fathom

HR2 RECEIVER AND SOFTWARE USER GUIDE

VERSION 1.1.0

AUGUST 12, 2016

vemco

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Contents

> 💡 **tip!** For the latest versions of user guides and software, visit our website.

> ⚠️ **WARNING:** If the HR2 is not used in the manner specified by the manufacturer, performance may be impaired.

What's New in this Release

Fathom 1.1.0 provides fixes to known issues in the previous version (if any), 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 Content.

New Features for version 1.1.0

VEMCO High Speed Offload Cable (HSOC)

To communicate with the HR2 receiver, Fathom uses a VEMCO high speed communication cable. The communication cable information is now described in its own topic.

Visualizing Data

You can now visualize the content of a VDAT file, using an option from the **Launcher** menu.

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Introduction

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 (VEMCO's traditional coding system) and HR (VEMCO's new High Residence coding system) transmissions from 180 kHz tags (transmitters).

HR2 receivers require the use of VEMCO's new **Fathom** software, developed to aid in preparing your receivers for deployment, and retrieving and exporting data when your study is complete.

This Section Contains Information On The Following:

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 **180kHz 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-Ion** battery: 2.88 kg w **Alkaline** battery: 3.16 kg
Receiver Frequency	180 kHz
Battery Life	**Lithium-Ion**: 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)*.

> ℹ️ **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 108.

1.2.1 HR2 Case Parts

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

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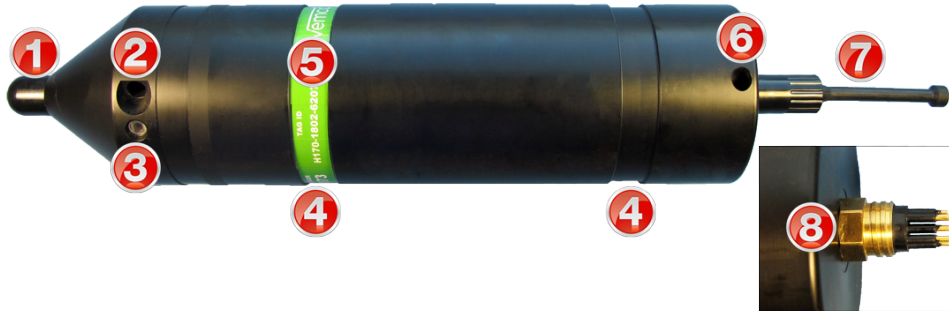
Figure 1-2: HR2 Receiver EXTERNAL case parts

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 99. 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 72.
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
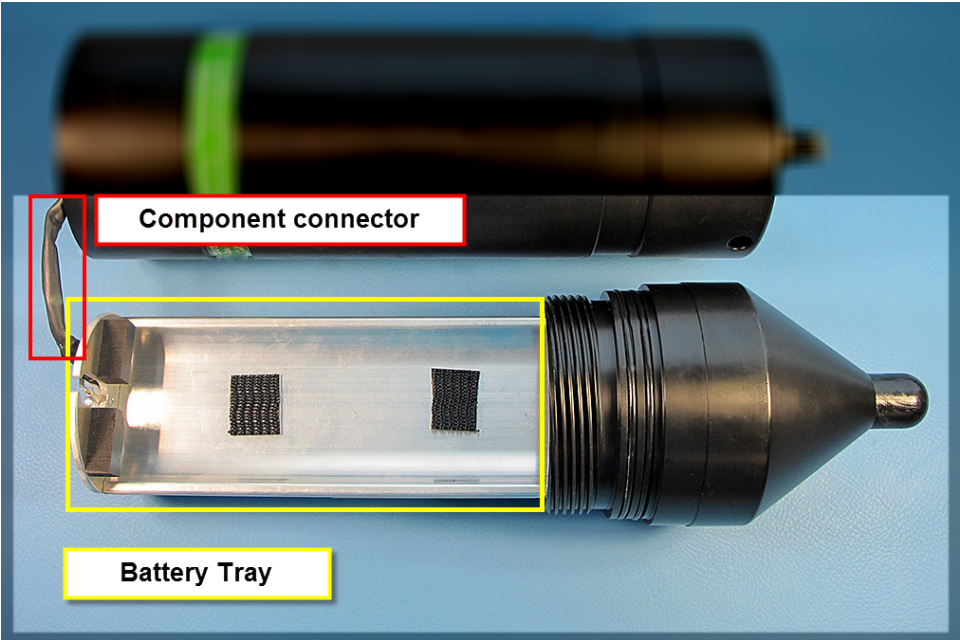
Figure 1-3: Opened HR2 Receiver INTERNAL parts (without battery pack)

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 63.

> ⚠ **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 54.

1.5 Fathom Software - Overview

The **Fathom** software has been developed to aid researchers in gathering and exporting acoustic detection data from VEMCO HR2 Receivers.

Fathom performs such tasks as retrieving receiver data files, setting the receiver's clock, clearing the receiver's memory, and exporting receiver data to CSV format. Fathom prepares your receivers for deployment and allows you to retrieve your data and export it when your study is complete.

We advise that you **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 7
- Windows 8
- Windows 10

1.5.2 What Can Fathom Do?

Through a cabled connection 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 **HR2** receiver user manual.

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.
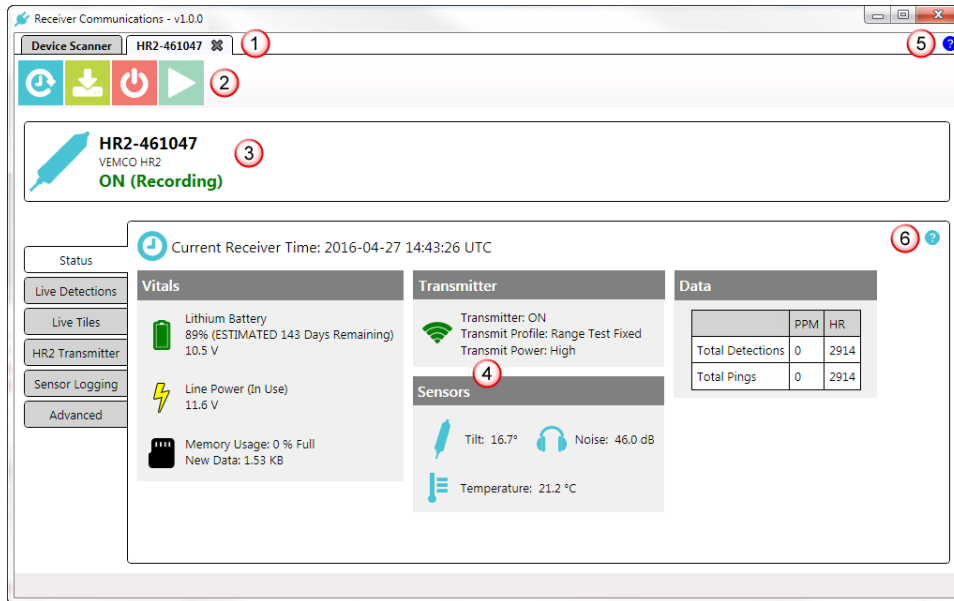
Figure 1-5: Fathom main UI view

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 25.

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 - Full Help - The **Full Help** icon provides access to the full Help system, for **Fathom** and your **HR2** receiver. For more information, see "More About Help", on page 119.

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 119.

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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).
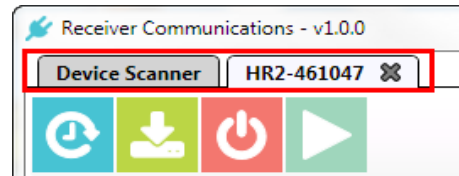
Figure 1-6: Device Scanner and Receiver hardware tabs

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 21.

- **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 23

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 25.

> **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.
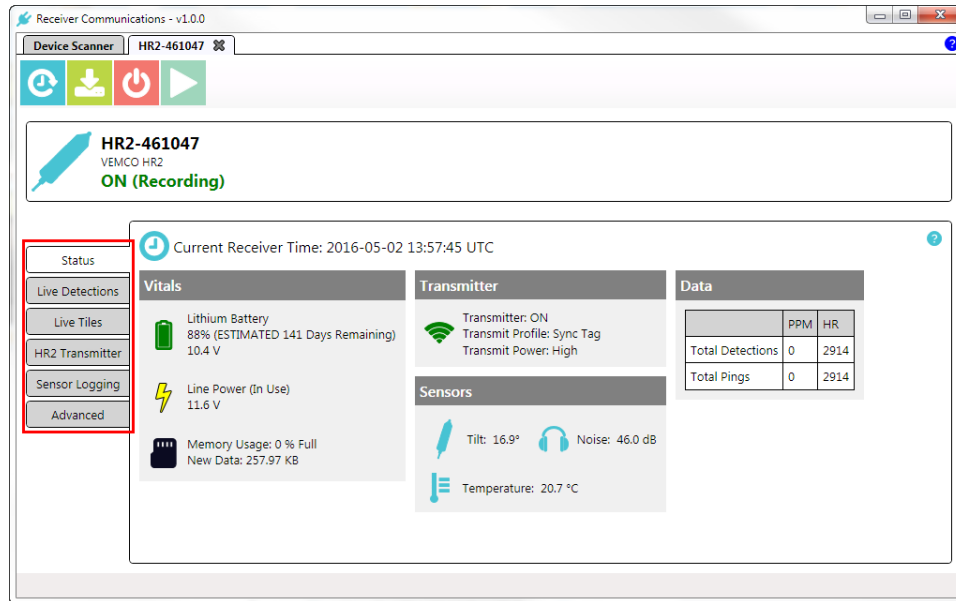
Figure 1-7: Software operation tabs

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 30.

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 32.

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 33.

HR2 Transmitter tab - The **HR2 Transmitter Tab** provides transmitter **identification information** and **configuration options**. For more information, see "HR2 Transmitter Tab", on page 39.

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 44.

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 46.

1.9 Getting Help

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

Online Help (within the software)

To access the Full 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 topic-specific help.

> tip! 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 119.

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.

> tip! The **Fathom** Help content and PDF Guide 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 **Online 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
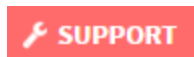
- **Phone:** 902-450-1700 extension 268 or 242.

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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** to start the **Fathom** software and click on the **Connect** icon.
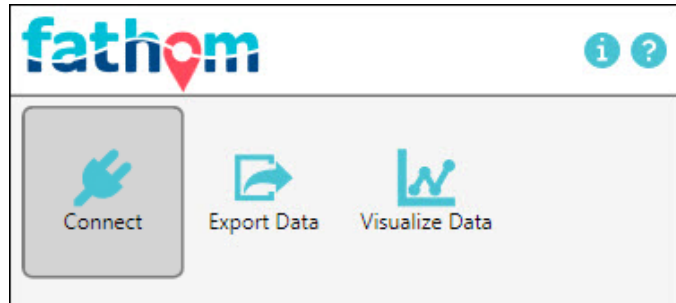
The **Receiver Communications** window appears. Available COM ports are automatically displayed.

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.
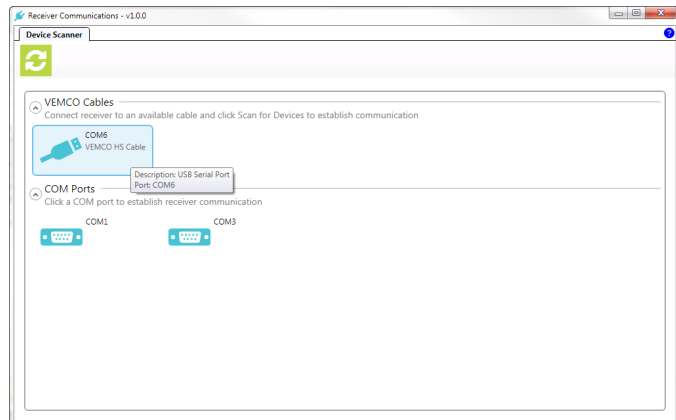
2.5 Device Scanner Tab

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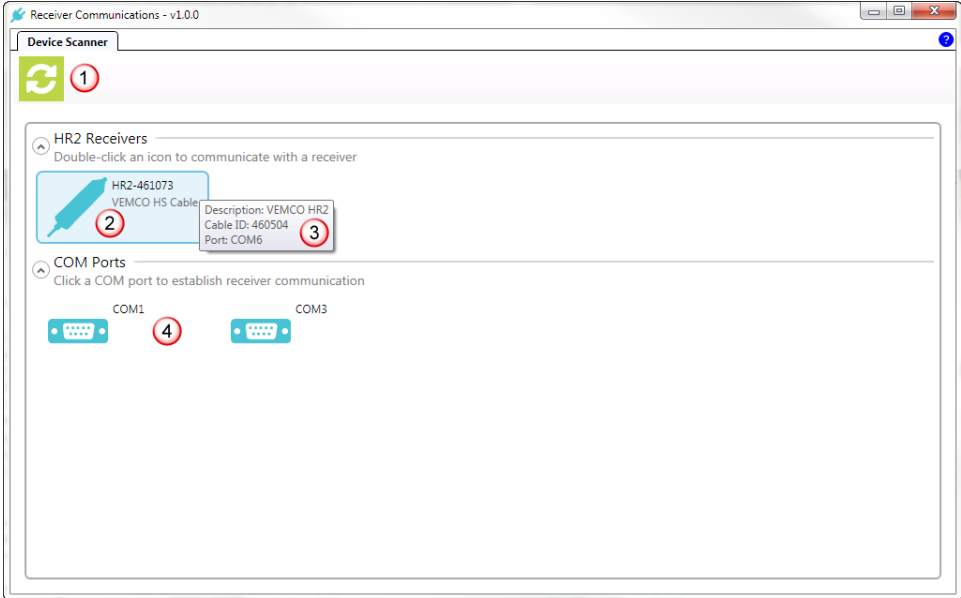
Figure 2-2: Device Scanner hardware tab

