site (More about Fathom)
- **A** - the **VEMCO website** (About VEMCO),
- **A** - **check for updates** to the Fathom software option, and
- **B** - the listing of "Open Source Licenses", on page 195 used in the development of the software.
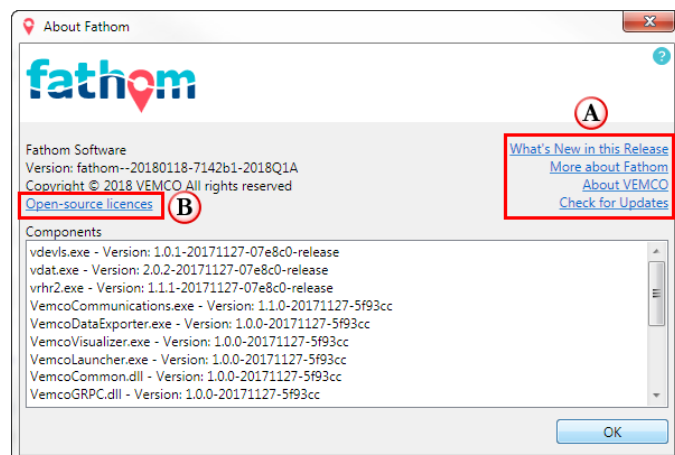
Checking for Updates

To see if any updates to Fathom are available, click **Check for Updates**. If an update is available, the following window appears.

To install the update, click **Install Update**, and follow the instructions provided by the installation wizard.

To install the update later, click **Remind me later**.

For information on performing a firmware update later/manually, see "Updating the Firmware (manually)", on page 55.
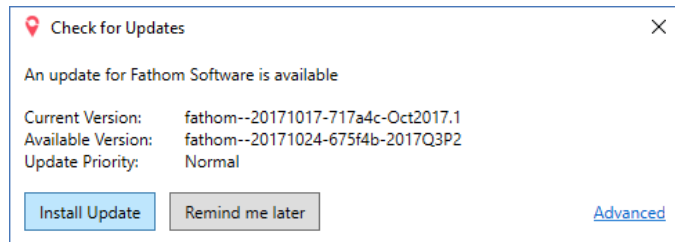
2.5 Device Scanner Tab

The **Device Scanner** tab displays communication ports and all receivers that are connected and have been identified:
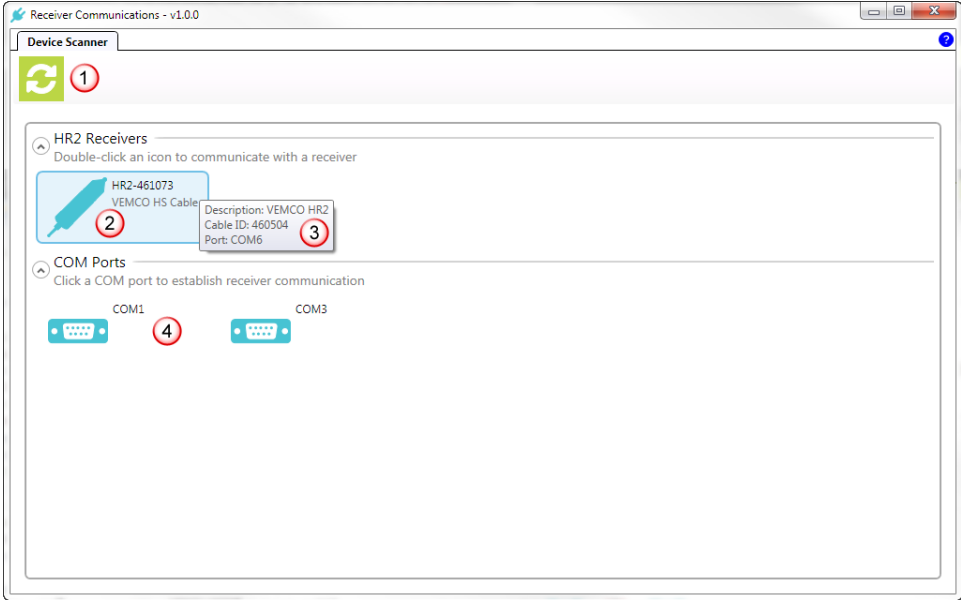
Figure 2-2: Device Scanner hardware tab

Item	Name	Description
1	Scan for devices	Button, to search again for communication ports and connected receivers (performs a "refresh").
2	Identified receiver	Receiver and serial number, as identified by the software and cable connection.
3	Receiver details	On hover over the Identified Receiver, Cable ID and Port Number displayed.
4	Identified communication ports	Communication ports identified on the computer.

2.6 Establishing Communication

To establish communication with an HR2 receiver from within the Fathom software, perform the following steps.

Step 1 - Fathom attempts to detect connected receivers

After launching Fathom, the **Receiver Communications** window appears. Available COM ports are automatically displayed.

When a VEMCO cable is detected, Fathom displays it as a **COM port** and automatically initiates a scan for devices connected to the cable.

While Fathom is scanning for receivers, the **Scan for Devices** button is temporarily unavailable for use. The device scan may take up to 6 seconds.
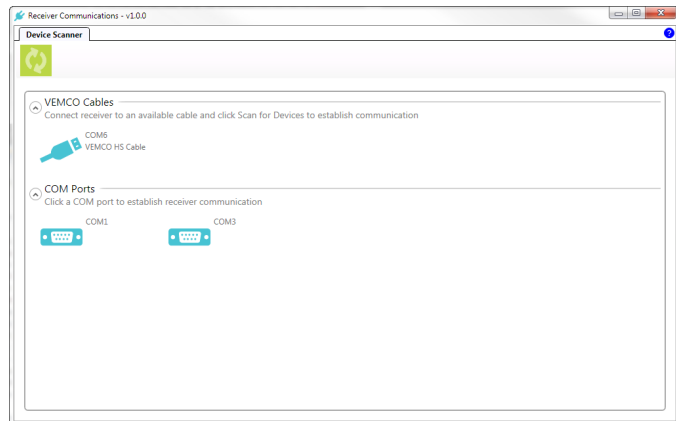
Step 2 - When a receiver is detected

When an **HR2** receiver is detected, it is displayed as shown here.
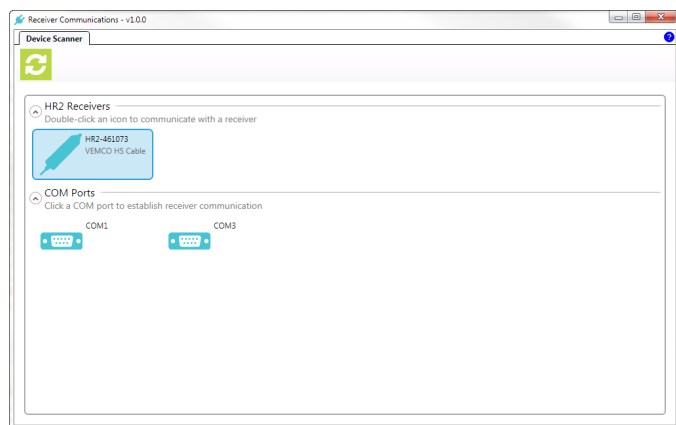
Step 3 - If no receiver is detected

When no receiver is detected, a receiver icon will not be displayed and you must manually initiate the connection.

- Click the **Scan for Devices** button to rescan for receivers (top left).
- If you are using a COM port for connection on the computer, click a **COM port** and select HR2 from the box that pops up, to establish receiver communication on that port.

  > **tip!** If you are not sure which COM port the receiver cable is connected to, unplug the cable and watch which COM port disappears from the COM Ports display. Plug the cable back in and attempt to connect to the receiver using the identified COM port.

- If you are unable to connect to the receiver, disconnect the cable from the computer, then the receiver, then reconnect to receiver and computer and try this again.

If you still are unable to connect to the receiver, consult our Customer Service website.
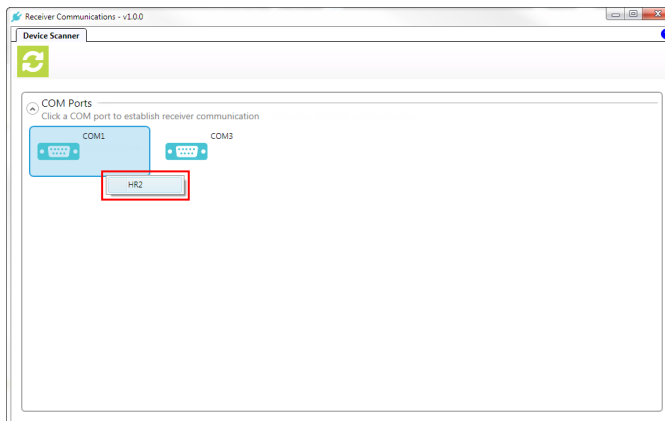
Step 4 - Displaying additional information

Additional information about the receiver can be displayed by *hovering* over the receiver's icon with the mouse. Available information includes the **Cable ID** number, and the **Communication Port** used.
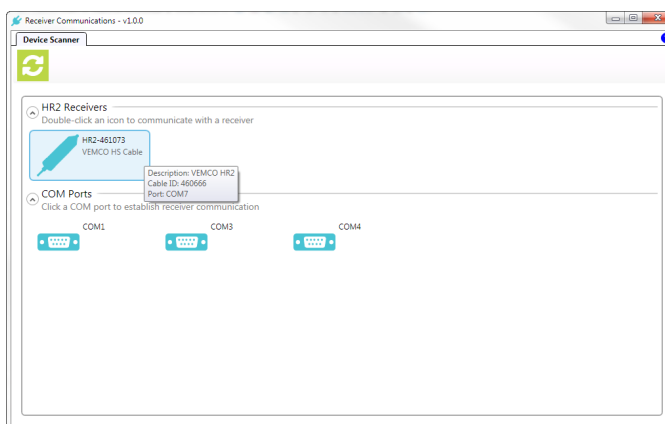
Step 5 - Establish communication

To establish communication, double-click on the receiver.
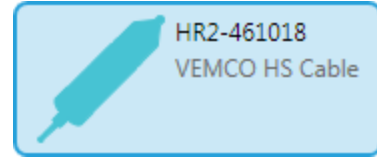
Step 6 - Information and Status tab

Wait for communication to be established. The **HR2** receiver's information and status are shown in a new tab, identified by the **receiver serial number**.

Fathom will select an appropriate communication speed (*session baud rate*) based on the cable you are using. If needed, the selected baud rate can be adjusted under the **Advanced tab**.

Step 7 - Update Firmware (if automatic update notification appears)

Once communication is established, you may receive a (receiver) **firmware update notification**.

> ⚠️ **WARNING:** When you perform a firmware update, the process may erase all data on the receiver, set the receiver's clock, and reset all transmitter and sensor logging settings to default values. **We recommend offloading your data before performing the update.**
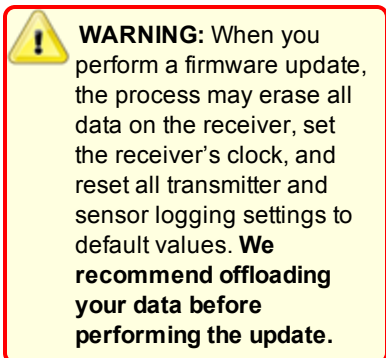
To update the firmware, click **Update** and follow the instructions. To perform the update at another time, click **Cancel**.

NOTE: We recommend installing the update **immediately** to ensure the ongoing best performance and functionality for your receiver.

For more information on Automatic Updates, see "Automatic Firmware Updates and Notifications", on page 168.

For information on performing a firmware update manually, see "Updating the Firmware (manually)", on page 55.

HR2-180-461143

⚠️ A firmware update is available
Proceed with firmware update?

Firmware version on the receiver: 1.0.0
Firmware version to be installed: 1.1.0

➜ Update

➜ Cancel
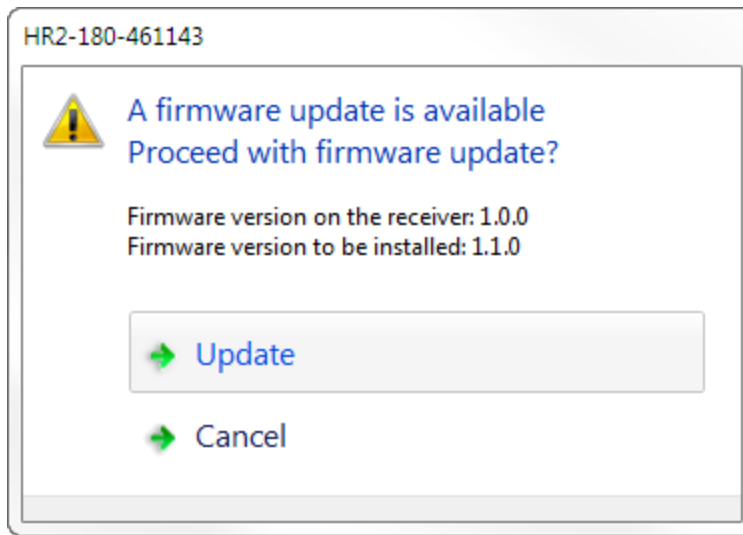
2.7 Receiver Tab

The **Receiver** tab displays receiver operation buttons and information. Each identified and connected receiver is shown in its own tab.
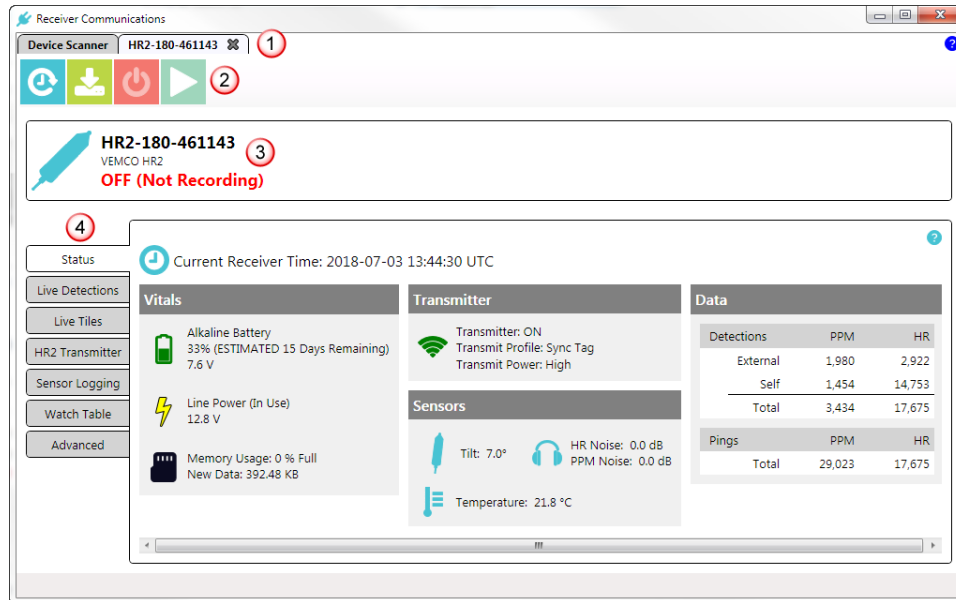
Figure 2-3: Receiver Tab

1 - **Receiver Tab Name** is receiver's serial number.

2 - **Operation** buttons.

3 - **Receiver basic information**: Receiver ID/Serial Number, and **ON** (recording) or **OFF** (not recording) status

4 - **Software operations tabs** (Status, Live Detections, etc.)

Operation Buttons

Receiver **Operation** buttons include:

Button icon	Button name and description
	Set Receiver Clock button - Sets the receiver's internal clock based on your computer's current time settings.
	Offload Data button - Initiates data offload to your location of choice on your computer.
	Suspend Receiver button - Suspends receiver operation. Detections are not recorded when the receiver is in Suspend Mode.
	Start a New Study button - Clears data on your receiver and starts a new study.

2.8 Testing the Receiver

Before deploying an HR2 Receiver, we recommend that you **conduct in-air tests** with one or more tags to:

1. Familiarize yourself with operating Fathom software and HR2 receivers. The air test will allow you to go through the process of connecting to an HR2, activating a tag and using Fathom to conduct a new study and upload data, etc.

2. Test your tags and receivers before implanting tags into your fish. If any problems arise we would like to know beforehand, rather than on the day you are conducting surgery and releasing fish or deploying receivers.

> *i* **IMPORTANT: Handle 180 kHz tags with care**. Do not squeeze the tags. Avoid using metal forceps.

Do not shock the tags with instruments that carry static charge.

If you drop a tag on a hard surface you should test the tag to see if it still functions and you should record it in your notebook (ID code & Serial Number). Our tags have a medically inert coating of Parylene. If you scratch the tag you might damage the coating.

Tests can, and should, be done in both *air* (see "In-Air Test", below), and *water* (see "In-Water Test", on the next page).

2.8.1 In-Air Test

The HR2 can detect coded tags and communicate with a VR100-200 in air but does so at a much *reduced range* compared to its range capabilities when it is in water.

> *i* **IMPORTANT:** Perform in-air tests *away* from electrical noise sources such as motors, PC screens, or fluorescent lights.

To perform an in-air test

Acoustic high frequency signals do not transmit well through air. To conduct the test the tag or tags need to be *touching* or *very close to* the HR2 hydrophone (millimeters, see image).

1. Connect receiver to computer (see "Connecting an HR2 Receiver to a computer", on page 18).

2. Launch Fathom software (see "Launch Fathom", on page 20).

3. Establish communication with receiver (see "Establishing Communication", on page 24).

4. Ensure receiver's built-in transmitter is **ON** (see "HR2 Transmitter Tab", on page 44).

5. Start a study (see "Starting a Study", on page 67).

6. Select the **Live Detections** tab.

7. Activate your 180 kHz tag(s) and place it less than 2.5 cm (1") away from the HR2 hydrophone (tip) so the side of the tag is facing the side of the hydrophone.

8. Observe the tag transmissions in the **Live Detection Monitor** display. You should see either **HR (A170-1802-XXXX)** or **PPM (A180-1702-XXXX)** or *both* transmission types.

   You should also see detections of the receiver's on-board transmitter, transmitting as programmed in **Step 4**. You can also watch the LED flash patterns as the tag is detected and the data are stored in memory:

   a. When activated, a transmitter transmits 10 IDs quickly over approx. 10-15 seconds and then the tag enters its programming cycle that was setup between you and VEMCO at the date of order.

   b. Each quick **red** flash of the **Status Light** is a received PPM ping.

   c. A long, bright **red** flash is a stored PPM detection.

   d. **Blue** flashes indicate HR detections.

   e. During this test you can also confirm that the on-board Sync tag is transmitting as programmed in Fathom.

   f. If the flash patterns are different, compare it to the **Status Light Flashes** chart (see "Status Light Flashes", on page 165).

9. Take a quick look at the number of detections and pings received listed in the receiver Status information on the **Status** tab, or select the **Live Detections** or **Live Tiles** tab to see live ping information.

10. Offload the data that was collected during the test, creating a data file (see "Offloading Data", on page 70).

11. Export the offloaded data to a CSV file (see "Exporting Data", on page 95) and view the data to verify that the data was stored and retrieved without problems.

12. If you do not plan to deploy your receivers right away (within a day or two), place the receiver in **Suspend Mode** (see "Suspend Mode (not recording)", on page 73). To *start* recording at deployment time, bring the receiver out of **Suspend Mode** by starting a new study (see "Starting a Study", on page 67).

This simple test confirms that the receiver is working properly, a tag is decoded properly, and it confirms that your tag is functioning as intended.

2.8.2 In-Water Test

Tests performed **in water** are almost identical to the in-air test. The only difference is that the equipment does not need to be as close in water as it does in air.

For example, the tag could be positioned **5 meters** from the receiver for testing purposes. In-water tests are often performed to establish an ideal range for the HR2 receivers in the environment in which they are moored. Details of conducting a **Range Test** are found at our Customer website.

To perform an in-water test

You can do this test in a bucket or tank or in a larger body of water.

> **NOTE**: Water testing can a bit trickier than air testing because in small spaces the signals might distort due to reflections and reverberation. In this case you might need to try and move the tags and receivers to different locations. If conducting the test in a small bucket try moving the tags around. Place your tags in a mesh bag or hold the tag underwater with your hands. If in a large body of water be careful not to drop your tags. You might need scuba to recover the tags!

Sometimes you might need to try different configurations to ensure that you can successfully decode the tag or tags. Stay away from hard surfaces, concrete, rocks, etc., when testing.

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Using Fathom with an HR2 Receiver

The options under each of the **Fathom** software tabs allow you to set up how you communicate with and use your **HR2** receiver.

This Section Contains Information On The Following:

3.1 Status Tab

The **Status Tab** provides you with a snapshot of the current status of your receiver.

See the descriptions below for details on each item displayed.
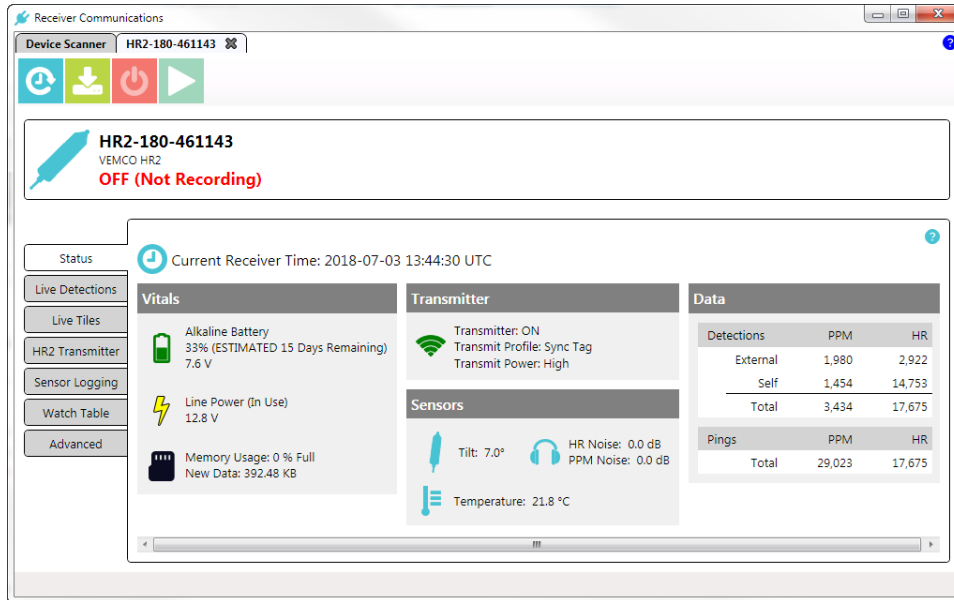
Figure 3-1: Status Tab

Receiver Clock

Displays the **Date and Time** of the receiver internal clock (as **UTC**[1] time), as automatically set during receiver initialization.

Vitals

Battery

Displays **battery information**:

- *Battery type* (Lithium-metal or alkaline)
- *percentage remaining* (example: 81% Remaining)
- *voltage* (example: 10.5V)

Line Power

Displays the **voltage** provided by the *external* power source, if connected.

The **HR2**'s external connector allows for the receiver to be powered from an external power source, such as a 12V lead-acid battery. The external power specifications are:

- **External DC Voltage:** 9.1V (minimum), 30V (maximum)
- **Typical Power Consumption (@12V):** 7.5 mA (Record Mode)

---

[1]Coordinated Universal Time is the primary time standard by which the world regulates clocks and time. Time zones around the world are expressed using positive or negative offsets from UTC, as in the list of time zones by UTC offset.

Memory Usage

Displays how much **memory** is used up as:

- a *percentage* value (% Full)

It also displays the amount of **New Data**, since initialization of the current study (example: 4.48KB).

Transmitter

Displays the following information:

- If the transmitter is **ON** (transmitting) or **OFF** (not transmitting).
- *Transmit Profile*, according to the profile selected under the **Transmitter** (configuration) tab
- *Transmit Power Level*, according to the power level selected under the **Transmitter** (configuration) tab

Sensors

Tilt

Displays the receiver's **tilt angle**, stated as number of degrees from vertical (0°). A tilt of 0° indicates that the **HR2** is vertical, with hydrophone pointing up, and a tilt of 90° indicates that the receiver is on its side, as it would be if placed on a table top.

Noise

Displays ambient noise, in decibels (dB).

Temperature

Displays ambient temperature, in degrees Celsius (°C).

Data

Detections

Displays **External**, **Self** (detections of the receiver's own transmitter), and **Total** numbers for PPM and HR detections accumulated on the receiver since the study was started.

- **PPM** - (Pulse Position Modulation) PPM detections are detections received at 180 kHz, using VEMCO's traditional **Pulse Position Modulation** coding technology.
- **HR** - (High Residency) HR detections are detections received at 170 kHz using VEMCO's **High Residency** coding technology.

Pings

Displays **total numbers for both PPM and HR pings** accumulated on the receiver since the start of the study. The number of HR pings since the start of the study is the same as the number of HR detections, as reported under **Total Detections**.

3.2 Live Detections Tab

The **Live Detections Tab** displays information about incoming detections, in real time. **HR** detections are shown in **blue** and **PPM** detection are shown in **red**. The following information is displayed:

- **Date and Time** of the detection. By default, detections are displayed in **UTC**[1] time.
- Which **Quality level** of detections to display (see "Live Tiles and Live Detection Filter Options", on page 38).
- The **full ID** of the detected transmitter (ex: H170-1802-39921)
- The **signal strength (S)** of the received detection
- The **ambient noise level (N)** at the time of the detection
- The **Quality Score (Q)** of the received detection. Quality Score is a measure of the *quality* of an HR detection, where **10** is excellent and **1** is poor. The quality score may be used to assist with filtering out false detections.
- The **Sensor values as ADC units (D)** where "D" indicates data. These values appear **only for sensor tags**.
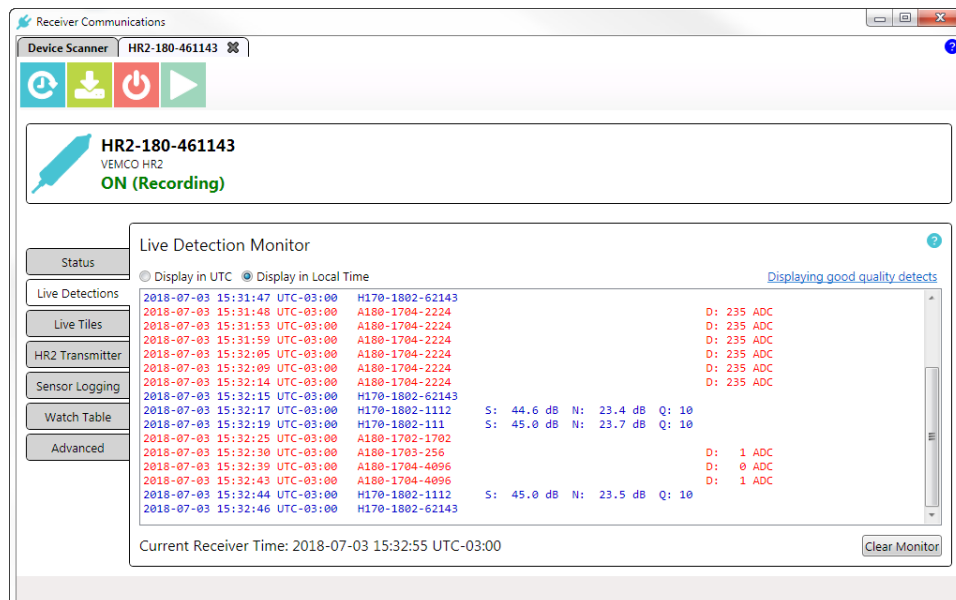
Figure 3-2: Live Tab and active Live Detection Monitor

Depending on the type of detection, some of the above fields may be empty. The table below indicates which fields apply to each type of detection.

Detection Type	Text Colour	Signal Strength	Noise	Quality Score
HR	**Blue**	Yes	Yes	Yes
HR_SELF*	**Blue**	No	No	Yes
PPM (decoder D1)**	**Red**	No	No	No
PPM (decoder D2)**	**Red**	Yes	Yes	No
PPM_SELF*	**Red**	No	No	No

* A HR_SELF or PPM_SELF detection is a detection of the receiver's own built-in transmitter.

The HR2 receiver has two methods of decoding PPM transmissions. PPM transmissions may be decoded by *one* or *both* decoders; in either case, a *single detection* is reported in the **Live Detections Tab.

To clear the current detection list from the display window, click the **Clear Monitor** button.

3.2.1 Time Display Options

You can display the Current Receiver Time either in **UTC** time or in **Local Time**. Select which option to use at the top of the **Live Detection Monitor** panel.
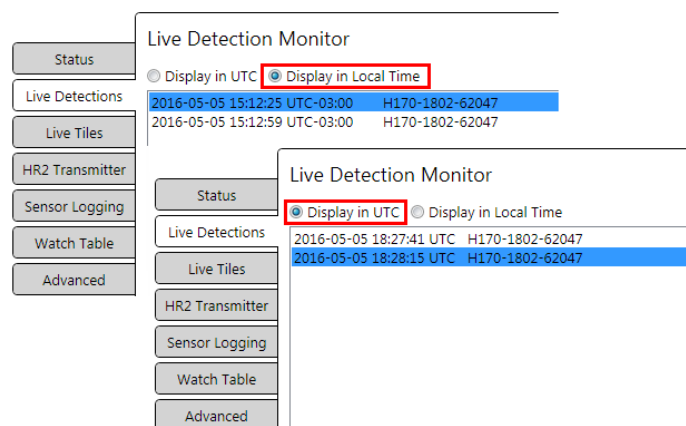
Figure 3-3: Live Tab receiver time display options

3.2.2 Live Tiles And Live Detection Filter Options

The **Live Tiles** and **Live Detections Filter Options** provide choices for which HR detection quality level to view, when connected to your HR2 receiver. You may view **good quality** detections (HR detections with a quality score >=3), **low quality** detections (HR detections with a quality score < 3), or detections of **any quality** (all quality scores). The default option is *good quality*. **Defining Quality Score**[1]

> **IMPORTANT:** The quality filter **is NOT** applied to PPM detections.

To select filter options

Live Tiles tab

Inside the **Live Tiles** tab, click the current filter option. The **Filter Options** box appears, and displays the available options. The default is *Good Quality* detects. Select the quality level to set the option and return to the **Live Tiles** tab.

Filter options

◉ Good quality
◯ Low quality
◯ Any quality
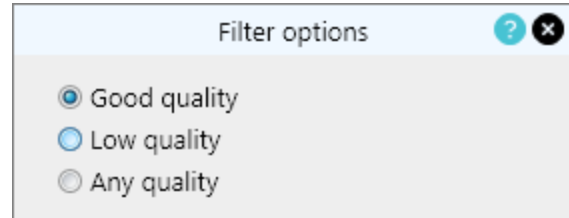
Live Detections tab

At the right of the **Live Detections** tab, click the current filter option. The **Filter Options** box appears, and displays the available options. The default is *Good Quality* detects. Select the quality level to set the option and return to the **Live Detections** tab.

