VUE SOFTWARE MANUAL

Using VUE software to view and organize data | version 2.7

innovasea.com/fish-tracking

DOC-4399-32

SUMMARY OF MANUAL

This manual is intended to provide the information required to use **VUE software**. Innovasea recommends that you fully read the manual before using VUE.

Section 1: Introduction

Getting to know what VUE software can do for you

Section 2: Getting VUE Started

How to get VUE ready to begin a study (i.e. before you deploy your receivers)

Section 3: Data Analysis – the basics

Getting your data ready for analysis

Section 4: Viewing Data

How to view your data in VUE, including using the filter feature

Section 5: Managing Data

How to import and export data, and how to view the millisecond timestamps

Section 6: Viewing Events

To view event information

Section 7: Additional Information

Helpful information, like how to install the software and set

Section 8: Appendices

Information pertaining to using VUE software with Innovasea receivers is located in the user manual for that receiver. For example, to learn how to communicate with a VR2W, go to the VR2W User Manual.

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For the latest versions of user manuals and software, visit
support.fishtracking.innovasea.com

1. INTRODUCTION

1.1 Overview of VUE Software

The VUE software has been developed to aid researchers in gathering, viewing, and analyzing acoustic detection data from Innovasea equipment. VUE employs a central database to allow the collection and viewing of data from multiple Innovasea receivers of various types. The VUE software is compatible with VR2W, VR2Tx, VR2AR, VR2C, and VR4-UWM receivers as well as the Ascent acoustic release. Legacy VR2 and VR3-UWM data files can also be imported into VUE databases.

VUE is used to perform such tasks as retrieving receiver data files, setting the receiver's clock, configuring the receiver's built-in transmitter (if applicable), and clearing the receiver's memory. Information on using VUE for receiver-specific communication is located in the individual receiver user manuals.

VUE databases combine detection data from multiple receivers.

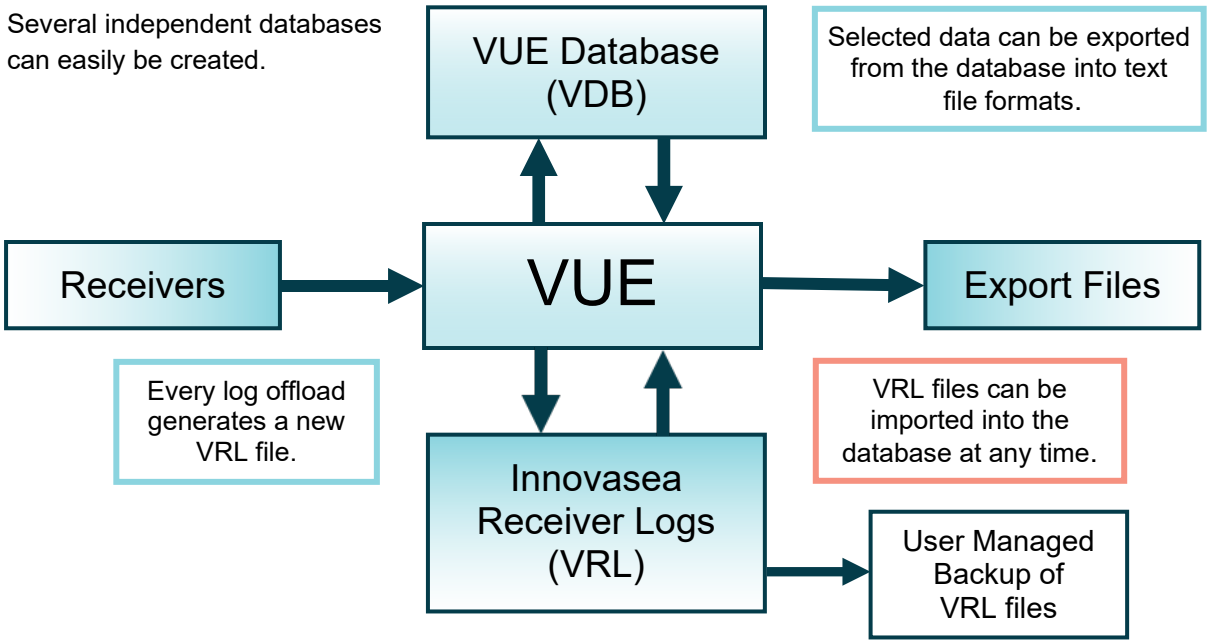
VUE can be used to create and manage one or more central databases combining data files from multiple receivers and multiple types of receivers. Having a central database allows easy comparison between detections from multiple studies, across multiple years, and from various locations. You may choose to create smaller, temporary databases on laptops used for collecting data in the field.
A larger, more central, database containing all receiver data files can then be created on a lab computer or network server.

Always use the latest version of VUE on your ***entire suite*** of PC's and laptops. This will ensure access to the latest software features and improvements and compatibility with newer and older Innovasea receivers.

1.1.1 What can VUE do?

VUE can…

1. Detect and report a misconfigured computer clock (see section 1.3 Setting correct UTC time)
2. Setup receivers to record data (details found in related receiver manual)
3. Collect data from receivers and create VRL files (details found in related receiver manual)
4. Adjust data for clock-drift (see section 3.1)
5. Filter data within the database (see section 4.3)
6. Deal with duplicate tags (see section 5.3)
7. Identify potential false detections for review (FDA tool, see section 3.2)
8. View data in graphical form (see section 4.2)
9. Export data (see section 5.7)
10. Update receiver firmware (details found in related receiver manual)



1.1.2 What's a VRL file?

A **VRL file** is created each time data is offloaded from a receiver using the VUE software[1]. VRL files are digitally encrypted/signed binary files that cannot be altered and provide a permanent record of the data logged by the receiver. A copy of these log files should be stored in a safe location as a backup of the collected data. If you ever need to restore your VUE database, you can import the original data from your VRL files. We suggest uploading your receiver log files to your Fathom Central account (fathomcentral.com) for secure backup and access to data management and visualization tools.

Always store a backup copy of all your VRL files in a safe location.

A VRL file contains receiver configuration information, diagnostic data, event records and the detection data. VRL files can be imported into any number of VUE databases and/or your Fathom Central account.

VRL files are named to allow you to identify the receiver to which they belong and the date that the data was offloaded. For example, the file VR2W_103047_20131130_1.VRL came from a VR2W receiver with the serial number 103047 and was offloaded on November 30, 2013. The "1" at the end indicates that it was the first offload of the day for that receiver using a particular PC.

VRL files with the RLD identifier in the filename (RLD data file, as in "VR2AR-RLD_545565_20141216_1.VRL") cannot be imported into VUE.

[1] VRL files are a different log file format than VDAT log files. VDAT log files are created when data are offloaded via the Fathom Mobile mobile app or the Fathom Connect desktop software. VDAT files can be converted to VRL file format for import into VUE using our online tool at fathomcentral.com.

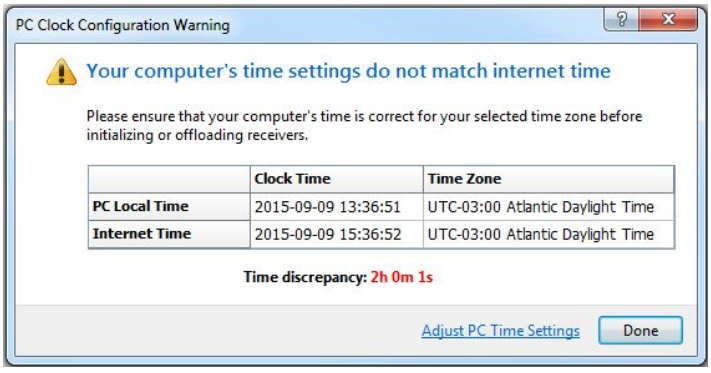
1.2 The order of things…

A common question is "*What tasks do I perform and in what order am I supposed to perform them?*"
The list below contains common tasks in a popular order.

1. Install VUE software (see section 7.1)
2. Set the correct UTC time (see section 1.3)
3. Setup VUE options (see section 7.4)
4. Create a database, if one doesn't yet exist (see section 2.1)
5. Setup sensor tags and stations (see sections 2.3 and 2.4)
6. With the receiver(s) (details found in related receiver manual):
    a. Initialize the study
    b. Test receiver(s) in-air and in water
    c. Deploy receivers and tags and wait…
    d. Offload data from receivers
7. Time correct data (see section 3.1)
8. Import data into database, if not imported during Time Correction (see section 5.1)
9. Identify any potential false detections and remove as required (see section 3.2)
10. View data (see section 4)
11. Export data, if desired (see section 5.7)

1.3 Setting the correct UTC time

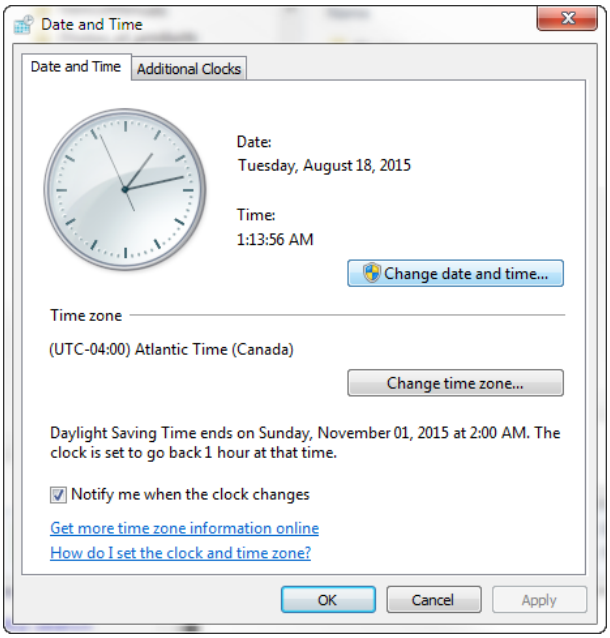
Each time you open VUE while connected to the internet, VUE will automatically obtain the current correct UTC time from an internet time server. VUE will then calculate your computer's UTC time based on your selected clock settings (time zone and displayed time of day). If your computer's UTC time does not match the time obtained from the internet, VUE will issue a "PC Clock Configuration Warning".
This warning indicates that your computer's displayed time of day is not consistent with your selected time zone.