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.
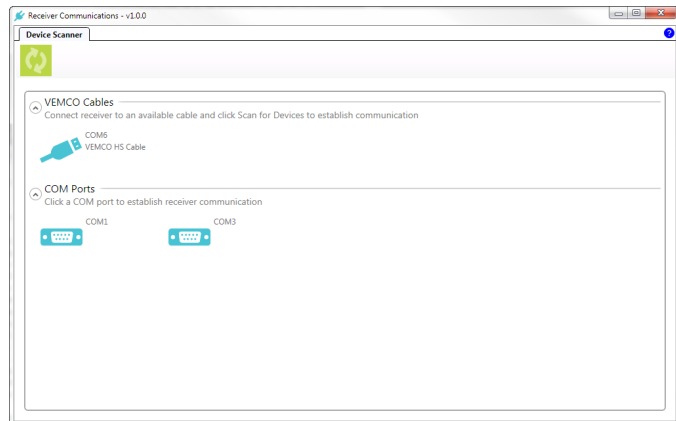
Step 2 - When a receiver is detected

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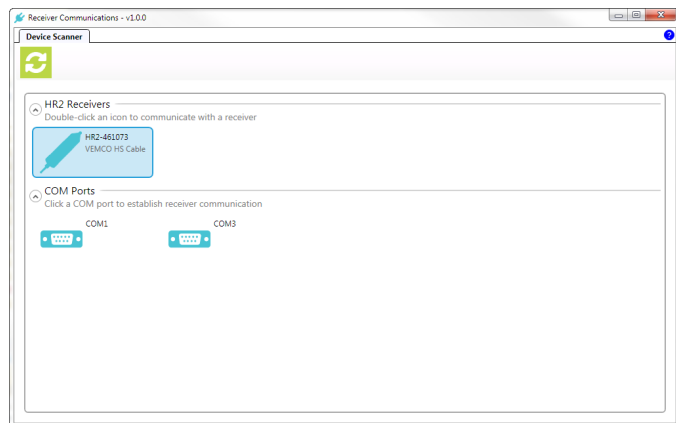
Step 3 - If no receiver is detected

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.
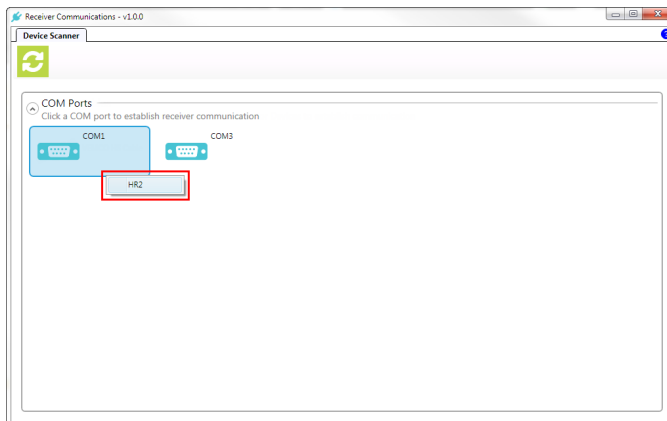
Step 4 - Displaying additional information

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.
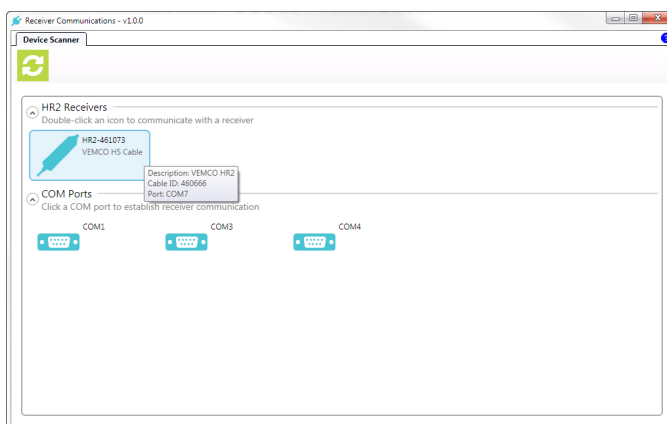
Step 5 - Establish communication

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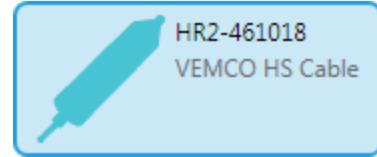
Step 6 - Information and Status tab

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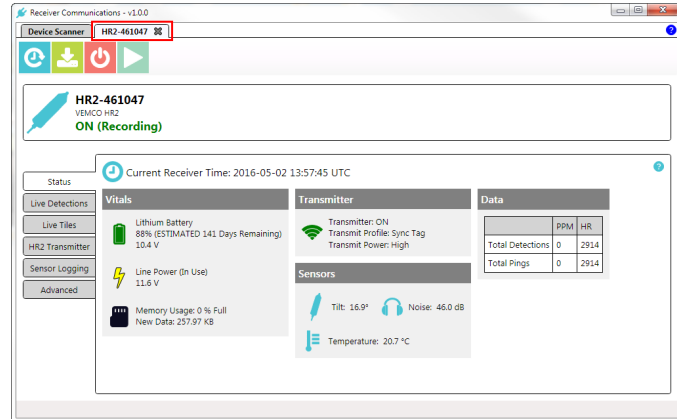
Fathom will select an appropriate communication speed (*session baud rate*) based on the cable you are using. If needed, the selected baud rate can be adjusted under the **Advanced tab**.

2.7 Receiver Tab

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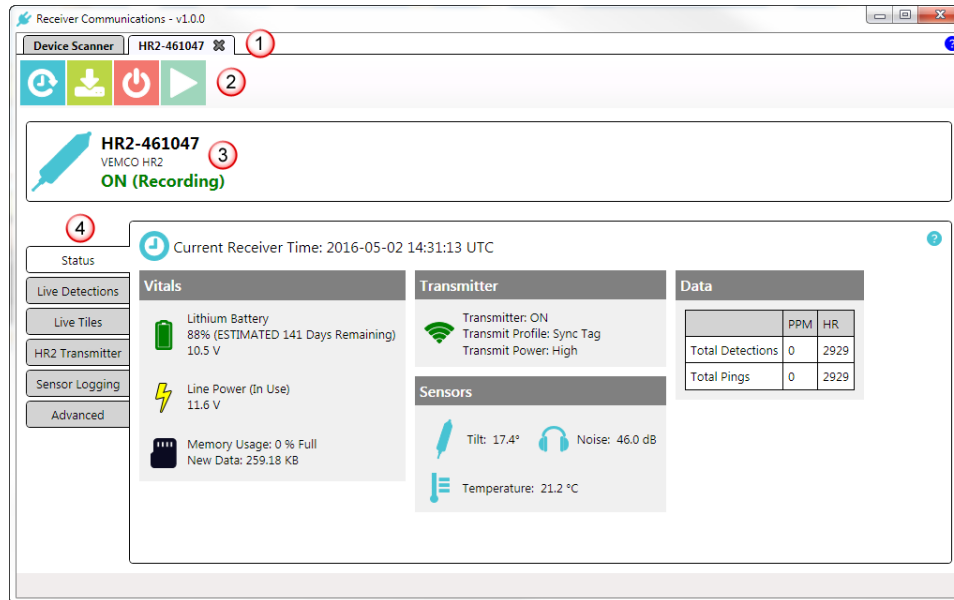
Figure 2-3: Receiver Tab

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, 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 a 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 facing 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 22).
4. Ensure receiver's built-in transmitter is **ON** (see "HR2 Transmitter Tab", on page 39).
5. Start a study (see "Starting a Study", on page 55).
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 99).

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 58).

11. Export the offloaded data to a CSV file (see "Exporting Data", on page 64) 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 63). To *start* recording at deployment time, bring the receiver out of **Suspend Mode** by starting a new study (see "Starting a Study", on page 55).

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.

Using Fathom

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.
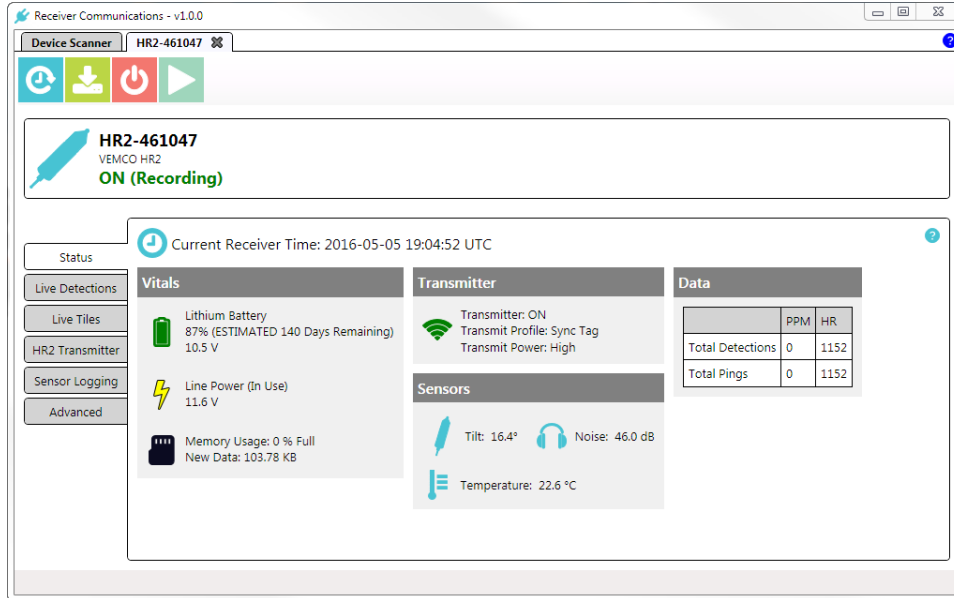
Figure 3-1: Status Tab

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-ion 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)

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[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

Total Detections

Displays total numbers of both 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

Total Pings

Displays the **total number of PPM pings** since the start of the study. The number of HR pings since initialization is the same as the number of HR detections since initialization, as reported under **Total Detections**.

3.2 Live Detections Tab

The **Live Detections Tab** displays the **Live Detection Monitor**. By default, detections are displayed in **UTC**[1] time.
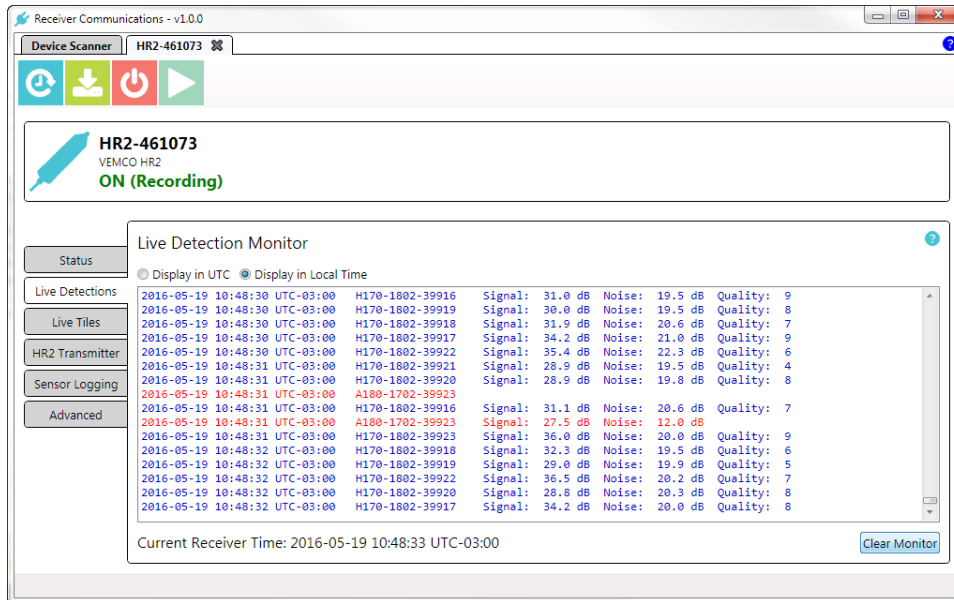
Figure 3-2: Live Tab and active Live Detection Monitor

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 o the **Live Detection Monitor** panel.
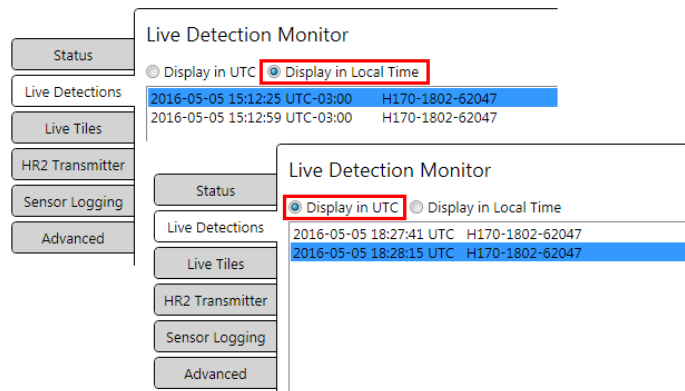
Figure 3-3: Live Tab receiver time display options

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[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.