---

[1]A measure of the quality of an HR detection, where 10 is excellent and 1 is poor. The quality score may be used to assist with filtering false detections out of a dataset. Detections with a quality score < 3 are filtered out upon export to CSV when using the Export Data application (HR detections on HR2 receivers only)

3.3 Live Tiles Tab

The **Live Tiles Tab** displays summary data (as *tiles*) about incoming detections of each transmitter, in real time. It allows quick and easy visualization of the detection frequency of test tags or animal tags within range of the connected receiver, as well as the detection frequency of neighbouring receivers' synctags. This feature is particularly useful when range testing or testing a VPS setup.
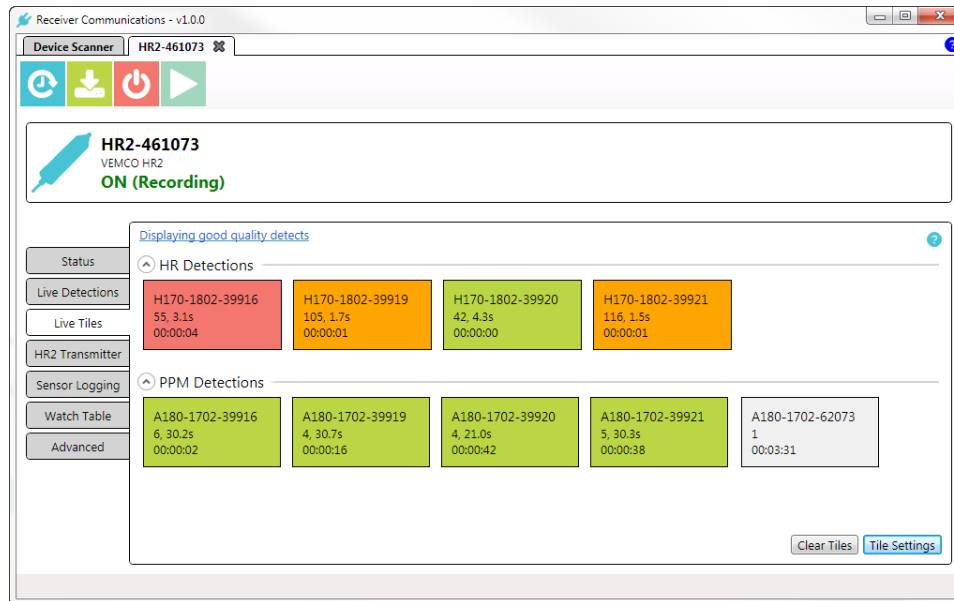
Figure 3-4: Live Tiles Tab

3.3.1 Understanding The Live Tiles Display

The **Live Tiles** display is divided into two sections: one for **HR** detections and one for **PPM** detections.

> **NOTE:** You can select which **Quality level** of detections to display (see "Live Tiles and Live Detection Filter Options", on the previous page).
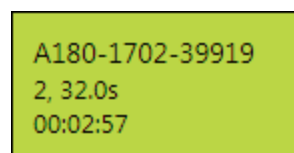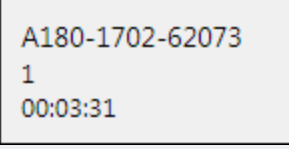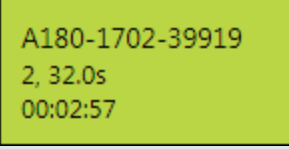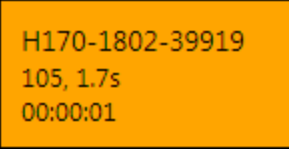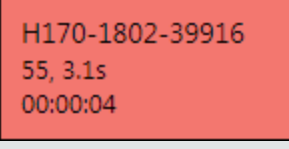
Figure 3-5: Sample Tile information

The information displayed on each tile is as follows:

- **First line:** Transmitter ID.
- **Second line, before the comma:** The total number of detections of the ID since connecting to the receiver, or since clearing the Live Tile display.
- **Second line, after the comma:** The average time between detections, in seconds. This number can be used along with the transmitter delay to calculate a rough estimate of the percentage of transmissions that are being detected.
- **Third line:** The amount of time (in hh:mm:ss) since the last detection of the ID.

Upon **first detection** of a given ID, a **grey** tile will appear in the appropriate section (HR or PPM).

The tiles are **automatically colour-coded**, according to the following set of rules:

Tile colour example	Rule description
A180-1702-62073 1 00:03:31	**Grey - First/initial detection** (HR detection example), needs a second detection to be validated. A tile will remain **grey** until a *second* detection of the same ID occurs. The second detection must be logged *within* the time threshold specified under **Tile Settings** (see "Live Tiles Display Settings", below), or the detection will be considered *false* and the tile will disappear.
A180-1702-39919 2, 32.0s 00:02:57	**Green - Second detection** (HR detection example), detection is validated. If a **second detection** of the ID **does** occur within the specified time threshold, the tile will turn **green** to indicate that detections of that ID are coming in at the expected rate. Once a tile has turned **green**, it will remain in the display window until the tile is closed (by clicking on the **red "X"** in the top right corner of the tile) or the **Clear Tiles** button is clicked. A tile will remain **green** as long as detections of that ID continue to come in *within* the time threshold specified under **Tile Settings**.
H170-1802-39919 105, 1.7s 00:00:01	**Orange -** Detection (PPM detection example) **exceeding** the time threshold limit. If the time threshold is reached without a new detection coming in, the tile will turn **orange** to indicate that the detection rate of the ID is lower than expected.
H170-1802-39916 55, 3.1s 00:00:04	**Red - Subsequent detections** (PPM detection example) **exceeding** the time threshold limit. If the detection frequency continues to miss the time threshold, the tile will turn **red**.

3.3.2 Live Tiles Display Settings

The **Live Tiles** display can be filtered to limit clutter on the screen in situations where many tags are within detection range at once. You may therefore want to focus exclusively on a *subset* of tags.

The time thresholds of the display can also be configured to suit the programming of your particular tags.

> *tip!* To view only HR detections or only PPM detections, collapse the section that you are not interested in by clicking on the **up/down arrow** to the left of the HR or PPM section header.

To set up or change the Live Tiles Display Settings

On the **Live Tiles** panel, at the bottom right, click **Tile Settings**. The **Tile Display Settings** dialog box appears.
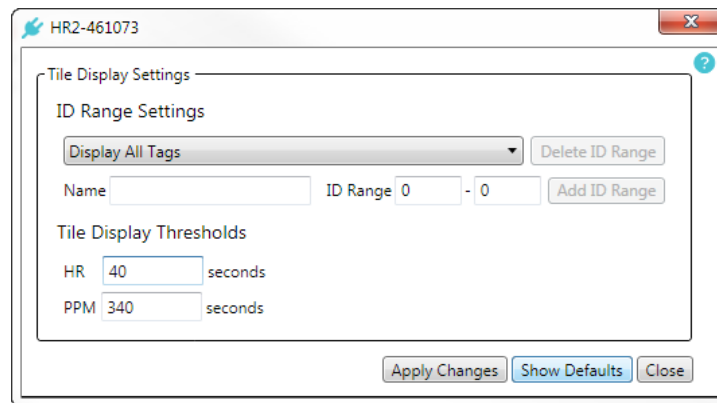
Figure 3-6: Live Tile Display Settings dialog box, using default settings

ID Range Settings

To filter out unwanted IDs from the **Live Tiles** display, you may set up one or more ID ranges of interest and limit the tile display to a single ID range at a time (a *subset* of tags).

To set up an ID Range subset of tags

> **NOTE:** Filters are applied to both PPM and HR detections.

1. In the **Name** field, type a name for the set of tags.
2. In the **ID Range** fields, type the *beginning* and *end* ID numbers for the tags.
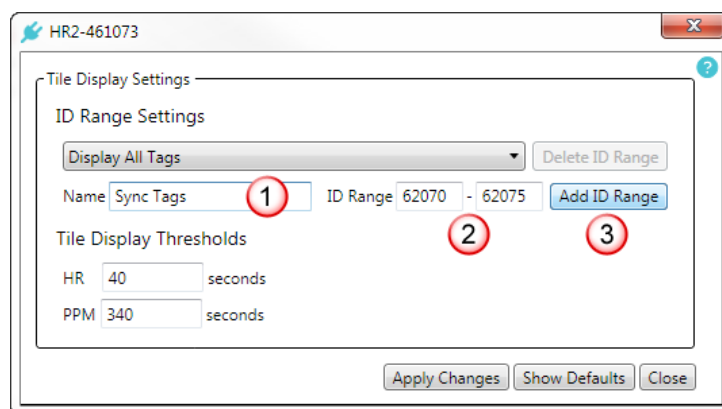
Figure 3-7: Setting up an ID Range or subset of tags

3. Click **Add ID Range**. The named range is added to the drop-down list.
4. You can add more ID Range sets, or click **Close** to return to the **Live Tiles** tab.

To **delete** custom ID ranges, select the **ID Range** in the drop-down list and click **Delete ID Range**.

To use an ID Range subset

1. Click the **ID Range** drop-down list.

2. Select an **ID Range** subset.
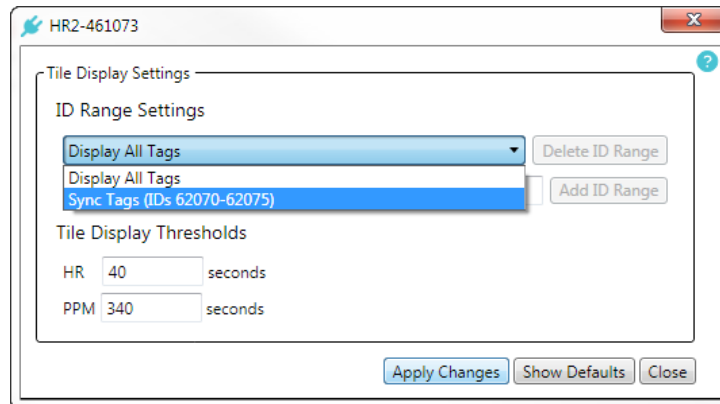
Figure 3-8: Selecting an ID Range or subset of tags for display

3. Click **Apply Settings**. The selected range is now the new settings.

4. If done with **Tile Display Settings**, click **Close**.

Tile Display Thresholds

Tile **Display Thresholds** control **how long** tiles will remain displayed before they either *disappear* or *change colour*, in the absence of new detections of the ID (see description of how this works above). Thresholds should be set *slightly longer* than the maximum transmission delay of your tag IDs of interest. This will prevent Fathom from prematurely *removing* tiles from the **Live Display**.

To Change the Tile Display Thresholds

1. In the **HR** field, type the desired value.

2. In the **PPM** field, type the desired value.
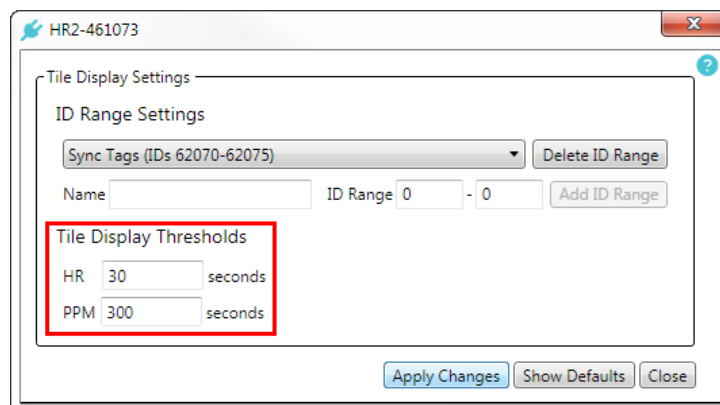
Figure 3-9: Setting the Tile Display Thresholds

3. Click **Apply Changes**. The new thresholds are now set.

4. If done with **Tile Display Settings**, click **Close**.

Default Settings

To restore Default Settings

1. At any time, if you want to return to the **Default Settings**, click **Show Defaults**. The default settings will be displayed in the **Tile Display Thresholds** fields.
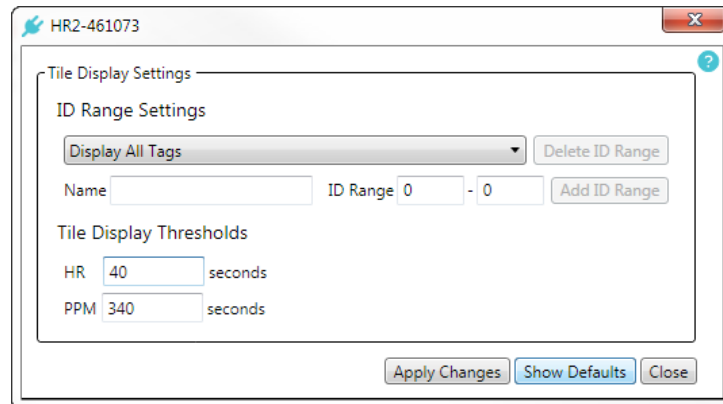
Figure 3-10: Showing the Tile Display Thresholds defaults

2. The default settings are **40 seconds** for HR, and **340 seconds** for PPM. These settings are appropriate for live observation of detections of synctags programmed with default delay settings (HR 25-35 s, PPM 270-330 s).

3. Click **Apply Changes** to reset the thresholds to the defaults.

4. If done with **Tile Display Settings**, click **Close**.

3.4 HR2 Transmitter Tab

The **HR2 Transmitter Tab** provides transmitter **identification information** and **configuration options**.
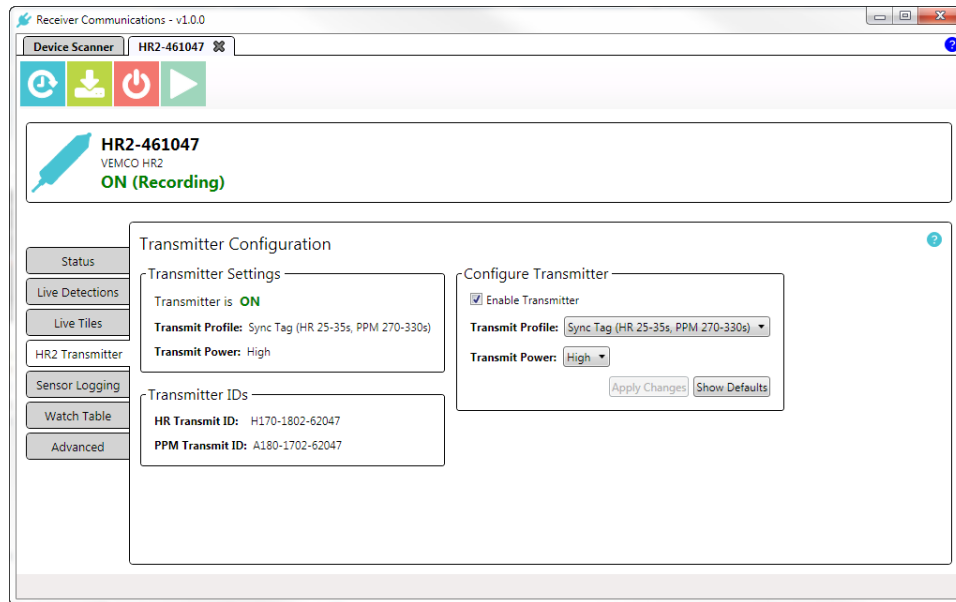
Figure 3-11: HR2 Transmitter tab and information

> **IMPORTANT:** Anytime you make changes to settings and attempt to *leave* the **HR2 Transmitter** tab (by going to another tab like **Status**, for example), the following message will be displayed: "*There are unsaved settings on this page. Would you like to save them now?*"
> Click **Yes** to apply the changes, or, **No** to leave without any changes.

3.4.1 Transmitter Settings

This section displays the current transmitter parameters:

- Whether the transmitter is **ON** (transmitting) or **OFF** (not transmitting).
- Which transmitter **Profile** is in use.
- The **Transmit Power** setting (*Low*, *Medium*, *High*, *Very High*)

3.4.2 Transmitter IDs

The **HR Transmitter ID** and **PPM Transmit ID** are displayed.

3.4.3 Configure Transmitter

This section provides options to configure your transmitter. Once you make changes and apply them, the updated settings appear in the **Transmitter Settings** section on the left (and also on the **Status Tab** under the **Transmitter** heading).

Enable Transmitter checkbox

Check the box to turn the transmitter **ON**, leave it clear for **OFF**.

> **IMPORTANT:** It is **critical** that the built-in transmitter is *enabled* for all fine-scale positioning (VPS) studies to allow for proper receiver time synchronization. For all other deployments, it is recommended that the built-in transmitter be enabled to provide data that can be used for system performance assessment post-deployment.
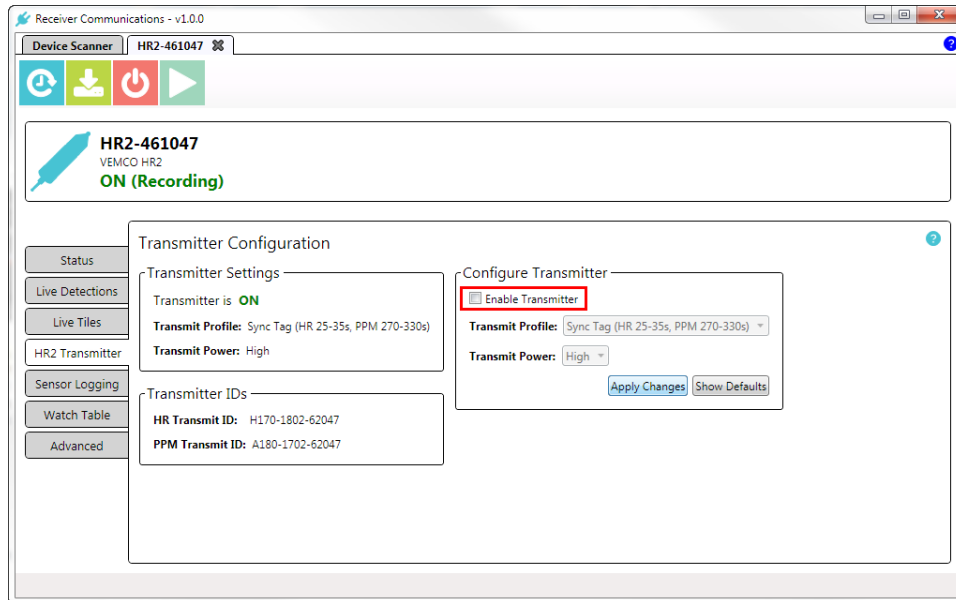
Figure 3-12: Enable Transmitter check box

Transmitter Profile options

Click the down arrow to display the options, and then select one for the receiver to use.

> **NOTE: Sync Tag** is the default transmit profile and is recommended at all times when not conducting range testing.

Sync Tag (HR 25-35s, PPM 270-330s)

This setting transmits with a **random** delay between 25 and 35 seconds for HR coding, and 270 and 330 seconds for PPM coding.

Use the **Sync Tag** setting if you are preparing your receivers for a longer-term deployment.

- If you are conducting a positioning (VPS) study, Sync Tag detections will be used to synchronize your receivers' clocks and facilitate accurate position calculation.
- If you are **not** conducting a VPS study, use the Sync Tag setting to have your transmitter act as a *control* or *sentinel* tag. In this case, you may use detections of the transmitter on neighbouring receivers as a means of monitoring ongoing acoustic conditions.

Range Test Random (HR 4-6s, PPM 25-35s)

This setting transmits with a **random** delay between 4 and 6 seconds for HR coding, and 25 and 35 seconds for PPM coding.

Use this setting when performing range tests using more than one transmitter, or when using a single transmitter in areas where tagged animals are present. The random delay setting will help to reduce the likelihood of transmission collisions in these cases.

Range Test Fixed (HR 5-5s, PPM 30-30s)

This setting transmits with a **fixed** delay of 5 seconds for HR coding and 30 seconds for PPM coding.

Use this setting only when performing range tests using a single transmitter, and when there are no tagged animals known to be in the area. The fixed delay setting means that transmission collisions are likely to occur if other transmitters are within range of your receivers at the same time.

> **IMPORTANT: Range Test Random** and **Range Test Fixed** transmit profiles should only be used for purposes of short term testing. For long term deployment, remember to change the transmit profile back to the default (sync tag) setting.
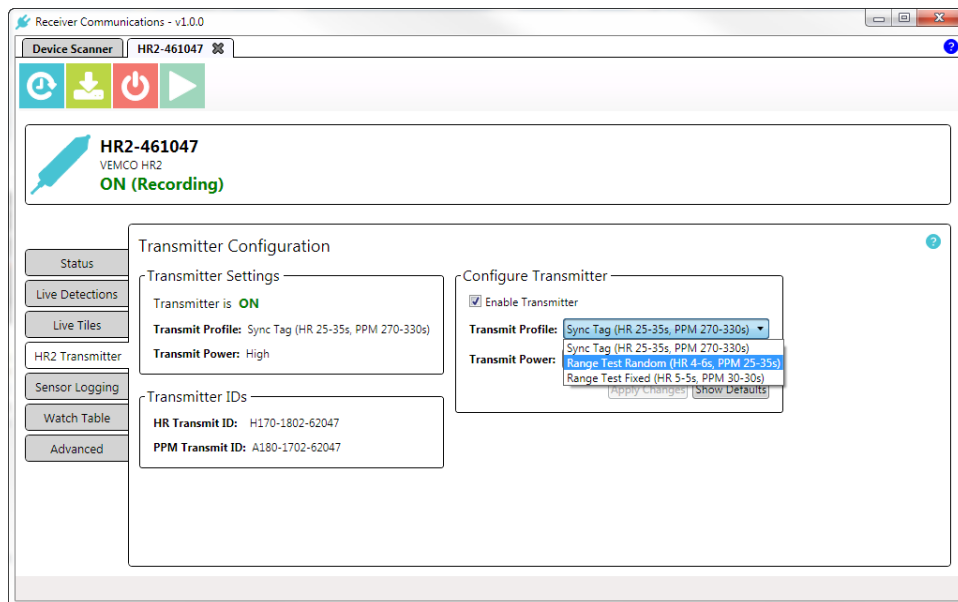
Figure 3-13: Transmit Profile options

Transmitter Power options

Click the down arrow to display the list of options, and select one of the following:

- Very High (147 dB)
- High (143 dB)
- Medium (139 dB)
- Low (135 dB)
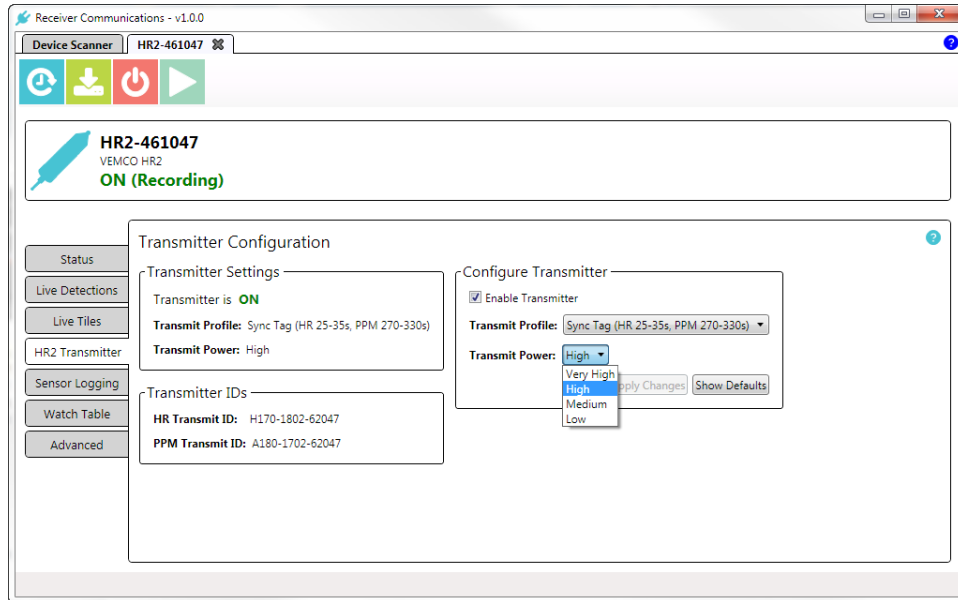
Figure 3-14: Transmit Power options

Applying changes

When you change configuration settings, the **Apply Changes** button is accessible. Click the button to immediately set the new parameters.
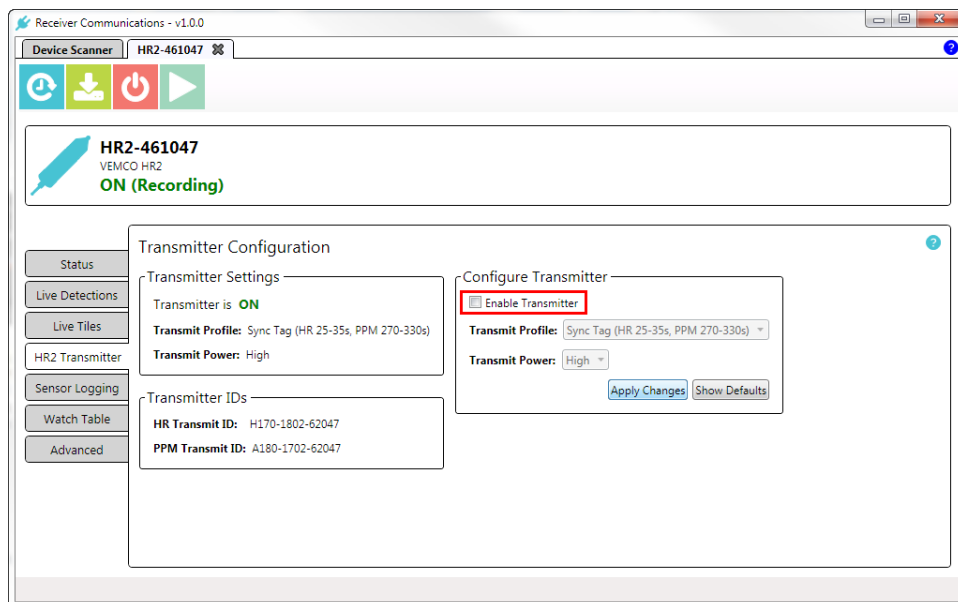
Figure 3-15: Applying Changes (disable Transmitter)

When the settings are successfully updated, a confirmation message will appear. Click **OK** to remove the message box.
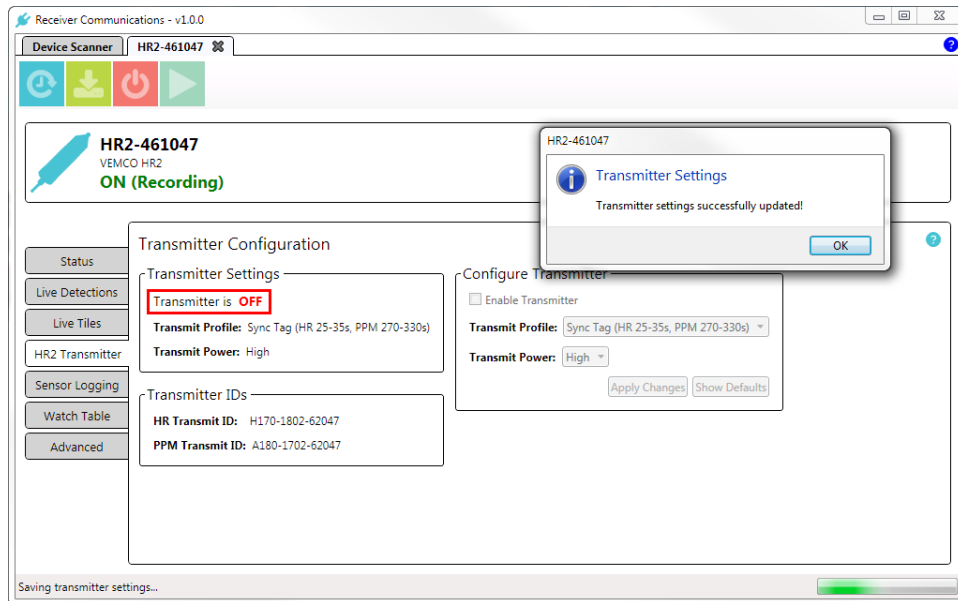
Figure 3-16: Transmitter is now OFF

Show Defaults

Clicking the **Show Defaults** button will change any current settings to the default settings, and make the **Apply Changes** button accessible. If you simply view the default settings and then click another tab (**Status**, for example), your current settings will remain unchanged.

Changes will only be applied if you click the **Apply Changes** button.

3.5 Sensor Logging Tab

The **Sensor Logging Tab** displays the **Sensor Data Logging Options**.

The **Sensor Logging Options** allow you to configure the *logging interval* for data from the receiver's built-in sensors (temperature, tilt, and noise).
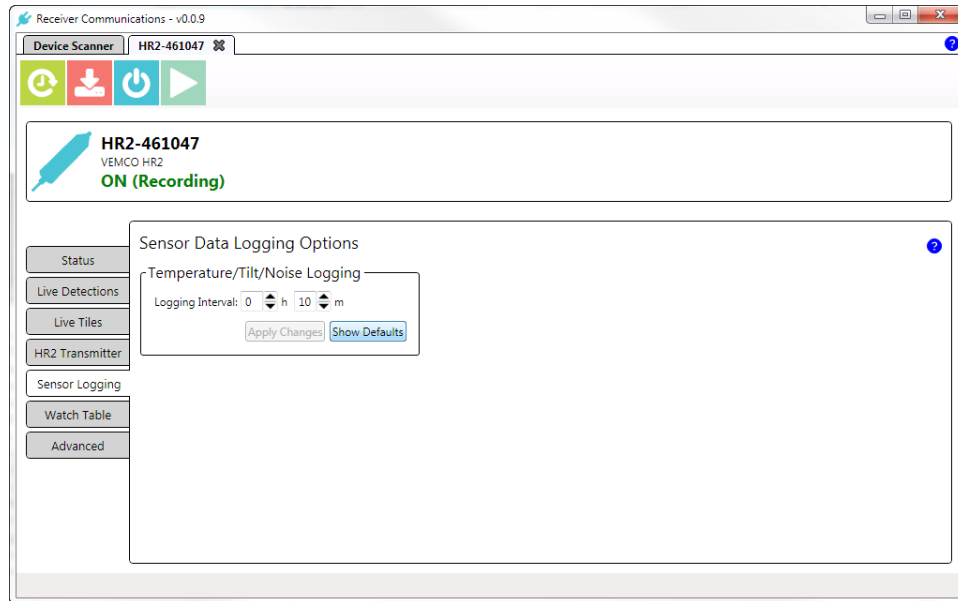
Figure 3-17: Sensor Logging Tab

Viewing the Default settings

To view the default *hours* and *minutes* settings, click **Show Defaults**. The default settings are displayed in the settings boxes.
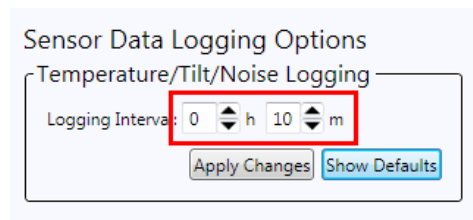
Figure 3-18: Showing the default settings

To **accept** the default settings, click **Apply Changes**.

To **keep your existing settings**, simply move to another tab. A warning message will inform you that you have unsaved settings on this tab (**Sensor Logging**) and offer you the option of *saving* (**Yes**) or *discarding* the changes (**No**).
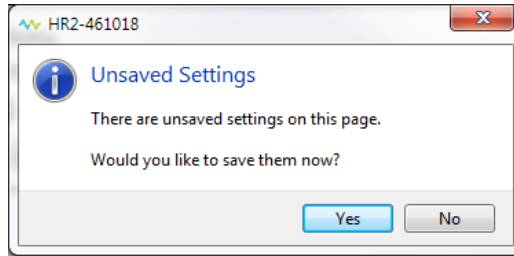
Figure 3-19: Unsaved Settings message

If you click **No**, your settings will remain as they were, and the view changes to your other selected tab.

Changing Settings

To change settings, either:

- Click the up or down arrows next to the **Hours (h)** and/or **Minutes (m)** boxes, or
- Click directly in a box and *type in* a new value.
- The **minimum** (combined) value is 0 hour/1 minute.
- The **maximum** (combined) value is 24 hours/0 minutes.