Innovasea **strongly recommends** correcting your computer's time settings *before* proceeding with your VUE session. The UTC time that VUE calculates from these settings is used to set your receiver clocks when starting a study and to calculate receiver clock drift when you time correct your VRL files.

Correct computer clock settings at both initialization and offload are critical to ensuring correct detection times in your data.

To correct your computer's clock settings, click "Adjust PC time settings"; the Windows Date and Time Settings window appears.



Adjust your **time zone** to the desired setting (click **Change time zone…** button) and then make sure that the **displayed time of day is correct for the time zone that you have selected** (click **Change date and time…** button).

VUE's PC Clock Configuration Warning box (see previous) will update the Discrepancy field (time discrepancy between your computer's time settings and internet time, displayed in the time zone you that have selected) with each change you make to your computer's clock settings. It is recommended that you set your computer's clock to **within 2 minutes** of internet time.

When satisfied that your clock settings are correct, click **Done**.

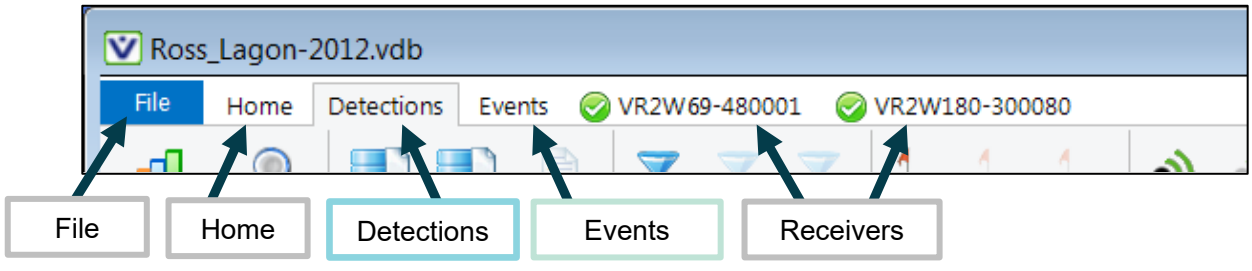
You may choose to ignore VUE's PC Clock Configuration Warning (by clicking **Done** without changing your clock settings), should you wish to correct your clock settings at a later time. This is, however, **not recommended**, and VUE will re-issue this warning should your clock settings remain incorrect and you attempt to **start** a new VUE session, **initialize** a receiver, or **offload** a receiver.

1.4 Software Tabs - an overview

VUE has a number of tabs allowing access to detections, events, and receivers depending if a database is open and/or a receiver is connected.

The File tab allows for databases to be created, opened, and closed, settings to be altered, and VRL files to be edited. The Home tab is used when connecting to a receiver and is explained in the receiver user manual. The Receiver tab is used, and only available, when VUE is communicating with a receiver. Multiple receivers can be in communication with VUE at once, resulting in more than one receiver tab open (see receiver manual for more information).

The tabs used during data manipulation are the Detections tab (see sections 1.4.1 and 4) and the Events tab (see sections 1.4.2 and 6). This VUE manual focuses on the functions of these two tabs. The Home and Receiver tabs are discussed in the receiver user manuals.



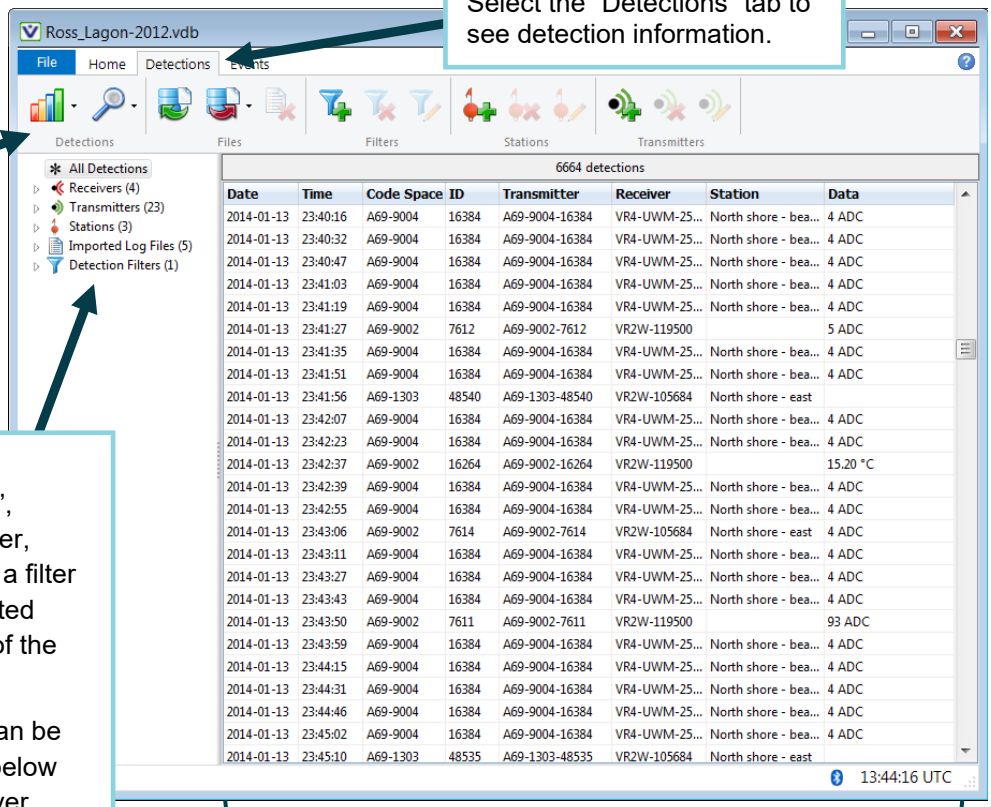
1.4.1 Detections Tab

The Detections tab contains all the detections in the open database and is only visible if a database is open. From here, we can graph detections (section 4.2), search data for animal residency (section 3.3), import (section 5.1) and export files (section 5.7), filter the data (section 4.3), add a new station (section 2.4.1) or transmitter record (section 2.3.1), and view data by receiver, transmitter, or station (section 4.1).

The Detections Tab

The Detections ribbon contains functions that can be performed with the data, such as graphing or filtering (section 4.1.1).

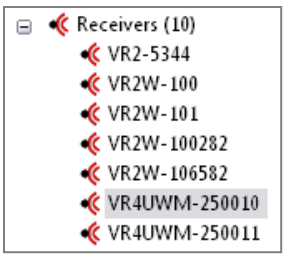
Select the "Detections" tab to see detection information.



Selection Tree:

Select "All Detections", a receiver, a transmitter, a station, a log file, or a filter to display the associated data in the right side of the VUE window.

Each item in the list can be expanded as shown below so an individual receiver, transmitter, etc. can be viewed (section 4.1.2).

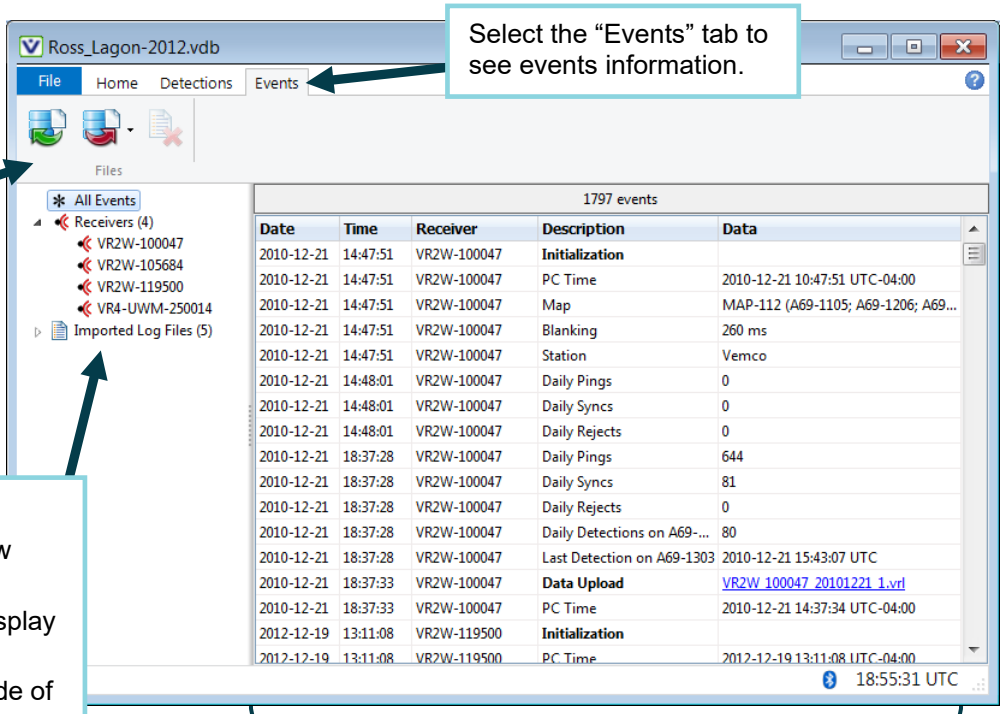


The right side of the VUE window changes according to what's selected in the tree on the left side of the window. If a receiver is selected, then this half of the window reports which tags were detected by that receiver. If a tag is selected, all the detections in the database for that tag are shown. If a station is selected, all detections in the database recorded at that station are shown.

1.4.2 Events Tab

The Events tab contains a list of key receiver-related events in the currently open database as well as diagnostic information such as pings counts and logged noise and tilt information (where available). The Events tab is only visible if a database is open. From here, we can view events by receiver, import and export files, and delete individual log files. Event information is explained in more detail in section 6.