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.
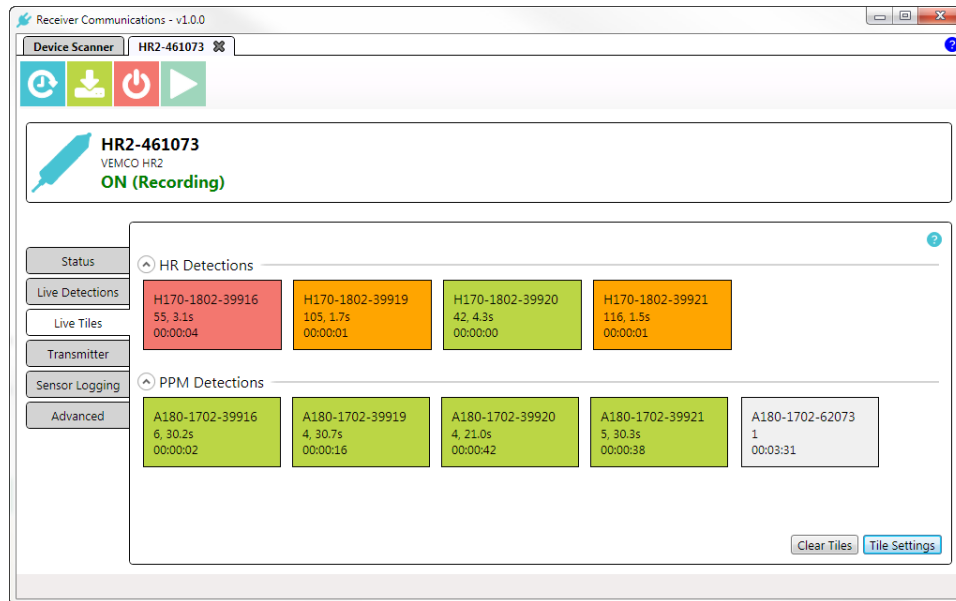
Figure 3-4: Live Tiles Tab

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.
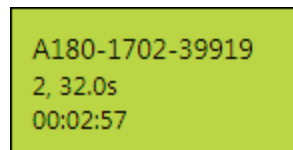
Figure 3-5: Sample Tile information

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.
- **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.

> 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.
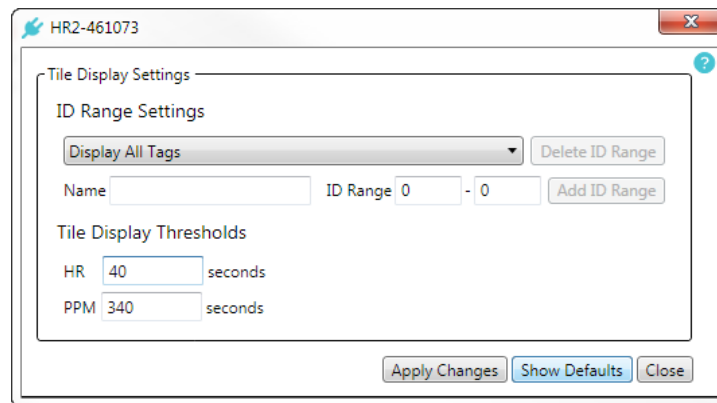
Figure 3-6: Live Tile Display Settings dialog box, using default settings

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.
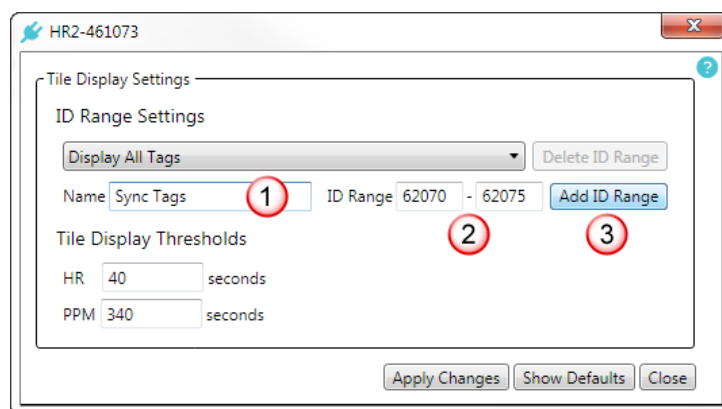
Figure 3-7: Setting up an ID Range or subset of tags

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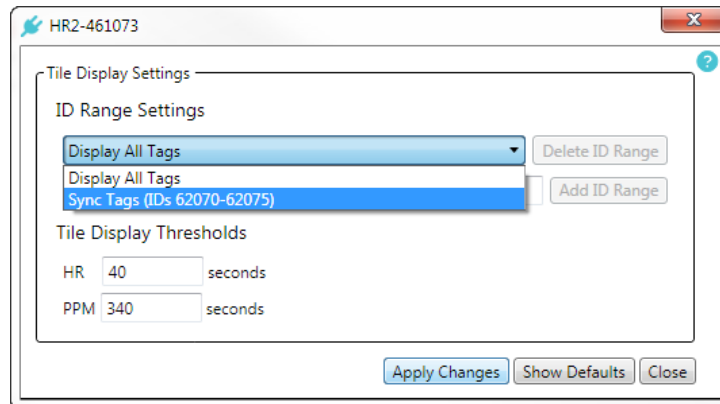
Figure 3-8: Selecting an ID Range or subset of tags for display

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.
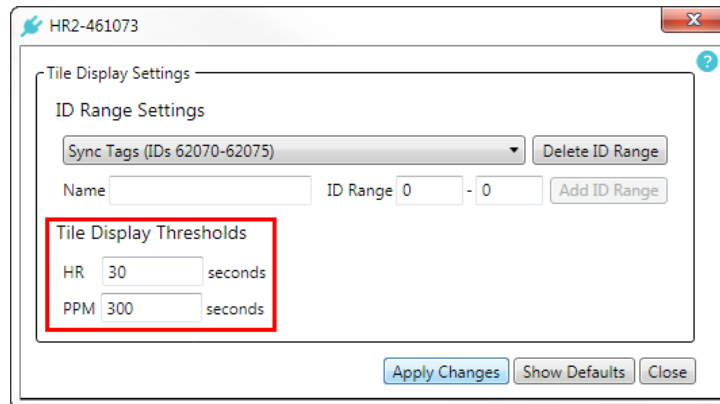
Figure 3-9: Setting the Tile Display Thresholds

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.
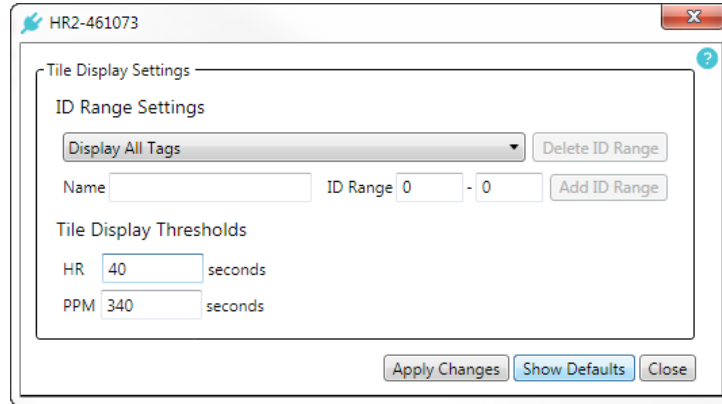
Figure 3-10: Showing the Tile Display Thresholds defaults

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**.
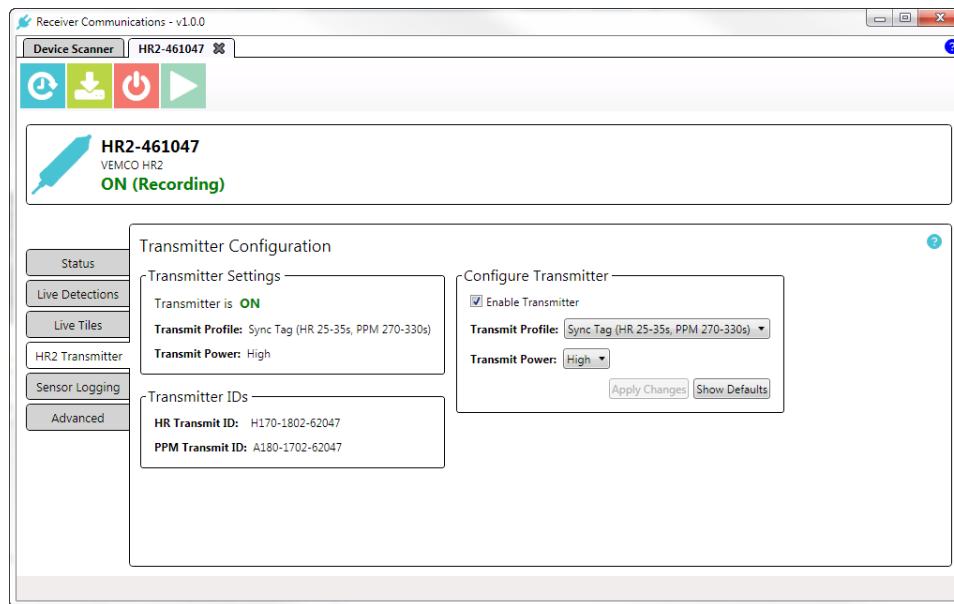
Figure 3-11: HR2 Transmitter tab and information

> **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, click **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.
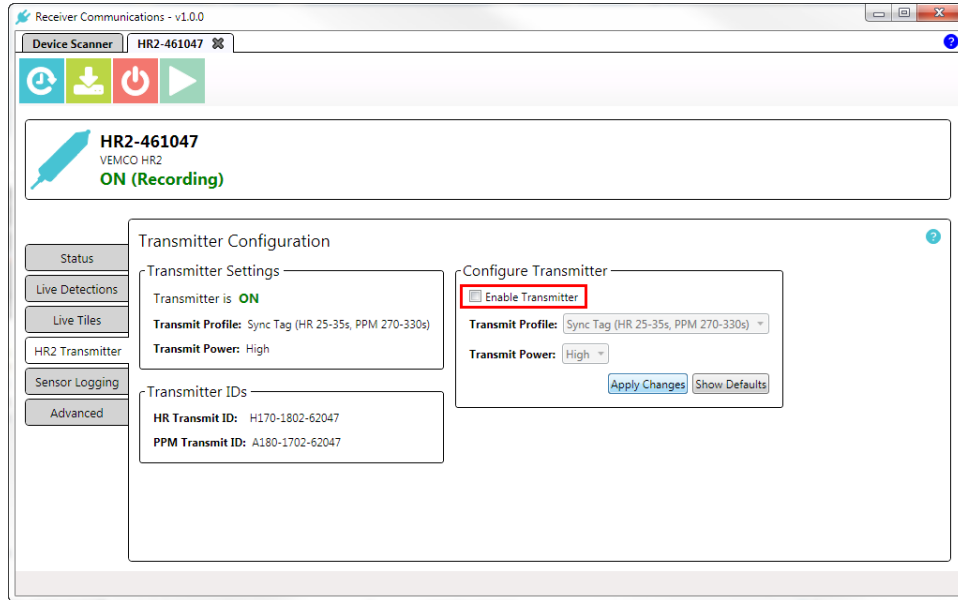
Figure 3-12: Enable Transmitter check box

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.

> *i* **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.
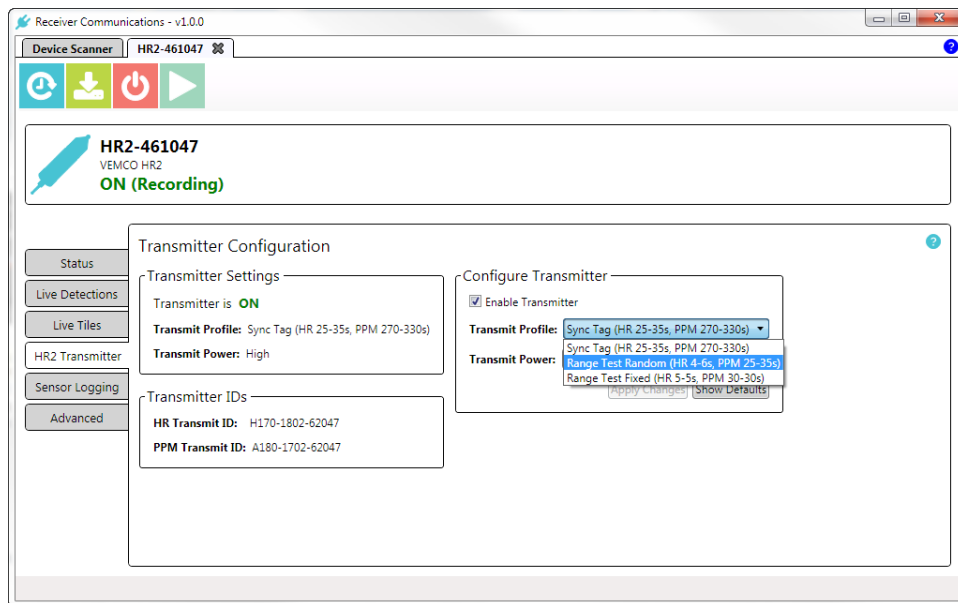
Figure 3-13: Transmit Profile options

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)
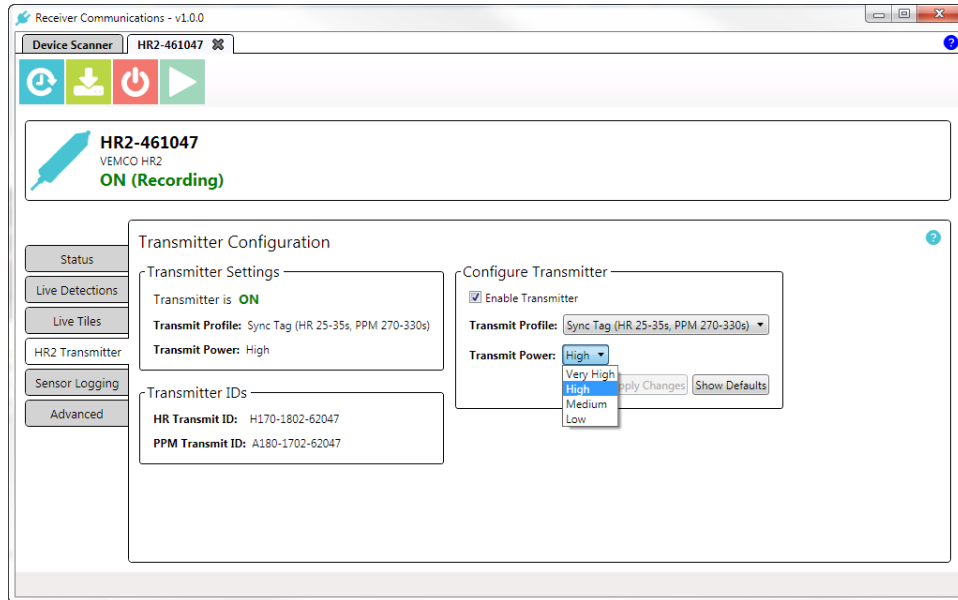
Figure 3-14: Transmit Power options