If you enter an *invalid* value, a red frame appears around the settings boxes.
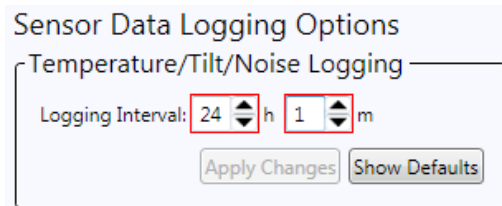
Figure 3-20: Invalid/outside acceptable values

Modify the values to comply with the *minimum* and *maximum* ones stated above.

Saving Settings

When you make changes to the **Sensor Data Logging Option** settings, the **Apply Changes** button becomes accessible.
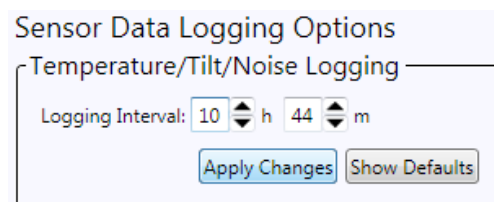
Figure 3-21: Applying Changes

To save your changes, click **Apply Changes**.

3.6 Watch Table Tab

The **Watch Table Tab** displays a list of tags of interest and is extremely helpful in identifying if a particular tag was in the area surrounding a receiver.

The tag information is entered in the Watch Table, where each tag entered is assigned an Index number between 1 and 192. When completed, this list is sent to the receiver through the communication cable and accessed using the VR100 while the HR2 is deployed.

> **NOTE:** The instructions on how to access the Watch Table using the VR100 are found in the VR100 documentation.
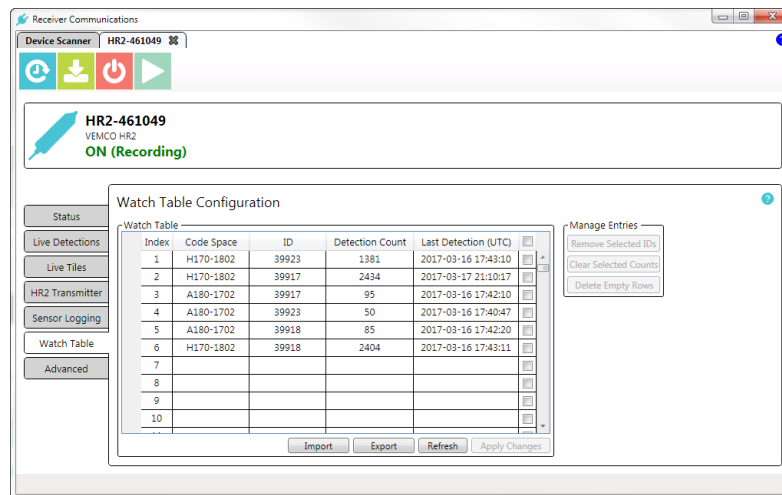
Figure 3-22: Watch Table Tab

3.6.1 Adding Tag IDs

Tag ID and **Code Space** information was shipped with the tag.

1. Select the **Code Space** from the drop-down list.

> **IMPORTANT:** Currently, you **cannot** enter *sensor tags* into a Watch Table.

2. In the **ID** field, enter the Tag ID of the tag you want added to the table.

3. Repeat Steps 1 and 2 to add tags until the Watch Table is complete based on your needs. You may add **up to 192 entries**.

> **NOTE:** All entries change to red text until you apply the changes.

4. Click **Apply Changes**.

> If you wish to organize your entries in "groups", you may skip one or more lines in the table, as desired. For example, you could have entries from 1 to 24, then skip to 31-45, etc. This may provide easier visual reference when you are consulting the table. Having "gaps" in the list is acceptable.

3.6.2 Selecting Tags

After a tag has been entered in the Watch Table, it may be selected by clicking the box at the far right of the row.

All tags can be selected at once by checking the **Select All Tags** box at the right of the **Last Detection (UTC)** column header.

3.6.3 Managing Entries

Remove Selected IDs

You may decide to remove some IDs from the entries list.

To remove selected IDs from the Watch Table list:

1. Select one or more entries by checking the box at the right of the entries. Under **Manage Entries** at the right, the **Remove Selected IDs** button becomes available.

2. Click **Remove Selected IDs**.

Clear Selected Counts

You can remove the **Detection Count total** from one or more entries, as needed, and have the count **reset to zero**.

To clear selected counts from the Watch Table list:

1. Select one or more entries by checking the box at the right of the entries. Under **Manage Entries** at the right, the **Clear Selected Counts** button becomes available.

2. Click **Clear Selected Counts**.

Delete Empty Rows

When you remove selected IDs from your Watch Table (or if you have deliberately left "gaps" in the list for organizational reasons), you may have some empty rows in the list. When empty rows are present, the **Delete Empty Rows** button is available for use. You may wish to remove the gaps in the list to make it more compact. To delete the empty rows in the list, just click **Delete Empty Rows**.

Refreshing the Watch Table List

To refresh the **Detection Count** and **Last Detection (UTC)** columns in the Watch Table, click **Refresh**.

Importing a Watch Table file

Fathom can import watch table entries from a `.csv` file created by you, or exported from another HR2 receiver.

To import a Watch Table file (.csv):

1. Click **Import**. The **Import Watch Table** dialog box appears.
2. Navigate to the location of the file, and select it.
3. Click **Open**.

When importing a watch table, Fathom will accept `.csv` files formatted as follows:

Example 1

Index	Code Space	Tag ID
1	A180-1702	39903
2	H170-1802	39903
3	A180-1702	39918
4	H170-1802	39918
5	A180-1702	39922
6	H170-1802	39922
7	A180-1702	62059
8	H170-1802	62059

Figure 3-23: Watch Table created from scratch (built by you)

Example 2

VEMCO WATCHTABLE	1.0.0		VemcoCommunications.exe - Version: 1.1.0-20170410-fe1005		
Index		Code Space	Tag ID	Detection Count	Last Detection (UTC)
1	A180-1702	39903	0		
2	H170-1802	39903	0		
3	A180-1702	39918	8	4/26/2017 18:01	
4	H170-1802	39918	117	4/26/2017 18:01	
5	A180-1702	39922	0		
6	H170-1802	39922	170	4/26/2017 18:01	
7	A180-1702	62059	11	4/26/2017 18:01	
8	H170-1802	62059	61	4/26/2017 18:01	

Figure 3-24: Watch Table exported from an HR2 Receiver

Exporting a Watch Table file

Fathom can export Watch Table information to a `.csv` file that can be used for the following:

- Keeping a record of the *detection counts* and *last detection times* from your last live watch table session with the HR2.
- Importing the same watch table into another HR2 Receiver.

To export a Watch Table file:

1. Click **Export**. The **Export Watch Table** dialog box appears.

2. Navigate to the location you want to save the file, and click **Save**.

Fathom will save the file with the default name format "HR2-180-461059 Watchtable 2017-04-26 150755.csv"

Example

VEMCO WATCHTABLE	1.0.0		VemcoCommunications.exe - Version: 1.1.0-20170410-fe1005		
Index	Code Space	Tag ID	Detection Count	Last Detection (UTC)	
1	A180-1702	39903	0		
2	H170-1802	39903	0		
3	A180-1702	39918	8	4/26/2017 18:01	
4	H170-1802	39918	117	4/26/2017 18:01	
5	A180-1702	39922	0		
6	H170-1802	39922	170	4/26/2017 18:01	
7	A180-1702	62059	11	4/26/2017 18:01	
8	H170-1802	62059	61	4/26/2017 18:01	

Figure 3-25: Sample exported Watch Table

3.7 Advanced Tab

The **Advanced Tab** displays **Hardware Configuration** information, options for **Serial Communication** settings, and **Hardware Status** information for your selected receiver.
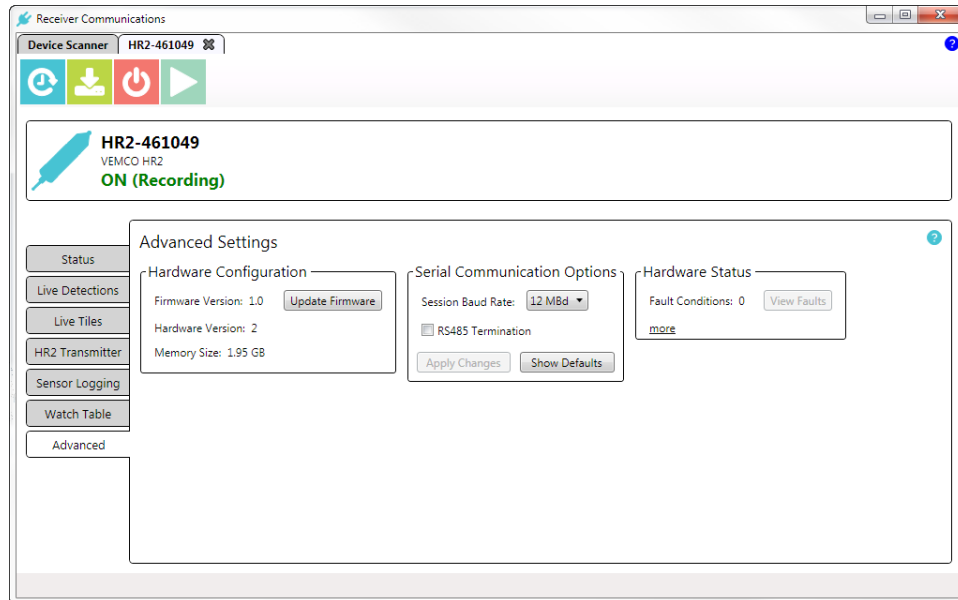
Figure 3-26: Advanced Tab

3.7.1 Hardware Configuration

The **Hardware Configuration** section displays the following information:

- **Firmware** Version ("software" that runs the receiver features), and **Firmware Update** option
- **Hardware** Version (receiver hardware), and **Factory Reset** option
- **Memory Size** Memory capacity of the receiver

Updating the Firmware (manually)

Firmware (FW) is a program that is stored permanently in a device, such as an **HR2** receiver. It is not to be confused with **Fathom**, the PC software used to communicate with the receiver. Firmware updates are rare and will occur to either complete a hardware change or occasionally for a significant addition to functionality.

> **NOTE: HR2** receiver firmware can only be updated when connected to **Fathom**.

> ⓘ **IMPORTANT:** Ensure that all data are offloaded from the receiver before performing a firmware update.

Normally, you would perform an firmware update after receiving an automatic firmware update notification (see "Automatic Firmware Updates and Notifications", on page 168). If you decided to perform the update later (and canceled the operation), you would be using this procedure to complete the update.

Step 1 - Start Update Firmware process

In the **Hardware Configuration** section, click **Update Firmware**.
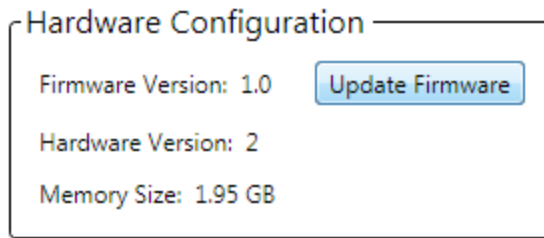
Figure 3-27: Update Firmware button

Step 2 - Continue with the Update

If you had canceled the automatic update after a notification, a **Continue with firmware update** window opens.
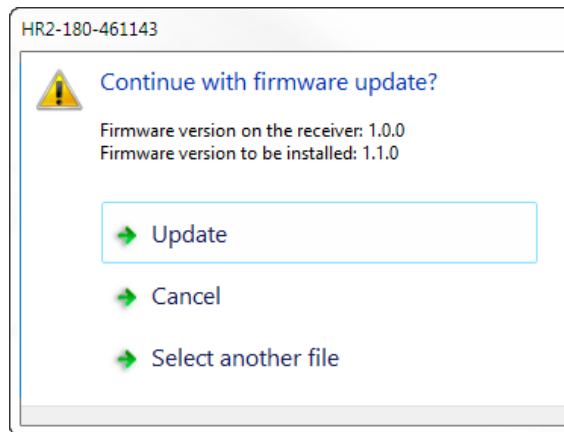
Figure 3-28: Continue with firmware update dialog box

Click **Update**.

A **Firmware Update Warning** window opens.

> **NOTE:** In unique circumstances (such as after contacting Support), you may need to use the **Select another file** option. Specific instructions would be provided at that time on how to proceed.

Step 3 - Offload data first warning

> ⚠️ **WARNING:** When you perform a firmware update, the process may erase all data on the receiver, set the receiver's clock, and reset all transmitter and sensor logging settings to default values. **We recommend offloading your data before performing the update.**
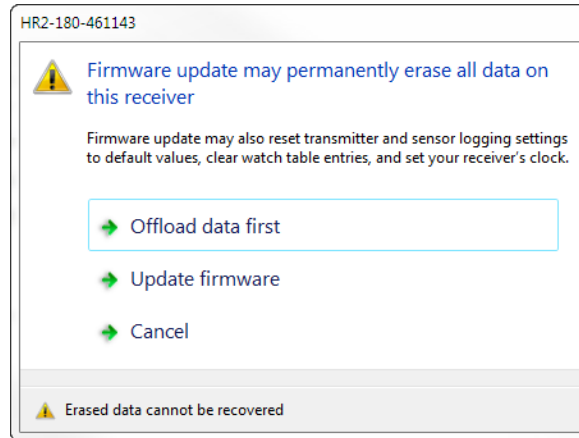
Figure 3-29: Firmware Update Warning dialog box

To offload your data first, click **Offload data first** and proceed to save your data.

To update the firmware without saving your data first, click **Update firmware** and follow the instructions.

Otherwise, click **Cancel**.

Once the update has completed, a **Write Firmware Success** message will confirm the success of the update.
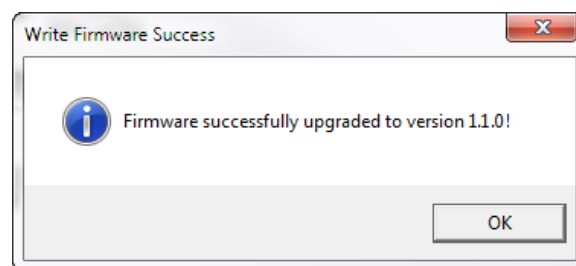
Figure 3-30: Successful firmware update message

For information on Automatic Updates, see "Automatic Firmware Updates and Notifications", on page 168.

Hardware Version

This field displays the hardware version of the receiver.

Memory Size

This field displays the total memory capacity of the receiver. Note that this number represents the memory available when the receiver is **completely empty**. To view the *percentage* of this memory capacity that has been used, go to the **Status Tab** and check **Memory Usage** under the **Vitals** heading.

3.7.2 Serial Communication Options

Setting the Session Baud Rate

The session baud rate is the communication speed in **bits per second (bps)** between your HR2 receiver and the Fathom software. Fathom will automatically set the baud rate to an appropriate value based on the cable you are using. You should only change the setting chosen by Fathom if you experience communication problems at the selected baud rate.

To set the Session Baud Rate

Click to open the **Session Baud Rate list**.
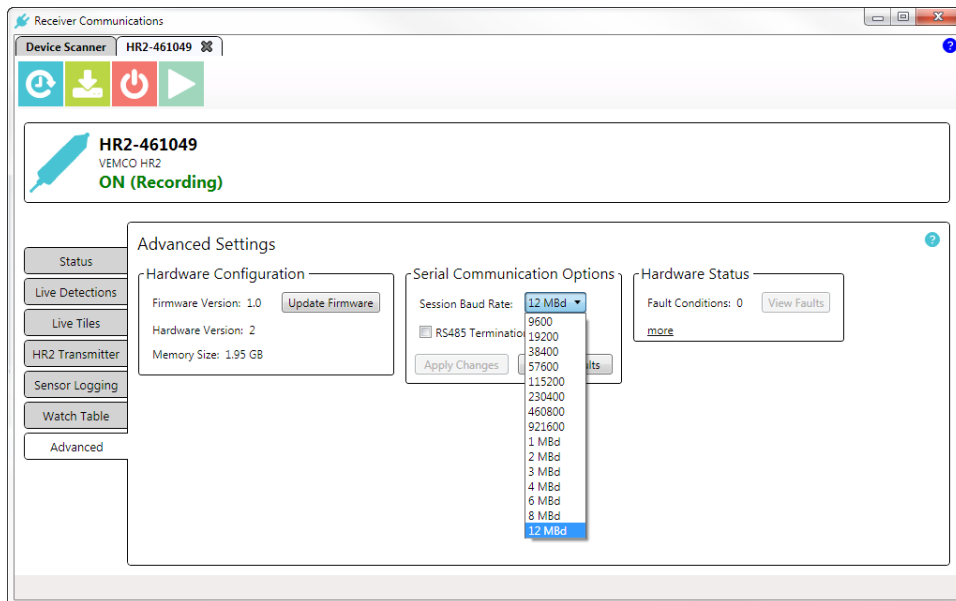
Figure 3-31: Session Baud Rate list

Select the desired Baud Rate. The **Apply Changes** button becomes available.
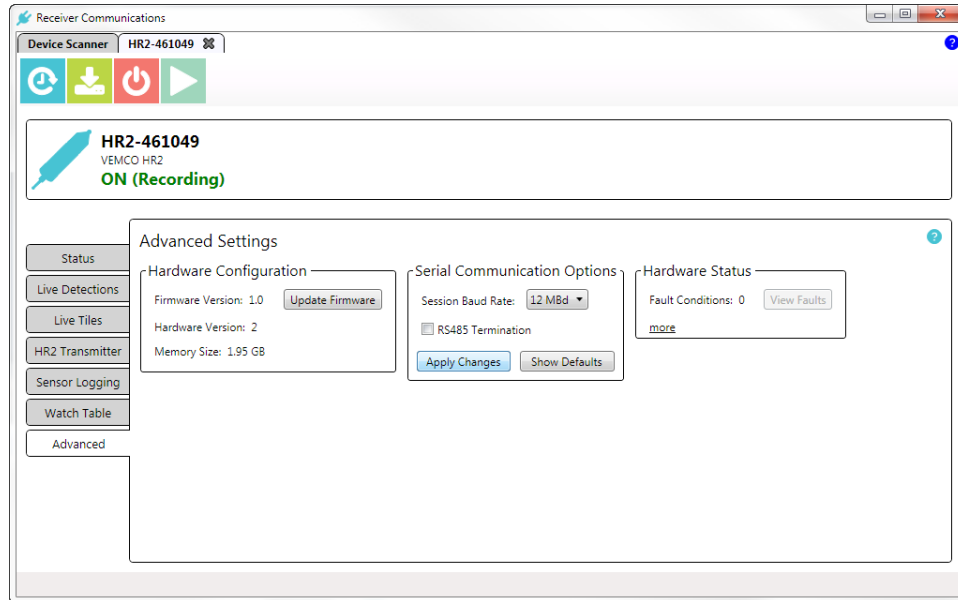
Figure 3-32: Session Baud Rate selected

RS485 Termination

If RS485 communication is being used with long cables and high baud rates (a reasonable rule of thumb would be cable longer than 200m using a baud rate higher than 57600), the system may require that RS485 Termination be enabled, to ensure a reliable communication link between the receiver and the RS485 host.

To enable RS485 Termination

To enable RS485 Termination, check the **RS485 Termination** box.

> **NOTE:** If there are multiple receivers attached to a single cable deployment, ensure that **only the furthest receiver** on the cable has RS485 Terminations enabled.

> **IMPORTANT:** Enabling RS485 Termination causes the receiver to consume a bit more power during active communication with the system host processor.
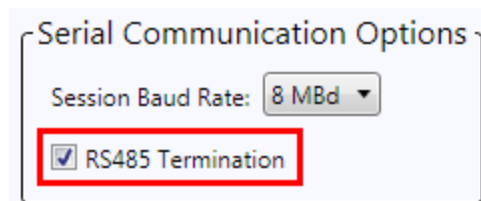
Figure 3-33: RS485 Termination selection box

Show Defaults

If you've made any changes to the Session Baud Rate or have checked the RS485 Termination option, clicking the Show Defaults button will return the settings to their default values (12MBd baud rate, and no RS485 Termination).

Apply Settings

When done with settings, click **Apply Changes**. The new settings take effect immediately.

3.7.3 Hardware Status

The **Hardware Status** section displays the following information:

- **Fault Conditions and View Faults option** - Displays the number of receiver faults (error conditions), if any currently exist.
- **Reset options** - Click **more** to display the available reset options for the receiver.

Faults

Upon connecting to an HR2 Receiver, Fathom performs a check of the receiver's state. If any faults are found, you will be presented with a fault diagnosis message.
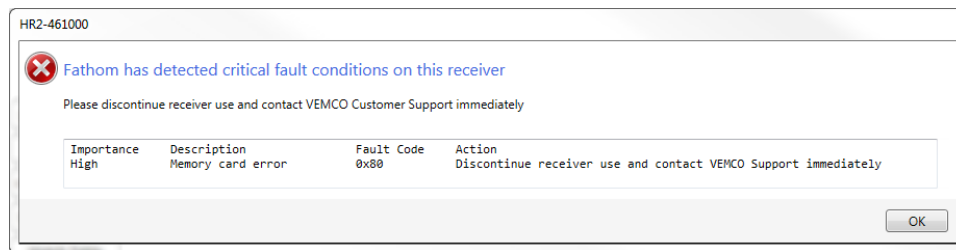
Figure 3-34: Sample start-up fault condition message

⚠️ **WARNING:** This warning only appears on start-up/connection to the receiver. It is critical that you take corrective action as recommended in the fault message.

There are three fault levels, as described next.

Level	Recommended Action
High	Discontinue receiver use and contact VEMCO Support **immediately**.
Medium	Replace the battery if that is indicated in the fault description or Contact VEMCO Support for all others.
Low	None required.

Click **OK** to clear the start-up fault warning message and return to the Fathom interface.

Viewing Faults

You may need to view faults again, when contacting Support.
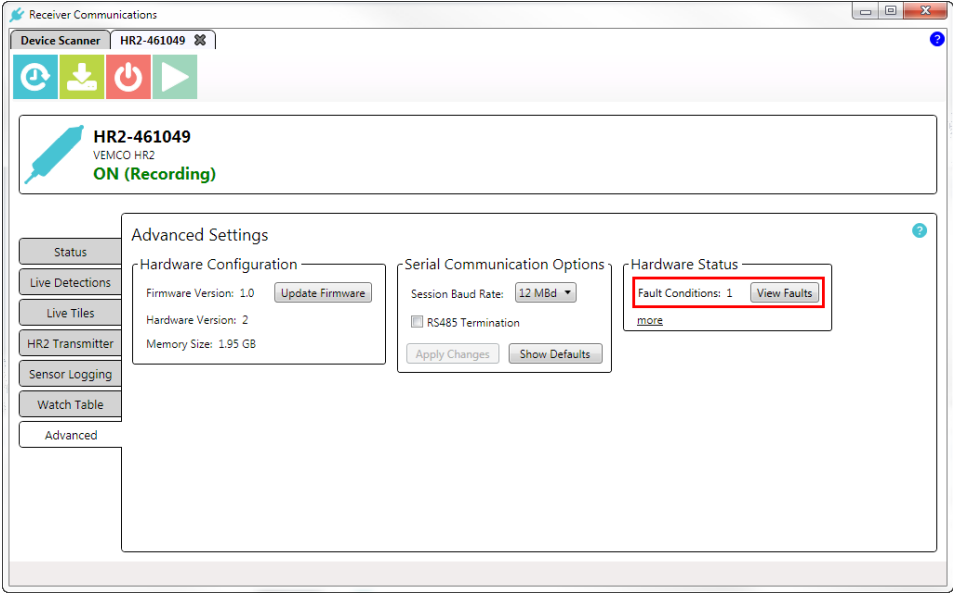
Figure 3-35: Advanced Settings displaying Faults Conditions

To view fault conditions, click **View Faults**. The **Current receiver faults** window appears.
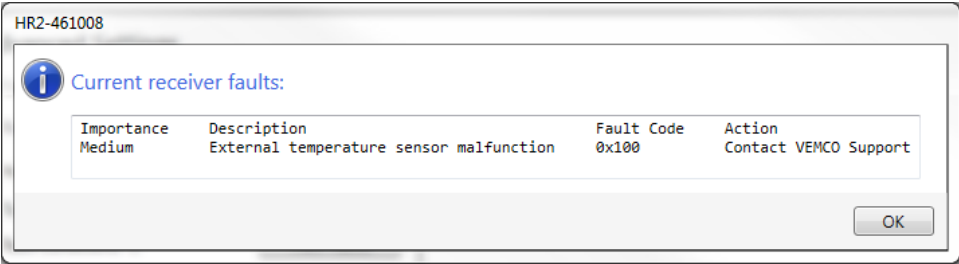
Figure 3-36: Sample receiver fault information

The window displays the following information:

- **Importance** level - Levels are low, medium, or high.
- Fault **Description** - A brief description of the fault.
- **Fault Code** - A code used by VEMCO Support.
- Recommended **Action** - VEMCO recommended action to take when encountering this fault.

To close the window, click **OK**.

Reset Options

Reboot

In some circumstances it may be necessary to reboot the HR2 receiver. For example, VEMCO Support may recommend this action to clear a non-critical fault condition. Rebooting the receiver temporarily powers it off and then powers it back on again.

> **NOTE:** Rebooting is not the same as initializing, because rebooting does not clear the receiver's memory.

To reboot the receiver:

1. In the **Hardware Status** section, click **more** to display the **Reset Options**, then click **Reboot**.
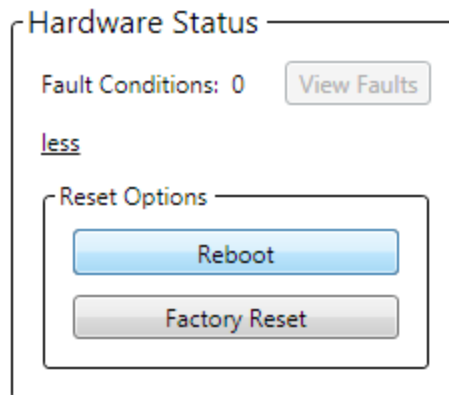
Figure 3-37: Reboot option

2. A reboot operation warning appears.
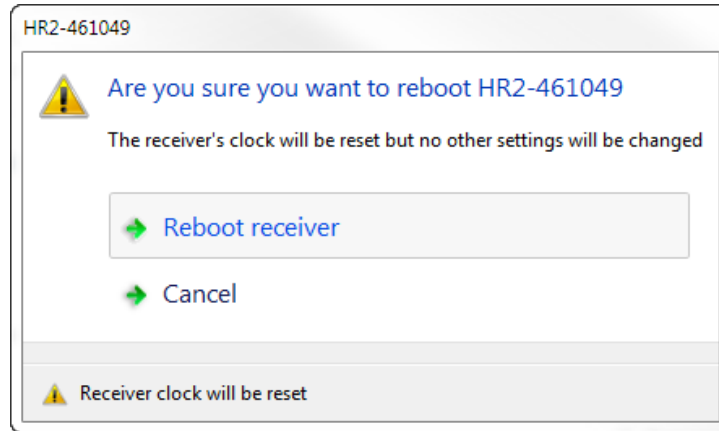
Figure 3-38: Reboot warning and options

3. Click **Reboot receiver** to continue. Settings will remain the same, aside from the receiver's clock being reset.

> **NOTE:** If it hasn't appeared yet in your work session, you may see the "*Are your computer's time settings correct?*" warning dialog. For details, see "Check Computer Time Settings warning", on page 67.

To leave this window without rebooting the receiver, click **Cancel** instead.

Factory Reset

Use the **Factory Reset** option to return the **HR2** receiver to its original settings.

> ⓘ Only use factory reset upon advice from VEMCO Support. Factory reset will erase all data on the receiver, set the receiver's clock, and reset all transmitter and sensor logging settings to default values.

1. In the **Hardware Status** section, click **more** to display the **Reset Options**, then click **Factory Reset**.
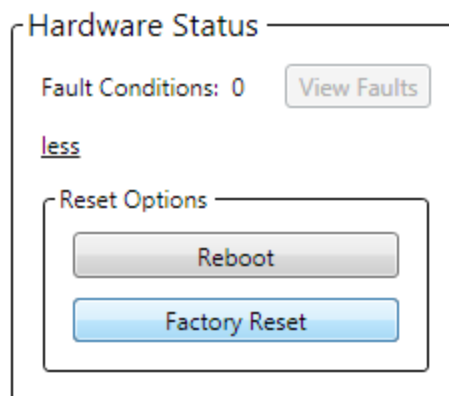
Figure 3-39: Factory Reset

2. A reset operation warning appears.
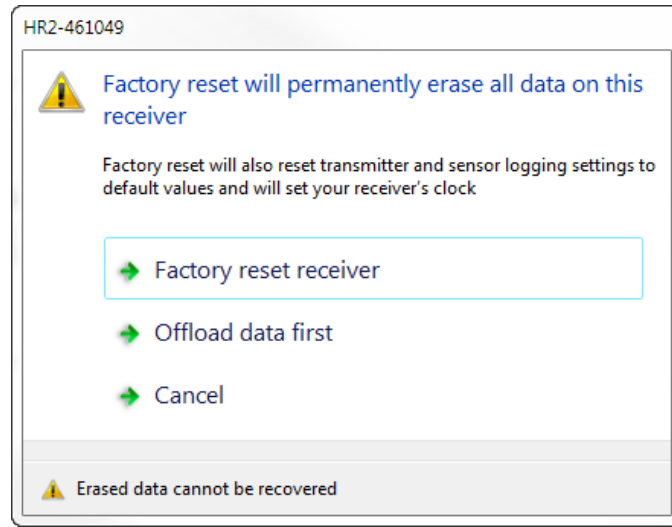
Figure 3-40: Factory Reset options

3. Consider the options carefully:

   a. **Proceed** - Will continue the reset operation, permanently erasing the data on the receiver, including all Watch Table entries, and return the receiver to its factory settings.

   b. **Offload** - Will offload data off of the receiver first then proceed with the reset.

   c. **Cancel** - Will cancel the operation and return to the **Advanced** tab panel.

   NOTE: If it hasn't appeared yet in your work session, you may see the "*Are your computer's time settings correct?*" warning dialog. For details, see "Check Computer Time Settings warning", on page 67.

4. Click the desired option to continue.
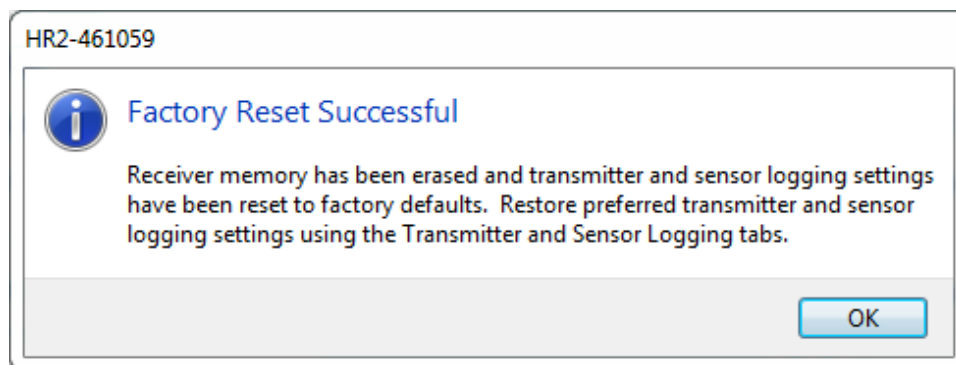
Figure 3-41: Factory Reset Successful message

Conducting a Study with an HR2 Receiver

Starting a study allows you to clear the HR2 receiver's memory and set the internal clock.

> Before deploying your HR2 receiver, we recommend that you consult the "Deploying an HR2 Receiver", on page 75 section.