The Events Tab



Select the "Events" tab to see events information.

The Events ribbon contains the tasks pertaining to the log files (section 5).

Selection Tree:

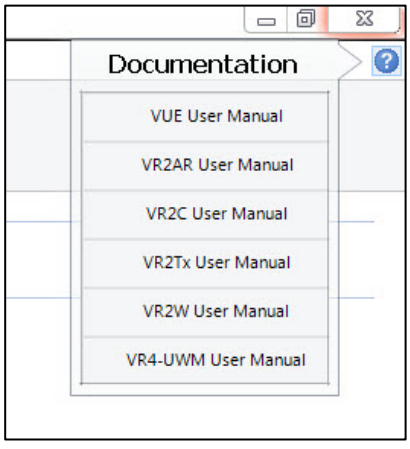
Select "All Events" to view every event or select a receiver or a log file to display the associated event information in the right side of the VUE window.

Each item in the list can be expanded so an individual receiver or file can be viewed (section 6.3).

The right side of the VUE window changes according to what's selected in the tree on the left side of the window. If a receiver is selected, then this half of the window reports the events that occurred to that receiver. If a log file is selected, the events contained in that file are shown here.

1.5 Getting Help

While VUE is open, you can access the user manual for VUE and for the receivers that are used with VUE by selecting the "Help" icon near the top right corner of the window (blue circle with question mark). When this icon is selected, a list of the available manuals will appear, and you can select the manual related to your receiver model. For example, if you have a question about communicating with the VR2W, then select the VR2W manual.



The manuals in VUE Help were current when the software was compiled. See support.fishtracking.innovasea.com for the latest version of the manuals.

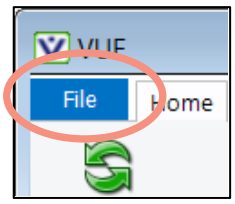
2. GETTING VUE STARTED

This section of the VUE manual has the necessary information to get you started using VUE for your data management and analysis. After you've collected the data from your receivers as explained in the user manual for your receiver(s), the remaining sections of this manual will explain how to prepare, view, and export your data.

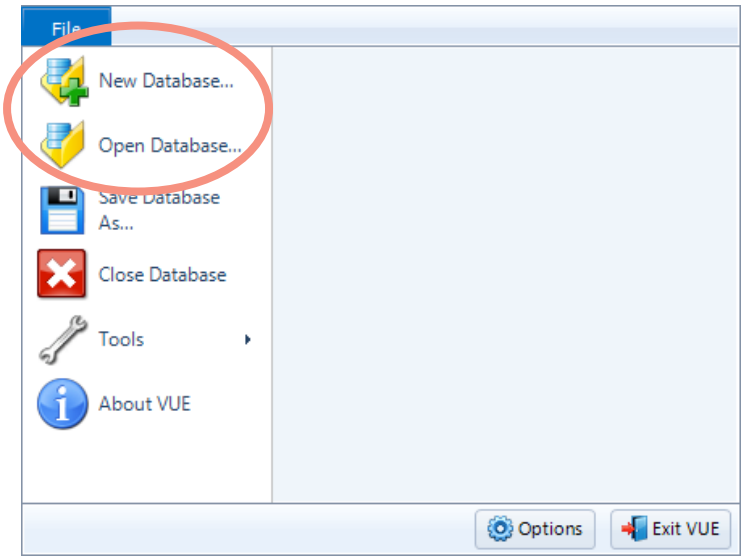
2.1 Open or Create a Database

To view data that has been offloaded from Innovasea receivers, first create a new database or open an existing database.

Begin by selecting the File menu button in the top left corner of the VUE software (circled at right). From the menu that appears, choose "New Database" to create a new database or choose "Open Database" to open an existing database (see below).



File menu button



Regardless of your choice, the window entitled "Open or Create a new database" opens to allow you to select an existing database from the list shown or to enter the name of the new database in the "File name" box.

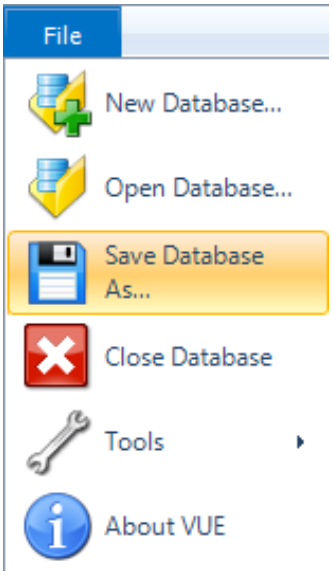
TIP: After a database is opened, it will automatically open each time you re-open VUE. This feature can be disabled, if desired, in the *Options* window (see section 7.4.6).

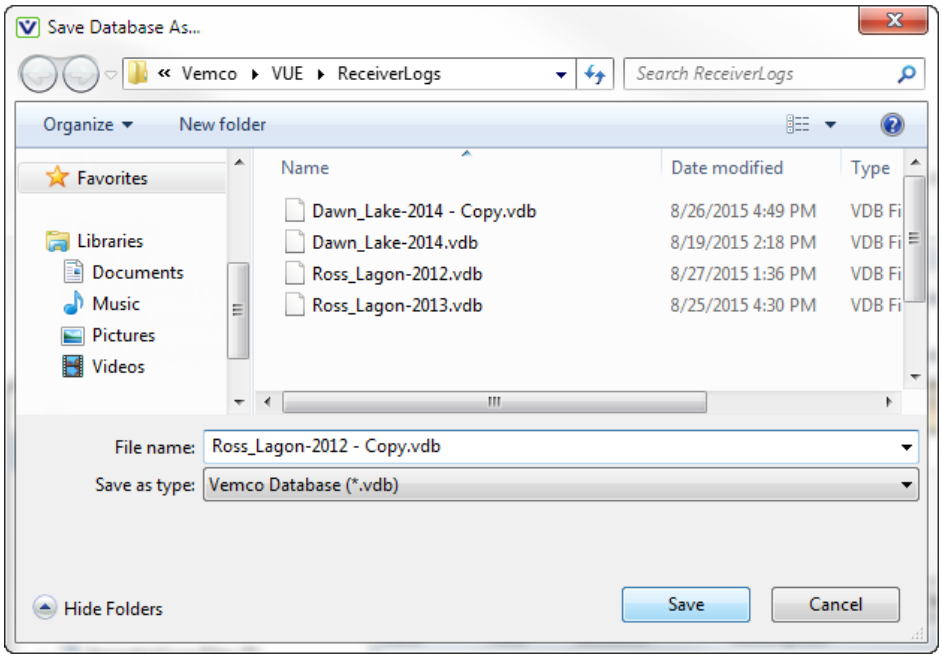
2.2 Saving a database copy

VUE allows you to save any currently open database under a different name (as a backup copy, for example).

> Innovasea **recommends** making a copy of your VUE database prior to making significant edits, since database **changes are irreversible**.

To save an open database under a different name, select the File menu button in the top left corner of the VUE software. From the menu that appears, choose "Save Database As…". The "Save Database As…" window appears.





In the **File Name** box, change the name of the file (example: `[FileName]-copy.vdb`), and click **Save**. By default, the database copy is saved in the same folder as the original file.

2.3 Set Up Tags

Coded tags will be detected without being setup.

Detections of both coded pingers (tags without sensors) and coded sensor tags will be displayed in VUE upon import of VRL file(s) with no additional setup. Uncalibrated sensor data are reported as Analog to Digital Converter units, or ADC. For all sensor tags except predation tags (section 2.3.3), the slope and intercept of the sensor must be entered into VUE to calibrate and view the data in the applicable "real world" units. Slope and intercept information can be found in the Transmitter Specifications printout received with your tags. You may also access and download your tag specifications by logging in to your Customer Support Community (support.fishtracking.innovasea.com) account. If you prefer to import sensor tag calibration information from a file, please request a .VXM file from your Innovasea Sales or Support representative and import this file into VUE[2]. Detailed instructions for importing sensor tag metadata from a .VXM file can be found at support.fishtracking.innovasea.com.

When entering sensor tag slope and intercept information manually, these values can be entered either before the tag is deployed (section 2.3.1) or after the tag has been detected and imported into the database (section 2.3.2).

[2] When importing sensor tag calibration information from a VXM file, be sure to import the VXM file ***before*** loading any detections of the specified sensor tags into your VUE database. Importing a VXM file after detections of the sensor tags already exist in the database will result in the creation of duplicate tags in the database

Tag calibration information is not stored in the receiver but instead is kept within the VUE database. Therefore, it is not necessary to enter tag calibration information into VUE before initializing and deploying a receiver. Tag calibration information can be exchanged between databases using the Export Metadata and Import Metadata features described in section 5.8.

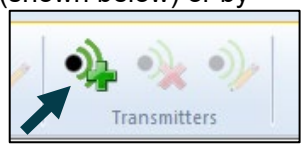
2.3.1 Add Information for a New Sensor Tag

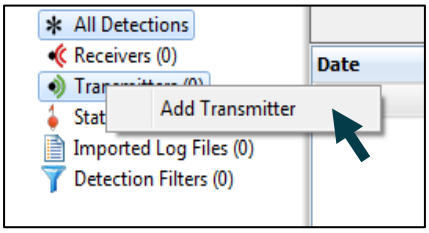
If a sensor tag detections are not yet present in a VUE database, use the steps below to prepare the database for sensor tag data to be displayed in the proper units (units selected in the *Options* window, section 7.4.1).

If you prefer to import sensor tag calibration information from a file, please request a .VXM file from your Innovasea Sales or Support representative and import this file into VUE. Detailed instructions for importing sensor tag metadata from a .VXM file can be found at support.fishtracking.innovasea.com.

STEP 1

Open the *Add Transmitter* window by either clicking on the "Add a new transmitter record" icon in the Detections ribbon (shown below) or by right-clicking on the transmitter list and selecting "Add Transmitter" (shown at far right).