Applying changes

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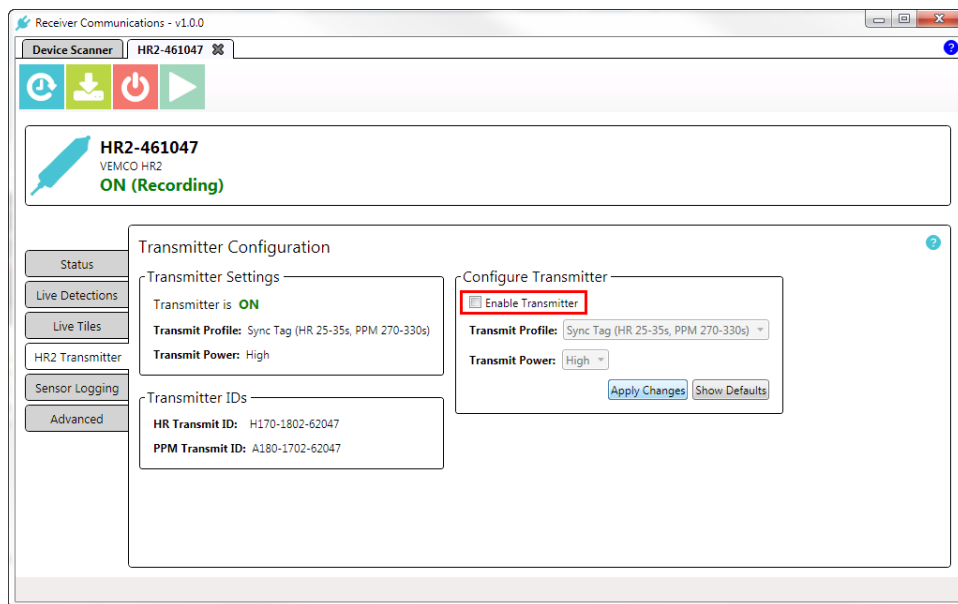
Figure 3-15: Applying Changes (disable Transmitter)

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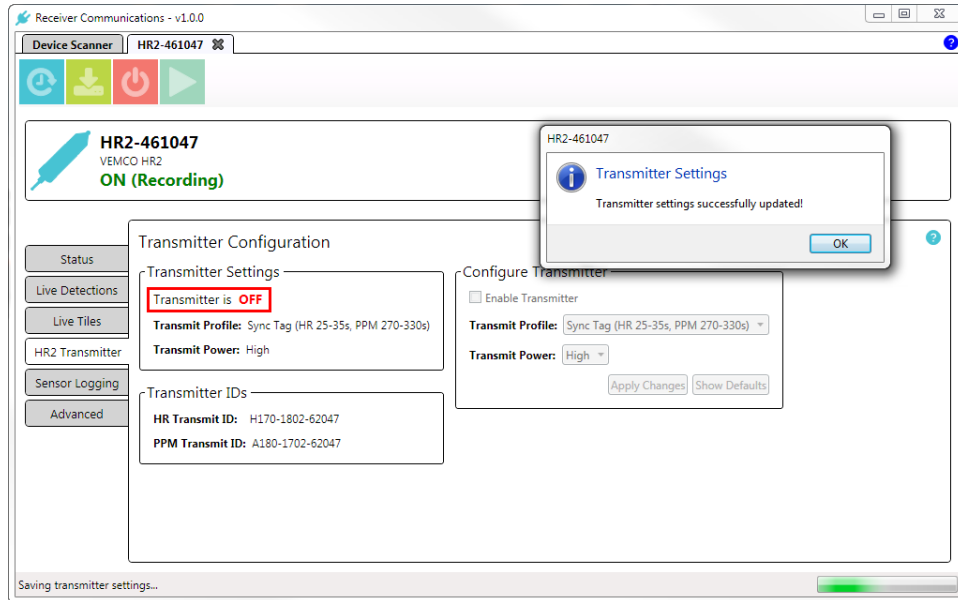
Figure 3-16: Transmitter is now OFF

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).
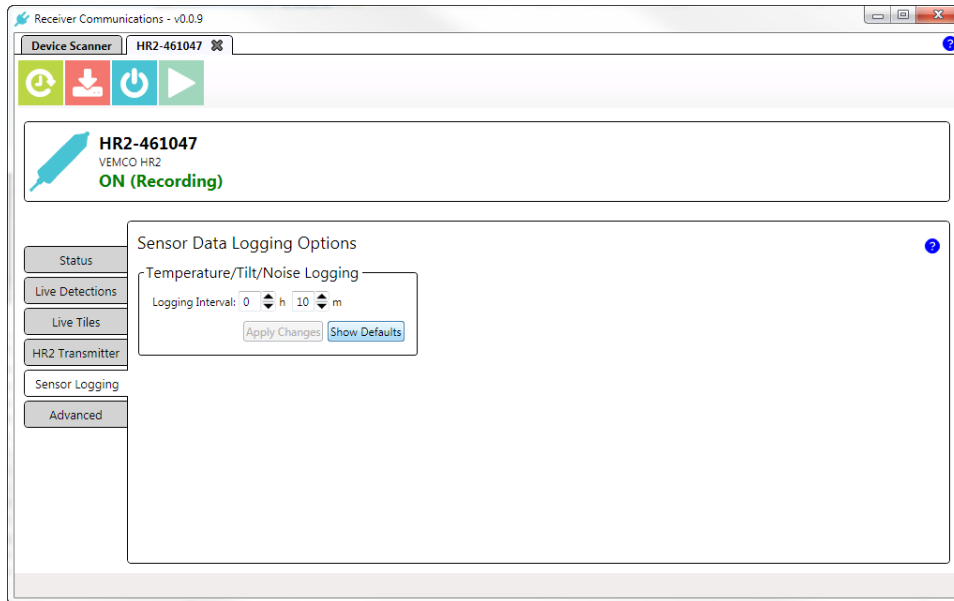
Figure 3-17: Sensor Logging Tab

Viewing the Default settings

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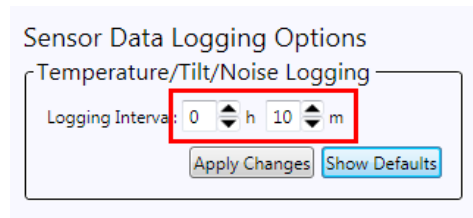
Figure 3-18: Showing the default settings

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**).
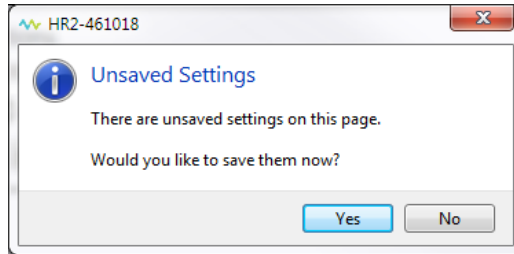
Figure 3-19: Unsaved Settings message

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.
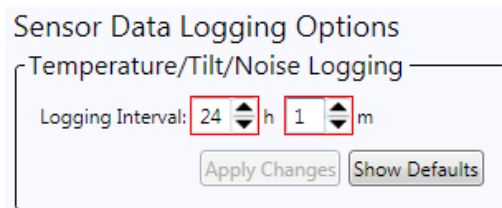
Figure 3-20: Invalid/outside acceptable values

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.
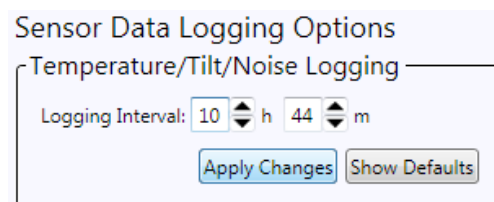
Figure 3-21: Applying Changes

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

3.6 Advanced Tab

The **Advanced Tab** displays **Hardware Configuration** information, and options for **Serial Communication** settings for your selected receiver.
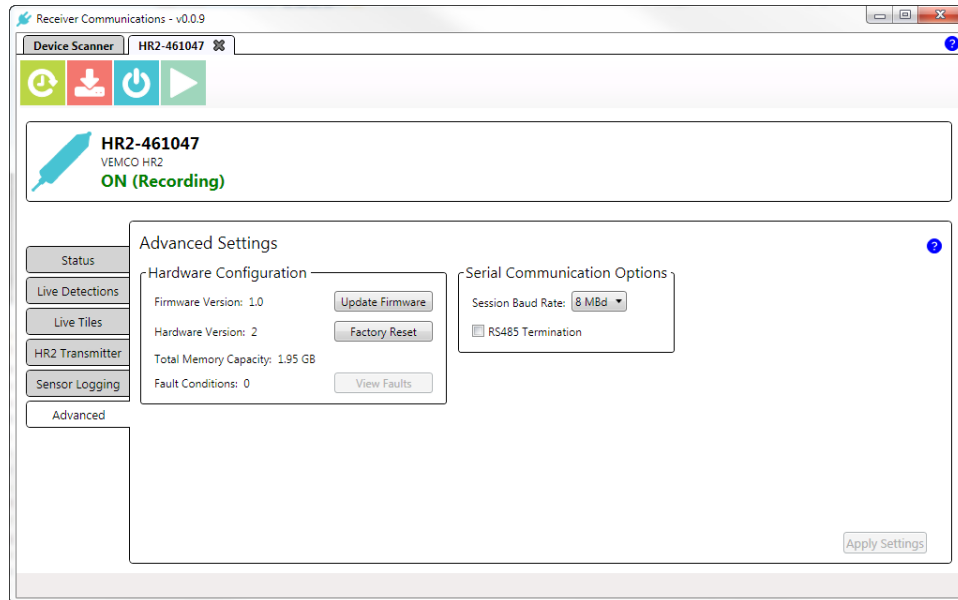
Figure 3-22: Advanced Tab

3.6.1 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
- **Total Memory Capacity** (memory capacity of the receiver)
- **Fault Conditions and Show Faults option** Displays the number of receiver faults (error conditions), if any currently exist.

Updating the Firmware

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**.

> *i* **IMPORTANT:** Has all the data been offloaded from the **HR2** receiver? Updating the firmware should not erase the data, but please take the precaution of offloading all data before updating.

Step 1 - Start Update Firmware process

In the **Hardware Configuration** section, click **Update Firmware**.
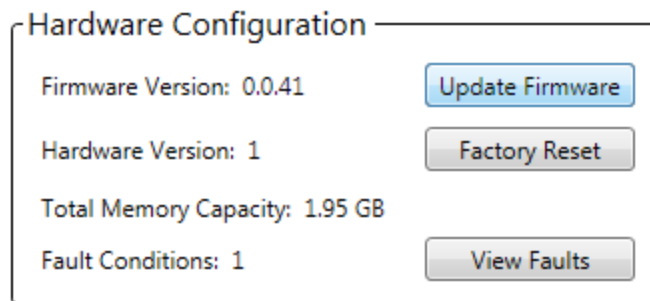
Figure 3-23: Update Firmware button

A **File Explorer** window opens.

Step 2 - Navigate to update file

Navigate to the location of the most recent firmware file on your computer, and **select it**. **HR2** receiver firmware files can be identified by the VFWP file extension, and are of this format: `vrhr2_*.vfwp`, where the asterisk represents the version.

Example: `vrhr2_1_0_0.vfwp` (version 1.0)
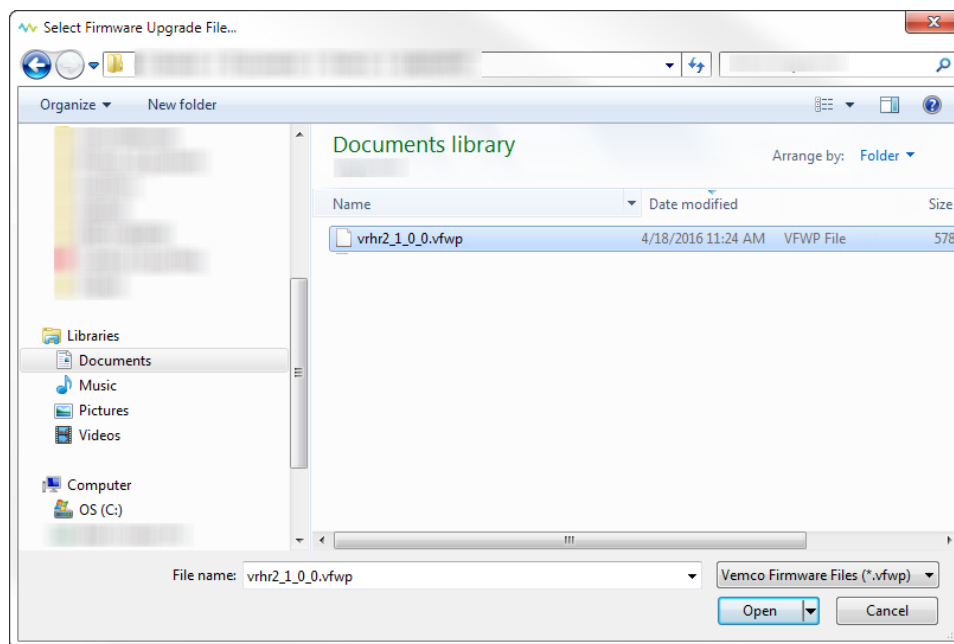
Figure 3-24: Locating and selecting an update firmware file

Step 3 - Open file to update

Click **Open** to use it and update the firmware on your receiver.