This Section Contains Information On The Following:

4.1 Record Mode

When you start a study (using the **Fathom** software), the HR2 enters **Record Mode**. It records received pings and detections and transmits its ID, even while connected to **Fathom** software.

To place the receiver in Record Mode

On the **HR2 Receiver Tab**, click the **Start a Study** button (start recording).

Follow the instructions on the next screen as described in .

4.2 Starting a Study

When you start a study, you *reset* the receiver ("initializing" the receiver). This operation **erases** the receiver's memory and **sets** the receiver clock again.

> **ⓘ** **IMPORTANT:** Always back up previously offloaded data before starting a new study. Internal memory is erased (data are permanently deleted from the receiver memory).

To start a study using Fathom

Establish communication between the **HR2** and the **Fathom** software (see "Establishing Communication", on page 24).

Step 1 - Start a Study button

On the **HR2 Receiver Tab**, click the **Start a Study** button (start recording).

NOTE: This button is not available before communication between the receiver and **Fathom** is established.

Step 2 - Check Computer Time Settings warning

The **Check Computer Time Settings** warning appears.

> **tip!** **This warning only appears once per Fathom session.** Ensure that your computer's displayed time of day is consistent with your selected time zone before proceeding to ensure that your receiver's internal clock is set correctly.

HR2-461073

⚠ Are your computer's time settings correct?

Your time settings will be used to set your receiver's clock.

Please confirm that your computer's time is correct for your selected time zone before proceeding.

Check PC time settings

OK   Cancel
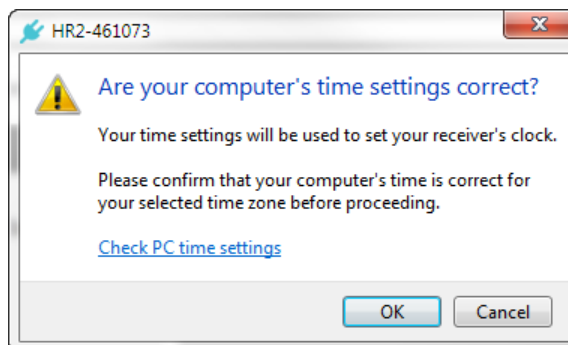
Step 3 - Heed the warning

A WARNING message appears, indicating that you are about to erase ALL data that may be present.

Choose an option:

- To proceed without saving data, click **Start a new Study**. If you want to stop the operation while it is under way, click **Abort** at the bottom right of the screen.
- If you need to offload data that is present, click **Offload** and offload your data first. For more information on the offload data procedure, see "Offloading Data", on page 70.
- Click **Cancel** to return to the **Fathom** screen.
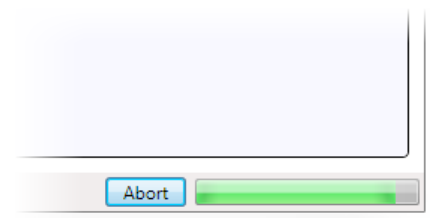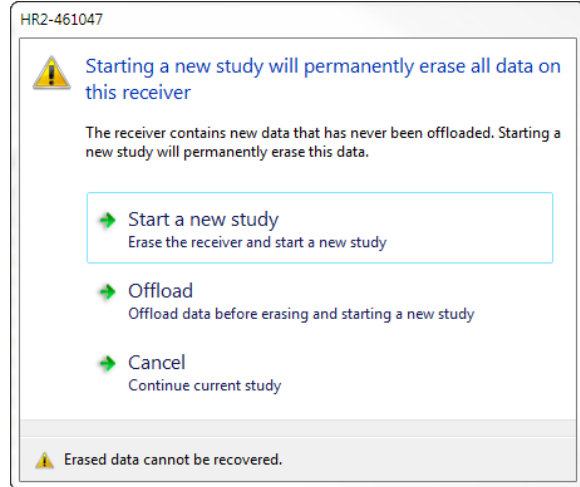
Step 4 - Initialization is successful
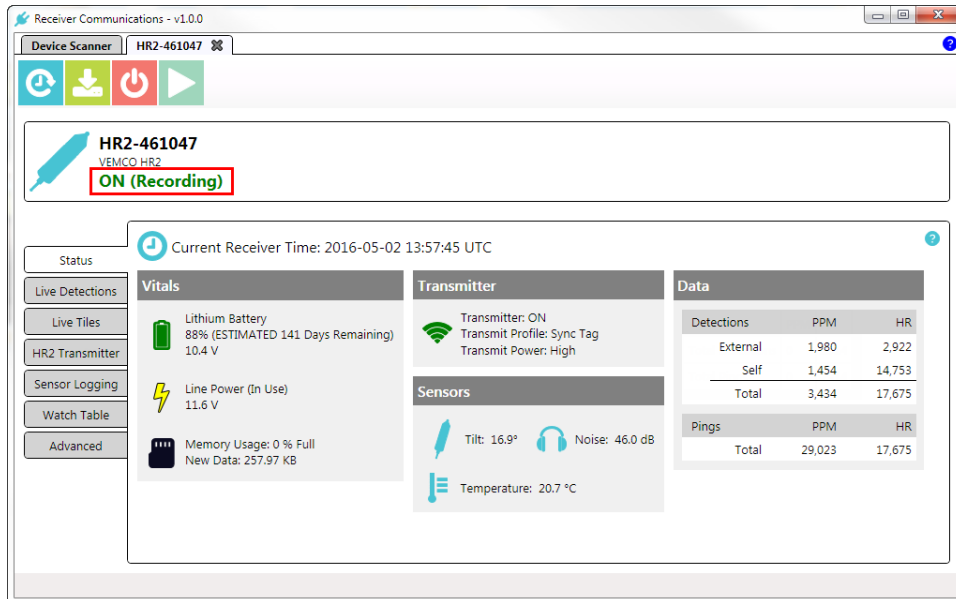
When the initialization is complete, a successful initialization message appears.

Click **OK** to continue.
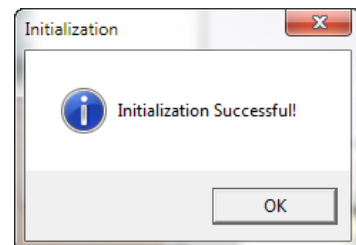
Step 5 - Check the Receiver Status

On the **Status** tab, the status of the **HR2** receiver should now display as **ON - Recording**.

Figure 4-1: Receiver Initialized and Recording

4.3 Offloading Data

After data have been collected by an HR2 Receiver during a long term deployment, that data must be offloaded to be accessed and viewed.

Data can only be offloaded from a HR2 Receiver while it is in communication with **Fathom** software, through a direct cable connection.

To offload data from your HR2 Receiver, using Fathom

Establish communication between the **HR2** and the **Fathom** software (see "Establishing Communication", on page 24).

Step 1 - Offload Data button

On the **HR2 Receiver Tab**, click the **Offload Data** button.

NOTE: This button is not available before communication between the receiver and **Fathom** is established.

Step 2 - Select Offload folder

Select the Offload **folder** to use.

To select a different folder than the default one displayed, click **Change** and navigate to the desired folder and click **OK**.

HR2-461047

Please select offload directory and start offload.

Offload Settings
C:\Fathom Offload Files   Change
☐ Set directory as default

◉ Offload All Data
◯ Offload New Data

Start   Cancel
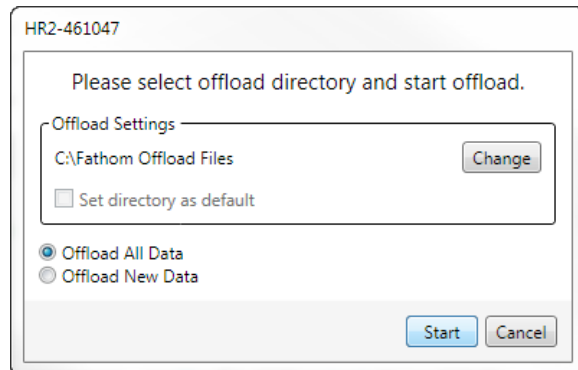
Step 3 - Select Offloading Data Option

Select an offload data option (see image in previous step):

- Offload **All** Data - All data collected by the receiver will be downloaded.
- Offload **New** Data - Only new data collected by the receiver (since the last offload operation) will be offloaded.

Step 4 - Start Offloading Data

Click **Start**. A warning message asks you if you are sure that your PC time settings are correct. Correct PC time settings are **critical** to ensure that detection data will be properly time corrected.

NOTE: this warning may not show up if it has already appeared previously in the Fathom session.

If you are sure, click **Proceed**.

Otherwise, click **Check PC time settings** to verify and adjust your time settings as needed.

The offload process begins. The amount of time to complete the download depends on the amount of data collected.
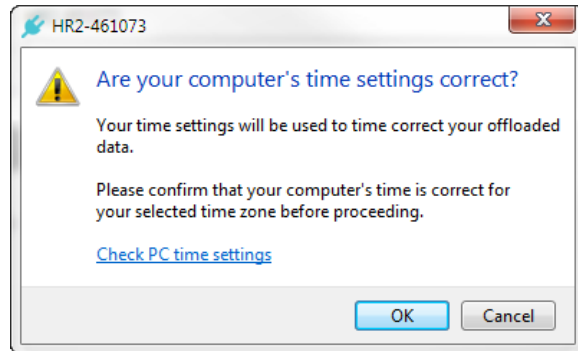
Step 5 - Data is Offloading

The offload progress is displayed, including estimated time remaining.
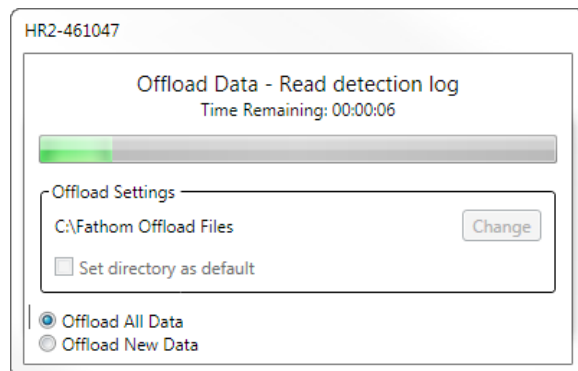
Step 6 - Successful Data Offload

Once the offload is completed successfully, a success message is displayed, including the full name of the offloaded file, and a data summary.

- **Self-detections:** detections from the HR2 Receiver's integrated transmitter.
- **External detections:** detections from tags *other* than the integrated one within the receiver.

NOTE: Counts do NOT include detections removed by the filters specified in "HR2 Data Export Detection Filters".

Click **OK** to finish and return to the **Fathom** screen.
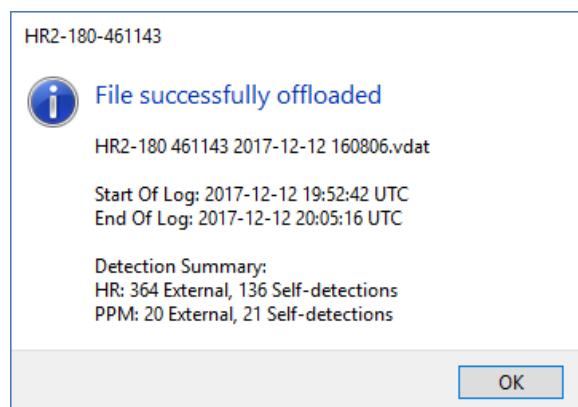
4.4 Disconnecting Communication with Receiver

Click the **Close View** button ("X" or red "X" when you hover over) to disconnect the communication between the HR2 and **Fathom** software.

Figure 4-2: Close receiver communication tab

A window will appear to confirm that you want to close the HR2 Receiver tab.

When the communication is disconnected, the HR2 resumes recording with the last study that was initialized. Ending communication does not re-initialize the receiver.

4.5 Suspend Mode (not recording)

Suspend Mode is the mode used for shipment and storage of the HR2 receiver. In Suspend Mode, the receiver consumes significantly *less* power than when it is recording data.

To place the receiver in Suspend Mode

On the **HR2 Receiver Tab**, click the **Suspend Receiver** button (stop recording).

Figure 4-3: Suspend Receiver button

The **Suspend receiver operation warning** appears.
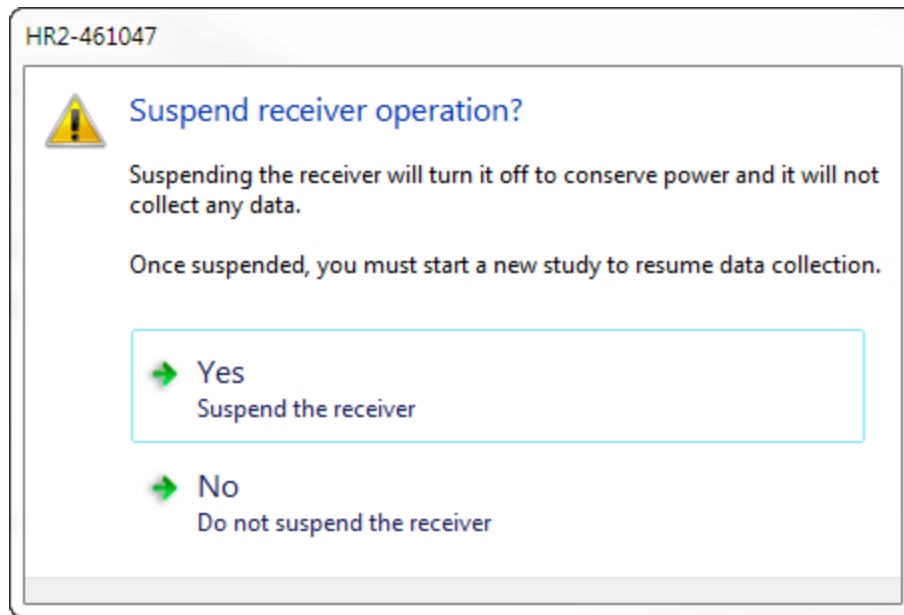
Figure 4-4: Suspend Receiver operation warning

- Click **Yes** to suspend the receiver operations, and the receiver will no longer record and collect any data. This will conserve power.
- Click **No** to return to the **Fathom** screen, keeping the receiver in **Record Mode**.

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Deploying an HR2 Receiver

<div style="text-align: right">**5**</div>

How an HR2 receiver is deployed is driven by the environment it is being deployed in and the type of study being performed. Some important points to keep in mind when designing a deployment plan for your HR2 receivers are explained here. The common method for attaching a HR2 to a mooring line is also given.

This Section Contains Information On The Following:

5.1 Case External Dimensions

The HR2 receiver's case dimensions can be useful when designing a mooring plan or mooring equipment. The dimensions, **in inches**, are shown in the drawings below.
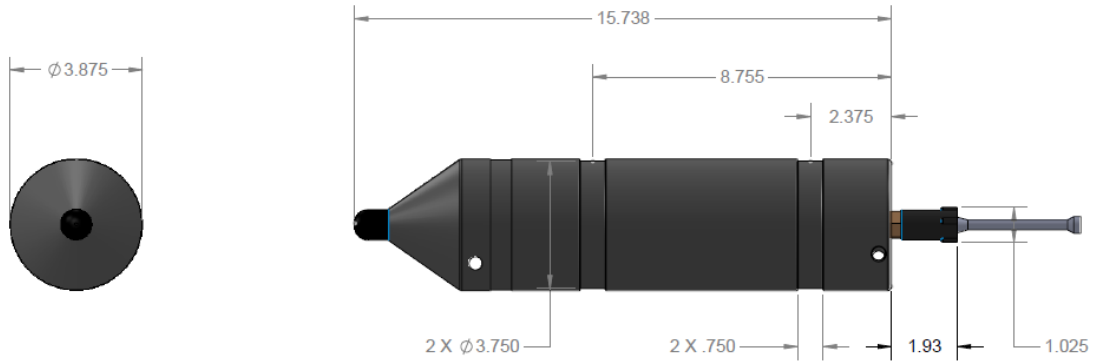
Figure 5-1: HR2 Case Dimensions

5.2 Deployment Facts and Tips

Before deployment, read these carefully to maximize the performance of your HR2 receivers.

5.2.1 Mooring

HR2 receivers are moored in many configurations often reflecting the bathymetry and oceanographic/weather conditions. A simple mooring design generally works well. However, in rougher conditions, heavier weights and mooring lines are usually required.

If a bottom mooring is desired, the HR2 should be positioned above the floor such that it has an unobstructed "view" of tagged animals within their expected acoustic range. Ensure the HR2's hydrophone is *unblocked* (do not position an air filled buoy directly above the hydrophone) and *free of any biofouling*.

In high flow locations, you may consider using hydro dynamically shaped buoys and low profile anchors.

For the best horizontal range, mount the HR2 receiver in a *vertical* position. Always mount the HR2 with the **hydrophone pointing up** to the surface, for better acoustic communication with the VR100.

> ⚠ **CAUTION:** The hydrophone must be kept **free of mooring lines and obstructions**. Objects around the hydrophone will adversely affect the detection range of the HR2 receiver.

5.2.2 Spacing

Receiver spacing is generally determined based on range testing and historical acoustic data. Our position is that you should try to space receivers such that you achieve good detection probability in most or all weather conditions. It is not always necessary to have 100% coverage if you have several other locations where you know the animals will be passing through.

However, if you wish to accurately quantify the passing of animals through every receiver location then you should strive for 100% detection probability. Typical spacing is usually between 100 and 300 meters.

> **REFERENCE:** See the Gate Design tutorial on our website.

Receiver spacing guidelines for VPS studies differ from gate studies because complete overlap of detection ranges is required for successful fine-scale positioning. For more information on estimating appropriate receiver spacing for your study, please refer to the **VEMCO Range Test Software Manual**, from our website, and make sure to conduct tests as described in "Testing the Receiver", on page 29.

5.2.3 Biofouling

Some customers use a rubber shrink tape, such as DAFLEX ST250 Cold Shrink Tape, available from Digikey (W211-ND), to prevent biofouling on the HR2 receiver. It can be used to cover the receiver body (**do NOT cover the hydrophone**) and does not leave a glue residue when removed. Another option is to use an antifouling paint, such as Interlux Micron CSC.

> **NOTE:** Keep the hydrophone uncovered to prevent acoustic dampening.

> ⚠ **CAUTION: The Status Light is also a pressure relief valve. Never cover the Status Light/Release Valve.** The release valve must be able to pop open if needed and must not be blocked by tape or paint.

5.3 Mooring Line Attachment

The common method used to attach a HR2 receiver to a mooring line is to use five cable ties (*zip tie* or *tie-wrap*) with the following characteristics:

- Non-reusable lashing **cable ties**

  - 388 mm (15.25") long

  - 7.5 mm (0.3") wide

  - UV protected

  - 120 lbs tensile strength

- **mooring line**

  - 3/8" minimum diameter nylon rope

A set of five cable ties is shipped with each new HR2 receiver and more may be purchased from VEMCO (product number HWE 507450).

Follow the instructions listed below to attach the HR2 receiver to the rope used as the mooring line.

Step 1 - Attach locations

Identify the location on the rope where the bottom of the HR2 receiver will be attached.

(VR2Tx example shown)

Step 2 - Twist rope

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

Step 3 - Slide cable tie through

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

(VR2Tx example shown)

Step 4 - Latch and tighten

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

(VR2Tx example shown)

Step 5 - Slide, latch and tighten

Open the warp in the rope again and slide another cable tie through rope so it lines up with the bottom half of the lower groove around the body of the HR2. Tighten the cable tie so the tie's head is next to the rope.

(VR2Tx example shown)

Step 6 - Slide, latch and tighten

Wrap a third cable tie around the HR2 receiver and the rope so the cable tie occupies the top half of the lower groove in the HR2 body. The bottom half of the groove is already occupied by the cable tie from Step 5 Latch the cable tie so the head of the cable tie is over the rope.

(VR2Tx example shown)

Step 7 - Slide, latch and tighten

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

Step 8 - Slide, latch and tighten

Wrap a fifth cable tie around the HR2 receiver and the rope so the cable tie occupies the bottom half of the groove used in Step 7. Latch the cable tie so the head of the cable tie is over the rope.

Step 9 - Trim off excess

Trim the cable ties so there is no excess cable tie material and no sharp edges.
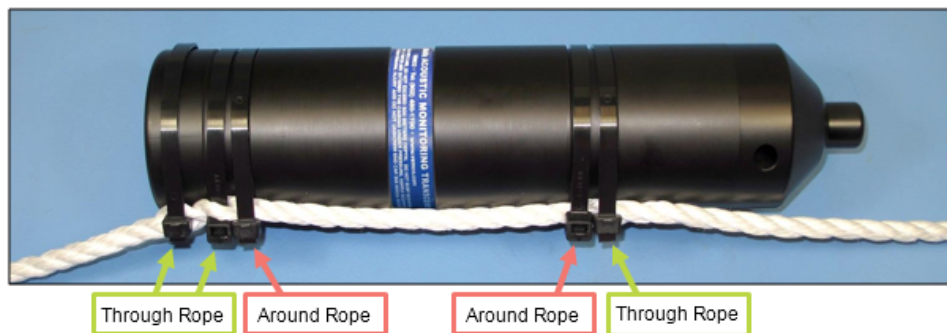
Figure 5-2: Sample mooring line attachment (VR2Txshown)

> ⚠ **WARNING:** Cut the cable ties when removing a HR2 from the mooring line. DO NOT re-use cable ties. Use only new cable ties when deploying a HR2 receiver.

5.4 External Cable

The HR2 Receiver uses an external cable to connect to other devices. VEMCO has successfully used cable with the following specifications:

- 2 Twisted Pair - 18 AWG stranded tinned copper (STC); 0.070" PP insulated; Individual foil shield, Drain (Twisted Pair coloring scheme: Pair 1: Green/White; Pair 2: Red/Black)
- Overall Copper Braided Shield (80% coverage)
- Black polyurethane jacket to an overall outer diameter of approximately 0.290"
- Two jacketed Kevlar 49 strength members with breaking strength of 350 lbs each
- UV stabilized
- SubConn MCIL8F connector on HR2 end

There could be variations on these cable specifications based on individual customer needs. VEMCO should be consulted when designing specific cabling solutions.

Figure 5-3: VEMCO high speed USB cable

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chapters start on right (odd number) pages.

Viewing and Managing Receiver Data

The Fathom software provides the ability to visualize detection and diagnostic data (where applicable) time series' for HR2, VR2W, VR2AR, VR2Tx, and VR4-UWM receivers.

It also provides the ability to convert HR2 .VDAT files (offloaded using Fathom) and VR2W, VR2AR, VR2Tx, and VR4-UWM VRL files (offloaded using VUE) to a new, easy-to-use CSV format.

This Section Contains Information On The Following:

6.1 Visualizing Data

After data have been collected from an HR2 Receiver, VR2W, VR2Tx, VR2AR, or VR4-UWM receiver, the detection records (and diagnostic records, if applicable) can be displayed in Fathom's **Visualize Data** application.

> **NOTE:** You do not need to be connected to a receiver to visualize data.

To Visualize Data from an offloaded file

Step 1 - Launch Fathom

Click the **Task Bar shortcut** for the **Fathom Launcher** to start the **Fathom** software (see below), and then click on the **Visualize Data** icon (see right).
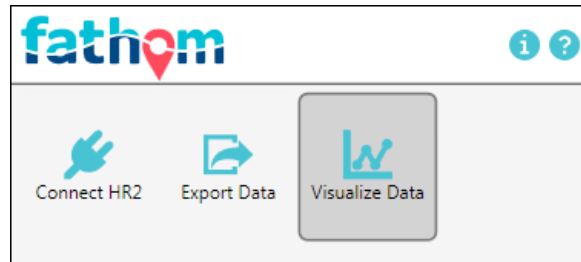
Step 2 - Select file to import

To select the file to import, click **File, Open Data File...**.

The **Select file to display** dialog box appears.

Navigate to the desired folder, select the file to display and click **Open**.
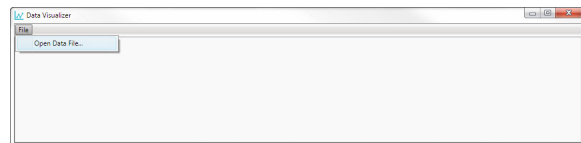
> **Good to know:** You can filter your search by selecting which type of file you are looking for (VDAT, VRL, or All Supported, see image below right).
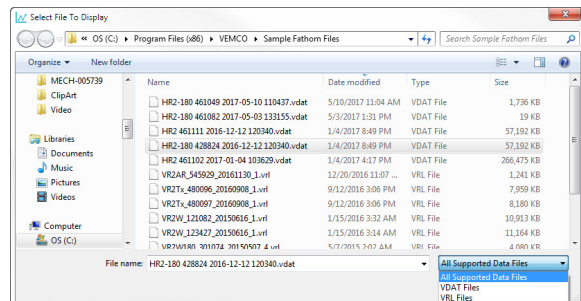
Step 3 - File Import in progress

The selected file name appears on the tab at the top of the **Data Visualizer** window, and the data extraction progress is displayed in the center of the window.

NOTE: You can *cancel* the import process by **clicking/closing** the tab.
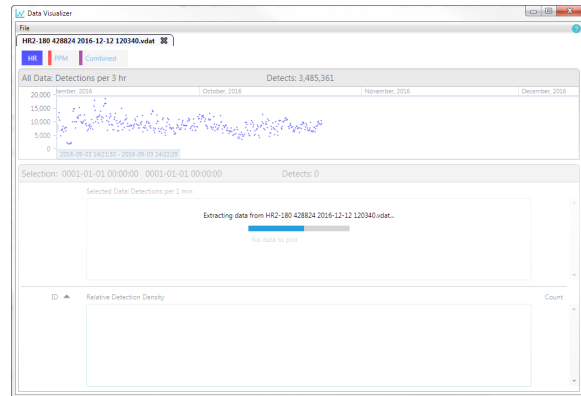
Step 4 - Data displayed

The data are displayed in the **Data Visualizer** window. Data are presented in two sections:

- **All Data** in the top section (**A**).
- **Selected Data** in the bottom section (**B**). The content displayed in this section is based on the **range selected** in the **All Data** section above.
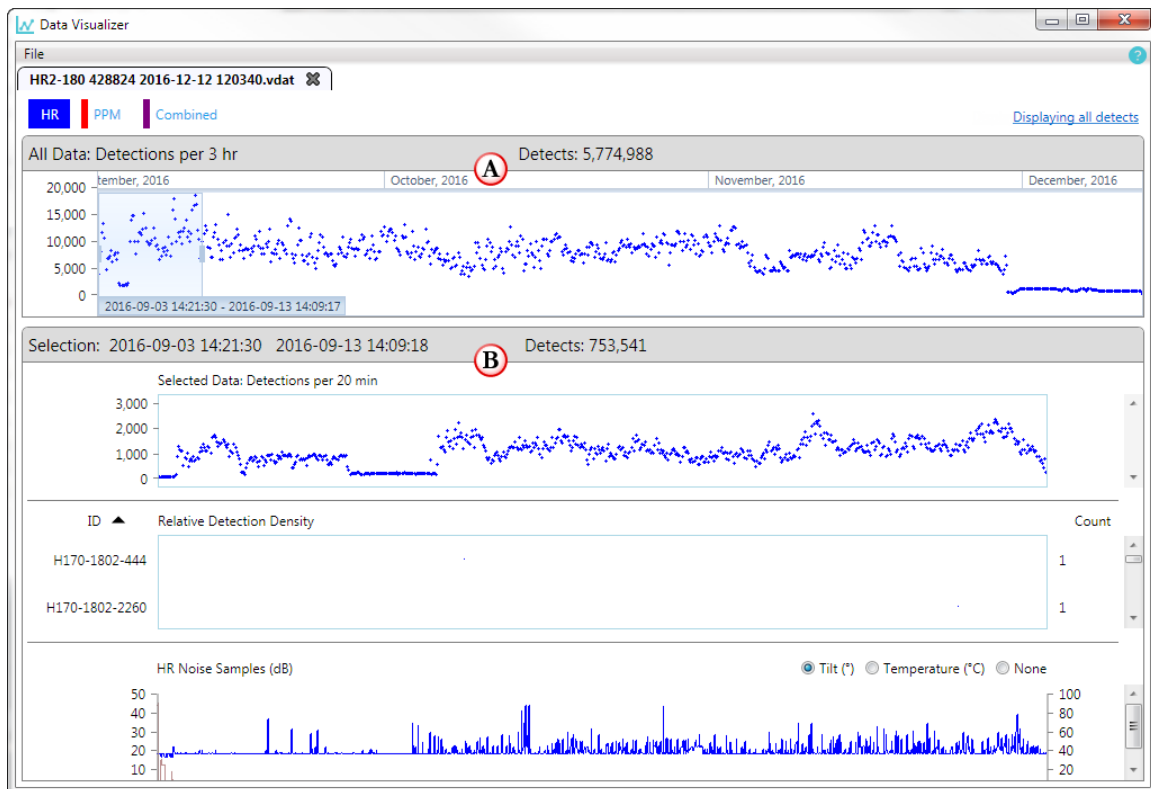
Figure 6-1: Data displayed as various graphs

6.1.1 Data Visualizer Main Window Features

The **Data Visualizer** main window provides the following display features:

- **(A) Filename** - The **filename** is displayed on the tab.
- **(B) Multiple tabs** - You can open **multiple files** and each will have its own tab.
- **(C) Resizable** - The main window is *fully resizable*, using click and drag action, or using the **Maximize** window button.

> **Good to Know:** When you resize the window, the graphs adjust to the size you pick, and "spreads" the data accordingly. A *small, tight window* size will present data in more "compressed" view, while a *large, wide window* will "spread" the data and graph over a more usable scale. For more details, see **Bin Size** below.
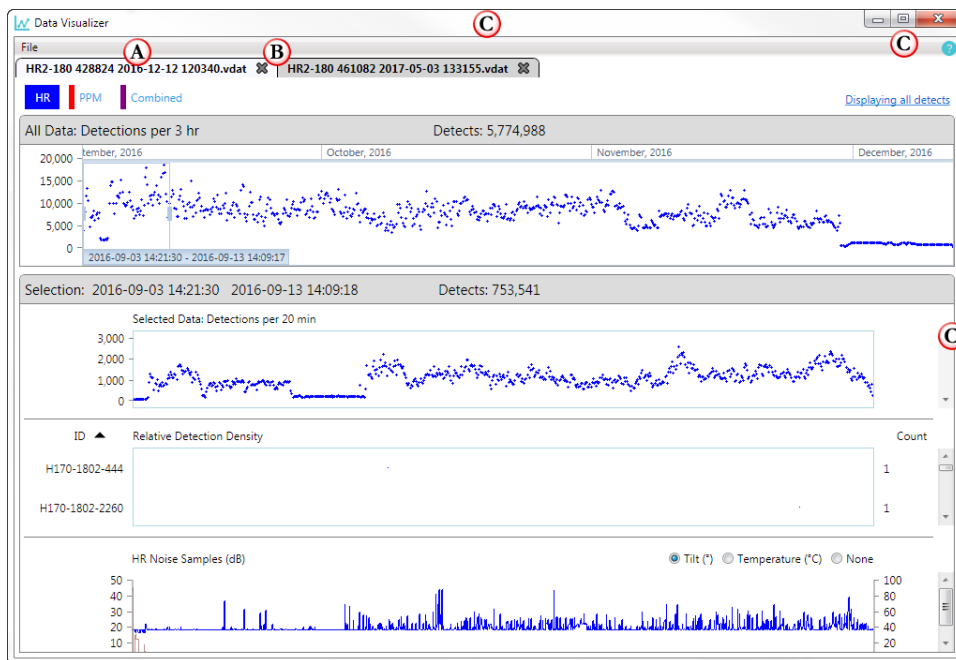
Figure 6-2: Data Visualizer Main Window features

6.1.2 ALL DATA Section Features

The plot in the **All Data** section displays a time series of binned detection counts. The All Data plot covers the entire dataset. This section provides the following display features:
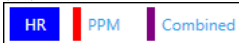
- **(A) HR/PPM/Combined (HR2 only, image shown)** - You can view your detections by **Type** [HR | PPM | Combined] (just click your choice): HR, PPM, or Combined HR and PPM detections. The option selected also affects the graphs in the **Selection** section.