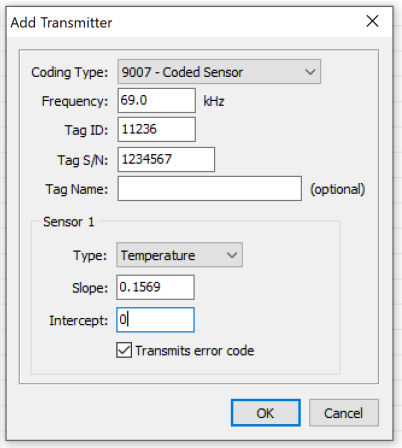


STEP 2

Enter the information in the *Add Transmitter* window. This information - including whether your tags can transmit an error code - is provided in the Transmitter Specifications printout that was shipped with the tags. For more information on transmitter error codes, please search "Transmits error code" on [support.fishtracking.innovasea.com.](support.fishtracking.innovasea.com)

Click "OK" when finished.

If you choose to name the tag, DO NOT use the same name for more than one tag. This causes ambiguity in the database.



TIP: To ease the task of adding sensor tag information to VUE, try importing the detection data collected during your in-air testing (instructions found in receiver manuals; test every sensor tag). Once the data are in VUE, follow the instructions in **section 2.3.2** to edit the tag information to include the serial number and calibration information.

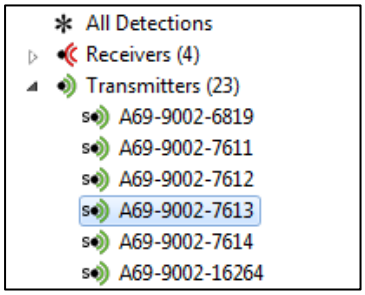
2.3.2 Edit Information for an Existing Sensor Tag

If sensor tag detections are present in a VUE database but sensor tag calibration information has not been setup, then the steps below will allow you to enter the necessary information for the data to be displayed in the proper units (units are selected in the *Options* window, section 7.4.1). As mentioned in the tip found in section 2.3.1, it is sometimes easier to enter a sensor's information after the tag has been detected by a receiver. In-air testing performed before the equipment is deployed, as described in the receiver manuals, not only ensures the equipment is functioning properly but can also be used to aid in entering sensor tag information.

Innovasea **recommends** making a copy of your VUE database prior to making significant edits, since database **changes are irreversible**. See section **2.2, Saving a database copy.**

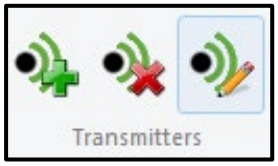
STEP 1

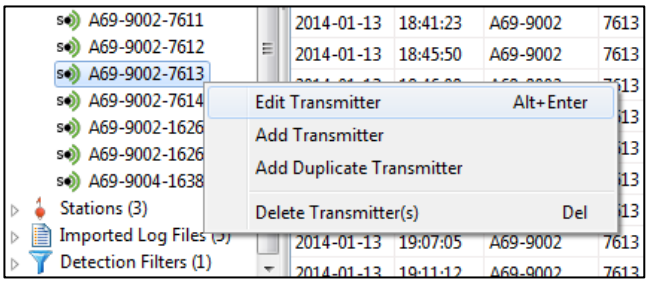
Highlight the sensor tag in the Transmitter section of the Selection Tree.



STEP 2

Open the *Edit Transmitter* window by either clicking on the "Edit the selected transmitter record" icon in the Detections ribbon (selected, below) or by right-clicking on the tag's ID number in the transmitter list and selecting "Edit Transmitter" (selected, right).

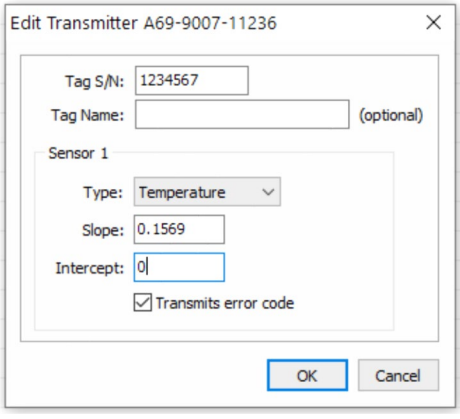




STEP 3

Enter the information in the *Edit Transmitter* window. This information - including whether your tags can transmit an error code - is provided in the Transmitter Specifications printout that was shipped with the tags. For more information on transmitter error codes, please search "Transmits error code" on support.fishtracking.innovasea.com

Click "OK" when finished.



If you choose to name the tag, DO NOT use the same name for more than one tag. This causes ambiguity in the database.

2.3.3 Predation Sensor Tags

When predation is detected by a predation sensor tag, it will transmit a sensor value that provides details on the predation status and the amount of time since the sensor was triggered[3]. The table below shows the meaning of unconverted raw sensor values (ADC units) for predation sensor tags.

Sensor Value (ADC Units)	Meaning
0	Sensor Fault
1	Untriggered
2	Triggering
3-254	Count of time since triggered
255	Maximum time counter reached

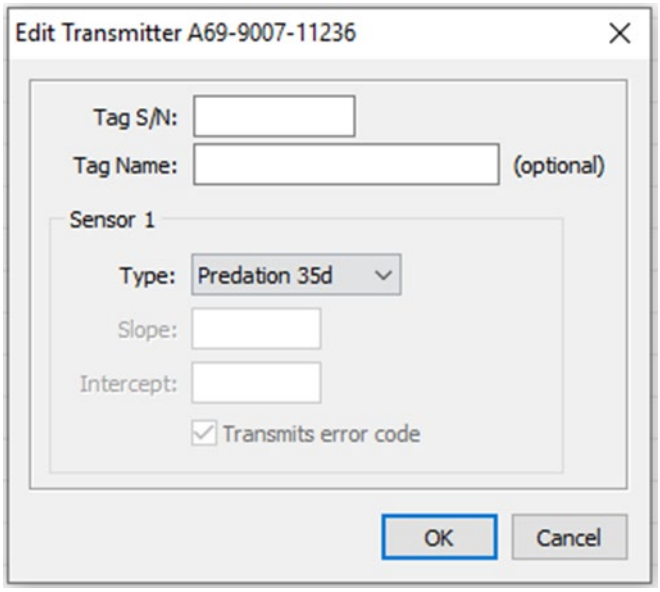
The precision of a predation sensor's time since trigger counter varies with the time since the sensor was triggered. As time since sensor trigger increases, time resolution decreases according to the table below.

Time Since Sensor Trigger* (Days)	Time Since Sensor Trigger* (Hours)	Sensor Value (ADC Units)	Precision
0 – 7 days	0 – 168 hours	3-170	±0.5 hour
7 – 14 days	170 – 334 hours	171-212	±2 hours
14 – 21 days	340 – 500 hours	213-233	±4 hours
21 – 35 days	512 – 832	234-254	±8 hours
>35 days	≥ 840	255	-

*Please note that the delay between the predation event and the sensor trigger event is dependent on a number of external factors including water temperature and predator meal size.

To view time since sensor trigger in VUE, follow the steps described in Section 2.3.1 (*Add Information for a New Sensor Tag*) or Section 2.3.2 (*Edit Information for an Existing Sensor Tag*) and select "Predation 35d" from the Type dropdown list. Note that predation sensor tag calibration does *not* require input of Slope and Intercept information.

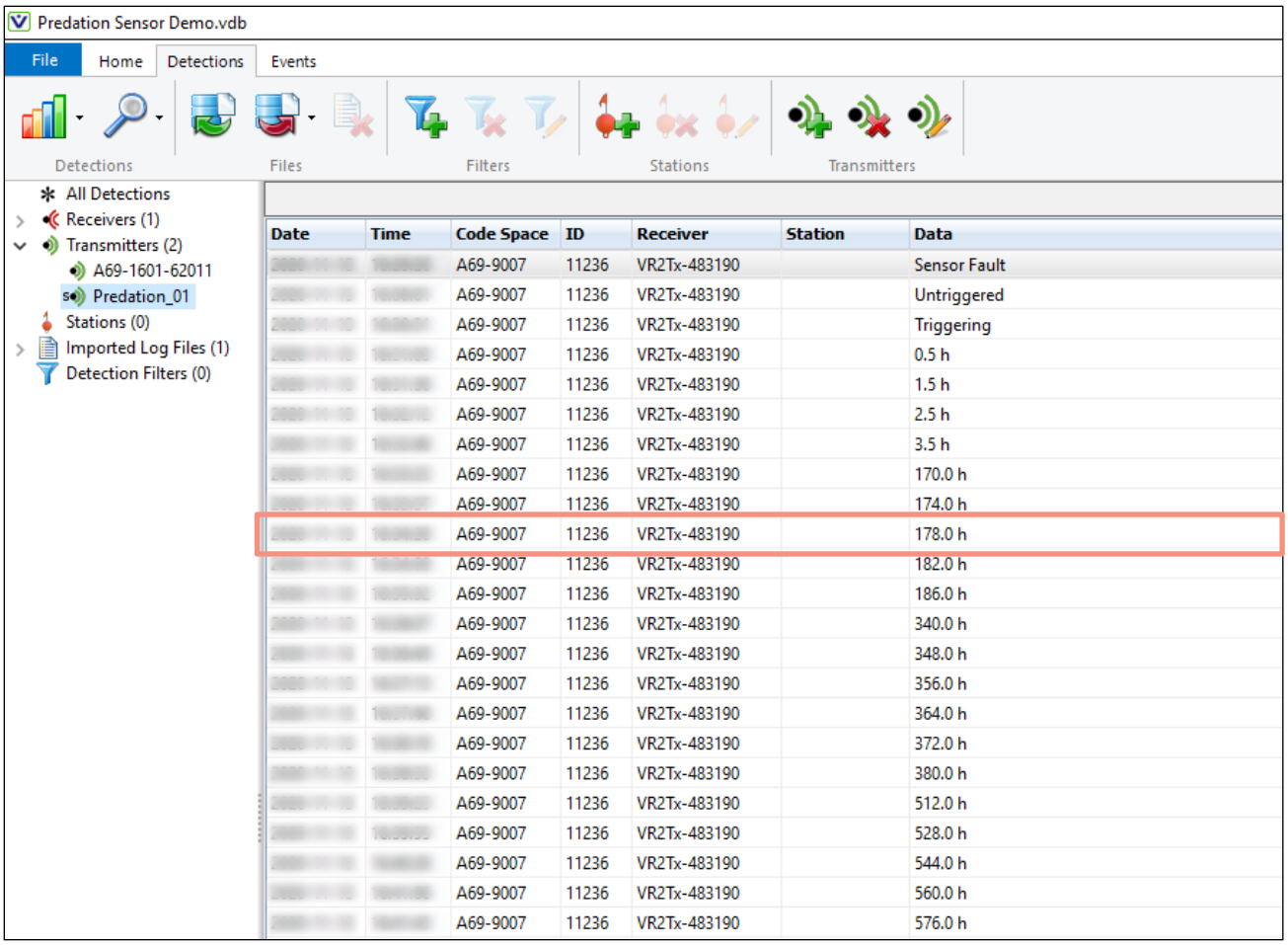
[3] Please note that 180 kHz V5D predation tags purchased prior to April 2020 function differently than indicated above. Earlier V5D tags were not sensor tags; instead, they change ID upon triggering. They did not report time since trigger.