Once the update has completed, a **Write Firmware Success** message will confirm the success of the update.
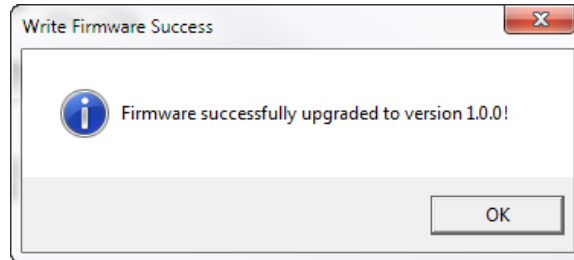
Figure 3-25: Successful firmware update message

Factory Reset

Use the **Factory Reset** option to return the **HR2** receiver to its original settings.
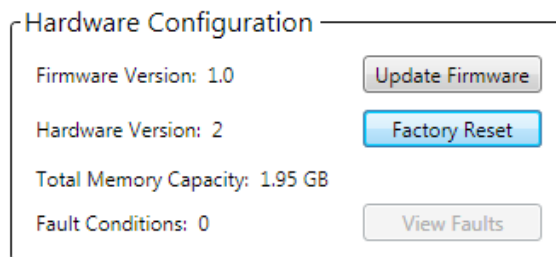
Figure 3-26: Factory Reset

Click **Factory Reset**. A reset operation warning appears.
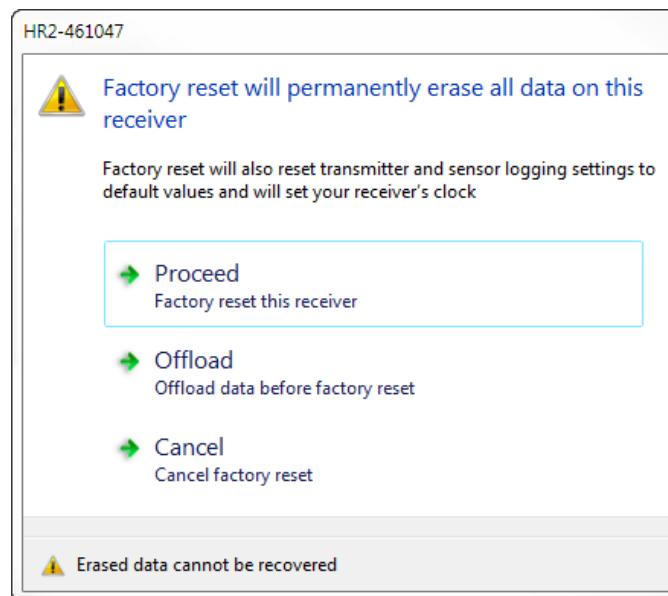
Figure 3-27: Factory Reset options

Consider the options carefully:

- **Proceed** - Will continue the reset operation, permanently erasing the data on the receiver, and returning the receiver to its factory settings.
- **Offload** - Will offload data off of the receiver first then proceed with the reset.
- **Cancel** - Will cancel the operation and return to the **Advanced** tab panel.

Click the desired option to continue.

Total Memory Capacity

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.

Faults

Upon connecting to an HR2 Receiver, Fathomperforms a check of the receiver's state. If any faults are found, you will be presented with a fault diagnosis message.
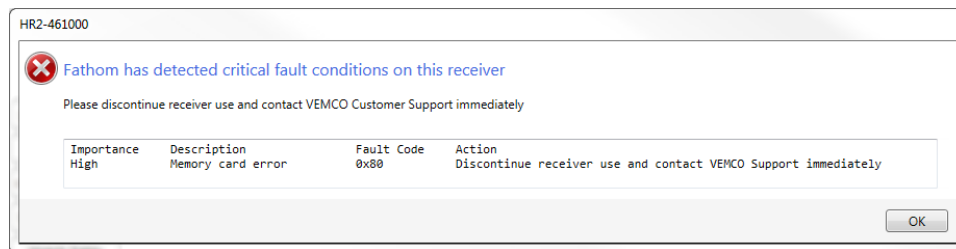
Figure 3-28: Sample startup fault condition message

> ⚠️ **WARNING:** This warning only appears on startup/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 startup fault warning message and return to the Fathom interface.

Viewing Faults

You may need to view faults again, when contacting Support.
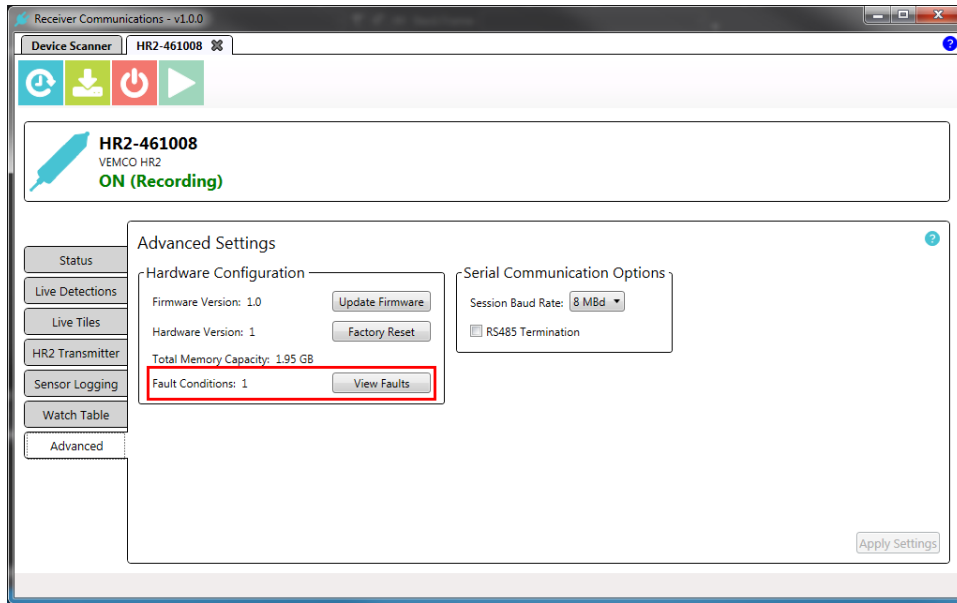
Figure 3-29: Advanced Settings displaying Faults Conditions

To view fault conditions, click **View Faults**. The **Current receiver faults** window appears.
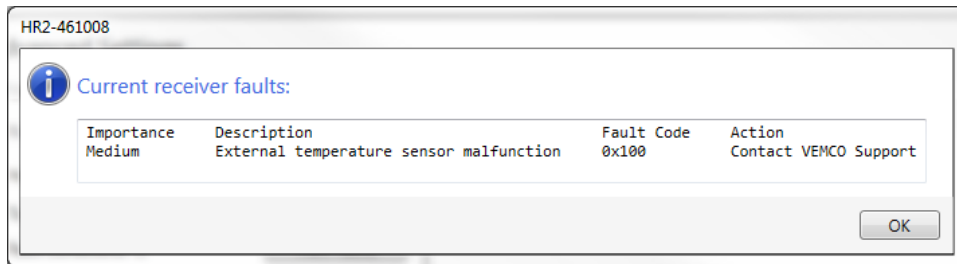
Figure 3-30: Sample receiver fault information

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**.

3.6.2 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.

Step 4 - Open the list

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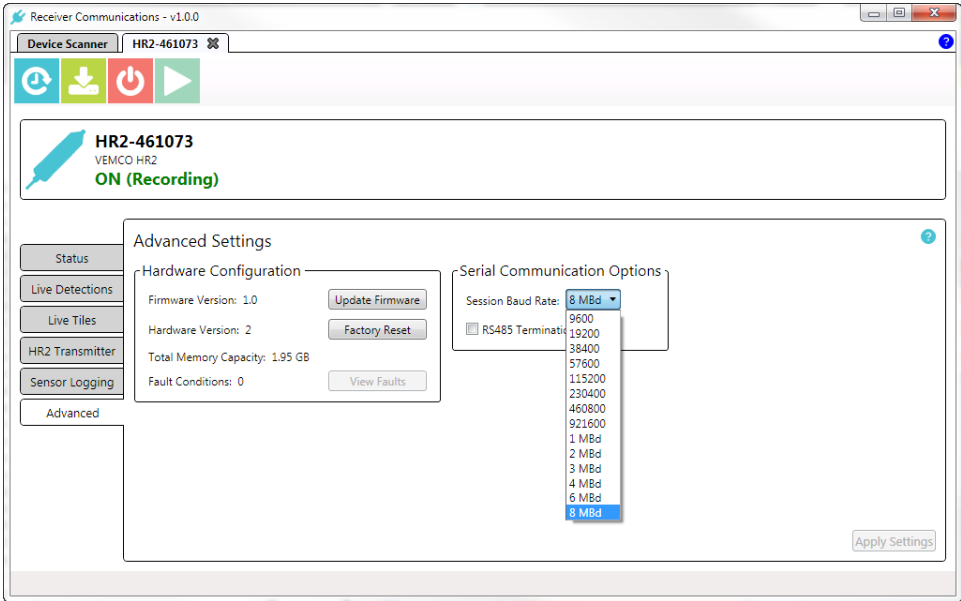
Figure 3-31: Session Baud Rate list

Step 5 - Select Baud Rate

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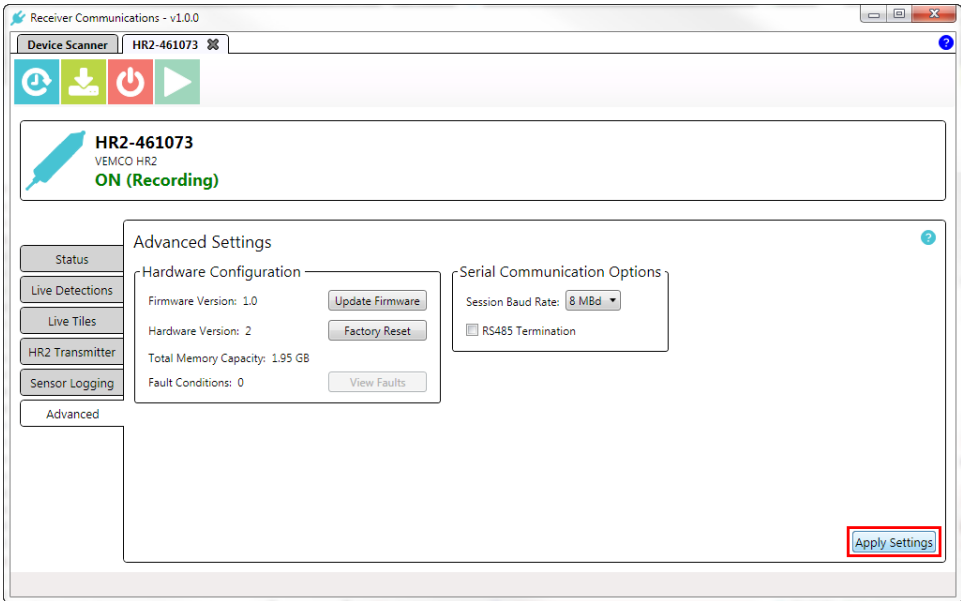
Figure 3-32: Session Baud Rate selected

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.

Step 6 - Enabling 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.

> ℹ **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

Apply Settings

Step 7 - Apply new settings

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

Conducting a Study

4

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

> **tip!** Before deploying your HR2 receiver, we recommend that you consult the "Deployment", on page 69 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.

> ℹ️ **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 22).

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.

> 💡 **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]
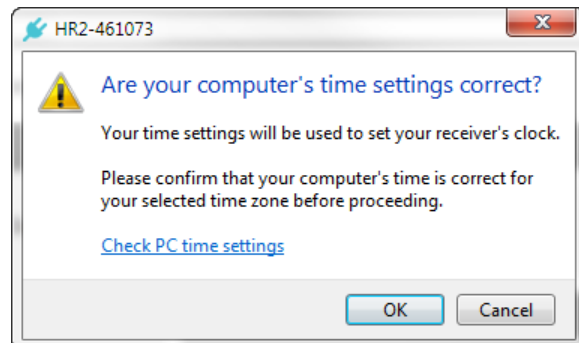
Step 3 - Heed the warning

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 58.
- Click **Cancel** to return to the **Fathom** screen.
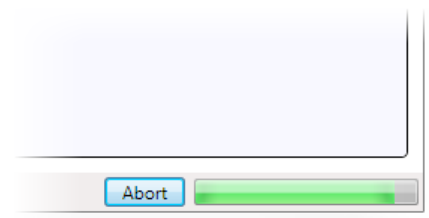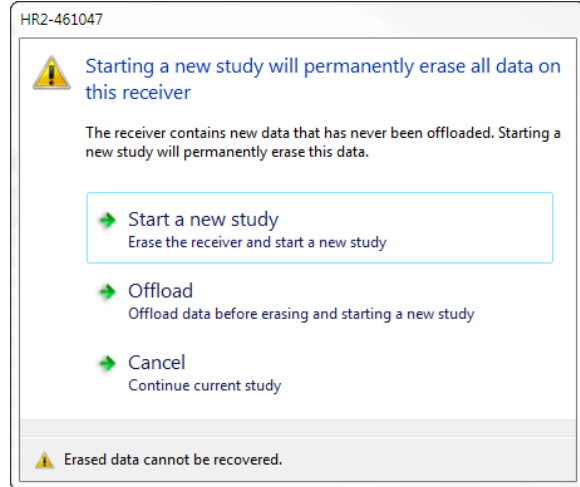
Step 4 - Initialization is successful

When the initialization is complete, a successful initialization message appears.