- **(A) A69/A180/Combined (VR4-UWM only)** - You can view your detections by **Type** [A69 | A180 | Combined] (just click your choice): 69 kHz, 180kHz, or Combined 69 and 180 kHz detections. The option selected also affects the graphs in the **Selection** section.

- **(B) Filter Options (Detections)** - Fathom offers filter options for which detections to display. For more information, see "Data Visualizer Filter Options", on page 91.

- **(C) Bin Size (Detections per)** - Fathom bins your detection counts into bins of optimal size for display purposes. The bin is recalculated each time you resize the **Data Visualizer** window, and appears at the top left of the **All Data** section.

- **(D) Total Detects** - The total number of detections of the type you have selected (HR, PPM or Combined HR and PPM) in the data file appears at the *top center* of the section.

- **(E) Range Selector** - The **Range Selector** tool allows you to select a range of dates/time to view in the plots in the **Selection** section. A *shorter* range provides more detail, a *longer* range provides a broader overview. For more information, see "Using the Range Selector Tool", on page 91.

- **(F) Start/End Dates and Times** - These are displayed at the bottom of the **Range Selector** tool.

- **(G) Resizable** - This section is *resizable in height*, using click and drag up or down action with the **resizing grab handle** [⇕], between the **sections** or **graphs.**

Figure 6-3: All Data section features, HR2 detections

6.1.3 SELECTION Section Features

The plots in the **Selection** section display data for the selected portion of the **All Data** plot only. This section provides the following display features.

Binned Detection Data

The top plot in the **Selection** section shows a zoomed in version of the plot in the **All Data** section.

- **(A) Start/End Dates and Times** - The time period covered by the selection. These are displayed at the top left of the **Selection** section.
- **(B) Detects** - The *selected* number of detections (from the **Range Tool** in **All Data** section above) appears at the *top center* of the section.
- **(C) Bin Size (Detections per)** - Fathom bins your detection counts in the **Selection** section into bins of optimal size for the selected date range. The bin size appears at the top left of the plot. To *decrease* or *increase* the bin size, **reduce** or **extend** the selected date range by *clicking and dragging* a handle on the **All Data** graph.
- **(D) Pinpointing bin detections** - You can access the **number of detections in a bin** at any time along the series by *moving the cursor over the location on the plot* where you want to see details. Date and Time are also displayed.
- **(E) Resizable** - This section is *resizable in height* internally, using click and drag up or down action with the resizing grab handle, between the **graphs**.

Figure 6-4: Binned Detection Data features

Relative Detection Density

The **middle** plot (HR2 receivers) / **bottom** plot (VR2W receivers) in the **Selection** section shows the relative detection rates of each detected ID for the selected time period.

- **(A) Detection Density by ID** - The ID corresponding to each row in the plot is listed to the left of the graph. To sort the individual plots by ID, click **ID** at the top left.
- **(B) Detection Count by ID** - The detection count of each ID for the selected time period is listed to the right of the graph. To sort the individual plots by detection count, click **Count** at the top right.
- **(C) Pinpointing Date and Time** - You can access the data and time *at any location along the time series* by moving the cursor over the location on the plot where you want to see details.
- **(D) Resizable** - This section is *resizable in height* internally, using click and drag up or down action with the resizing grab handle, between the **graphs**.

Figure 6-5: Relative Detection Density features

Diagnostic Information (HR2, VR2Tx, VR2AR, and VR4-UWM receivers only)

- **(A) Noise Samples (dB or mV)** - Noise values are plotted relative to the primary y-axis. You can access the **noise level** at any time along the series by *moving the cursor over the location on the plot* where you want to see details. Date and Time are also displayed. Noise readings are not available for VR4-UWM receivers.

- **(B) Tilt and Temperature** - Tilt and temperature values are plotted relative to the secondary y-axis. Select which value you would like to display using the **Tilt**, **Temperature**, or **None** options at the top right of the plot. You can access tilt or temperature values at any time along the series by *moving the cursor over the location on the plot* where you want to see details. This information appears along with the Noise Sample and Date and Time described above. Temperature is not available for VR4-UWM receivers.

- **(C) Resizable** - This section is *resizable in height* internally, using click and drag up or down action with the resizing grab handle, between the **graphs**.
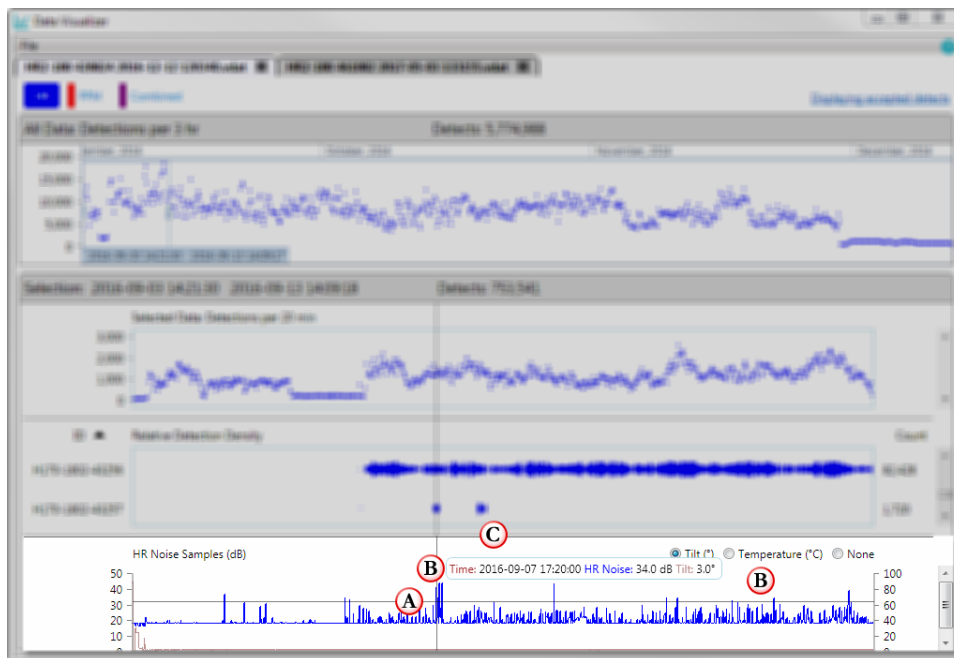
Figure 6-6: Diagnostic Information features (HR2 receiver info shown)

6.1.4 Data Visualizer Filter Options

The **Data Visualizer Filter Options** provide choices for filtering detections based on the source of the detection (HR2 VR2Tx, and VR2AR receivers only). You may view **self-detections** (detections of a receiver's own *built-in* transmitter) only, **external detections** (all detections *except* those of the receiver's own built-in transmitter) only, or detections from **both sources**. The default option is *both sources*.

To select a filter option

At the right of the **Data Visualizer** window, click the current filter option. The **Filter Options** box appears, and displays the available options. Select the source to set the options and return to the **Data Visualizer** window.
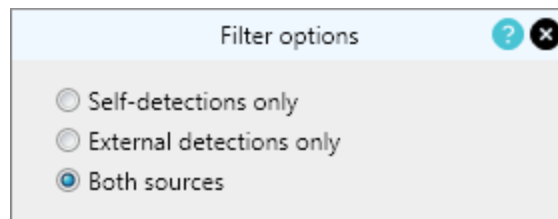
Figure 6-7: Data Visualizer filter options

6.1.5 Using The Range Selector Tool

The **Range Selector** tool allows you to select a range of dates/time to view in the graphs in the **Selection** section. A shorter range provides more detail, a longer range provides a longer overview.
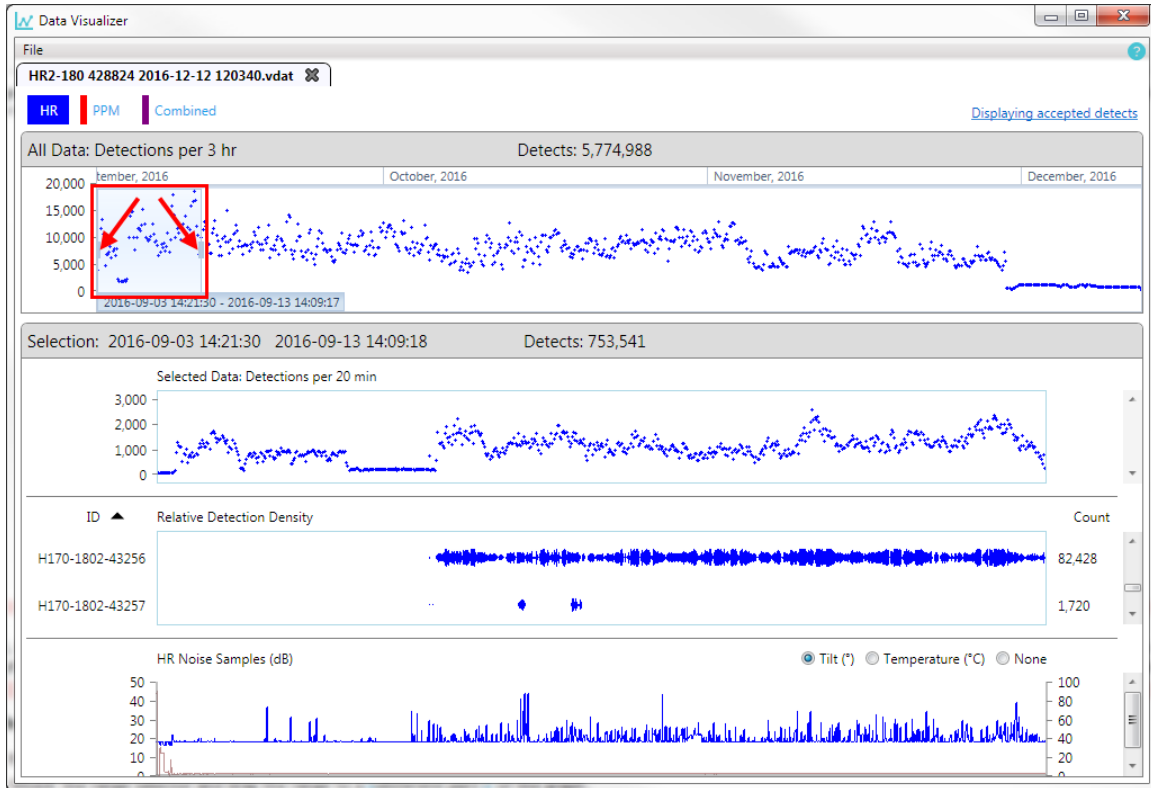
Figure 6-8: Range Selector tool

By default, the tool shows a limited range, from the beginning of the data file. The **red arrows** in the image above point to the left and right "handles" that you can use to modify the range. Anytime you modify the range, the **Selection** section graphs update to display the new range. Try using the tool as described next, and watch the updated results on the graphs.

To use the Range Selector tool

There are three ways to set the range:

A. Click INSIDE the range selector and drag the range to a *different part* of the graph.
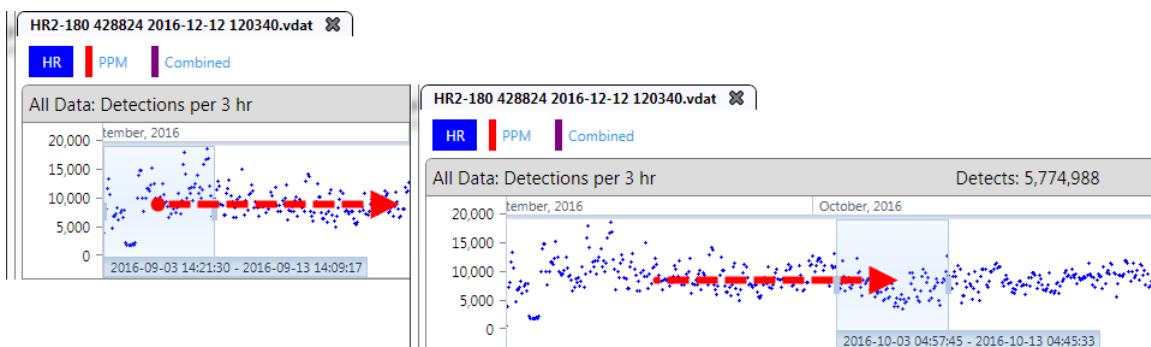
Figure 6-9: Clicking and dragging the current range to another section of the graph

B. Click on a **different** section of the graph, and the range tool will settle on that section. The tool selects the range according to the *heading* above the graph, such as "October 2016", in this example.
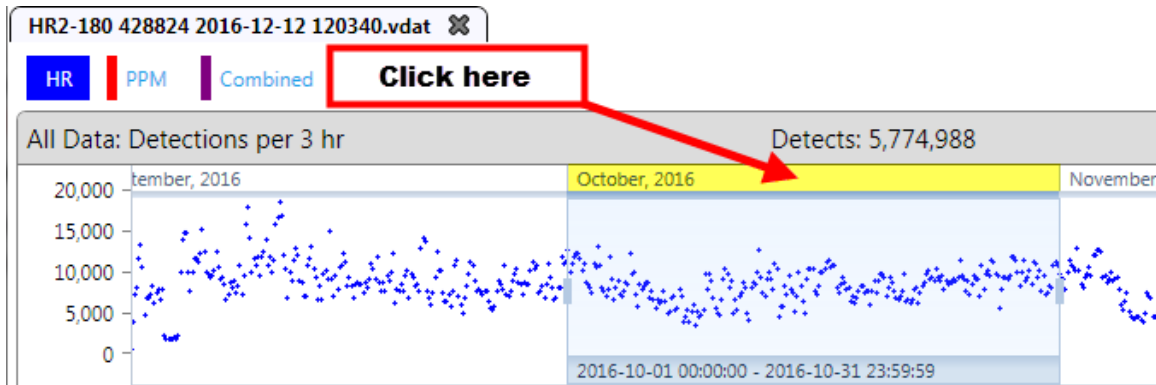
Figure 6-10: Clicking on a different section of the graph

C. Click and grab a **handle** and drag left or right to *extend* or *reduce* the range.
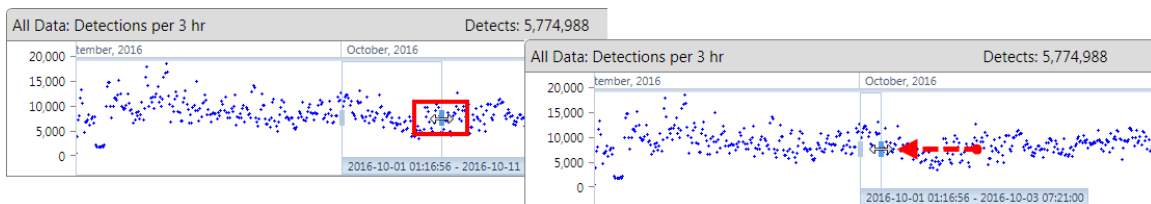
Figure 6-11: Grabbing a handle and dragging to reduce the range example

6.1.6 Noise Samples, Tilt, And Temperature (HR2, VR2Tx, VR2AR, And VR4-UWM Receivers Only)

The HR2, VR2Tx, and VR2AR provide information on **Noise Samples (dB or mV)**, **Tilt (°)**, and **Temperature (°C)**. The VR4-UWM receiver provides information on **Tilt (°)** only. This is presented in a graph, at the bottom of the **Selection** section.

Simply point the cursor somewhere along the graph, and an information "bubble" displays the date and time of the data collection, along with the information you requested from your choices for the graph.

- For the HR2, you can view the **Noise Samples** by **Type** (just click your choice): HR, PPM, or Combined HR and PPM. For the VR4-UWM, you can also view the samples by **Type** (just click your choice): 69 kHz, 180kHz, or Combined 69 and 180 kHz. The VR2Tx and VR2AR receivers only measure and display PPM Noise.

  ○ Noise samples are expressed in decibels (dB) (HR2 receivers) or millivolts (mV) (VR2Tx and VR2AR receivers), and are always displayed in the graph.

  ○ The noise **scale** appears on the *left* side of the graph.

- Additionally, depending on the receiver, you can view the **Tilt, Temperature, or None** (just click your choice).

  ○ **Tilt** is expressed in degrees (°) from vertical (0°). Available for HR2, VR2AR, VR2Tx, and VR4-UWM only.

  ○ **Temperature** is expressed in degrees Celsius (°C). Available for HR2, VR2AR, and

VR2Tx only.

○ The Tilt or Temperature **scale** appears on the *right* side of the graph.

Example 1
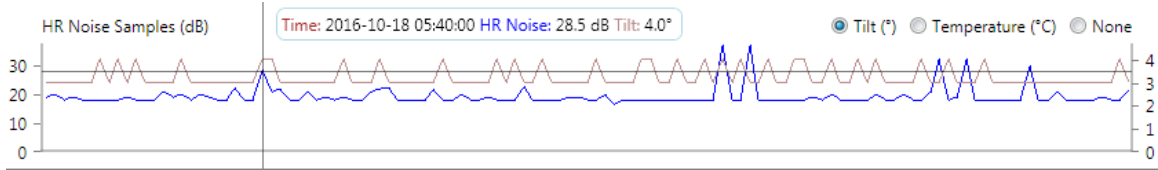
Figure 6-12: HR Noise Samples and Tilt information

Example 2
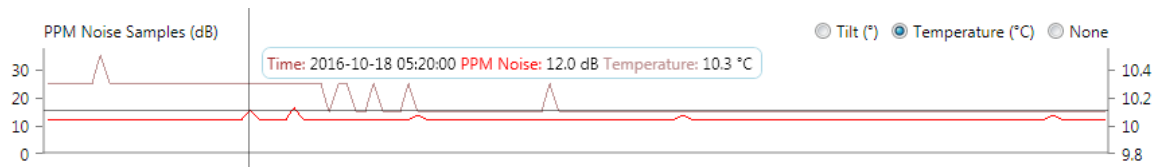
Figure 6-13: PPM Noise Samples and Temperature information

Example 3
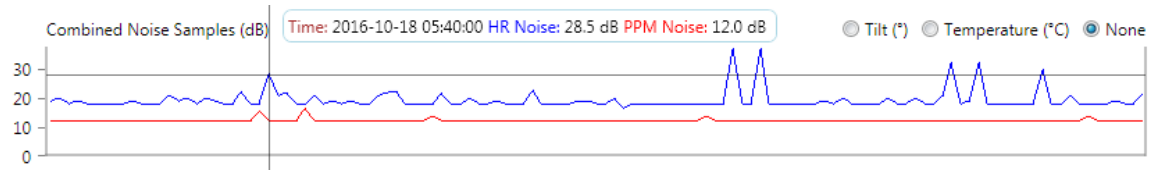
Figure 6-14: Combined HR and PPM Noise Samples only (no Tilt or Temperature)

6.2 Exporting Data

After data has been collected and offloaded from an HR2 Receiver, VR2AR, VR2Tx, and VR4-UWM (or VR2W), that data can be exported to be viewed and manipulated.

> **NOTE:** You do not need to be connected to a receiver to perform the export operation.

To export data from an offloaded file

Step 1 - Launch Fathom

Click the **Task Bar shortcut** for the **Fathom Launcher** to start the **Fathom** software and click on the **Export Data** icon.
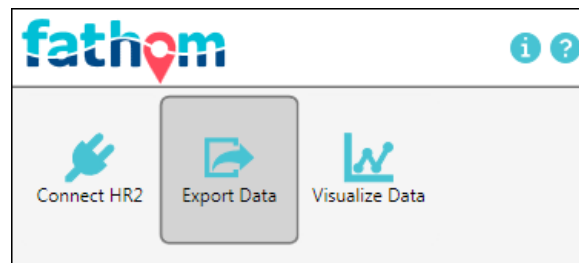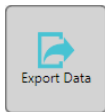
Step 2 - Select files to export

To select the files to export, click **Select Files...**.

The **Select Files to Export** dialog box appears.

Navigate to the desired folder, select the file(s) to export and click **Open**.

> **Good to know:** You can filter your search by selecting which type of file you are looking for (VDAT, VRL, or All Supported, see image below right).

The selected files are then shown in the **Files for Export** section of the **Data Export** window.

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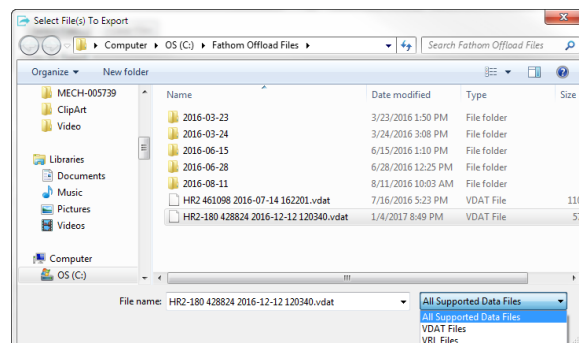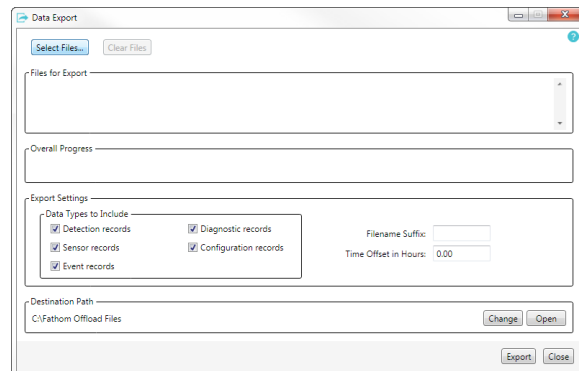
Step 3 - Select Export Settings

You can select to export the following (see table below for full list of each type of records):

- Detection records*
- Sensor records
- Event records
- Diagnostic records
- Configuration records

To select, check the box next to the option(s).

For details on record types included in the export options above, see "Record Types included in each export option", on page 98.

*Fathom uses some filtering criteria on detection data from HR2 receivers when they are converted from VDAT to CSV format. Information on these filters can be found here: "HR2 Data Export Detection Filters", on page 187.
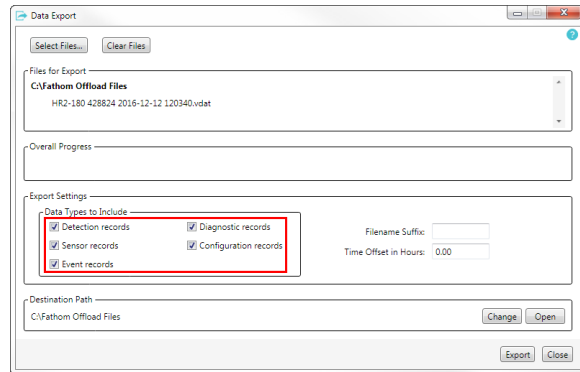
> **ℹ️ IMPORTANT:** There are also a few OTHER record types that are exported to the CSV file with ANY of the checkbox selection you make. For details, see "Other Records", on page 101.

For more information, you can also view:

- "Record Types by receiver model", on page 102, and
- "Field Descriptions by Record Type", on page 107.

Step 4 - Add Keyword to filename (optional)

You can append a keyword or keywords of your choice to the end of the filename of the CSV file that you export (such as DETECTS, DIAGS, EVENTS). This can help to differentiate between files containing different record types exported from the same receiver log file.

> **tip!** If you want to use a keyword for a single type of records (EVENTS file, for example), **check only that export option**, and an automatic/default keyword matching the record types will be added. If you want to type in a different keyword, just overwrite the automatic one.
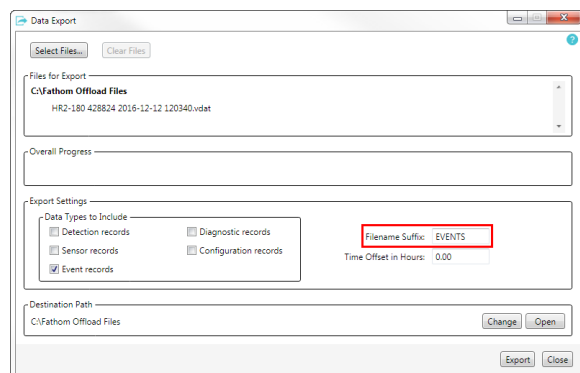
If NO keyword(s) is specified, Fathom will give the CSV file the same name as the receiver log file the records are exported from, but will change the file extension to CSV.

Step 5 - Display Date and Time using UTC Offset (optional)

Upon export to CSV format, all data records are automatically corrected for receiver clock drift by the Fathom software. Fathom uses the difference between the receiver's clock and the UTC time calculated from your PC clock at offload to calculate corrected times for each record in the receiver log. If receiver clock times were also adjusted during deployment (for example, using an external device to periodically send time corrections to the receiver through a cabled connection), then these adjustments are also used to calculate corrected times for records in the receiver log.

The exported CSV file includes:

- a field containing the original uncorrected date and time for each data point (Device Time (UTC) and

- a field containing the corrected date and times (Time).

The corrected field will be provided in UTC format unless an offset is specified under **Time Offset in Hours**. The selected offset is displayed in the column header of the generated CSV file.

To display drift-adjusted (corrected) date and time according to a specific **UTC Offset**, in the **Time Offset in Hours** field, type in a value for the offset.

Step 6 - Set or change Destination Path

To set or change the export **Destination Path**, click **Change** and navigate to the desired folder and click **OK**.

You can also click **Open** to view the content of the current **Destination** folder.

Step 7 - Start Exporting Data

Click **Export** (**A**).

The export process begins. The export progress (**B**) is displayed (**green** progress bar at the right of the file name.

NOTE: The amount of time to complete the export depends on the amount of data collected.
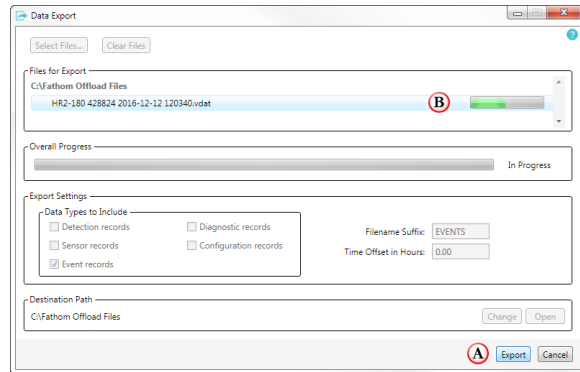
Step 8 - Successful Data Export

Once the export is completed successfully, a **complete** indicator appears to the right of the exported file name.

Click **Close** to finish and return to the **Fathom** screen.
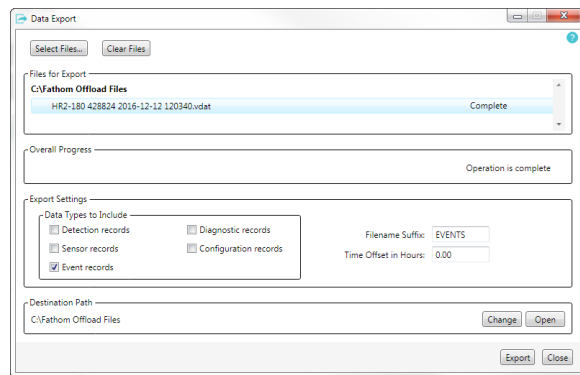
6.2.1 Record Types Included In Each Export Option

Record Options are listed as they appear in the Exporting Settings panel, and provide a description for each record type included under that option.

Detection Records

Record Types Exported	Record Identifier in CSV File	Applicable Receiver Models
Tag detection information	DET	HR2, VR2W, VR2Tx, VR2AR, VR4-UWM
Detection filter information	DET_FILTER	HR2

Diagnostic Records

Record Types Exported	Record Identifier in CSV File	Applicable Receiver Models
Battery specifics and status information	BATTERY	HR2, VR2W, VR2Tx, VR2AR, VR4-UWM
HR2 regular system diagnostic information	DIAG_HR2	HR2
VR2AR regular system diagnostic information	DIAG_VR2AR	VR2AR
VR2AR intermittent system diagnostic information	DIAG_VR2AR_ INTERIM	VR2AR
VR2Tx regular system diagnostic information	DIAG_VR2Tx	VR2Tx
VR2Tx intermittent system diagnostic information	DIAG_VR2Tx_ INTERIM	VR2Tx
VR2W regular system diagnostic information	DIAG_VR2W	VR2W
VR2W intermittent system diagnostic information	DIAG_VR2W_ INTERIM	VR2W
VR4-UWM regular system diagnostic information	DIAG_VR4	VR4-UWM

Event Records

Record Types Exported	Record Identifier in CSV File	Applicable Receiver Models
Receiver general event	EVENT	HR2, VR2W, VR2Tx, VR2AR
Receiver fault information	EVENT_FAULT	HR2, VR2W, VR2Tx, VR2AR
Receiver initialization information	EVENT_INIT	HR2, VR2W, VR2Tx, VR2AR
Receiver offload information	EVENT_OFFLOAD	HR2, VR2W, VR2Tx, VR2AR
HR2 memory remaining and other health information	HEALTH_HR2	HR2

Record Types Exported	Record Identifier in CSV File	Applicable Receiver Models
VR2AR memory remaining and other health information	HEALTH_VR2AR	VR2AR
VR2Tx memory remaining and other health information	HEALTH_VR2Tx	VR2Tx
VR2W memory remaining and other health information	HEALTH_VR2W	VR2W
VR4-UWM memory remaining and other health information	HEALTH_VR4	VR4-UWM

Sensor Records

Record Types Exported	Record Identifier in CSV File	Applicable Receiver Models
Receiver tilt sensor readings	ATTITUDE	HR2 , VR2Tx, VR2AR, VR4-UWM
Receiver depth sensor readings	DEPTH	VR2AR
Receiver depth sensor stats (min, max, mean)	DEPTH_STATS	VR2AR
VR2AR noise sensor stats (min, max, mean)	NOISE_STATS_VR2AR	VR2AR
VR2Tx noise sensor stats (min, max, mean)	NOISE_STATS_VR2Tx	VR2Tx
Receiver temperature sensor readings	TEMP	HR2, VR2Tx, VR2ARVR4-UWM
Receiver temperature sensor stats (min, max, mean)	TEMP_STATS	VR2Tx, VR2AR

Configuration Records

Record Types Exported	Record Identifier in CSV File	Applicable Receiver Models
Receiver channel configuration information	CFG_CHANNEL	HR2, VR2W, VR2Tx, VR2AR, VR4-UWM
Station information	CFG_STATION	VR2W, VR2Tx VR2AR, VR4-UWM
Study information	CFG_STUDY	VR2W, VR2Tx VR2AR, VR4-UWM
Receiver built-in transmitter configuration information	CFG_TRANSMITTER	HR2, VR2Tx, VR2AR

There are also a few other record types that are exported to the CSV file with any of the checkbox selection you make.

Other Records

Record Types Exported	Record Identifier in CSV File	Applicable Receiver Models
Information on external clock used for reference purposes	CLOCK_REF	VR2W, VR2Tx VR2AR, VR4-UWM
Information on external clock used to set receiver clock	CLOCK_SET	HR2
Data error information	DATA_ERROR	HR2, VR2W, VR2Tx, VR2AR, VR4-UWM
VDAT or VRL file information	DATA_SOURCE_FILE	HR2, VR2W, VR2Tx, VR2AR, VR4-UWM

6.2.2 Record Types By Receiver Model

Receiver Models are listed alphabetically here, and provide a description for each record type, by record option.