2.3.3.1 Interpreting Predation Sensor Data in VUE

The database shown below contains detections of a predation sensor tag. The "Data" column shows either sensor status (Sensor Fault, Untriggered, or Triggering), or, if triggered, count of time since triggered.

To interpret displayed count of time since triggered, refer to the table in Section 2.3.3 above. For example, for the detection highlighted in red below, the Data column indicates 178 h since the sensor was triggered. Referring to the table in Section 2.3.3, we see that at 178 h trigger time, sensor precision is ±2 hours. Therefore, this sensor tag triggered between 176 and 180 hours before it was detected.



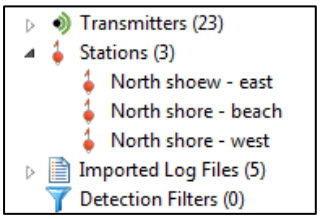
Note that when predation sensor detection data are exported from VUE to a CSV file, sensor precision information is included in the "Sensor Precision" column of the CSV file:

Date and Time (UTC)	Receiver	Transmitter	Transmitter Serial	Sensor Value	Sensor Unit	Transmitter Type	Sensor Precision
		A69-9007-11236	1234567	Sensor Fault	state	Predation 35d	
		A69-9007-11236	1234567	Untriggered	state	Predation 35d	
		A69-9007-11236	1234567	Triggering	state	Predation 35d	
		A69-9007-11236	1234567	0.5	h	Predation 35d	0.5
		A69-9007-11236	1234567	1.5	h	Predation 35d	0.5
		A69-9007-11236	1234567	2.5	h	Predation 35d	0.5
		A69-9007-11236	1234567	3.5	h	Predation 35d	0.5
		A69-9007-11236	1234567	170	h	Predation 35d	2
		A69-9007-11236	1234567	174	h	Predation 35d	2
		A69-9007-11236	1234567	178	h	Predation 35d	2
		A69-9007-11236	1234567	182	h	Predation 35d	2
		A69-9007-11236	1234567	186	h	Predation 35d	2
		A69-9007-11236	1234567	340	h	Predation 35d	4

2.4 Set Up Stations

As receivers are portable units easily moved from one location to another, VUE has provided the option to associate a receiver with a station (location) for a particular deployment. This is setup when you configure the receiver (see *Start a Study* in the receiver manual). The station specifies a location, including latitude and longitude (if desired), which is assigned and recorded in the receiver's memory during initialization.

A station is used to identify the location of the receiver during deployment.



Multiple receivers can be associated with the same station name and a receiver can be associated with multiple stations.

Selecting a station name in the Detections tab (see section 4.1.2) will show all detections in the open database from that station, including those from multiple receivers.

It is possible to associate detections with a station after the data has been offloaded from a receiver, but the original VRL file will not contain any location information. This post-deployment editing is explained in section 2.4.2.

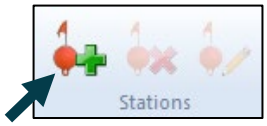
WARNING: DO NOT give multiple locations the same Station Name. This causes ambiguity in the database.

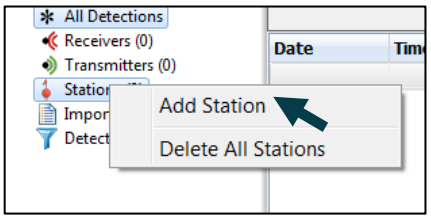
2.4.1 Add a New Station

To associate a receiver with a particular station before it is deployed, you must first use VUE to add a station name to your database. Follow the steps listed below to add a station.

STEP 1

Open the *Add Station* window by either clicking on the "Add a new station record" icon in the Detections ribbon (shown below) or by right-clicking on the station list and selecting "Add Station" (shown at far right).





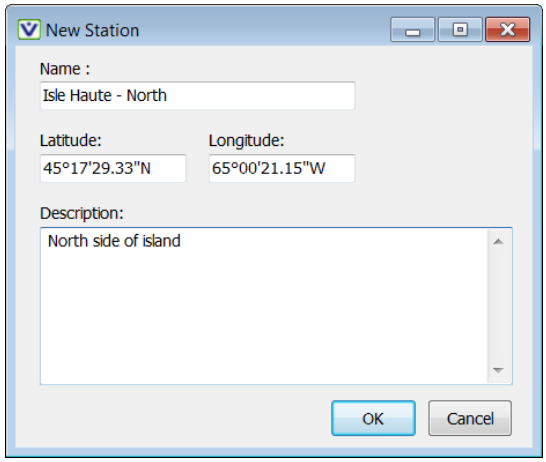
Continued…

STEP 2

Enter the location's unique name in the box labelled "Name". The station name will be used to identify the station in the selection tree and in the Station field of the database. This name should be unique from all other station names.

Optionally, enter the location's latitude and longitude in the boxes marked "latitude" and "longitude". There are various formats that will be recognized, and you may use any of the formats listed in the table below when inputting your data. Hemisphere must be indicated by either using +/- or by N/S/E/W.

Regardless of which format of "latitude" and "longitude" you choose to input, the default display setting is in +/- Degrees and will automatically convert to that format. This default display can be changed in the *Options* window (see section 7.4.1).



Format	Latitude	Longitude
Degrees	+44.64085	-063.67083
	44.64085° N	063.67083° W
	N44.64085	W063.67083
Degrees/Mins	44°38.451′ N	063°40.250′ W
	N4438.451	W06340.250
	+4438.451	-06340.250
Degrees/Mins/Secs	44°38′27.07″ N	063°40′14.98″ W
	N443827.07	W0634014.98
	+443827.07	-0634014.98

Always use unique station names (no two stations with the same name) to avoid ambiguity in the database.

Enter a description of the location in the "Description" box for your reference.

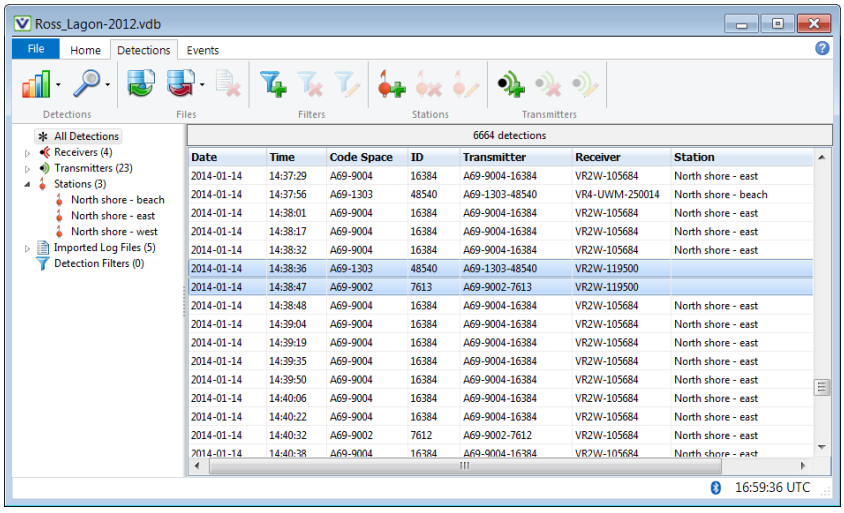
Click "OK" when finished.

TIP: Hold the "Alt" key and type "248" on the number pad to enter the degree symbol (°).

2.4.2 Edit a Station

It is possible to change the station association of a detection or group of detections. To do so, select the desired detections and "drag and drop" them onto the correct station name within the station selection tree. Remember that you can use Shift key to select a group of detections together. If you want to change the station for an entire VRL file, see section 5.2.1.

You can also edit a station name, the location, and/or the description associated with a station. When station information is changed, it will change for all data associated with the original station name. It's better to edit a station name rather than delete a station and then add a new station at the same location because the data association is lost when a station is deleted.



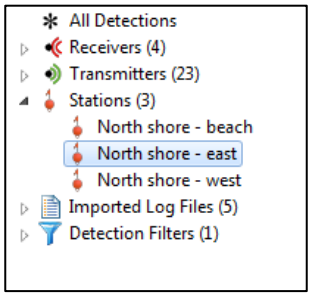
Edit a station rather than delete it and add a replacement.

Follow the steps below to edit an existing station's information.

Innovasea **recommends** making a copy of your VUE database prior to making significant edits, since database **changes are irreversible**. See section **2.2, Saving a database copy.**

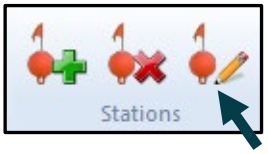
STEP 1

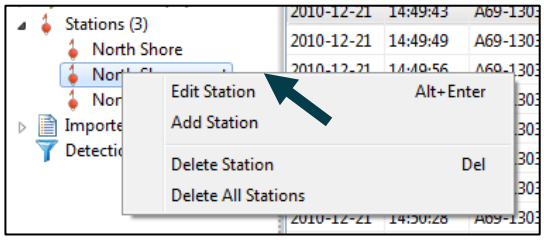
Highlight the station in the Stations section of the Selection Tree.