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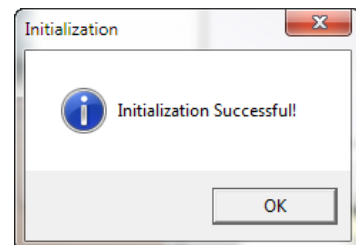
Step 5 - Check the Receiver Status

On the **Status** tab, the status of the **HR2** receiver should now display as **ON - Recording**.
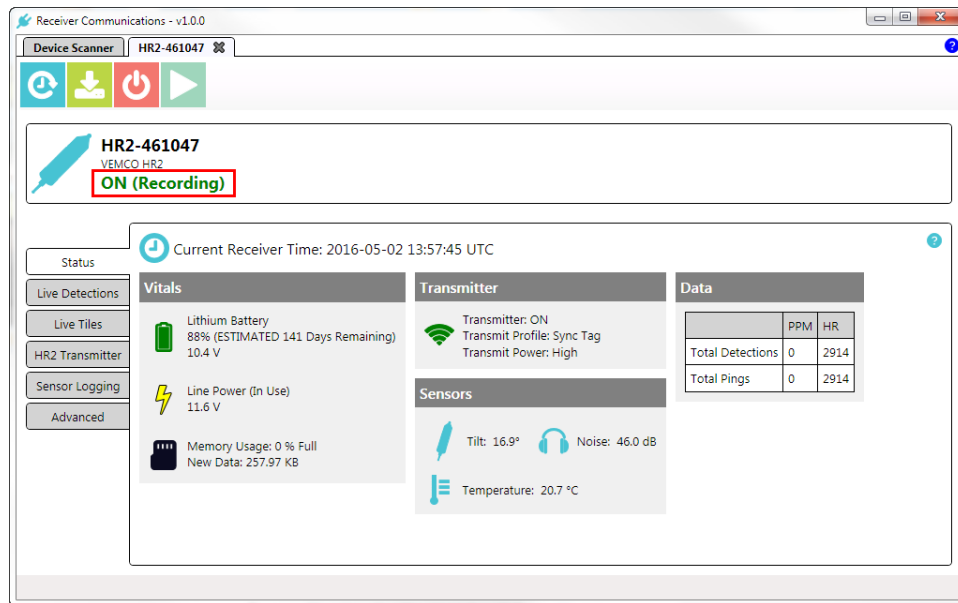
Figure 4-1: Receiver Initialized and Recording

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 22).

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**.
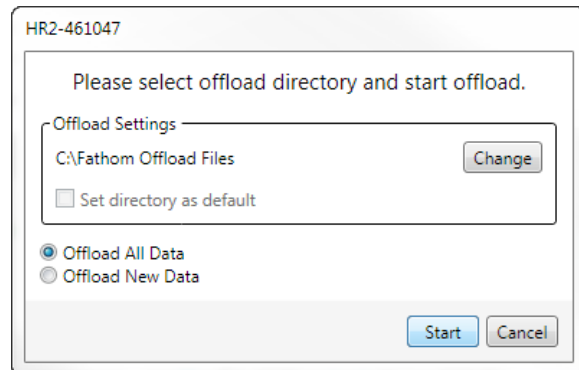
Step 3 - Select Offloading Data Option

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.
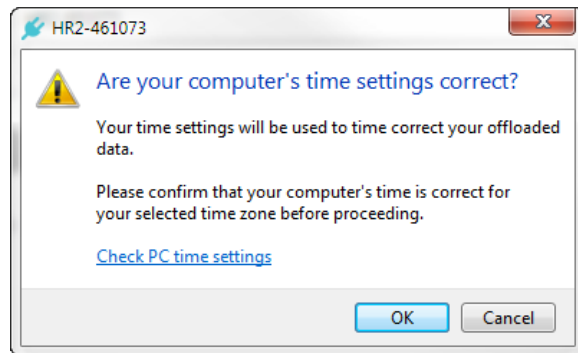
Step 5 - Data is Offloading

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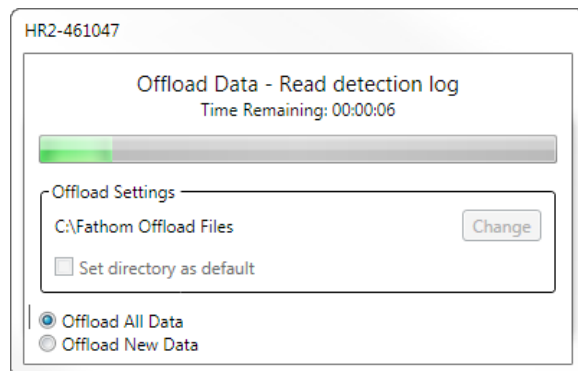
Step 6 - Successful Data Offload

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

Click **OK** to finish and return to the **Fathom** screen.
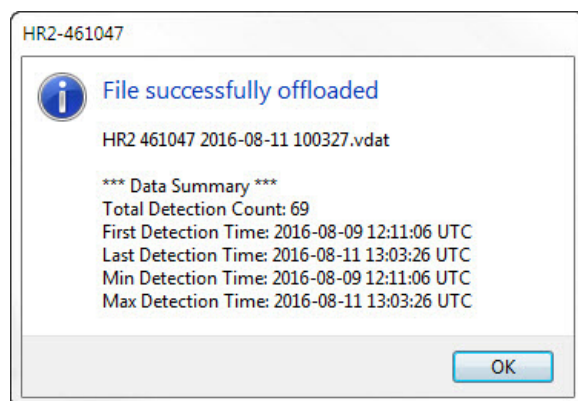
4.4 Visualizing Data

After data has been collected from a HR2 Receiver, that data can be displayed as a graph.

Data can only be viewed from an imported VDAT file.

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

To Visualize Data from an VDAT file

Step 1 - Launch Fathom

Click the **Task Bar shortcut** for the **Fathom Launcher** to start the **Fathom** software and click on the **Visualize Data** icon.
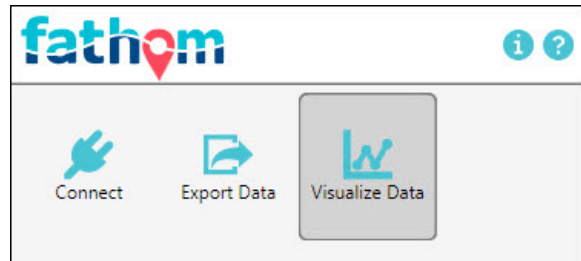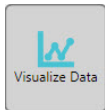
Step 2 - Select file to import

To select the file to import, click **File, Import VDAT File...**.

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

Navigate to the desired folder, select the file(s) to display and click **Open**.
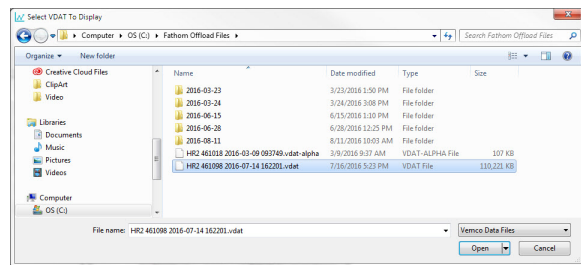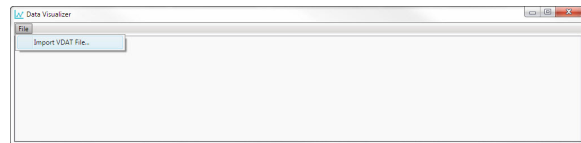
Step 3 - File Import in progress

The selected file name is displayed at the top middle of the **Data Visualizer** window, as the file is being parsed before viewing.
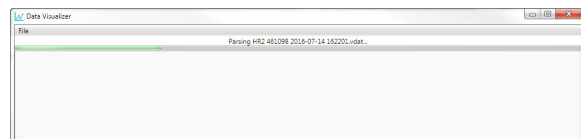
The data is displayed in the **Data Visualizer** window.
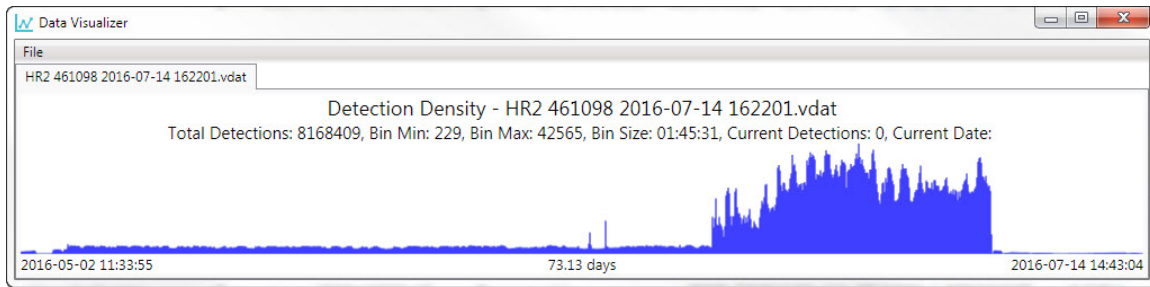
Figure 4-2: Data displayed as a graph

Data Visualizer window options

The **Data Visualizer** window provides the following display options:

- **VDAT Filename** - The VDAT filename is displayed on the tab, and at the top of the tab panel (Detection Density - "`[filename.VDAT]`"). **You can open multiplefiles** and each will have its own tab.
- **Start/End Dates and number of Days** - These are displayed at the bottom left/right and center of the window.
- **Resize** - The window is *fully resizable*, using click and drag action with the mouse, or using the **Maximize** window button.
- **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. The total number of detections at that date and time will be displayed in the **Current Detections** and **Current Date** fields below the plot's title.

Available data

- **Total Detections** - The total number of detections in the data file (PPM and HR detections combined).
- **Bin Min** - Minimum binned detection count in the data series.
- **Bin Max** - Maximum binned detection count in the data series.
- **Bin Size** - Fathom bins your detetion counts into bins of optimal size for display purposes. The bin is recalculated each time you resize the **Data Visualizer** window.
- **Current Detections** - Detection count of the bin at the current mouse/cursor location.
- **Current Data** - Date and time of the bin at the current mouse/cursor location.

4.5 Disconnect 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 4-3: 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.

4.6 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 4-4: Suspend Receiver button

The **Suspend receiver operation warning** appears.
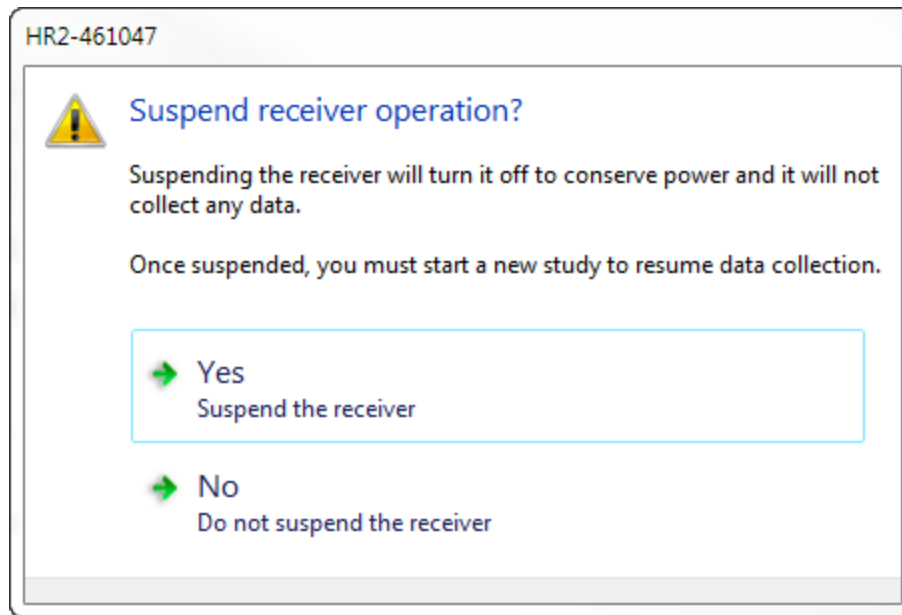
Figure 4-5: Suspend Receiver operation warning

- 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**.

4.7 Exporting Data

After data has been collected and offloaded from an HR2 Receiver, that data can be exported to be viewed and manipulated.

Data can only be exported from a downloaded VDAT file.

> **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.
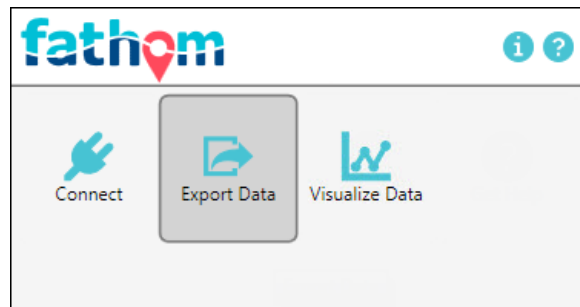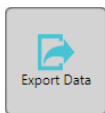
Step 2 - Select files to export

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**.

The selected files are then shown in the **Files for Export** section of the **Data Export** window.
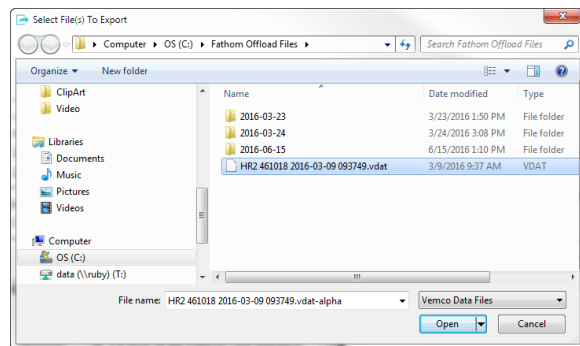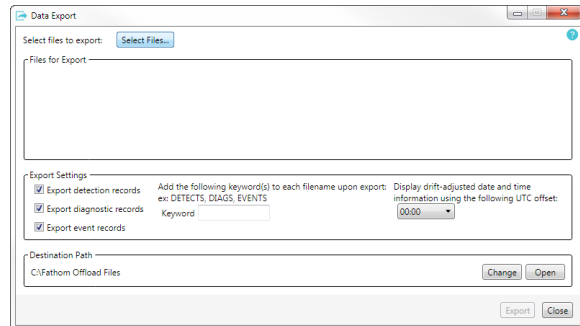
### Step 3 - Select Export Settings

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

- Detection records
- Diagnostic records
- Event records

To select, check the box next to the option(s).
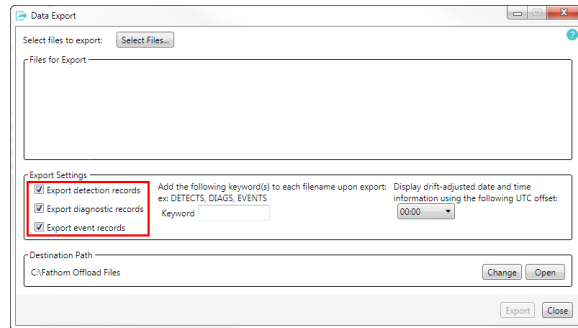
Export Records option	Record types	Identifier (in CSV table)
DETECTION	Tag Detection Records	DET
DIAGNOSTICS	HR2 Sensor Records	DIAG_HR2
	HR2 Battery Records	DIAG_BATTERY
EVENT	Status Event Records	EVENT_STATUS_RECVR
	Offload Records	EVENT_OFFLOAD
	Initialization Records	EVENT_INIT
	HR2 Health Records	EVENT_HEALTH
	HR2 Transmitter Configuration Records	EVENT_TRANSMIT_CFG
	HR2 Self Test Records	EVENT_FAULT

There are also a few record types that are exported to the CSV file regardless of the checkbox selection you make. These are:

Record types	Identifier (in CSV table)
Time correction records	TIME
Filter records	FILTER

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 VDAT 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.
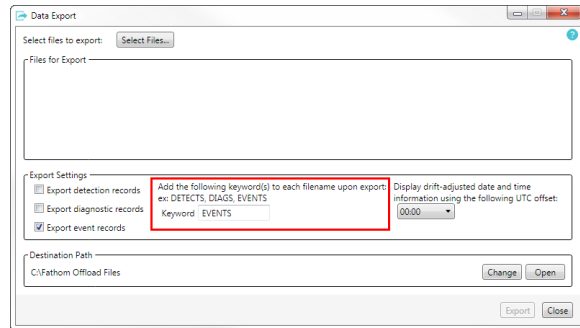
If NO keyword(s) is not specified, Fathom will give the CSV file the same name as the VDAT file the records are exported from, but will change the file extension to CSV.