HR2

Export Records Option	Record Types Exported	Record Identifier in CSV File
Detection records	Tag Detection Information	DET
	Detection filter information	DET_FILTER
Diagnostic records	Battery specifics and status information	BATTERY
	HR2 regular system diagnostic information	DIAG_HR2
Event records	Receiver general event	EVENT
	Receiver fault information	EVENT_FAULT
	Receiver initialization information	EVENT_INIT
	Receiver offload information	EVENT_OFFLOAD
	HR2 memory remaining and other health information	HEALTH_HR2
Sensor records	Receiver tilt sensor readings	ATTITUDE
	Receiver temperature sensor readings	TEMP
Configuration records	Receiver channel configuration information	CFG_CHANNEL
	Receiver built-in transmitter configuration information	CFG_TRANSMITTER
Other records	Information on external clock used to set receiver clock	CLOCK_SET
	Data error information	DATA_ERROR
	VDAT or VRL file information	DATA_SOURCE_FILE

VR2W

Export Records Option	Record Types Exported	Record Identifier in CSV File
Detection records	Tag Detection Information	DET
Diagnostic records	Battery specifics and status information	BATTERY
	VR2W regular system diagnostic information	DIAG_VR2W
	VR2W intermittent system diagnostic information	DIAG_VR2W_INTERIM
Event records	Receiver general event	EVENT
	Receiver fault information	EVENT_FAULT
	Receiver initialization information	EVENT_INIT
	Receiver offload information	EVENT_OFFLOAD
	VR2W memory remaining and other health information	HEALTH_VR2W
Sensor records	NONE	
Configuration records	Receiver channel configuration information	CFG_CHANNEL
	Station information	CFG_STATION
	Study information	CFG_STUDY
Other records	Information on external clock used for reference purposes	CLOCK_REF
	Data error information	DATA_ERROR
	VDAT or VRL file information	DATA_SOURCE_FILE

VR2Tx

Export Records Option	Record Types Exported	Record Identifier in CSV File
Detection records	Tag Detection Information	DET
Diagnostic records	Battery specifics and status information	BATTERY
	VR2Tx regular system diagnostic information	DIAG_VR2TX
	VR2Tx intermittent system diagnostic information	DIAG_VR2TX_INTERIM
Event records	Receiver general event	EVENT
	Receiver fault information	EVENT_FAULT
	Receiver initialization information	EVENT_INIT
	Receiver offload information	EVENT_OFFLOAD
	VR2Tx memory remaining and other health information	HEALTH_VR2TX
Sensor records	Receiver tilt sensor readings	ATTITUDE
	VR2Tx noise sensor stats (min, max, mean)	NOISE_STATS_VR2TX
	Receiver temperature sensor readings	TEMP
	Receiver temperature sensor stats (min, max, mean)	TEMP_STATS
Configuration records	Receiver channel configuration information	CFG_CHANNEL
	Station information	CFG_STATION
	Study information	CFG_STUDY
	Receiver built-in transmitter configuration information	CFG_TRANSMITTER
Other records	Information on external clock used for reference purposes	CLOCK_REF
	Data error information	DATA_ERROR
	VDAT or VRL file information	DATA_SOURCE_FILE

VR2AR

Export Records Option	Record Types Exported	Record Identifier in CSV File
Detection records	Tag Detection Information	DET
Diagnostic records	Battery specifics and status information	BATTERY
	VR2AR regular system diagnostic information	DIAG_VR2AR
	VR2AR intermittent system diagnostic information	DIAG_VR2AR_INTERIM
Event records	Receiver general event	EVENT
	Receiver fault information	EVENT_FAULT
	Receiver initialization information	EVENT_INIT
	Receiver offload information	EVENT_OFFLOAD
	VR2AR memory remaining and other health information	HEALTH_VR2AR
Sensor records	Receiver tilt sensor readings	ATTITUDE
	Receiver depth sensor readings	DEPTH
	Receiver depth sensor stats (min, max, mean)	DEPTH_STATS
	VR2AR noise sensor stats (min, max, mean)	NOISE_STATS_VR2AR
	Receiver temperature sensor readings	TEMP
	Receiver temperature sensor stats (min, max, mean)	TEMP_STATS
Configuration records	Receiver channel configuration information	CFG_CHANNEL
	Station information	CFG_STATION
	Study information	CFG_STUDY
	Receiver built-in transmitter configuration information	CFG_TRANSMITTER

Export Records Option	Record Types Exported	Record Identifier in CSV File
Other records	Information on external clock used for reference purposes	CLOCK_REF
	Data error information	DATA_ERROR
	VDAT or VRL file information	DATA_SOURCE_FILE

VR4-UWM

Export Records Option	Record Types Exported	Record Identifier in CSV File
Detection records	Tag Detection Information	DET
Diagnostic records	Battery specifics and status information	BATTERY
	VR4-UWM regular system diagnostic information	DIAG_VR4
Event records	Receiver general event	EVENT
	Receiver fault information	EVENT_FAULT
	Receiver initialization information	EVENT_INIT
	Receiver offload information	EVENT_OFFLOAD
	VR4-UWM memory remaining and other health information	HEALTH_VR4
Sensor records	Receiver tilt sensor readings	ATTITUDE
	Receiver temperature sensor readings	TEMP
Configuration records	Receiver channel configuration information	CFG_CHANNEL
	Station information	CFG_STATION
	Study information	CFG_STUDY
Other records	Information on external clock used for reference purposes	CLOCK_REF
	Data error information	DATA_ERROR
	VDAT or VRL file information	DATA_SOURCE_FILE

6.2.3 Field Descriptions By Record Type

Record Types are listed alphabetically here, and provide a description for each field.

ATTITUDE

ATTITUDE records contain receiver orientation (ex: tilt) data from a receiver's built-in sensor(s) (if applicable). They are generated according to the logging interval selected in the **Sensor Logging** tab of the Receiver Communications window in the Fathom software. Attitude data are also available in the receiver-specific DIAG_* record.

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the *corrected* time). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
Tilt (degrees)	The tilt of the receiver, in degrees from vertical

BATTERY

BATTERY contain battery status information. They contain different information depending on the receiver model and the event that generated the record. All receiver models log a battery record at least once per day at midnight.

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the *corrected* time). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
Battery Position	Specifies which battery the record refers to. • PRIMARY refers to the battery that powers the receiver • MOTOR refers to the battery that powers the acoustic release • (If unspecified, data in this record is for the PRIMARY receiver battery)
Battery Type	Specifies whether the receiver battery is a lithium or alkaline battery (HR2 receivers only, at initialization only)
Battery Serial Number	Serial number of Vemco-supplied battery pack (HR2 receivers only, at initialization only)
Battery Voltage (V)	Battery voltage remaining
Battery Remaining (%)	Estimated remaining battery life, as percent of full life (HR2 receivers only)

CFG_CHANNEL

CFG_CHANNEL records contain information about the configuration of a receiver channel. Receivers with multiple channels (ex: the HR2 receiver) have multiple CFG_CHANNEL entries (one entry per channel).

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the *corrected* time). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
Index	Unique channel identifier, used by VEMCO Support
Frequency (kHz)	Channel frequency
Decoder	Type of decoder used to decode the detections on this channel
PPM Map ID	PPM code map (list of code spaces) used to decode PPM detections
HR Coding ID	HR code space used to decode HR detections

CFG_STATION

CFG_STATION records contain information about the station (location) where the receiver is deployed.

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the *corrected* time). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
Station Name	The name of the station (deployment location)
Latitude (degrees)	Station latitude
Longitude (degrees)	Station longitude

CFG_STUDY

CFG_STUDY records contain information about the study.

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the *corrected* time). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
Description	Description of the study.

CFG_TRANSMITTER

CFG_TRANSMITTER records contain information about the settings of the receiver's built-in transmitter (if applicable). These records are generated at study initialization and when changes are made to the built-in transmitter settings. Receivers with built-in transmitters that transmit multiple transmission types (ex: HR2 receiver, PPM and HR transmissions) have multiple CFG_ TRANSMITTER entries for each configuration event (one entry per transmission type).

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the *corrected* time). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
Transmission Type	The coding system used to transmit (ex: HR)
Full ID	Full ID of the receiver's built-in transmitter, including code space (ex: H170-1802-62049)

CLOCK_REF

CLOCK_REF records contain clock reference information. Clock reference information is date and time information from an external source, such as your computer, that is added to the receiver log file to help with correction for receiver clock drift. CLOCK_REF records are used in conjunction with CLOCK_SET records to calculate drift-corrected times ("Time" field) for the data in all record types.

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the *corrected* time). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
External Time (UTC)	UTC date and time of the external (reference) device (ex: UTC time calculated from your computer's time and time zone settings)
External Difference (s)	Difference between the external (reference) date and time ("External Time (UTC)") and the date and time according to the receiver's clock
Source	Source of the external date and time information

CLOCK_SET

CLOCK_SET records contain information about receiver clock set events. A clock set event is generated when the receiver's clock is set using an external source such as your computer (ex: at initialization). CLOCK_SET records are used in conjunction with CLOCK_REF records to calculate drift-corrected times ("Time" field) for the data in all record types.

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the *corrected* time). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
Prior Device Time (UTC)	UTC date and time according to the receiver's clock before the clock was set using the external source
Prior Difference (s)	Difference between the external date and time (ex: UTC time calculated from your computer's time and time zone settings) and the date and time according to the receiver's clock ("Prior Device Time (UTC)"), immediately prior to setting the receiver's clock
Source	Source of the external date and time information

DATA_ERROR

DATA_ERROR records contain information about errors in the data file. They are used by VEMCO Support for troubleshooting purposes.

Field	Description
Type	The type of data error (RECORD or PAGE)
Error	The name of the error (ex: DECODER_EXCEPTION)
Page	unused
Offset	unused
Description	Description of the error.

DATA_SOURCE_FILE

DATA_SOURCE_FILE records contain information about the receiver log file that was used to generate the CSV output.

Field	Description
File Name	The name of the receiver log file that was used to create this CSV file
UUID	A unique identifier for the file. Used by VEMCO Support for troubleshooting purposes.
Type	File type information. Used by VEMCO Support for troubleshooting purposes.
Size	Size of the receiver log file that was used to create this CSV file
State	Indicates whether the receiver log file used to create this CSV file is an ORIGINAL or EDITED file

DEPTH

DEPTH records contain depth data from a receiver's built-in depth sensor (if applicable). They are generated according to the logging interval selected in VUE's **Logging Options** window.

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the **corrected time**[1]). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
Depth (m)	Receiver depth at the time of this record.

---

[1]Upon export to CSV format, all data records are automatically corrected for receiver clock drift by the Fathom software. Fathom uses the difference between your receiver's clock and the UTC time calculated from your PC clock at offload to calculate corrected times for each record in the receiver log. If the receiver clock was also adjusted during deployment (for example, using an external device to periodically send time corrections to a cabled receiver), then these adjustments are also used in the calculation of corrected times.

DEPTH_STATS

DEPTH_STATS records contain summarized depth information calculated from depth samples from a receiver's built-in depth sensor (if applicable). They are generated according to the stats logging interval selected in VUE's **Logging Options** window.

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the **corrected time**[1]). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
Depth Min (m)	Minimum depth during the stats Accumulation Period.
Depth Max (m)	Maximum depth during the stats Accumulation Period.
Depth Mean (m)	Mean depth during the stats Accumulation Period.
Sample Count	Number of depth samples collected during the Accumulation Period, used to calculate Depth Mean. To calculate raw data sampling interval, divide Accumulation Period by Sample Count.
Accumulation Period (s)	Period of time, in seconds, over which depth samples were collected and stats calculated.

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[1]Upon export to CSV format, all data records are automatically corrected for receiver clock drift by the Fathom software. Fathom uses the difference between your receiver's clock and the UTC time calculated from your PC clock at offload to calculate corrected times for each record in the receiver log. If the receiver clock was also adjusted during deployment (for example, using an external device to periodically send time corrections to a cabled receiver), then these adjustments are also used in the calculation of corrected times.

DET

DET records include tag detection information. Some fields in this record only apply to certain receiver models and tag types; these are indicated in the table where appropriate. Only detections passing the filters listed in DET_FILTER records are included in DET records.

Detection Type	Signal Strength	Noise	Quality Score
HR	Yes	Yes	Yes
HR_SELF*	No	No	Yes
PPM (decoder D1)**	No	No	No
PPM (decoder D2)**	Yes	Yes	No
PPM_SELF*	No	No	No

* A HR_SELF or PPM_SELF detection is a detection of the receiver's own built-in transmitter.

** The HR2 receiver has two methods of decoding PPM transmissions. PPM transmissions may be decoded by *one* or *both* decoders; in either case, a *single detection* is reported in the **Live Detections Tab**.

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the **corrected time**[1]). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.

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[1]Upon export to CSV format, all data records are automatically corrected for receiver clock drift by the Fathom software. Fathom uses the difference between your receiver's clock and the UTC time calculated from your PC clock at offload to calculate corrected times for each record in the receiver log. If the receiver clock was also adjusted during deployment (for example, using an external device to periodically send time corrections to a cabled receiver), then these adjustments are also used in the calculation of corrected times.

Field	Description
Detection Type	There are four types of detections: • **PPM** – detections of IDs transmitted using Vemco's traditional coding system. • **HR** – detections of IDs transmitted using Vemco's HR coding system (HR2 receivers only) • **PPM_SELF** – detections logged when a PPM (traditional coding system)-compatible receiver's own built-in transmitter transmits (HR2 receivers only) • **HR_SELF** – detections logged when an HR (high residency coding system) -compatible receiver's own built-in transmitter transmits (HR2 receivers only)
Full ID	Full ID of the detected transmitter, including code space (ex: A69-1601-2056)
ID	The ID of the detected transmitter, without the code space (ex: 2056)
Signal Strength (dB)	Signal strength of the received detection (HR and PPM detections on HR2 receivers only)
Noise (dB)	Ambient noise level at the time of the detection (HR and PPM detections on HR2 receivers only)
Quality Score	A measure of the quality of an HR detection, where 10 is excellent and 1 is poor. The quality score may be used to assist with filtering false detections out of a dataset. Detections with quality score < 3 are filtered out upon export to CSV when using the **Export Data** application (HR detections on HR2 receivers only
Decoder	The decoder in the receiver that was used to decode the detection (PPM detections on HR2 receivers only)
Sensor Value	Sensor data (temperature, pressure, or acceleration), expressed in units as indicated in the "Sensor Unit" field (sensor tags only)
Sensor Unit	Units corresponding to the data in the "Sensor Value" field. Possible units are as follows: • ADC* – raw sensor data • (sensor tags only)

* To convert ADC values to calibrated units, use the transmitter slope and intercept values found on the transmitter specification sheet that came with your order.

Unless otherwise indicated on the transmitter specification sheet, calibrated units are **SI units** as follows:

- Depth = m
- Temperature = °C
- Acceleration = m/s2

Apply the following equation to convert from ADC units to calibrated units:

Sensor value in calibrated units = (slope * ADC units) + intercept

DET_FILTER

DET_FILTER records contain information about filters applied to DET records upon export from a receiver log to CSV format. Detection filters are only applied to log files from certain receiver models. For more information on detection filters, see "HR2 Data Export Detection Filters", on page 187.

Field	Description
Filter Name	Name of the filter applied to the DET records
Details	Description of filter
Rejected Detections	Number of detections rejected by the filter (not exported to the CSV file)

DIAG_HR2

DIAG_HR2 records contain HR2 diagnostic information. They are generated according to the logging interval selected in the Sensor Logging tab in Fathom.

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the *corrected* time)). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
Tilt (degrees)	HR2 receiver tilt angle (degrees from vertical), sampled at time of logging
HR Noise (dB)	HR (170 kHz channel) noise (dB), sampled at time of logging
HR Accepted Detections	Number of HR detections passing the filter criteria described in DET_FILTER, since the previous DIAG_HR2 record
HR Rejected Detections	Number of HR detections rejected by the filter criteria described in DET_FILTER, since the previous DIAG_HR2 record
PPM Pings (D1)	Number of PPM pings recorded by decoder D1* since the previous DIAG_HR2 record
PPM Detections (D1)	Number of PPM detections decoded by decoder D1* since the precious DIAG_HR2 record
PPM Pings (D2)	Number of PPM pings recorded by decoder D2* since the previous DIAG_HR2 record
PPM Detections (D2)	Number of PPM detections decoded by decoder D2* since the precious DIAG_HR2 record
PPM Noise (dB)	PPM (180 kHz channel) noise (dB), sampled at time of logging

* The HR2 receiver has two methods of decoding PPM transmissions. PPM transmissions may be decoded by one or both decoders; in either case, a single detection is reported in the DET record. Ping and detection counts are separated by decoder in the DIAG_HR2 record to allow accurate calculation of ping: detection ratios for system troubleshooting purposes.

DIAG_VR2W

DIAG_VR2W records contain daily VR2W diagnostic (ping and detection count) information. They are generated every 24 hours at midnight (UTC).

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the *corrected* time). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
Pings	Number of pings recorded in the previous 24 hours
Detections	Number of detections recorded in the previous 24 hours

DIAG_VR2W_INTERIM

DIAG_VR2W_INTERIM records contain VR2W diagnostic (ping and detection count) information collected at irregular intervals. Entries are typically associated with receiver events (such as offload, for example).

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the *corrected* time). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Serial number of the receiver that generated the data in this record.
Serial Number	Serial number of the receiver that generated this log file.
Pings	Number of pings recorded since the start of the study or the previous midnight
Detections	Number of detections recorded since the start of the study or the previous midnight

DIAG_VR2AR

DIAG_VR2AR records contain VR2AR diagnostic information collected at regular intervals. Ping and detection counts are calculated every 24 hours at midnight (UTC), and Noise and Tilt readings are sampled according to the interval selected in VUE's **Logging Options** window.

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the *corrected* time). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
Pings	Number of pings recorded in the previous 24 hours
Detections	Number of detections recorded in the previous 24 hours
Noise (mV)	Ambient noise in mV, sampled at time of logging
Tilt (deg)	VR2AR receiver tilt angle (degrees from vertical), sampled at time of logging

DIAG_VR2AR_INTERIM

DIAG_VR2AR_INTERIM records contain VR2AR ping and detection count information collected at irregular intervals. Entries are typically associated with receiver events (such as offload, for example).

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the *corrected* time). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
Pings	Number of pings recorded in the previous 24 hours
Detections	Number of detections recorded in the previous 24 hours

DIAG_VR2Tx

DIAG_VR2Tx records contain VR2Tx diagnostic information collected at regular intervals. Ping and detection counts are calculated every 24 hours at midnight (UTC), and Noise and Tilt readings are sampled according to the interval selected in VUE's **Logging Options** window.

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the *corrected* time). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
Pings	Number of pings recorded in the previous 24 hours
Detections	Number of detections recorded in the previous 24 hours
Noise (mV)	Ambient noise in mV, sampled at time of logging
Tilt (deg)	VR2Tx receiver tilt angle (degrees from vertical), sampled at time of logging

DIAG_VR2Tx_INTERIM

DIAG_VR2Tx_INTERIM records contain VR2Tx ping and detection count information collected at irregular intervals. Entries are typically associated with receiver events (such as offload, for example).

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the *corrected* time). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
Pings	Number of pings recorded in the previous 24 hours
Detections	Number of detections recorded in the previous 24 hours

DIAG_VR4

DIAG_VR4 records contain VR4-UWM diagnostic information collected at regular intervals. Ping counts, detection counts and tilt readings are reported at midnight (UTC), according to the schedule selected in VUE's **Advanced Settings** window.

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the *corrected* time). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
Pings (69 kHz)	Number of 69 kHz pings recorded since midnight of the previous record (1 to 14 days ago)
Detections (69 kHz)	Number of 69 kHz detections recorded since midnight of the previous record (1 to 14 days ago)
Pings (180 kHz)	Number of 180 kHz pings recorded since midnight of the previous record (1 to 14 days ago)
Detections (180 kHz)	Number of 180 kHz detections recorded since midnight of the previous record (1 to 14 days ago)
Tilt (deg)	VR4-UWM receiver tilt angle (degrees from vertical), sampled at time of logging

EVENT

EVENT records track the occurrence of significant receiver events. All events except initialization, offload and fault events are catalogued in the EVENT record. For initialization, offload, and receiver fault information, refer to the EVENT_INIT, EVENT_OFFLOAD, and EVENT_FAULT records respectively.

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the *corrected* time). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
Event Type	Event descriptor (ex: RECORDING_RESUMED)
Event Details	Additional information relevant to the event used by VEMCO Support

EVENT_FAULT

EVENT_FAULT records track the occurrence of receiver faults for troubleshooting purposes.

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the *corrected* time). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
Fault Importance	An indicator of the severity of the fault. Fault levels are as follows: **LOW** - No action required **MEDIUM** – Replace receiver battery (if indicated) or contact VEMCO Support **HIGH** – Discontinue receiver use and contact VEMCO Support immediately
Fault Code	A code used by VEMCO Support.
Fault Description	A brief description of the fault.

EVENT_INIT

EVENT_INIT records contain receiver initialization information.

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the *corrected* time). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
Prior Device Time (UTC)	UTC date and time of the receiver's clock, prior to being set according to the external device clock at initialization
External Time Zone	Time zone of the device that was used to set the receiver's clock at initialization
Firmware Version	Firmware version of the receiver at initialization

EVENT_OFFLOAD

EVENT_OFFLOAD records contain receiver offload information. Some fields in this record only apply to certain receiver models; these are indicated in the table where appropriate.

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the *corrected* time). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
External Time (UTC)	UTC date and time of the device that was used to offload the receiver (calculated from the device's clock time and time zone)
External Time Zone	Time zone of the device that was used to offload the receiver
HR Total Accepted Detections	A count of the HR detections found in the DET records (detections passing the filters in DET_FILTER), except detections of the receiver's own built-in transmitter (type HR_SELF). (HR2 receivers only)
PPM Total Accepted Detections	HR2 receivers: A count of the PPM detections found in the DET records (detections passing the filters in DET_FILTER), except detections of the receiver's own built-in transmitter (type PPM_SELF) VR2W receivers: A count of all detections on the receiver
Memory Remaining (%)	Percent of total memory capacity remaining at offload
Battery Remaining (%)	Percent of battery life remaining at offload (HR2 receivers only)
Original File	The name that Fathom assigned to the offloaded receiver log file

HEALTH_HR2

HEALTH_HR2 records contain HR2 receiver health information.

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the *corrected* time). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
Line Voltage (V)	Displays the voltage provided by the external power source, if connected.
Memory Remaining (%)	Percent of total memory capacity remaining at offload
RTC Time	Current time of the receiver's real time clock. Used by VEMCO Support for troubleshooting purposes.

HEALTH_VR2W

HEALTH_VR2W records contain VR2W receiver health information.

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the *corrected* time). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
Line Voltage (V)	Displays the voltage provided by the external power source, if connected.
Memory Remaining (%)	Percent of total memory capacity remaining at offload
RTC Time	Current time of the receiver's real time clock. Used by VEMCO Support for troubleshooting purposes.

HEALTH_VR2AR

HEALTH_VR2AR records contain VR2AR receiver health information.

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the *corrected* time). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
Memory Remaining (%)	Percent of total memory capacity remaining at offload
RTC Time	Current time of the receiver's real time clock. Used by VEMCO Support for troubleshooting purposes.

HEALTH_VR2Tx

HEALTH_VR2Tx records contain VR2Tx receiver health information.

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the *corrected* time). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
Memory Remaining (%)	Percent of total memory capacity remaining at offload
RTC Time	Current time of the receiver's real time clock. Used by VEMCO Support for troubleshooting purposes.

HEALTH_VR4

HEALTH_VR4 records contain VR4-UWM receiver health information.

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the *corrected* time). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
Memory Remaining (%)	Percent of total memory capacity remaining at offload
Relative Humidity (%)	Relative humidity inside the receiver, sampled at the time of logging.
RTC Time	Current time of the receiver's real time clock. Used by VEMCO Support for troubleshooting purposes.

NOISE_STATS_VR2AR

NOISE_STATS_VR2AR records contain summarized noise information calculated from noise samples (see DIAG_VR2AR record) from a receiver's built-in noise sensor (if applicable). They are generated according to the stats logging interval selected in VUE's **Logging Options** window.

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the **corrected time**[1]). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
Noise Min (m)	Minimum noise during the stats Accumulation Period.
Noise Max (m)	Maximum noise during the stats Accumulation Period.
Noise Mean (m)	Mean noise during the stats Accumulation Period.
Sample Count	Number of noise samples collected during the Accumulation Period, used to calculate Noise Mean. To calculate raw data sampling interval, divide Accumulation Period by Sample Count.
Accumulation Period (s)	Period of time, in seconds, over which depth samples were collected and stats calculated.

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[1]Upon export to CSV format, all data records are automatically corrected for receiver clock drift by the Fathom software. Fathom uses the difference between your receiver's clock and the UTC time calculated from your PC clock at offload to calculate corrected times for each record in the receiver log. If the receiver clock was also adjusted during deployment (for example, using an external device to periodically send time corrections to a cabled receiver), then these adjustments are also used in the calculation of corrected times.

NOISE_STATS_VR2Tx

NOISE_STATS_VR2Tx records contain summarized noise information calculated from noise samples (see DIAG_VR2Tx record) from a receiver's built-in noise sensor (if applicable). They are generated according to the stats logging interval selected in VUE's **Logging Options** window.

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the **corrected time**[1]). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
Noise Min (mV)	Minimum noise during the stats Accumulation Period.
Noise Max (mV)	Maximum noise during the stats Accumulation Period.
Noise Mean (mV)	Mean noise during the stats Accumulation Period.
Sample Count	Number of noise samples collected during the Accumulation Period, used to calculate Noise Mean. To calculate raw data sampling interval, divide Accumulation Period by Sample Count.
Accumulation Period (s)	Period of time, in seconds, over which depth samples were collected and stats calculated.

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[1]Upon export to CSV format, all data records are automatically corrected for receiver clock drift by the Fathom software. Fathom uses the difference between your receiver's clock and the UTC time calculated from your PC clock at offload to calculate corrected times for each record in the receiver log. If the receiver clock was also adjusted during deployment (for example, using an external device to periodically send time corrections to a cabled receiver), then these adjustments are also used in the calculation of corrected times.

TEMP

TEMP records contain temperature data from a receiver's built-in temperature sensor (if applicable). They are generated according to the logging interval selected in the **Sensor Logging** tab of the Receiver Communications window in the Fathom software.

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the *corrected* time). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
Ambient (degrees C)	Ambient external temperature
Internal (degrees C)	Internal receiver temperature. Used by VEMCO Support for receiver troubleshooting purposes.

TEMP_STATS

TEMP_STATS records contain summarized ambient temperature information calculated from temperature samples from a receiver's built-in temperature sensor (if applicable). They are generated according to the stats logging interval selected in VUE's **Logging Options** window.

Field	Description
Device Time (UTC)	UTC date and time of the data according to the receiver's clock (the uncorrected time).
Time	Date and time of the data following correction for receiver clock drift (the **corrected time**[1]). The time offset of this time from UTC is indicated in the "Time Offset (h)" column.
Time Offset (h)	Offset from UTC time, in hours, of the value in the "Time" column. The time offset is as selected when the receiver log was exported to Fathom CSV format using the Fathom software.
Time Correction (s)	The difference between uncorrected ("Device Time (UTC)") and corrected ("Time") times.
Model	Receiver model that generated the data in this record.
Serial Number	Serial number of the receiver that generated the data in this record.
Ambient Min (m)	Minimum ambient temperature during the stats Accumulation Period.
Ambient Max (m)	Maximum ambient temperature during the stats Accumulation Period.
Ambient Mean (m)	Mean ambient temperature during the stats Accumulation Period.
Sample Count	Number of temperature samples collected during the Accumulation Period, used to calculate Ambient Mean. To calculate raw data sampling interval, divide Accumulation Period by Sample Count.
Accumulation Period (s)	Period of time, in seconds, over which depth samples were collected and stats calculated.

---

[1]Upon export to CSV format, all data records are automatically corrected for receiver clock drift by the Fathom software. Fathom uses the difference between your receiver's clock and the UTC time calculated from your PC clock at offload to calculate corrected times for each record in the receiver log. If the receiver clock was also adjusted during deployment (for example, using an external device to periodically send time corrections to a cabled receiver), then these adjustments are also used in the calculation of corrected times.

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Maintaining an HR2 Receiver

Regular and timely maintenance will help keep your HR2 receiver in peak operating condition. It will also help when preparing it for storage.

This Section Contains Information On The Following:

7.1 Replacing the Main Battery

When your receiver battery needs replacement, you may acquire a new battery from VEMCO and install it yourself.

> ⚠️ **WARNING:** It is *critically important* that the electronics inside the receiver case **do not come in contact with any water** or the receiver will be damaged. For this reason, VEMCO recommends the HR2 be opened in a controlled environment, and *not* in the field or on the deck of a boat.

Replacing a battery in the HR2 requires four basic steps:

1. Opening the case (see)

2. Disconnecting and removing the battery (see)

3. Inserting the battery (see)

4. Closing the case (see)

> ℹ️ **IMPORTANT: PLEASE** be kind to the environment and dispose of the battery according to your local regulation.

7.1.1 Opening The HR2 Case

Two steel rods are necessary to properly open and close the case. Every shipment of new HR2 receivers includes a pair of steel rods.

Step 1 - Ensure there is no water on or near the case

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

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

Step 2 - Place receiver on a clean and dry flat surface

Place the HR2 on a clean, flat surface so the top end (hydrophone end) is just hanging over the edge as shown. DO NOT let the receiver fall off the surface.

> tip! A non-slip surface, such as a rubber mat, helps keep the HR2 in place while opening it.

Step 3 - Insert the steel rod - Bottom end

Hold the body of the HR2 securely in place.

Insert one steel rod into the hole that runs through the diameter of the case near the **bottom end** of the HR2. Position it so most of the rod is on the left side of the receiver, as shown.

Place a hand on the back of the receiver to hold it in place. The back of the receiver often "jumps" during the unscrewing step, so be prepared.
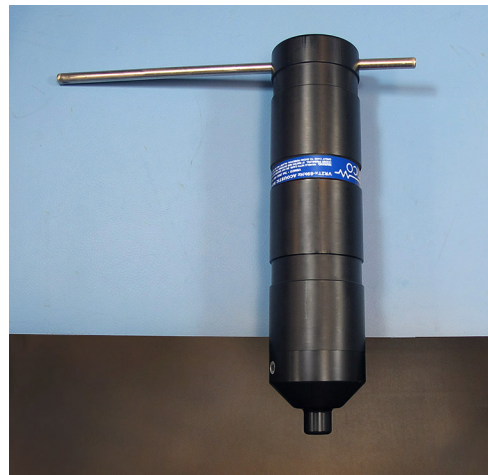
Step 4 - Insert the steel rod - Top end

Hold the body of the HR2 securely in place.

Insert the steel rod into the hole at the **top end** of the receiver and hold on to the rod – it can slide right through the hole and potentially damage something below.

Make sure the rod is inserted *through to the other side* – damage may occur to the hole if the rod is only partially inserted.