STEP 2

Open the *Edit Station* window by either clicking on the "Add a new station record" icon in the Detections ribbon (on left, below) or by right-clicking on the station in the list and selecting "Edit Station" (on right, below).





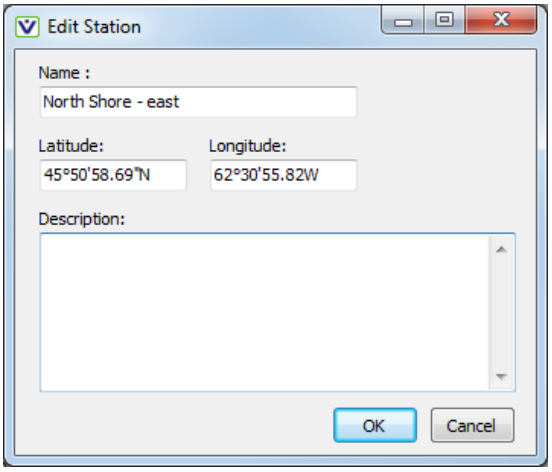
STEP 3

Enter the location's unique name in the box labelled "Name". The station name will be used to identify the station in the selection tree and in the Station field of the database. This name should be unique from all other station names.

Optionally, enter the location's latitude and longitude in the boxes marked "latitude" and "longitude". There are various formats that will be recognized and you may use any of the formats listed in the table below when inputting your data. Hemisphere must be indicated by either using +/- or by N/S/E/W.

Regardless of which format of "latitude" and "longitude" you choose to input, the default display setting is in +/- Degrees and will automatically convert to that format. This default display can be changed in the *Options* window (see section 7.4.1).

Format	Latitude	Longitude
Degrees	+44.64085	-063.67083
	44.64085° N	063.67083° W
	N44.64085	W063.67083
Degrees/Mins	44°38.451′ N	063°40.250′ W
	N4438.451	W06340.250
	+4438.451	-06340.250
Degrees/Mins/Secs	44°38′27.07″ N	063°40′14.98″ W
	N443827.07	W0634014.98
	+443827.07	-0634014.98



Always use unique station names (no two stations with the same name) to avoid ambiguity in the database.

Enter a description of the location in the "Description" box for your reference (optional).

Click "OK" when finished.

TIP: The degree symbol (°) can be entered on the keyboard by holding the "Alt" key while typing "248" on the number pad.

3. DATA ANALYSIS – THE BASICS

Data processing with VUE begins by collecting the data from the various receivers being used in a study. The data collection, or offloading, process is explained in detail in the various receiver user manuals. Some additional steps are: time correcting data files (section 3.1), removing false detections (section 3.2), and performing residency searches if desired (section 3.3).

3.1 Time Correction

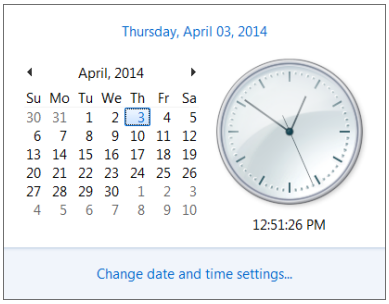
What is time correction and why should you do it? Innovasea submerged receivers rely on crystal oscillators to keep track of time. Due to manufacturing variations, the frequency of the crystal oscillators varies slightly between receivers. Each receiver's internal clock will drift – losing or gaining up to 4 seconds per day. This time drift can be caused by changes in temperature and/or variations in the oscillator. In most cases clock drift is highly linear and can be easily corrected.

We strongly recommend time-correcting data before beginning any data analysis.

Time correcting receiver data aids in lining up detections by ensuring that detections from all receivers in a study are timestamped according to a common reference. For example, if five receivers receive the same transmission from Fish A, the time stamp of the detections can vary across receivers by several minutes or more. This variance may lead one to believe that multiple tag transmissions from this animal were detected on the receivers in the area; in reality, however a single transmission was detected at different times due to clock drift. Correcting this clock-drift would reveal detection of a single transmission at the same time on multiple receivers. Note this is an especially important consideration when attempting to assess directionality of animal movement, as in a survival study in a river system.

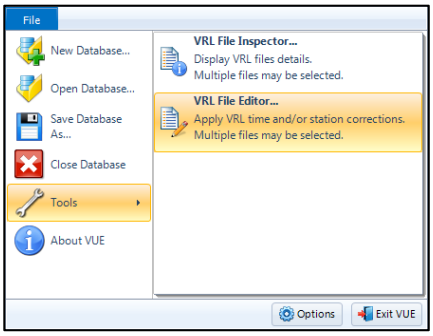
STEP 1

Establish that computer clock settings were correct (displayed time of day consistent with selected time zone) when the receiver was initialized and when the data were offloaded. Time correction is performed based on the assumption that the initialization and offload PC clock settings are correct. **If either is incorrect then the time correction changes will be incorrect.** Times can be edited if necessary (see Step 4).



STEP 2

Open the File menu and select Tools → VRL File Editor.



Continued…

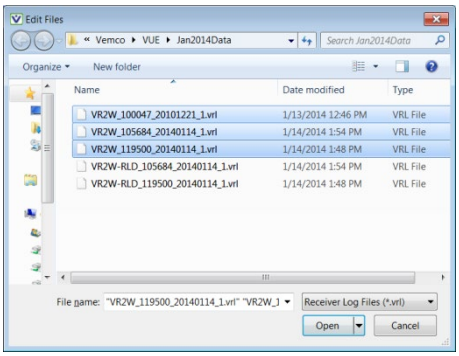
STEP 3

Select the VRL files you wish to time correct.

You may edit multiple files at one time by holding the CTRL key while selecting multiple files with the mouse.

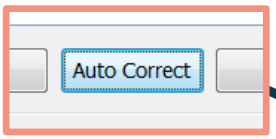
Click “Open”.

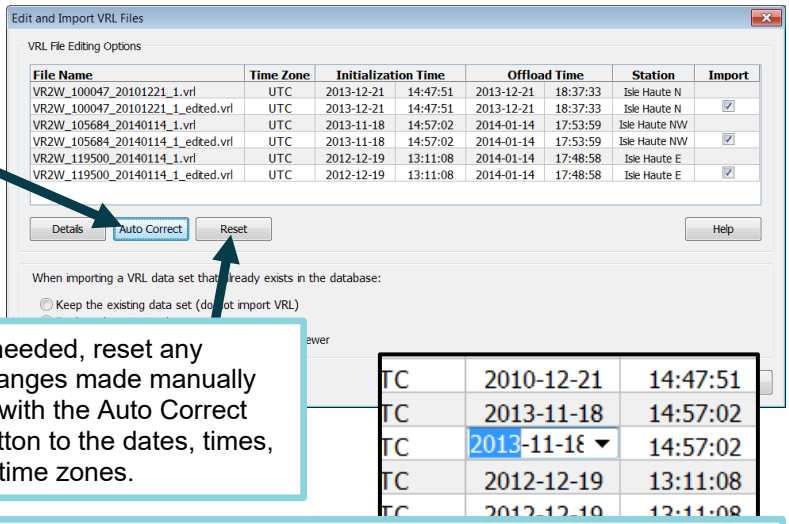
Your default location will open automatically.
See section 7.4.2 to change your default location.



STEP 4

Select the Auto Correct button in the VRL editing window.





Notice that beneath each chosen file is a new file with “_edited” appended to the filename. Your existing VRL files will not be altered but a new edited file will be created and stored with your existing VRL files.

If needed, reset any changes made manually or with the Auto Correct button to the dates, times, or time zones.

If a date, time, or time zone is incorrect, click on the incorrect information in the white line (edited file) and make the necessary change(s). Make sure the Auto Correct button is selected after the change has been made.

When selecting **Auto Correct**, if you notice a time drift of **more than 30 minutes**, or if you think that the original **Time Zone** and/or **Offload Time** is incorrect, please contact Innovasea Support.

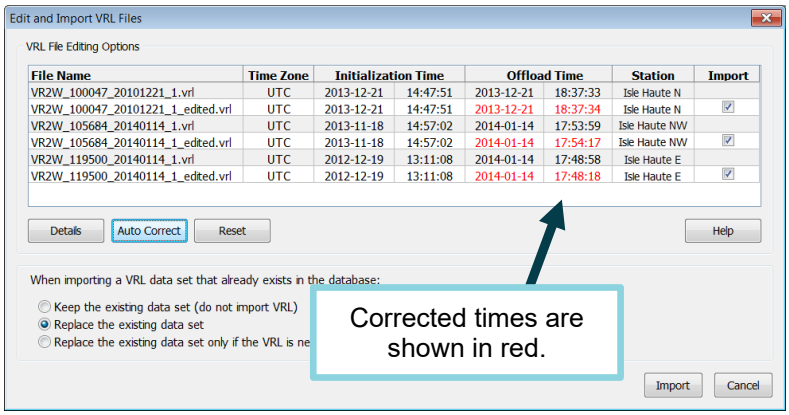
Continued…

STEP 5

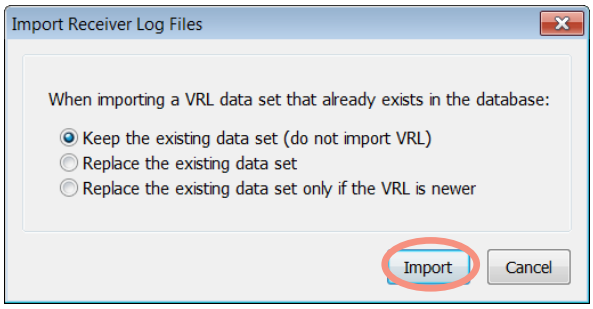
Watch for very large differences in times between the offloaded time and the corrected offloaded time as this may indicate there's a problem.