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

To display drift-adjusted date and time according to a specific **UTC Offset**, click to open the drop-down list and select the UTC Offset.

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 HR2's receiver clock and the UTC time calculated from your PC clock at offload to calculate drift-adjusted 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 drift-adjusted 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 (Date and Time (UTC)) and
- a field containing the drift-adjusted date and times (Drift-Adjusted Date and Time).

The drift-adjusted field will be provided in UTC format unless an offset is specified under "Display drift-adjusted date and time information using the following UTC offset:" The selected offset is displayed in the column header of the generated CSV file.
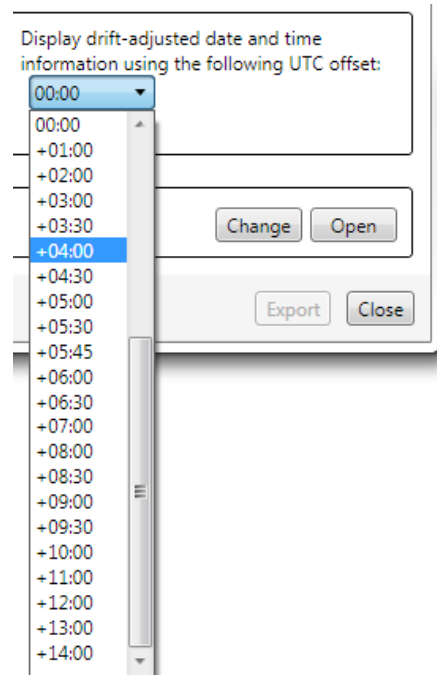
Step 6 - Set or change Destination Path

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**.

The offload process begins. The export progress is displayed (**green** progress bar at the right of the file name), including estimated time remaining.

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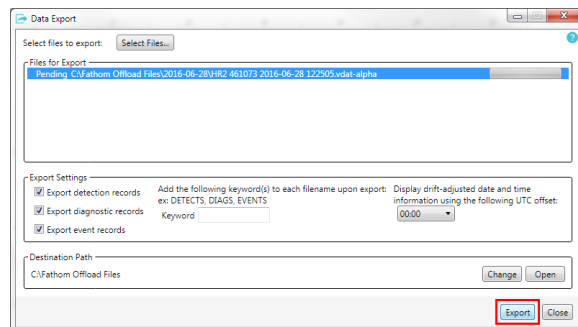
Step 8 - Successful Data Export

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

Click **OK** to finish and return to the **Fathom** screen.
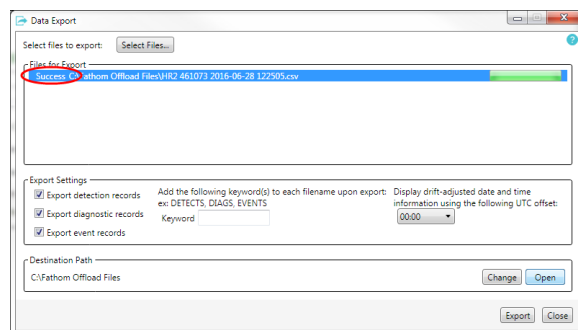
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chapters start on right (odd number) pages.

Deployment

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.
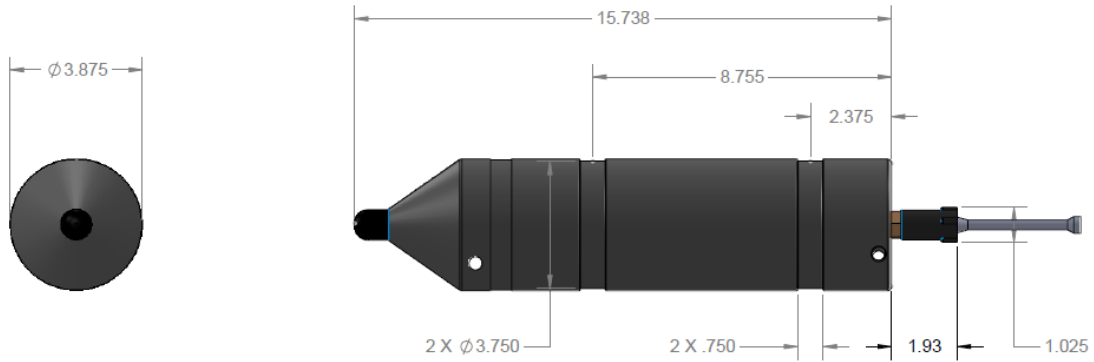
Figure 5-1: HR2 Case Dimensions

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 26.

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.
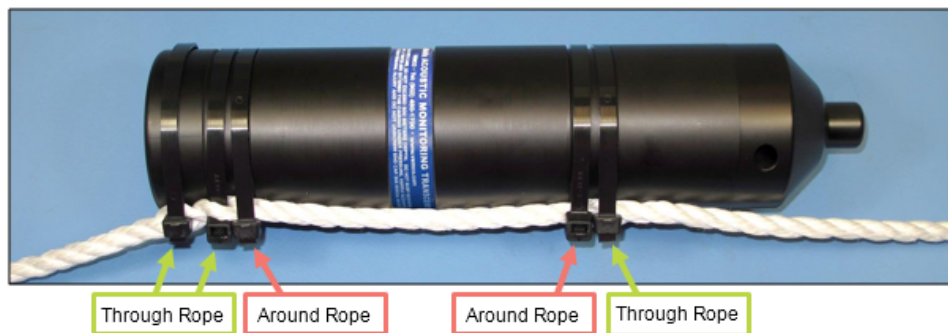
Figure 5-2: Sample mooring line attachment (VR2Txshown)

> ⚠️ **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.

Maintenance

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:

6.1 Main Battery Replacement

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 "Open the HR2 Case", below)

2. Disconnecting and removing the battery (see "Disconnect and Remove the Battery", on page 82)

3. Inserting the battery (see "Install and Connect a Battery", on page 86)

4. Closing the case (see "Close the HR2 Case", on page 89)

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

6.1.1 Open 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.
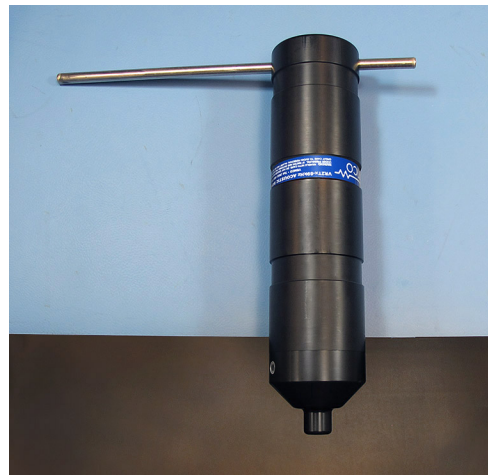
Step 4 - Insert the steel rod - Top end

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).
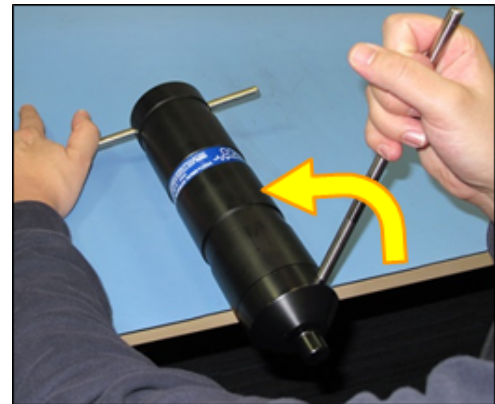
Step 6 - Remove the end cap

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 108.

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.

> *i* **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.
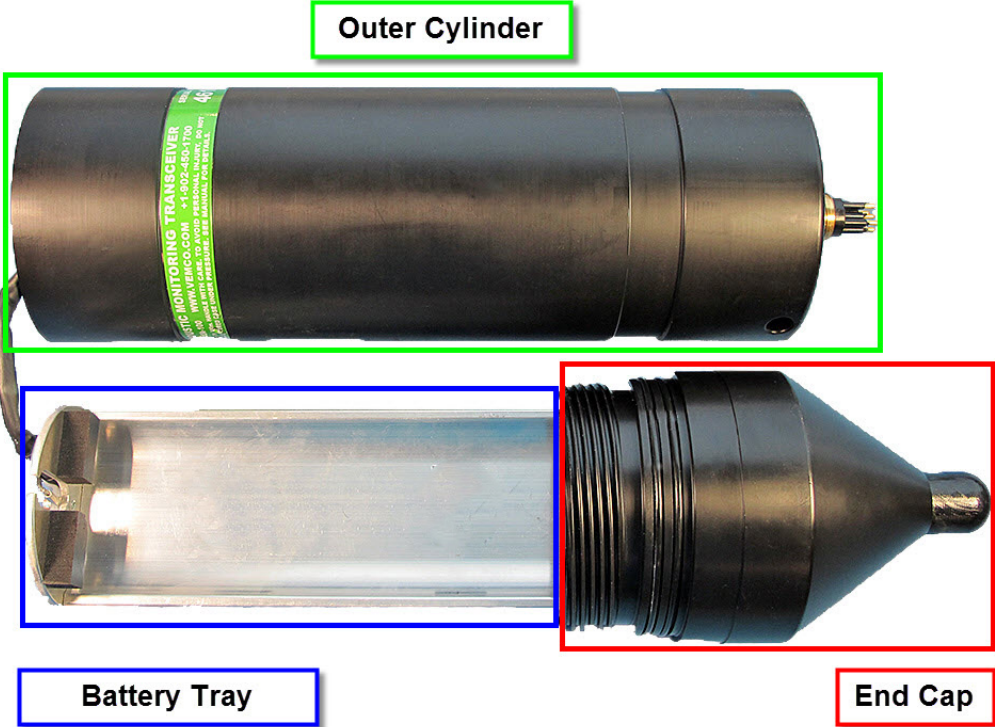
Figure 6-1: HR2 Receiver Parts

6.1.2 Disconnect And Remove The Battery

Follow these steps to remove a battery from your receiver.

Step 1 - Open the case

Open the case as explained in "Open the HR2 Case", on page 78, and set the outer cylinder to the side.

> ℹ **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 92).

Step 2 - Remove tape

Grab the securing tape end and unwrap the tape that secures the battery to the cradle to remove it.
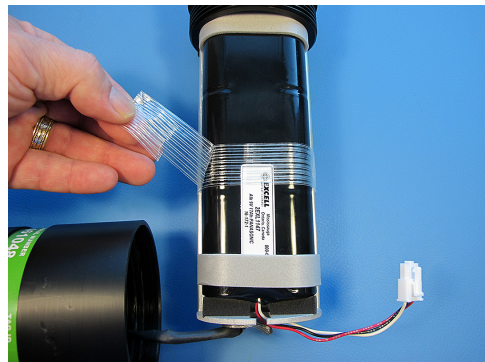
Step 3 - Disconnect

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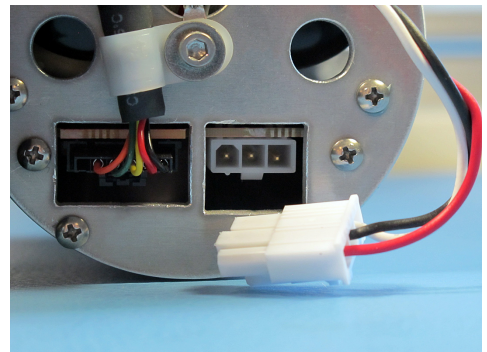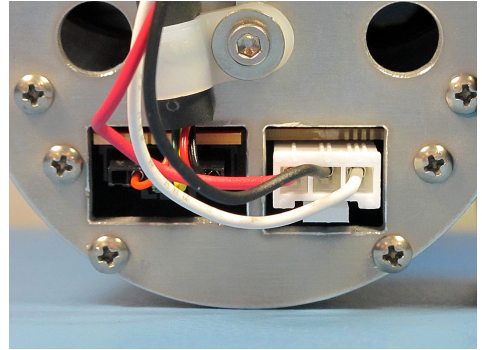
Step 4 - Pull connector wires up and out of slot

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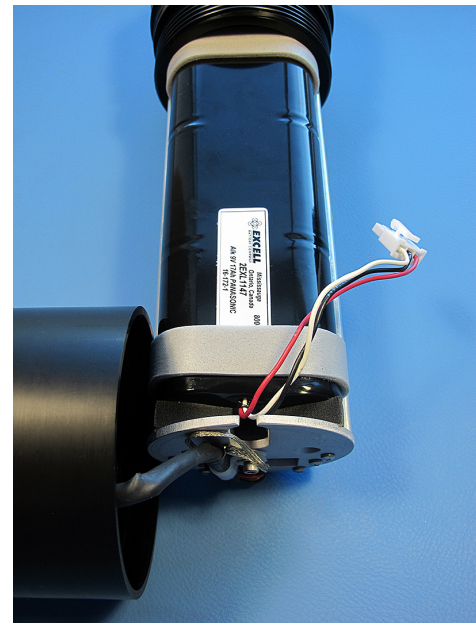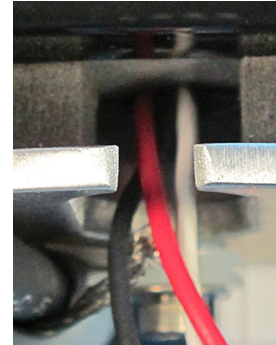
Step 5 - Lift battery up

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.