Step 5 - Unscrew the end cap

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

Continue to rotate the rod, and therefore the end cap, until turning becomes easier (but not quite free from the outer cylinder).
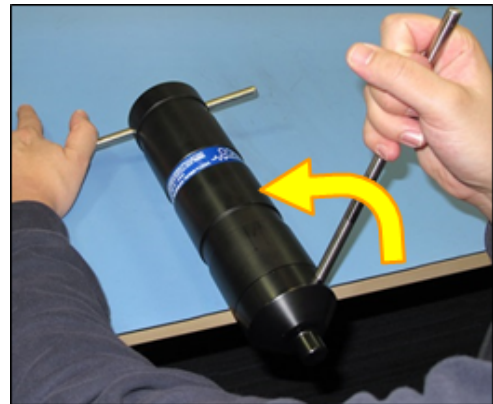
Step 6 - Remove the end cap

Remove the **top** steel rod from the HR2 case and set it aside.

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

> *i* **IMPORTANT:** Once they separate, do NOT twist the end cap anymore, simply slide it out from the outer cylinder.

> ⚠ **WARNING:** DO NOT impact the threads on the end-cap or they will dent and prevent the case from closing. For tips on thread care, see "The Threads Have Been Damaged", on page 176.

Step 7 - Slide the components apart

Push the receiver back onto the work surface.

Gently slide the receiver end cap out of the outer cylinder. The bottom end steel rod acts as a stabilizer for the outer cylinder.

Step 8 - Separate the components

Slide the end cap and outer cylinder apart until the battery compartment has cleared the cylinder. Be very careful not to damage the threads on the end cap or the HR2 won't close and seal properly.

> ⓘ **IMPORTANT:** The parts are linked through a component cable that is attached to the bottom of the battery tray and into the outer cylinder. DO NOT pull or twist this cable.
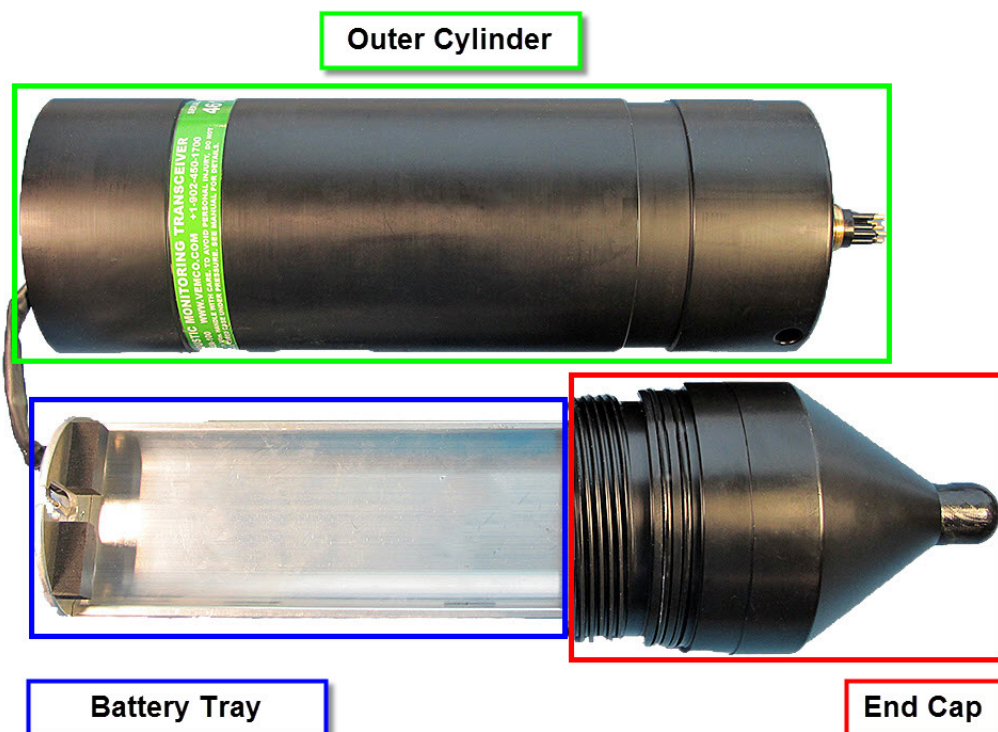
Figure 7-1: HR2 Receiver Parts

7.1.2 Disconnecting And Removing The Battery

Follow these steps to remove a battery from your receiver.

Step 1 - Open the case

Open the case as explained in "Opening the HR2 Case", on page 144, and set the outer cylinder to the side.

> ⓘ **IMPORTANT**: Check the inside of the receiver for any signs of moisture/water. Completely dry the battery tray and parts before re-assembling and deployment.
> Also check your O-rings for any signs of damage and replace them as needed (see "O-Ring Care", on page 158).

Step 2 - Remove tape

Grab the securing tape end and unwrap the tape that secures the battery to the cradle to remove it.

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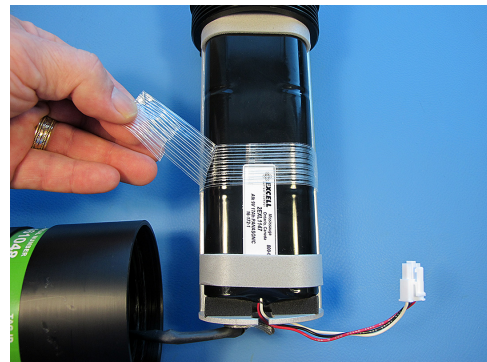
Step 3 - Disconnect

Press the release lever clip on the bottom of the battery connector and pull the connector out.
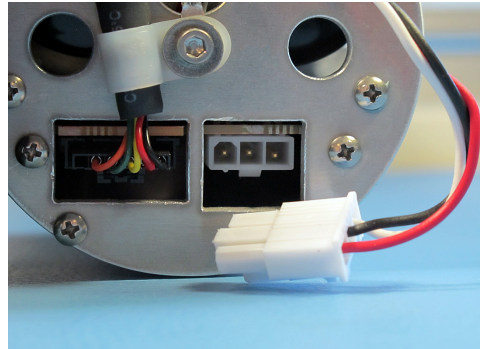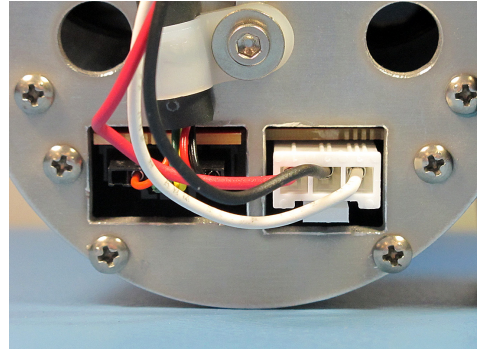
Step 4 - Pull connector wires up and out of slot

Gently pull the connector wires up and out through the slot at the bottom of the battery tray.
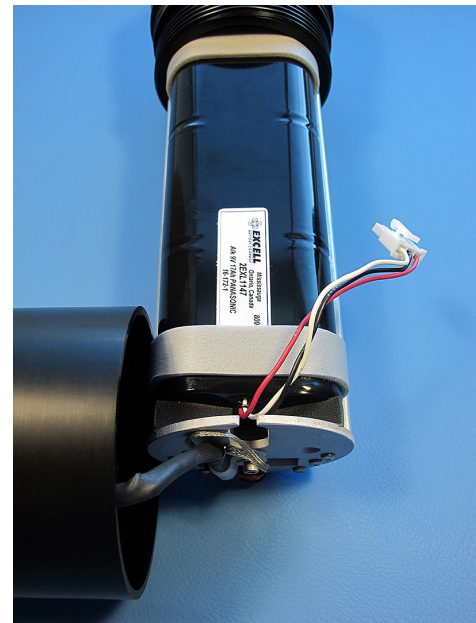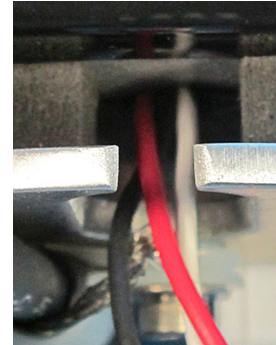
Step 5 - Lift battery up

Grab the battery from both sides and push a bit forward against the top foam cushion in the battery tray. Lift battery up from the back end.

NOTE: The battery is held in place underneath by two hook and loop strips. You will feel them "rip" off as you pull the battery up.
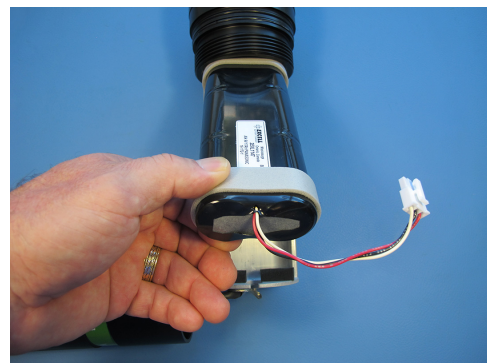
Step 6 - Remove the battery

Pull the battery out of the battery tray and set it aside.

> 🛈 **PLEASE** Be kind to the environment and dispose of the battery according to your local regulation.

7.1.3 Installing And Connecting A Battery

Follow these steps to install a battery in your receiver.

> ⚠ **WARNING:** It is *critically important* that the electronics inside the receiver case **do not come in contact with any water** or the receiver will be damaged. For this reason, VEMCO recommends the HR2 be opened and closed in a controlled environment, and *not* in the field or on the deck of a boat.

Step 1 - Open the case

Open the HR2 case as described in "Opening the HR2 Case", on page 144 (and remove an existing battery, if present).

Step 2 - Position battery

The battery uses hook and loop retainer strips to keep it in place.

Step 3 - Insert battery

Insert the battery top end first, as shown. Lower the bottom end (wire connector end) in, making sure that you don't *pinch* the connector wires on the battery tray's bottom plate.
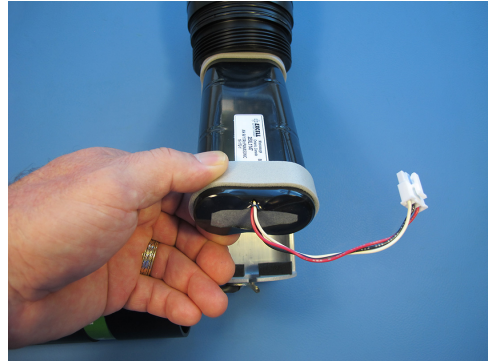
Step 4 - Check that battery is secure

Ensure that the battery is pressed onto its hook and loop retainer strips, and that it fits tightly between its top and bottom foam "cushion" retainers.

NOTE: The connector wires should not be pinched by the foam bottom retainers.
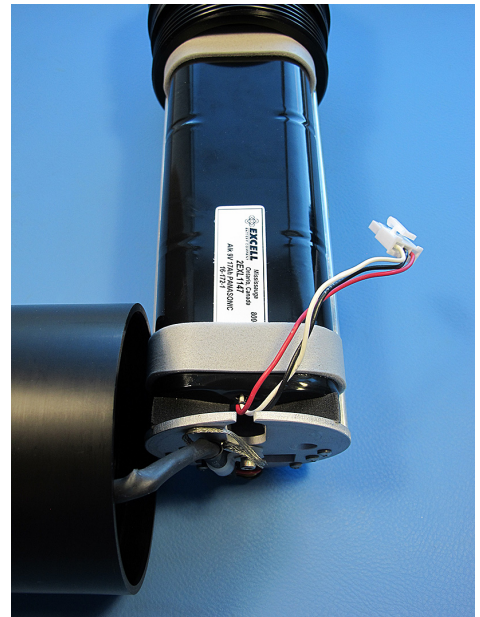
Step 5 - Wrap tape

Grab the tape end and wrap the tape around the battery and cradle to secure it.
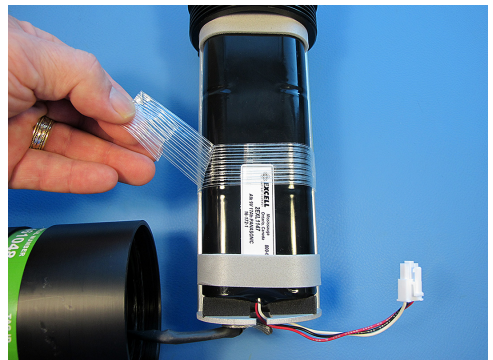
Step 6 - Position connector wires

Tuck the connector wires down through the slot.
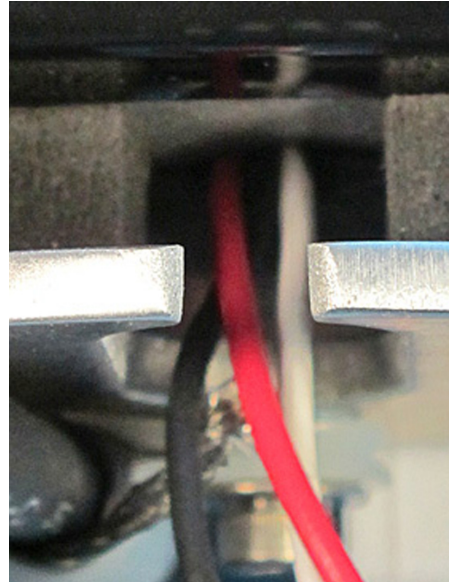
Step 7 - Position the wire connector

Position the battery wire connector, with the retainer clip on the bottom.
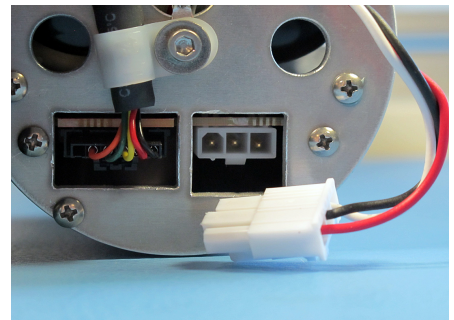
Step 8 - Connect the battery

Gently but firmly push the connector in until the clip *clicks* into its locked position.
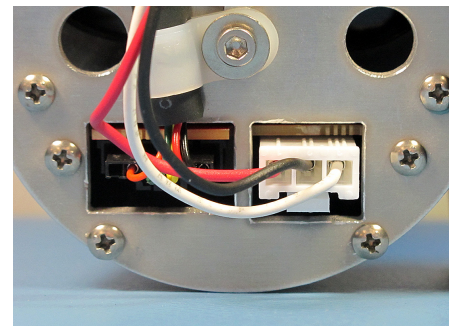
Close the case as described in "Closing the HR2 Case", on the facing page.

7.1.4 Closing The HR2 Case

Two steel rods are necessary to properly open and close the case. Every shipment of new HR2 receivers includes a pair of steel rods.

Before deploying or storing a HR2 receiver, the case must be properly closed and sealed to prevent damage to the electronics. Water, even in a small quantity, can damage the internal circuits beyond repair. This also means the electronics cannot be exposed to a sudden change in temperature and humidity that will cause condensation to develop on the electronics and destroy the receiver.

> **IMPORTANT**: Before closing back your receiver, check the inside for any signs of moisture/water. Completely dry the battery tray and parts before re-assembling and deployment.
> Perform a visual inspection of the O-rings and the O-ring surface inside the outer cylinder to be sure they are clean, properly greased, undamaged, and debris free. For more information, see "O-Ring Care", on page 158.
> VEMCO recommends the HR2 be opened and closed in a controlled environment, and *not* in the field or on the deck of a boat.

Step 1 - Use a new desiccant pack

Place a new **desiccant pack** (if the existing one has been used in a previous deployment) in the bottom of the outer cylinder so both ends of the pack are touching opposite sides of the cylinder's wall (sideways).

NOTE: A desiccant pack has been included in the bottom of the HR2 receiver to reduce the occurrence of condensation. One of these packs should remain in the receiver case during storage and deployment.

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

For more information on the availability and usage of these packs, consult our website.

Step 2 - Slide the components together

Insert one steel rod into the hole that runs through the diameter of the case near the **bottom end** of the HR2.

Gently slide the receiver end cap into the outer cylinder, until the threads are in position for hand tightening.

NOTE: The bottom end steel rod acts as a stabilizer for the outer cylinder.

Step 3 - Hand tighten the end cap

Reposition the HR2 so the hydrophone (top end) is hanging over the edge enough that the large hole is past the edge of the surface. DO NOT let the receiver fall off the surface.

Hold the body of the HR2 securely in place.

Hand tighten the end cap in a *clockwise* direction until the cap and outer cylinder are fairly tight.

> ⚠ **WARNING:** DO NOT impact the threads on the end-cap or they will dent and prevent the case from closing. For tips on thread care, see "The Threads Have Been Damaged", on page 176.

Step 4 - Prepare for final tightening

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

Step 5 - Insert the steel rod - Top end

Hold the body of the HR2 securely in place.

Insert the steel rod into the hole at the **top end** of the receiver and hold on to the rod – it can slide right through the hole and potentially damage something below.

Make sure the rod is inserted *through to the other side* – damage may occur to the hole if the rod is only partially inserted.

Step 6 - Tighten the end cap

Apply pressure to the rod in the **top end** hole to turn it in a *clockwise* direction as you are facing the hydrophone. The rod at the bottom of the receiver acts as a brace while you apply pressure, but be careful of it "jumping" off the flat surface.

Continue to rotate the rod, and therefore the end-cap, until turning becomes tight (DO NOT overtighten).

> ℹ️ **IMPORTANT:** Make sure to test your receiver before deploying it. For more information, see "Testing the Receiver", on page 29.

If you intend to store your HR2 receiver, see "Storing a receiver", on page 161.

7.2 O-Ring Care

O-rings located in the end-cap of the HR2 case are crucial to the watertight seal of the receiver. Each time an O-ring is disturbed, for any reason, it must be checked before the unit is sealed again. Something as simple as a stray hair could be the difference between a successful study and a damaged receiver.

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

Just as the O-rings are vital to a good seal, so are the **O-ring surfaces**. These surfaces hold the O-ring in position and must also be clean and damage free or the HR2 case could flood with water.

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

7.2.1 Removing O-Rings

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

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

To remove O-ring

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

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

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

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

5. Clean any O-ring grease on the plastic casing.

7.2.2 Cleaning O-Ring Surfaces

An O-ring surface is **any surface the O-ring touches**.

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

The HR2 has three:

- the two **grooves** between the threads and the LED on the end cap, where the o-rings are seated, and
- the **first flat/smooth area** inside the Outer Cylinder (2 cm), between the threads and the end of the cylinder.
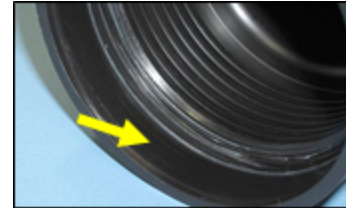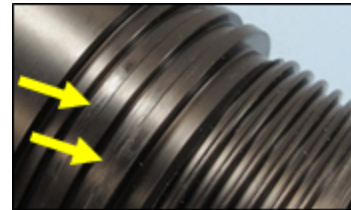
Step 1 - Clean O-rings and surfaces

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

Step 2 - Inspect O-rings grooves

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

Step 3 - Inspect O-rings

Inspect the O-rings for debris and for any damage. If there is any question about the condition of an O-ring, we recommend it be replaced rather than risk damage to the receiver and loss of data. O-rings can be purchased from VEMCO or locally. The replacement O-rings must be PARKER #2-143 O-RING, 70 Bn NITRILE.

> ⚠️ **CAUTION:** O-rings can *stretch* with continued handling. We advise that undamaged O-rings not be used for more than three deployments.

Step 4 - Apply O-ring grease to grooves

Use your gloved fingers to evenly spread a very thin layer of O-ring grease (we suggest **Molykote 55**) – enough to make the area appear shinny – around the O-ring surface on the inside of the Outer Cylinder (the smooth area between the threads and the end of the case). You shouldn't be able to see grease globs or streaks. This thin layer of grease will make screwing the two pieces together again much easier and will also help to create a better seal.

Step 5 - Apply O-ring grease to O-ring

While you have grease on your glove, evenly spread grease over the entire surface of the O-ring until the O-ring is slippery, but doesn't have clumps of grease on it. Too much grease can cause an O-ring to "pop" out of the groove while the case is being closed, giving little protection from water entering the HR2.

7.2.3 Installing O-Rings

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

1. Slowly move one of the O-rings along the body of the HR2 to the end cap and carefully lift it over the threads.

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

3. Slowly move the second O-ring over the HR2's body, over the threads, and into the other groove. Check that it's entirely in the groove.

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

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

For information on closing back the receiver, see

7.3 Storing a receiver

When a receiver will not be deployed for an extended period of time, place the receiver in **Suspend Mode**, to stop the HR2 from recording. This will prevent the possibility of recording pings from noise sources during storage and also saves battery life.

The **desiccant pack** should be left in the case during storage to reduce the occurrence of condensation in the HR2.

Be sure to store the HR2 in a safe location where the case will not be damaged. Also be sure the temperature of the receiver during storage does not exceed the operating temperature specified in "HR2 Specifications", on page 183.

> *i* **IMPORTANT:** It is strongly suggested that all data are offloaded and backed up prior to storage. Following storage, the HR2 will need to be initialized to resume recording. During initialization, all data will be erased from receiver memory.

7.4 Cleaning Instructions

Clean the HR2 Receiver with a damp cloth and mild detergent.

- Do not use solvents.
- Do not use a scraper or abrasive cleaner on the LED window or the seal surfaces.

Additional Information

This Section Contains Information On The Following:

8.1 Flash Memory

The HR2 receiver uses 2 GB of *non-volatile* Flash Memory (memory that can retain stored information even when not powered) to store valid detections of coded transmitters and the date/time at which the detection was recorded. The HR2 will not continue to record received data once the memory is full.

A HR2 receiver with 2 GB can store more than 170 million detections. How long it takes to fill the memory depends on how frequently detection data is received and how often diagnostic data is being logged.

8.2 Status Light Flashes

The **Light Emitting Diode (LED) Status Light** on the side of the HR2 case flashes based on the task being performed or the status of the receiver. The flashes can be interpreted using the table below.

HR2 LED Flashes (during normal operation)	Meaning of Flashes
No flash	Battery is disconnected or has depleted, or receiver is in Suspend Mode
2 quick red flashes every 5 seconds	HR2 is in Record mode (records any received pings)
2 quick red flashes every 10 seconds	The HR2 memory is full
One short red flash	An acoustic ping was received
One long red flash	A PPM detection was written to memory
One short blue flash	An HR detection was written to memory
One short green flash*	An acoustic ping was transmitted
One long green flash*	Transmitted pings were written to memory

* Green flashes only occur if the transmit feature is enabled. For more information on enabling or disabling the transmitter, see "HR2 Transmitter Tab", on page 44.

The Status Light (LED) on an HR2 flashes either red, green or blue. Generally, the red flashes are related to *received* pings, and the green flashes are related to *transmitted* pings.

After an HR2 is powered, it performs a self-test and flashes both the green and red lights at the same time, making the light look more of an orange colour. After these orange flashes, you will see either a very long green light to indicate the tests passed and all is well, or a long red light to indicate there was a problem. If you see the long red light followed by more flashes, contact VEMCO for instructions.

When the transmit feature is enabled in the HR2, the status light will flash a quick flash for each ping sent and a longer green flash to indicate that the pings were recorded in the receiver memory.

LED event (on boot up or when starting a study)	Means...
Steady WHITE light (~5 seconds)	self-test
GREEN flash following steady white, and only on boot up (not on starting a study)	self-test passed
RED flash following steady white, and only on boot up (not on starting a study)	failed self-test

8.3 Batteries

The HR2 receiver is powered by a **10.8 V lithium-metal** or **alkaline** battery pack. Specifications for the batteries are available on the battery label.

The HR2 is shipped with the battery installed and connected. Before the HR2 can begin recording data, it must be connected to computer and switched from **Suspend Mode** to **Record Mode**.

> *i* **IMPORTANT:** Always **place the receiver in Suspend Mode** when the receiver is not being used for an extended period of time.

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

8.4 Updating the Fathom Software

You have received the latest version of our Fathom software with your VEMCO product purchase.

Automatic Software Update Notifications

When you are connected to the Internet, you will get notified automatically when new versions of Fathom are available for download (see also "Checking for Updates", on page 22). To download and install the latest update, just follow the download instructions.

NOTE: We recommend installing the update **immediately** to ensure the ongoing best performance and functionality.

8.5 Automatic Firmware Updates and Notifications

When connecting and establishing communication with a receiver, the Fathom software checks for available firmware updates. If an update is available for your receiver, a **firmware update notification** will appear.
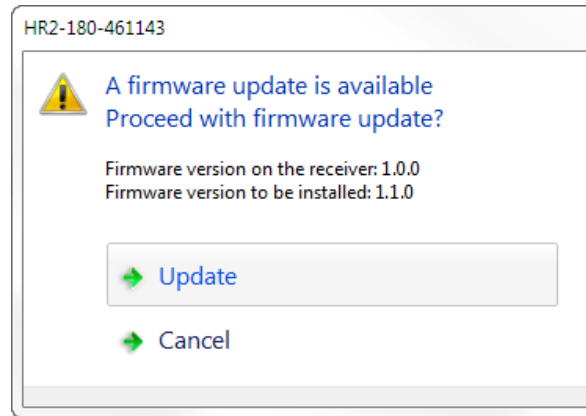
Figure 8-1: Firmware Update notification

WARNING: When you perform a firmware update, the process may erase all data on the receiver, set the receiver's clock, and reset all transmitter and sensor logging settings to default values. **We recommend offloading your data before performing the update.**

NOTE: We recommend installing the update **immediately** to ensure the ongoing best performance and functionality for your receiver.
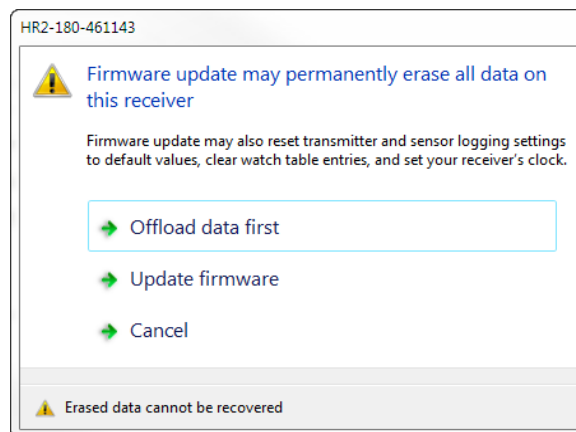
Figure 8-2: Firmware Update warning dialog box

- To *offload* your data first, click **Offload data first** and proceed to save your data.
- To *update* the firmware without saving your data first, click **Update firmware** and follow the instructions.

Otherwise, click **Cancel**.

For information on performing a firmware update later/manually, see "Updating the Firmware (manually)", on page 55.

8.6 Installing the Communication Cable Drivers

Fathom requires drivers for the cable that you use to connect and communicate with the HR2 receiver.

> **IMPORTANT:** If you want to use the cable with a laptop that you travel with (**in the field and without internet access**), you should set up the FTDI drivers before leaving.

There are three options for installing the appropriate cable drivers.

Option 1 - Allow Windows to automatically locate and install the drivers (you need internet access)

In most cases, upon connecting the HR2 cable to your computer Windows will automatically find and install the correct drivers for the cable. However, if this does not occur then you must use one of the options that follow to install the drivers.

Option 2 - From the driver website

To manually install the cable drivers using the web:

1. If your cable is a high-speed VEMCO cable

    a. go to www.ftdichip.com
    b. Download the latest VCP driver executable for Windows.

2. If your cable is **NOT** a high speed VEMCO cable

    a. go to www.sealevel.com
    b. Download the latest SeaCOM asynchronous serial software drivers for Windows.

3. Run the executable file to install the driver.

Option 3 - From your computer's hard drive

Two sets of drivers are saved to your hard drive when you install the Fathom software. **If you do not have internet access when you are attempting to install the cable drivers**, you may use one of the executable files provided. Note, however, that the most up to date cable drivers are always found on the manufacturer websites indicated in Option 2.

To manually install the cable drivers from your hard drive:

1. Navigate to the folder on your hard drive where the Fathom software was installed (usually `C:\Program Files (x86)\Vemco\Fathom\`) and open the "drivers" folder.

    a. **If your cable is a high-speed VEMCO cable**, double-click on the executable file called `FTDIDrivers.exe` to install the driver.
    b. **If your cable is NOT** a high speed VEMCO cable, double-click on the executable file called `SealinkDrivers.exe` to install the driver.

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chapters start on right (odd number) pages.

Common Questions

This Section Contains Information On The Following:

9.1 HR2 Receiver Related Questions

Find answers to HR2 common questions here.

9.1.1 How Long Will My HR2 Battery Last

Depending on the battery used with your receiver:

- If using a **Lithium-metal** battery pack, *approximately* **6 months**.
- If using an **Alkaline** battery pack, *approximately* **2 months**.

9.1.2 What Is Considered A Quality Score For Detections?

A **Quality Score** is a measure of the quality of an HR detection, where **10** is *excellent* and **1** is *poor*. The quality score may be used to assist with filtering false detections out of a dataset. Detections with a quality score **< 3** are filtered out upon export to CSV when using the **Export Data** application (HR detections on receivers only).

For related information, see "HR2 Data Export Detection Filters", on page 187.

9.2 Fathom Related Questions

Find answers to Fathom common questions here.

9.2.1 What Is Initialization?

Initialization (also referred to as *starting a study*) is an important step required to configure your receiver correctly.

The receiver clock is always updated based on your PC clock during the initialization process. This information will be resident with the HR2 receiver and will be available during offload, regardless of whether you use the same computer or not. Initialization also *erases* the receiver log files, so be sure to offload data from your receiver *before* initializing it.

> ⓘ **IMPORTANT:** Your HR2 receiver **must** be initialized to remove it from **Suspend Mode**, and start recording.

9.2.2 What Date/Time Format Is My Data Stored In The Receiver?

All detection data and events are stored in the receiver in **UTC**[1] (Coordinated Universal Time).

Fathom calculates UTC time from your computer's displayed time and zone setting, and uses this UTC time to set your receiver's clock during initialization. Provided your computer time and the Time Zone settings are correctly matched, (your computer time is correct for the time zone you have selected), then your data will be correctly timestamped when stored in the receiver.

9.2.3 Why Do I See A Discrepancy Between Detections In My HR2 Live Views And Detections In The Exported CSV File?

Fathom uses some filtering criteria on detection data from HR2 receivers when they are converted from VDAT to CSV format. This is to help *minimize the number of false detections* that appear in the CSV file.

The filters are not applied to the *live views* (**Live Tiles** and **Live Detections** tabs) in Fathom, which is why you may see a discrepancy. We think it is valuable to **show all detections** (both *high* and *low* quality) in the live displays, to allow for system troubleshooting in the field.

For more information, see "HR2 Data Export Detection Filters", on page 187.

9.2.4 Where Do I Find The Fathom Software Version Number?

The Fathom software version number is available from the Fathom Launcher's About Fathom window.

Click the Fathom Launcher icon, then click the information icon at the top right of the window. The About Fathom window appears.

The complete version number is listed as below.