If you're uncertain if the times in a VRL file are correct, then uncheck the "Import" box on the right to not import that VRL file into the database, look into the issue, and import the file later.

Click "Import" to save the edited files and import the corrected data into the open database.



Select what you would like done with any duplicate data that may be imported and click "Import".



The three options are:

Keep the existing data set (do not import VRL)

This option will not import a VRL if that same VRL has already been imported into VUE and therefore does nothing with the selected file.

Replace the existing data set

This option will remove the previously imported VRL file before importing the selected file. Use this option if you want to replace a VRL file in the database with an edited version of the same file.

Replace the existing data set only if the VRL is newer

This option will remove the previously imported VRL file before importing the selected file but only if the selected file is newer than the previously imported one. Use this option if you have several edited versions of a file and you want to have the newest one in the database.

Duplicate detections are defined as multiple records of a detection made for the same transmitter, by the same receiver at the exact same time. If you import a VRL file multiple times, or import two or more VRL files which have overlapping data, for example, by offloading data from a receiver and redeploying the receiver without erasing the previous data, VUE will identify duplicate detections and remove them from the database.

None of these options will detect overlapping data sets. If a detection has already been imported from a different data set (either a subset or a superset), it will not be overwritten.

3.2 False Detection Analysis Tool

All communication systems experience transmission errors which can result in false detections. The Vemco system is quite conservative in its approach and thus the number of false detects is normally low, however they can still occur.

The **False Detection Analysis (FDA) tool** is designed to allow you to quickly identify the detections that may be questionable and therefore require further scrutiny. This tool does not state that the identified detections are false, but rather that the detections occurred in such a way that further analysis is needed before determining if the detection was false or not.

The FDA tool is based on an algorithm that uses the premise that false detections are generally separated by long intervals with only occasional short intervals. Details on the algorithm, ***False Detections: What They Are and How to Remove Them from Detection Data***, can be found in the "Downloads" section of support.fishtracking.innovasea.com.

The FDA tool analyzes your detection data and determines, on a receiver- or station-to-tag basis, the number of short and long intervals between detections. Those tag-receiver or tag-station records for which there are more long intervals than short intervals are flagged as questionable data and require additional scrutiny before being accepted by the researcher as valid data. Single detections of a tag on a given receiver or at a given station are also flagged as questionable.

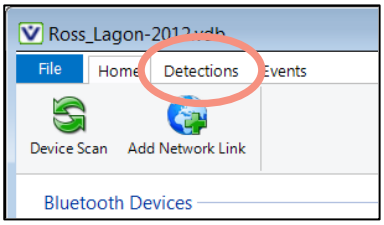
3.2.1 Using the FDA tool

STEP 1

Open VUE and open the database (if not already open – see section 2.1 about automatically opening a database).

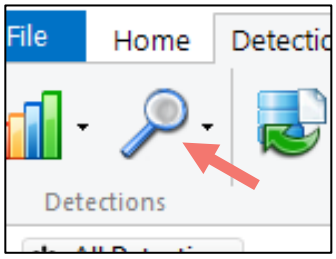
STEP 2

Select the Detections tab to bring the Detections ribbon into view.



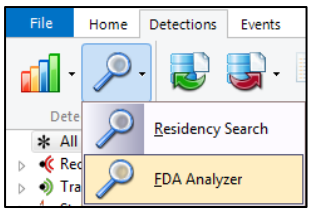
STEP 3

Select the database search icon (magnifying glass)



STEP 4

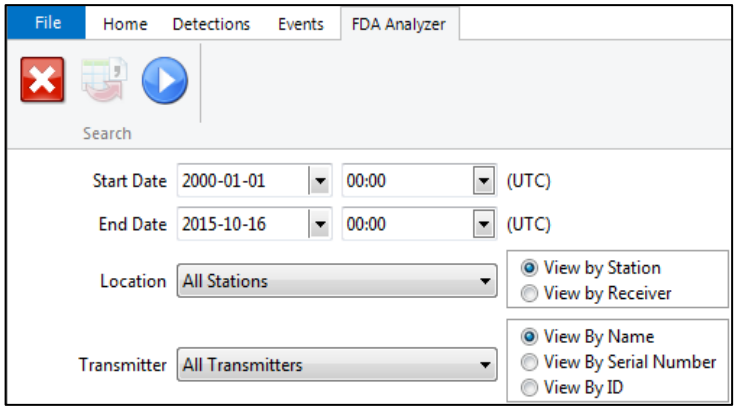
Select "FDA Analyzer" to open the FDA Analyzer tab.



Continued…

STEP 5

Enter the desired start and end times within which to search. If desired, select a specific location (station or receiver) to limit the search area.



View available stations by selecting **View by Station** in the box to the right of the **Location** drop-down list.

View the list by receiver by selecting **View by Receiver**.

Choose a particular transmitter to search by selecting from the **Transmitter** drop-down list.

You may perform the search on a transmitter's *Name*, *Serial Number*, or *ID*.

NOTE: Only transmitters that have been named will appear in the **View by Name** drop-down list.

Similarly, unless you specify a serial number for a transmitter, it will not appear in the **View by Serial Number** drop-down list.

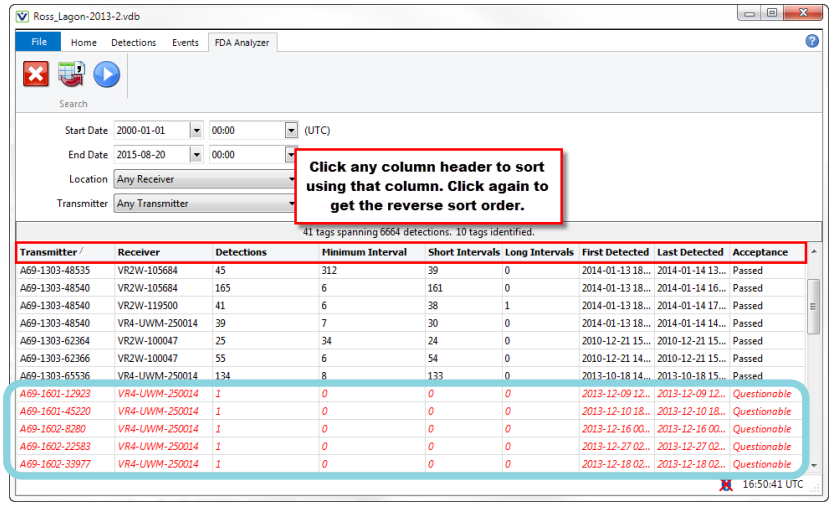
For dual-ID sensor tags, it is best to perform the search either by *Name* or *Serial Number*; otherwise, the FDA tool assumes that each ID belongs to a different animal.

By default, the false detection analysis is performed on *all locations and all transmitters*.

STEP 6

Click the blue "Execute" button and wait for the results. Any tags with single detections - or that have more long intervals than short intervals between detections - on a given receiver or station are shown in red, and the acceptance is listed as "Questionable".

By default, VUE sorts FDA results by *transmitter*. To sort by another field, simply click on the column header. Click on the same column header a second time to reverse the sort order.



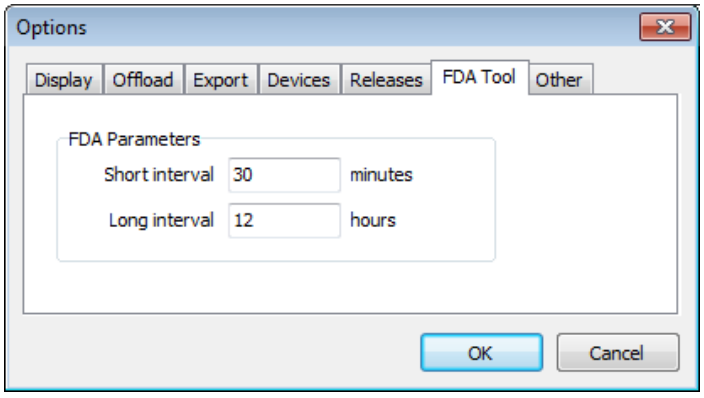
3.2.2 Reviewing "Questionable" Data

It's important to note that FDA analysis does not conclusively determine that the "questionable detections" are false, only that the data require further scrutiny. Some things to consider when looking at questionable data are:

1. Detection activity. If there are many tags around a receiver, tag collisions can happen and can cause false detections. Single detections, or multiple detections spaced far apart recorded in the presence of other tags should be viewed very cautiously as they are most likely to be false.
2. Detections of a certain ID number on other receivers may provide you with enough confidence to classify a questionable detection as real, assuming the timing makes sense.
3. Fixed tags or range test tags – if you have deployed tags for a range test and they are on the edge of the detection range, it will be normal for them to fade in and out during the range testing. Depending on the range performance these could look like detections that are separated by long intervals and thus flagged as questionable even though they are legitimate detections.
4. The short and long intervals are set up by default as 30 minutes and 12 hours respectively. This works well with normal tag delays (e.g. 30 sec to 5 minute delays). If your tags have very long random delays – tens of minutes and longer – you may not detect any short intervals and thus they are flagged as questionable even though they are valid detections. The default interval times can be changed as required (see below).
5. High Residency situation – if you have a large number of tags resident around a receiver, you may expect to see longer intervals between tag detections due to tag collisions. It may be necessary to stretch out the minimal interval for the FDA analysis to allow for these longer intervals.
6. Finally, when in doubt call us. We are happy to have our team of experts review your data and provide guidance on whether to accept detections as real.

3.2.3 Changing FDA Interval times

There are situations when the FDA tool's default interval times may need to be adjusted according to the needs of your data. If you decide to do so, access to the FDA Parameters by opening the *Options* window (see section 7.4.6) and selecting the FDA Tool tab. The default times are shown in the window below.