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

6.1.3 Install And Connect 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 "Open the HR2 Case", on page 78 (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.
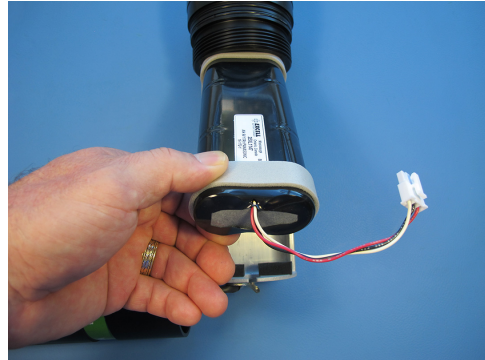
Step 4 - Check that battery is secure

 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.
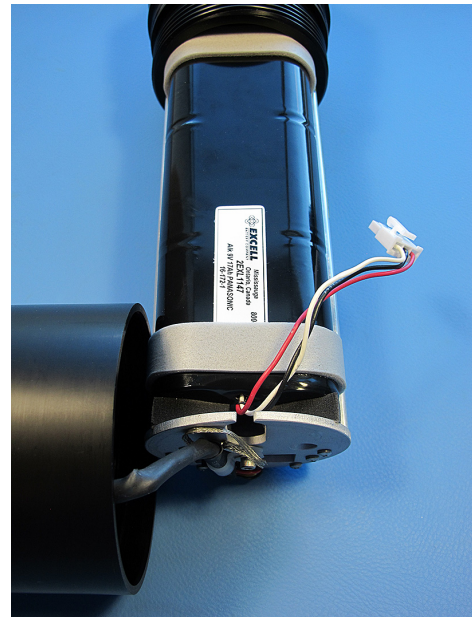
Step 5 - Wrap tape

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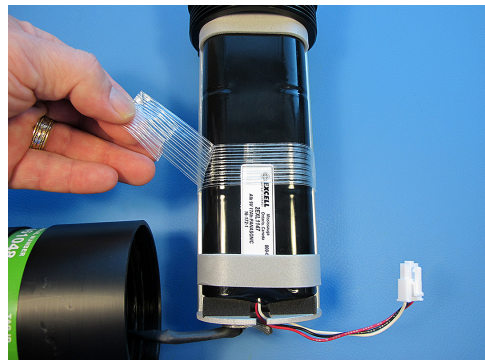
Step 6 - Position connector wires

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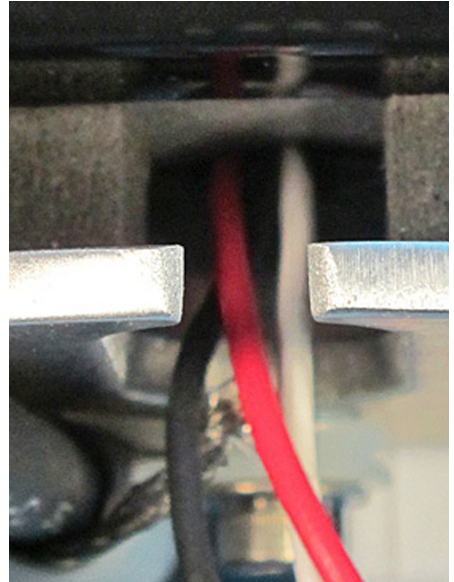
Step 7 - Position the wire connector

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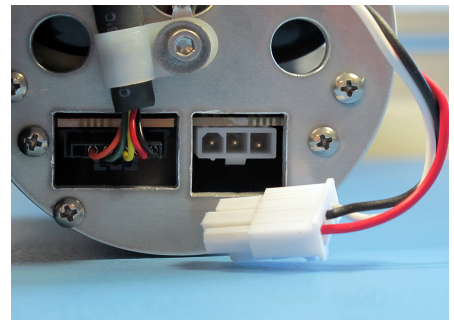
Step 8 - Connect the battery

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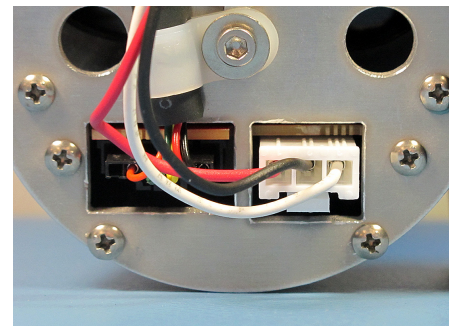
Close the case as described in "Close the HR2 Case", on the facing page.

6.1.4 Close 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 92.
> 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 dessicant 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 108.

Step 4 - Prepare for final tightening

Place a hand on the back of the receiver or steel rod to hold it in place.
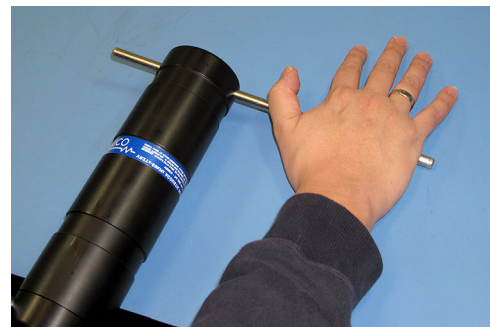
Step 5 - Insert the steel rod - Top end

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).

i **IMPORTANT:** Make sure to test your receiver before deploying it. For more information, see "Testing the Receiver", on page 26.

If you intend to store your HR2 receiver, see .

6.2 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.

6.2.1 Remove O-Ring

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.

6.2.2 Clean O-Ring Surfaces

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

> **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.
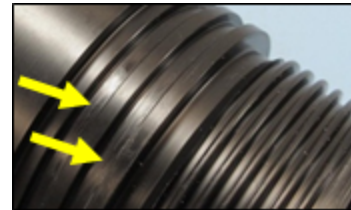
Step 1 - Clean O-rings and surfaces

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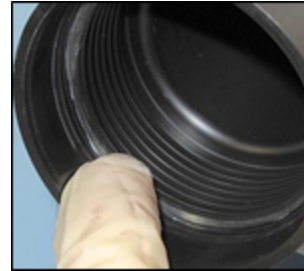
Step 5 - Apply O-ring grease to O-ring

While you have grease on your glove, evenly spread grease a 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.

6.2.3 Install 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 .

6.3 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 115.

> ⓘ **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.

6.4 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:

7.1 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.

7.2 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 long 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 39.

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

7.3 Batteries

The HR2 receiver is powered by a **10.8 V lithium** 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**.

> **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.

7.4 Updating the Fathom Software

You have received the latest version of our Fathom software with your VEMCO product purchase.
Check our website periodically for updates.

7.5 Installing the Communication Cable Drivers

Fathom requires drivers for the cable that you use to connect and communicate with the HR2 receiver. There are three options for installing the appropriate cable drivers.

Option 1 - Allow Windows to automatically locate and install the drivers

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.

2. **If your cable is a high-speed VEMCO cable**, double-click on the executable file called `FTDIDrivers.exe` to install the driver.

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

Common Questions

8

This Section Contains Information On The Following:

8.1 HR2 Receiver Related Questions

Find answers to HR2 common questions here.

8.1.1 How Long Will My HR2 Battery Last

Depending on the battery used with your receiver:

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

8.2 Fathom Related Questions

Find answers to Fathom common questions here.

8.2.1 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.

8.2.2 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 stores it in your receiver during initialization. Provided your computer time and the Time Zone settings are correct and match, (your computer time is correct for the time zone you have selected), then your detection data will be stored in the correct UTC format at the time of initialization and data offload.

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[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.

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Troubleshooting

9

This Section Contains Information On The Following:

9.1 HR2 Receiver Related Troubleshooting

Find answers to HR2 common troubleshooting questions here.

9.1.1 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.

9.1.2 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 "Open the HR2 Case", on page 78). 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.

9.2 Fathom Related Troubleshooting

Find answers to Fathom common troubleshooting questions here.

9.2.1 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 23, 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.

9.2.2 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 102.

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**

5. Observe **LED Status Light** and verify built in transmitter operation (see "Status Light Flashes", on page 99 for expected flash sequence/colour).

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

7. If immediately deploying, keep receiver in **Record Mode** and see "In-Air Test", on page 26 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-Ion** battery: 2.88 kg w **Alkaline** battery: 3.16 kg
Receiver Frequency	180 kHz
Battery Life	**Lithium-Ion**: 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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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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chapters start on right (odd number) pages.

More About Help

Fathom provides you with a full set of Online Help tools. Whether you access the **Full Help** from the **Help** button in the top toolbar, or use **Context-Sensitive Help (CSH)** by clicking the **CSH** button 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 Online Help workspace
- Navigation Tabs (TOC, Glossary, Quick Start)
- Navigation Tools in Topics
- Using the Search Tool

D.1 Tour of the Online Help Workspace

Take a moment to get familiar with the Online Help workspace. It will allow you to find answers quicker when consulting help.

D.1.1 Main Areas Of The Online Help Workspace

The Online Help's user interface consists of four (4) main areas:

- **Navigation pane (1) -** The left side of the Online 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 123).
- **Top Toolbar (3) -** The top portion of the Online Help interface is the toolbar location, for the different help navigation buttons (see "Online Help Top Toolbar", on page 122).
- **Topic Viewing pane (4) -** The Topic Viewing pane is the main area of the Online Help interface, where all *topic content* is displayed.

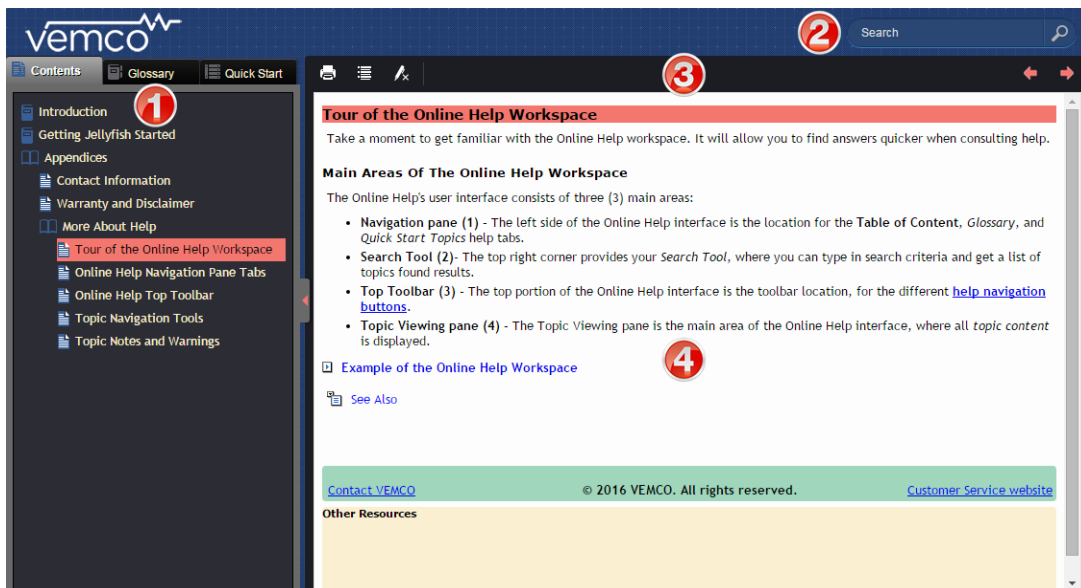**Example of the Online Help Workspace**

Figure D-1: The Online Help Workspace

D.2 Online Help Navigation Pane Tabs

When you access the full Online 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 the your **HR2** receiver and **Fathom** software.

Click on any of the **tabs** to access the feature.

D.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.

D.2.2 Table Of Contents (TOC) Tab

The Online 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 Online 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.

D.2.3 Glossary Tab

A glossary is a feature added to help users understand the meaning of individual terms.

The Online 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).

D.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.

D.3 Online Help Top Toolbar

The Online Help **Toolbar** buttons allow you to perform operations such as printing topics, saving topics to your favorites list, and so on.
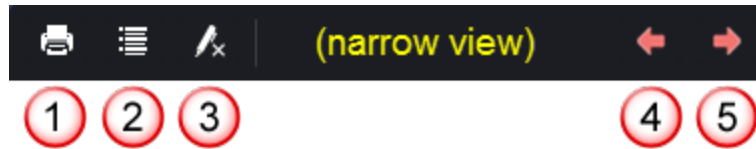

Figure D-2: The Online Help toolbar

Use these buttons to perform the following:

1. **Print** - Click this button to *print* the currently viewed topic.

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.**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.

D.4 Topic Navigation Tools

Topic navigation tools provide a way to reduce the scrolling size of an Online 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.

D.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.

D.4.2 Toggler (Online 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.

D.4.3 Drop-down Text (Online 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.

D.4.4 Expanding Text (Online 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.

D.5 Using the Search Tool

The full-text **Search** feature allows you to search every topic in the Online 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 Online Help. Once you are used to them, you will be able to quickly return to specific information about your products.

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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.

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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.

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Glossary

C

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

F

firmware
Software (programs or data) that has been written onto read-only memory (ROM). Firmware is a combination of software and hardware.

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 180kHz 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.

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).

R

ROM
Acronym for Read-Only Memory. ROM is computer memory on which data has been prerecorded. 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.