---

[1]Coordinated Universal Time is the primary time standard by which the world regulates clocks and time. Time zones around the world are expressed using positive or negative offsets from UTC, as in the list of time zones by UTC offset.
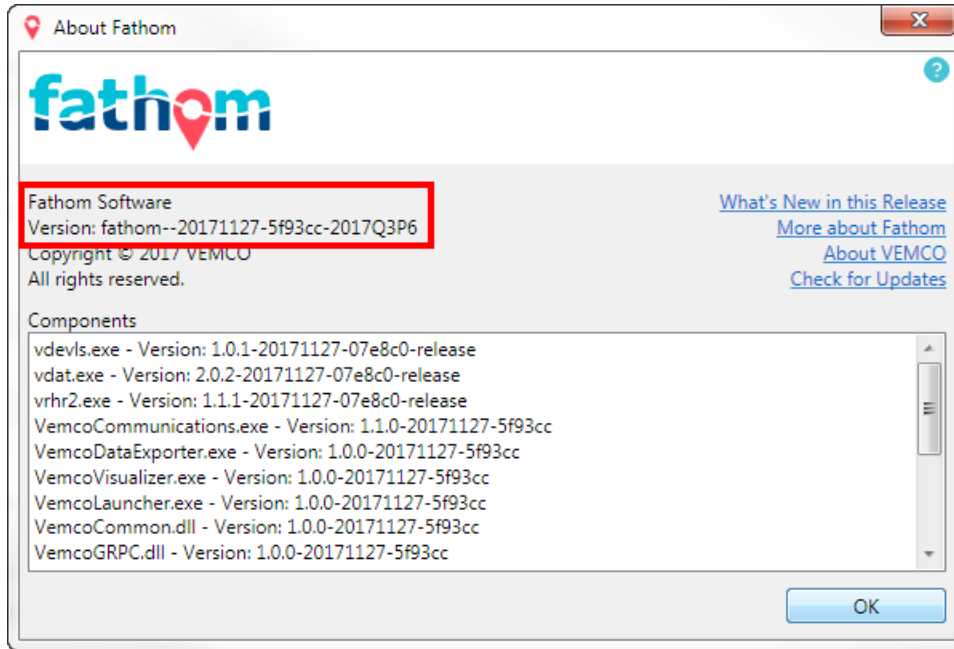
NOTE: You can also find the more basic version number at the **bottom center of every topic** in the Help system.
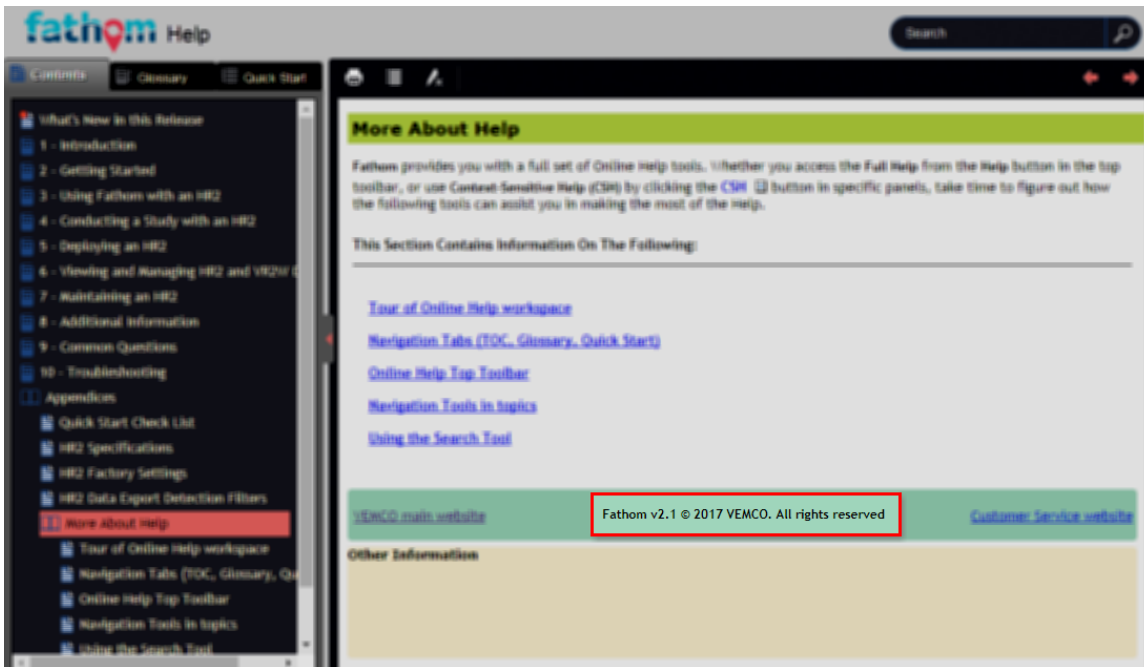
Troubleshooting

This Section Contains Information On The Following:

10.1 HR2 Receiver Related Troubleshooting

Find answers to HR2 common troubleshooting questions here.

10.1.1 The Threads Have Been Damaged

It's critically important that the threads on the End Cap are not dented or the outer cylinder will not thread onto the End Cap properly. If the threads are slightly dented, use a sharp knife, such as an X-Acto knife, to remove the deformed plastic until the sides of the thread are smooth and below the normal line of the thread.

It is important that there be nothing sticking out of the thread to damage the thread on the outer cylinder or prevent the case from closing.

10.1.2 I Think The Case Might Be Pressurized

When handled correctly, the HR2 pressure case and seal have a static depth rating of **300 meters (440 psi)**. If the receiver experiences pressure greater than this, water may enter the case.

> **NOTE:** Physical shocks to the receiver, such as bumping into a solid object, when it is at any depth can result in a considerably higher pressure on the casing than just the depth pressure. Also, if the O-rings or their mating surfaces are dirty or damaged, then water may enter the receiver case. If water enters the receiver case under high pressure and the Release Valve is unable to open and equalize the pressures, then some water and compressed air may still remain in the case when it is returned to the surface. This can be identified by its increased weight and a sloshing sound when the case is moved. The HR2 case will also be very difficult to open, if at all possible.

If you are suspicious there is compressed air in the receiver case, then check for air or water leaking from seam in the case where the End Cap and outer cylinder meet.

To check for...	Do this
Water leakage	Dry the seam completely and watch for drops of water around the seam.
Air leakage	Spread soapy water around the seam and watch for bubbles indicating air escaping.

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

When the pressure has been released from the HR2 case, carefully unscrew the End Cap from the outer cylinder (see). Use *fresh* water to rinse the internal parts of the HR2, while avoiding skin contact with any battery electrolyte that may have escaped from the battery. Do not attempt to re-use the HR2 receiver after water has been inside the case. The internal casing protecting the electronics is not waterproof and the electronics have been destroyed by contact with water.

10.2 Fathom Related Troubleshooting

Find answers to Fathom common troubleshooting questions here.

10.2.1 I Cannot Connect To My HR2 Receiver

First, confirm that your cable connections are solid, at the receiver and at the computer end. Click the **Scan for Devices** button and wait to see if the receiver gets identified and connected to. If it does not, proceed to the next step here.

- **If no receiver is detected**, a receiver icon will not be displayed (see "If no receiver is detected", on page 25, for icons and screenshots of Fathom) and you must manually initiate the connection.

  - If you are using a COM port for connection on the computer, click a **COM port** to establish receiver communication on that port (bottom)

  > *tip!* If you are not sure which COM port the receiver cable is connected to, unplug the cable and watch which COM port disappears from the COM Ports display. Plug the cable back in and attempt to connect to the receiver using the identified COM port.

  - If you are unable to connect to the receiver, disconnect the cable from the computer, then the receiver, then reconnect to receiver and computer and try again.

  - If you still are unable to connect to the receiver, please contact VEMCO (see "Contacting Support", on page 13).

- If you have a **spare battery**, try replacing the battery in the **HR2** with a new battery.

If you are still unable to communicate with the receiver, please contact VEMCO (see "Contacting Support", on page 13) to receive RMA information and send the unit back to VEMCO for assessment/repair.

10.2.2 These Detected IDs Don't Belong To Me

We would be very pleased to help connect you with the owners of any unknown IDs. Use our **Unknown IDs form** at http://vemco.com/customer-service/?cs-unknown-ids to send a list of the unknown ID's and all associated .vdat files to the VEMCO support team.

VEMCO will first review the data to identify false detections and provide you with a false detection report, then we'll contact the tag owners for all the valid detections and request that they contact you directly.

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Appendices

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Quick Start Checklist

You've just gotten a new HR2 receiver. Use this quick start checklist to ensure that your receiver is working as expected.

> ⚠️ **CAUTION:** The HR2 is shipped in **Suspend** mode, with the internal battery connected. Always put the receiver in **Record** mode (start a study) before deployment.

> ⚠️ **CAUTION:** Always handle your receiver with great care. The **hydrophone** (the receiver's "microphone") is the receiver's most delicate part. **Do not bump the hydrophone** or the receiver may be damaged and unable to detect transmitters.

To verify the proper operation of your receiver

1. Install **Fathom** software.

2. After taking the receiver out of the box, remove the **Dummy Plug** and connect cable from receiver to computer.

3. If automatic installation of RS-485 drivers does not succeed, see "Installing the Communication Cable Drivers", on page 169.

4. Launch Fathom (click **Connect** from the VEMCO Launcher in the Task Bar).

5. To take the receiver out of **Suspend Mode**, start a new study (click **Start a Study**).

6. Check for **2 quick red flashes** every 5 seconds (to verify **Record Mode** is ON).

7. On the **Status Tab**, check the following:

   a. Verify **Tilt** is working.
   b. Verify **Temperature** is accurate.
   c. Check **% remaining on battery** (should be close to 100%).
   d. Check built-in **transmitter settings**.

8. Observe **LED Status Light** and verify built in transmitter operation (see "Status Light Flashes", on page 165 for expected flash sequence/colour).

9. Put receiver back in **Suspend Mode** if not immediately deploying.

10. If immediately deploying, keep receiver in **Record Mode** and see "In-Air Test", on page 29 for instructions on performing in-air test with transmitter.

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HR2 Specifications

For more information, consult the **HR2 Receiver Data Sheet**.

HR2 Specifications	
Dimensions	40 cm (15.9") x 10 cm (3.9") diameter
Weight (in-air)	w **Lithium-metal** battery: 2.88 kg w **Alkaline** battery: 3.16 kg
Receiver Frequency	180 kHz
Battery Life	**Lithium-metal**: Approximately 6 months **Alkaline**: Approximately 2 months
Data Capacity and Type	PPM/HR: (170,000,000 detections)
Operating Temperature	-5°C to +40 °C; Water must not freeze.
Maximum Depth	300 meters (440 psi)
PC Software	**Fathom**
Communication	Cable (RS-485 up to 12 Mbps)
External power supply (optional)	10-30 VDC
Typical Power consumption (external, @12V)	Record mode 7.5mA @ 12V Data offload 15-30mA @ 12V
Diagnostics	Transmitted signal strength, receiver noise, tilt, rotation, temperature, battery capacity, etc.
Transponding	2-way acoustic communications between the HR2 and the researcher at the surface (requires a VR100-200 Deck Box and 180 kHz transponding hydrophone, both sold separately)

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chapters start on right (odd number) pages.

HR2 Factory Settings

These are the factory settings used, when the receiver is **shipped**, or a **Factory Reset** operation is performed.

HR2 Factory Settings	
Receiver Mode	Suspended (not recording)
Transmitter state	Enabled
Transmit Profile	Sync Tag (HR 25-35s, PPM 270-330s)
Transmit Power	High

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HR2 Data Export Detection Filters D

Fathom uses some filtering criteria on detection data from HR2 receivers when they are converted from VDAT to CSV format.

D.1 Quality Score Filter

Only HR detections with a Quality Score of **3 or higher** are included in the CSV output. This is to help *minimize the number of false detections* that appear in the CSV file. In systems with high numbers of animals present and in highly reflective acoustic environments, detection data could become *cluttered* with high numbers of false detections. This filter minimizes the inclusion of poor quality data in the output file, and keeps the CSV file sizes as small as possible.

D.2 HR Residency Filter

A **second** filter that is applied to HR Detection data upon conversion from VDAT to CSV is the **HR Residency Filter**. This filter *rejects* HR detections of a given ID that are *not duplicated within one hour of each other*. While false HR detections can be relatively common in some acoustic environments, they do not typically repeat themselves within short periods of time. The purpose of this filter is to *minimize the number of false detections* appearing in the CSV output.

The number of detections discarded by the HR Residency filter and the Quality Score filter is listed in the DET_FILTER record in your CSV file under the filter name "HR Combined", in the **Rejected Detections** column.

	A	B	C	D
1	VEMCO DATA LOG	1.0.0	vdatapi-2.1.1-20171127-07e8c0-release	
2	RECORD TYPE	FIELD	FIELD	FIELD	F
16	DET_FILTER_DESC	Filter Name	Details	Rejected Detections
623	DET_FILTER	HR Combined	All enabled filters	69

Figure D-1: Filtered/Rejected Detections

The filters described above are not applied to the *live views* (**Live Tiles**, **Live Detections**, and **Status** tabs) in Fathom when connected to an HR2 receiver.

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More About Help

<div style="float:right; background:#b4cf3a; padding:1em; font-size:2em; font-weight:bold;">E</div>

Fathom provides you with a full set of Help tools. Whether you access **Help** from the **Help** icon in the top toolbar, or use **Context-Sensitive Help (CSH)** by clicking the **CSH** ⑦ icon in specific panels, take time to figure out how the following tools can assist you in making the most of the Help.

This Section Contains Information On The Following:

- Tour of the Help workspace
- Navigation Tabs (TOC, Glossary, Quick Start)
- Navigation Tools in Topics
- Using the Search Tool

E.1 Tour of the Help Workspace

Take a moment to get familiar with the Help workspace. It will allow you to find answers quicker when consulting Help.

E.1.1 Main Areas Of The Help Workspace

The Help's user interface consists of four (4) main areas:

- **Navigation pane (1) -** The left side of the Help interface is the location for the **Table of Content**, *Glossary*, and *Quick Start Topics* help tabs.
- **Search Tool (2)**- The top right corner provides your *Search Tool*, where you can type in search criteria and get a list of topics found results (see "Using the Search Tool", on page 193).
- **Top Toolbar (3) -** The top portion of the Help interface is the toolbar location, for the different help navigation buttons (see "Help Top Toolbar", on page 192).
- **Topic Viewing pane (4) -** The Topic Viewing pane is the main area of the Help interface, where all *topic content* is displayed.
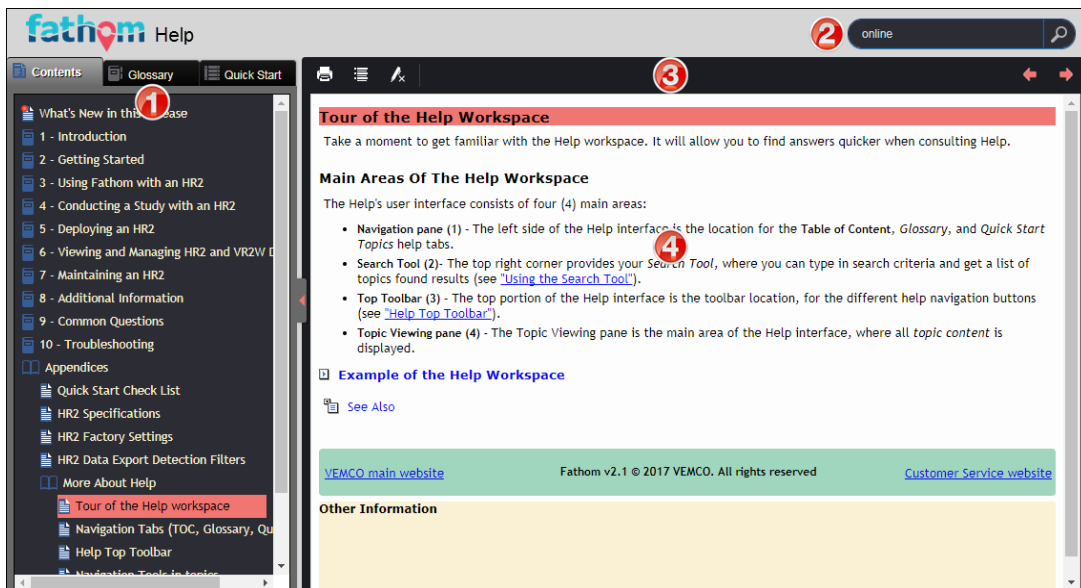
Example of the Help Workspace

Figure E-1: The Help Workspace

E.2 Help Navigation Pane Tabs

When you access the full Help by clicking the main **Help** button, the *Table of Contents*, *Glossary*, and *Quick Start* navigation tabs are visible. These provide quick and easy access to *topics* and *keywords* about your **HR2** receiver and **Fathom** software.

Click on any of the **tabs** to access the feature.

E.2.1 Using The Navigation Pane

To use the navigation pane tabs, the **Navigation Pane** must be displayed. If it is currently hidden, on the middle left side of the Help window, click the **red** arrow tab to *display* the navigation pane (Table of Contents and other items). Hiding the navigation pane provides more viewing space for the topics you want to consult.

E.2.2 Table Of Contents (TOC) Tab

The Help TOC is organized and displayed as a series of chapters, represented by *closed* and *open* **Book icons** ▤ / 📖 , and topics, represented by a **Topic icon** 📄 .

The TOC feature displays these books in the same order that they appear in the printed documentation form (PDF). It provides an overall outline and organization of the Help system.

1. To **open (or close) a book**, click on the book or the book title. The sub-topics it contains are then listed/displayed below.

2. To **view a topic**, click on the topic title. The topic is displayed in the topic viewing pane.

E.2.3 Glossary Tab

A glossary is a feature added to help users understand the meaning of individual terms.

The Help Glossary helps you understand the meaning of individual terms used within or relating to your HR2 Receiver and Fathom software. It is organized and displayed in alphabetical order.

Click a glossary term to see its definition in two ways:

1. Click the term in the **Glossary** tab.

2. You can click the term in individual topics (if you specify that glossary terms should be converted to links).

E.2.4 Quick Start Topics Tab

Quick Start Topics are topics that have been organized for quick access, in a specific order. While the TOC covers all of the functionality of the **HR2** receiver and **Fathom** software, you may not want to navigate through it to find how to perform some common tasks. You can benefit from quick start topics that take you directly to a "*How Do I do this or that?*" process.

E.3 Help Top Toolbar

The Help **Toolbar** buttons allow you to perform operations such as printing topics, saving topics to your favorites list, and so on.
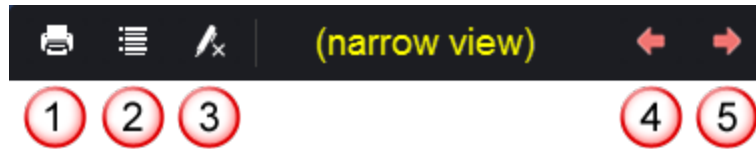

Figure E-2: The Help toolbar

Use these buttons to perform the following:

1. **Print** - Click this button to *print* the currently viewed topic.

   > When you want to print a topic that contains *drop-down sections* of text (you normally click on a "title" that "drops down" a block of information), click **Expand All** first (see below). This will ensure that all of the text is displayed on the pages you are printing.

2. **Expand All/Collapse All** - When the topic contains "hidden" content, such as in *drop-down boxes* or *expanding text* features, click the **Expand All** button to *open all* of them in one action. To *collapse* them back again, click the same button ("Collapse All") again.

3. **Remove Search Highlighting** - After performing a search and then selecting a topic from the search results, the keyword used in your search appears highlighted where it is found throughout the topic. To *remove* the highlighting, click this button.

4. **Back (left-pointing double arrows)** - After navigating forward two or more topics, click this button to return to the *previous* topic viewed.

5. **Forward (right-pointing double arrows)** - After navigating backwards through topics by using the **Back** button, click this button to go to the *next* topic in a previously viewed sequence.

E.4 Topic Navigation Tools

Topic navigation tools provide a way to reduce the scrolling size of a Help topic, by using tools such as drop-down text, expanding text and togglers. See the main content only, or click on these to access more of the information available, such as definitions, images, and examples.

E.4.1 Chapter Mini Table Of Content

A chapter **mini table of content** displays the main topic levels in the chapter. The first page of each chapter contains one.

E.4.2 Toggler (Help Only, Appears Inline In PDF)

A **toggler** is used to provide a quick example image (such as a button to click), where the keyword might be in the middle of a sentence. Clicking on the toggler shows/hides the image.

E.4.3 Drop-down Text (Help Only, Appears Inline In PDF)

Access **Drop-Down text** by clicking on highlighted text: the hidden text "drops down" and is displayed. This can be used to *hide* or *show* an image/screenshot, with or without additional text, or long lists or procedures.

E.4.4 Expanding Text (Help Only, Appears Inline In PDF)

Access **Expanding text** by clicking on highlighted text: a definition or more details about the text "expands" to the right of the highlighted text after the click. To **close**, simply click the highlighted text again.

E.5 Using the Search Tool

The full-text **Search** feature allows you to search every topic in the Help system for a *word* or *phrase*. When you want to find information about a specific subject, simply enter keywords in the **Search** field. A search engine looks through every topic. When it finds the terms, it presents you with a list of topics to choose from and open. Search results are *ranked*, not listed alphabetically.

While the **Index** feature provides a sequential search of partial or full indexed keywords only, the **Search** feature finds topics that contain the *actual word or phrase* sought.

1. In the **Search** field, type in the keyword.

2. Click **Search** (or press ENTER) to perform the search.

3. Select the topic you wish to view by clicking on it. The topic is displayed, with **search highlighting** on the search text you had entered that is present in the topic.

4. To *remove* the search highlighting, click the **Remove Search Highlighting** button.

> Take time to explore and try out the various search features of the **HR2** receiver and **Fathom** software Help. Once you are used to them, you will be able to quickly return to specific information about your products.

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Open Source Licenses

Fathom makes use **open-source software**[1] components. It is required to list these within the product.

To view the open-source components and their licenses

1. In the **About Fathom** window, click **Open-source licenses**.
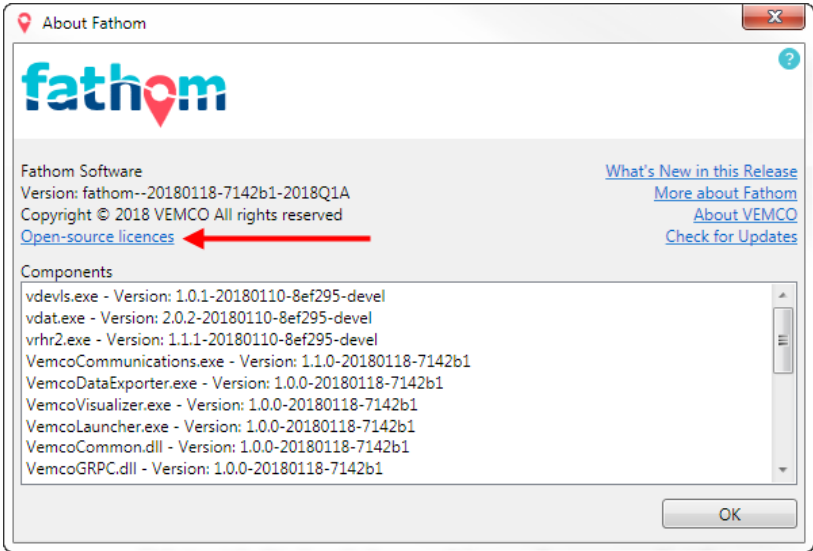
Figure F-1: The open-source licenses[2] link in the About Fathom window

2. The **Open-Source Licenses** window appears.

---

[1]Open source software is software with source code that anyone can inspect, modify, and enhance.

[2]Open source licenses are licenses that comply with the Open Source Definition — in brief, they allow software to be freely used, modified, and shared. To be approved by the Open Source Initiative (also known as the OSI), a license must go through the Open Source Initiative's license review process.

195
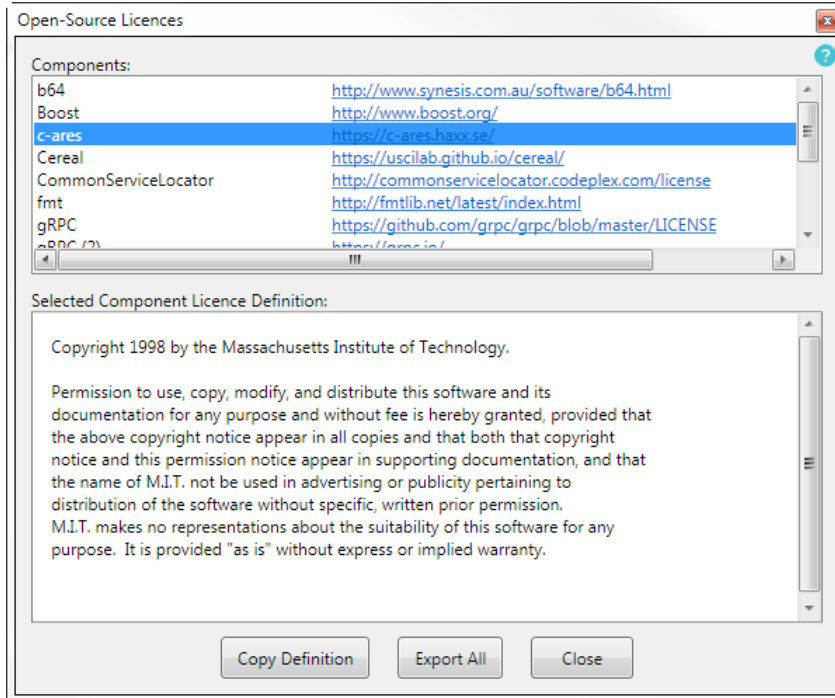
Figure F-2: Open-Source License window and listing

3. Select a component from the list. The **Selected Component License Definition** is displayed.

   NOTE: (for developers) If you wish to export all of the open-source license information, just click the **Export All** button. The file will be saved as a **markdown**[1] file (`.md`).

---

[1]Markdown is a lightweight markup language with plain text formatting syntax. It is designed so that it can be converted to HTML and many other formats using a tool by the same name. Markdown is often used to format readme files, for writing messages in online discussion forums, and to create rich text using a plain text editor.

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Warranty and Disclaimer

AMIRIX Systems Inc.

Warranty and Disclaimer

WARRANTY

AMIRIX Systems Inc., doing business under its trade name VEMCO, provides a one (1) year warranty period for the Product from date of shipment.

VEMCO warrants that on the date of shipment all Products manufactured by VEMCO are free from defects in material and workmanship under normal use and service. This warranty applies to the components necessary for equipment upgrades, i.e. the VR1/VR2 to VR2W upgrade. With respect to transmitter products, while VEMCO is able to predict battery life with some certainty, VEMCO cannot guarantee that these Products will remain functional while submerged for extended periods of time. This warranty does not apply to any equipment, materials or design supplied by Buyer or a third party; re-battery services provided by VEMCO; Products for which VEMCO has not received payment; problems that results from: external causes such as accident, abuse, misuse; servicing not authorized by VEMCO; usage not in accordance with Product instructions; failure to follow the Product instructions or failure to perform preventative maintenance; usage of accessories, parts or components not supplied by VEMCO.

This warranty shall survive delivery only on the conditions and subject to the limitations set forth below.

NOTICE PERIODS

To receive a warranty remedy for a Product, Buyer must contact VEMCO's Customer Support Department during the warranty period to receive the Return Material Authorization ("RMA") instructions. Each defective Product returned for warranty remedy must be shipped at the Buyer's expense according to the RMA instructions and must include reasonable proof that the claimed defect is due to a matter embraced within the warranty set forth above and that such defect did not result from any act or omission of Buyer, including but not limited to any failure to operate and maintain the Product in accordance with VEMCO's applicable written instructions.

REMEDY

VEMCO's liability, and the Buyer's exclusive remedy under this warranty, as to a defect in material or workmanship, is limited to the repair of such defect in the accessory, equipment or part in which the defect appears or, at VEMCO's option, to the replacement of such accessory, equipment or part with a similar item free from defect. As to any item repaired by VEMCO or furnished as a replacement by VEMCO, VEMCO's liability and the Buyer's exclusive remedy to the repair or replacement of such item for any further defect in material or workmanship, provided VEMCO receives written notice at Halifax, Nova Scotia, of such further defect from BUYER within ninety (90) days after the repaired or replaced item is shipped to BUYER and provided that BUYER returns same to VEMCO as provided under "Notice Periods".

RETURNED ITEMS

All repairs, replacements and corrections described above shall be performed by VEMCO at its plant at Halifax, Nova Scotia, or at such other place as may be mutually agreeable, and with reasonable care and dispatch in order that the Product, accessory, equipment or part will not be kept out of service longer than necessary. Return to BUYER of a repaired, replacement, or corrected accessory, equipment, part or Product shall be at VEMCO's expense. Title to and risk of loss of the Product, accessory, equipment, or part returned to VEMCO pursuant hereto shall at all times remain with the BUYER, except that title to a returned accessory, equipment, part, or Product shall pass to VEMCO concurrently with shipment to BUYER of any item furnished by VEMCO to BUYER as a replacement therefore. VEMCO shall have only such responsibility for any Product, accessory, equipment, or part owned by the BUYER and in the possession of VEMCO as is chargeable by law to a bailee for hire, but shall not be chargeable for loss of use thereof.

WEAR AND TEAR

Normal wear and tear and the need for regular maintenance shall not constitute a defect under this warranty.

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NEGOTIATED AGREEMENT

It is fully understood by the parties that the price of the Product and other mutual agreements of the parties set forth in this agreement were arrived at in consideration of this warranty, SPECIFICALLY INCLUDING THE WAIVER, RELEASE AND RENUNCIATION BY BUYER SET FORTH ABOVE (DISCLAIMER AND RELEASE).

Glossary

C

Context-sensitive help
Context-sensitive help (CSH) provides information for the specific feature that you are currently using.

corrected time
Upon export to CSV format, all data records are automatically corrected for receiver clock drift by the Fathom software. Fathom uses the difference between your receiver's clock and the UTC time calculated from your PC clock at offload to calculate corrected times for each record in the receiver log. If the receiver clock was also adjusted during deployment (for example, using an external device to periodically send time corrections to a cabled receiver), then these adjustments are also used in the calculation of corrected times.

F

firmware
Software (programs or data) that has been written onto read-only memory (ROM). Firmware is a combination of software and hardware.

G

glossary
An alphabetical list of technical terms in some specialized field of knowledge; usually published as an appendix to a text on that field

H

HR
High Residence (HR) is a VEMCO technology that allows for the reliable detection of hundreds of animals in a particular location at one time. Each transmitter carries a unique ID and can be programmed to transmit as quickly as once per second while keeping transmission collision rates to a minimum. HR transmitters can also be programmed with traditional PPM coding, and are thus compatible with both VEMCO HR2 receivers and 180 kHz VR2Ws.

Hydrophone
An underwater microphone that will listen to, or pick up, acoustic signals. A hydrophone converts acoustic energy into electrical energy and is used in passive underwater systems to listen.

I

initializing
Initializing (a receiver) - Process of setting the receiver's clock, clearing the receiver's memory, and starting a new study.

M

Markdown
Markdown is a lightweight markup language with plain text formatting syntax. It is designed so that it can be converted to HTML and many other formats using a tool by the same name. Markdown is often used to format readme files, for writing messages in online discussion forums, and to create rich text using a plain text editor.

O

open-source license

Open source licenses are licenses that comply with the Open Source Definition — in brief, they allow software to be freely used, modified, and shared. To be approved by the Open Source Initiative (also known as the OSI), a license must go through the Open Source Initiative's license review process.

open-source software

Open source software is software with source code that anyone can inspect, modify, and enhance.

P

PPM

Pulse Position Modulation (PPM) is a signal modulation technique that allows computers to share data by measuring the time each data packet takes to reach the computer (transmitter to receiver).

Q

Quality Score

A measure of the quality of an HR detection, where 10 is excellent and 1 is poor. The quality score may be used to assist with filtering false detections out of a dataset. Detections with a quality score < 3 are filtered out upon export to CSV when using the Export Data application (HR detections on HR2 receivers only)

R

ROM

Acronym for Read-Only Memory. ROM is computer memory on which data has been pre-recorded. It retains its contents even when the computer is turned off.

U

UTC

Coordinated Universal Time is the primary time standard by which the world regulates clocks and time. Time zones around the world are expressed using positive or negative offsets from UTC, as in the list of time zones by UTC offset.

V

VDAT

VEMCO Data file (VDAT).VDAT files are binary files that cannot be altered, and therefore provide a permanent record of the data stored by the receiver.