3.3 Residency Search

The residency search option provides a method of reducing the volume of your data by summarizing detection counts by transmitter and receiver or station during a fixed period of time. You can specify the start and stop times and the number of detections required for a residency event (i.e. how many times must a tag be detected before it's considered in residence at a particular location). The "Absence Threshold" allows you to specify the maximum time between detections to be considered part of a single residency period at a location. Specific receivers or transmitters can be selected as parameters of the residency search.

The Residency Search is particularly helpful if you are working in a fixed area, such as a reef, and you wish to know when the tagged animals arrived in the area and when they left, but you are not interested in how many times they were detected while they were in the area.

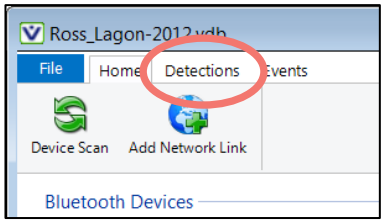
Follow the steps below to use Residency Search:

STEP 1

Open VUE and open the database (if not already open – see section 2.1 about automatically opening a database).

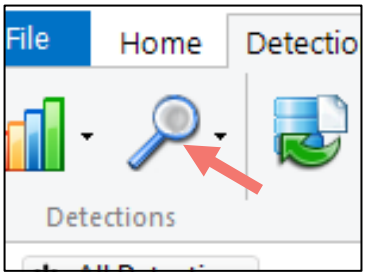
STEP 2

Select the Detections tab to bring the Detections ribbon into view.



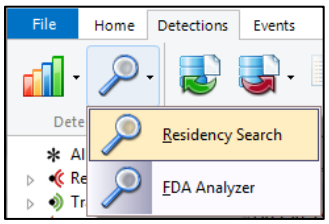
STEP 3

Select the database search icon (magnifying glass).



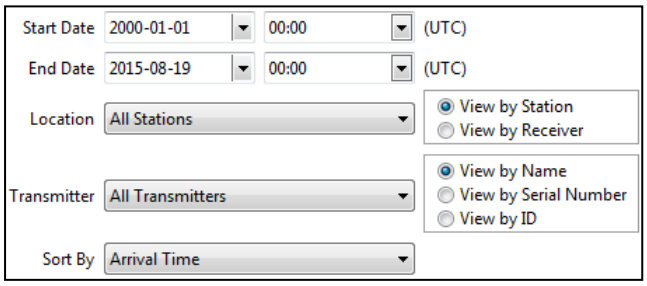
STEP 4

Select "Residency Search" to open the Residency tab.



Continued…

STEP 5



Enter the desired start and end times within which to search. If desired, select a specific location (station or receiver) to limit the search area. View available stations by selecting **View by Station** in the box to the right of the **Location** drop-down list. View the list by receiver by selecting **View by Receiver.**

Choose a particular transmitter to search by selecting from the **Transmitter** drop-down list. You may perform the residency search on a transmitter's *Name*, *Serial Number*, or *ID*. Only transmitters that have been named will appear in the **View by Name** drop-down list.

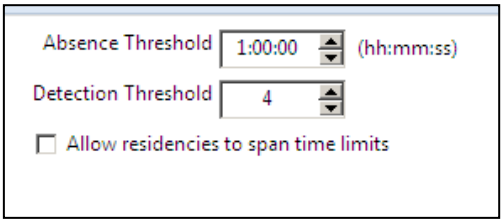
Similarly, unless you specify a serial number for a transmitter, it will not appear in the **View by Serial Number** drop-down list.

For dual-ID sensor tags, it is best to perform the residency search either by *Name* or *Serial Number*; otherwise, the residency tool assumes that each ID belongs to a different animal.

By default, the Residency Search is performed on *all locations and all transmitters*.

The **Sort By** field lets you select if the results will be listed based on when a tagged animal *arrived* or when it *departed*.

STEP 6



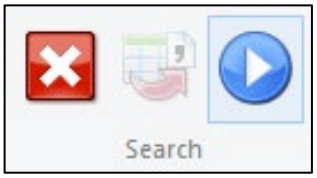
Select the **Absence Threshold** (the maximum length of time permitted between detections within a single residency period), and the **Detection Threshold** (the minimum number of detections required for a residency event to be reported.)

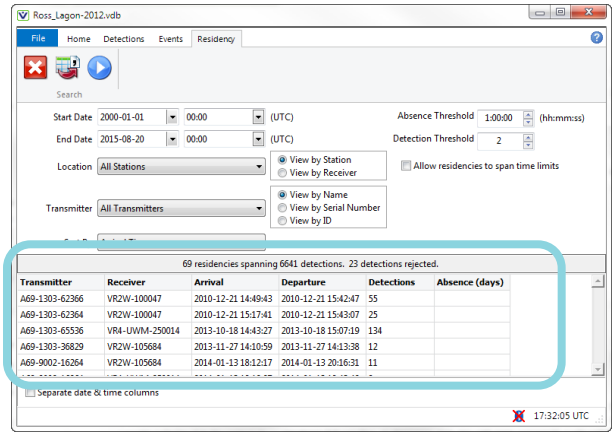
The **Allow residencies to span time limits** option, when enabled, allows residencies to span the start and end time limits. When disabled, residencies are cut off before the limit.

Continued…

STEP 7

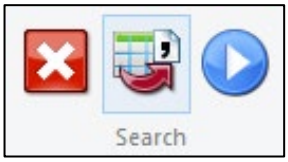
Click the “Execute” button to begin the search. The results are listed in the lower section of the window.





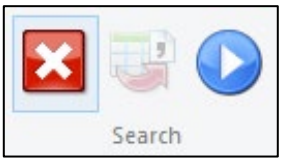
STEP 8

Export the search results as a CSV file by clicking the “Export search results as a CSV file” icon and entering a directory and file name.



STEP 9

Close the Residency tab by clicking the red “X” icon in the ribbon. More than one Residency tab can be open at the same time.

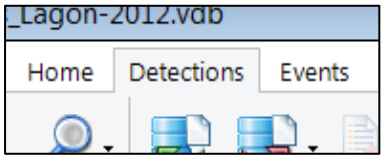


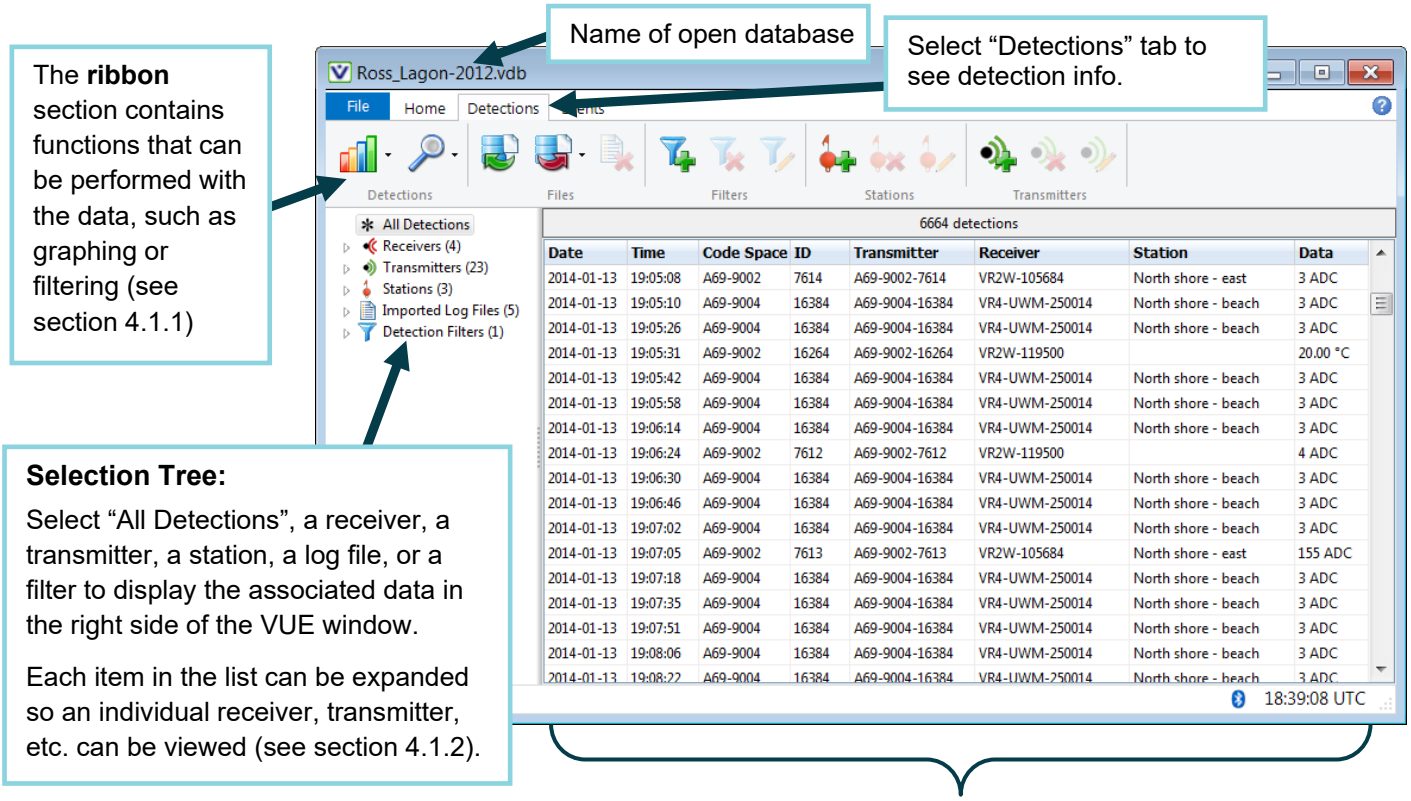
4. VIEWING DATA

Data are retrieved from receivers using the Offload feature. Specifics for offloading data are described in your receiver's user manual. If a database is open when the data are offloaded from a receiver, then a prompt will ask if the data should be imported into the open database. Data can be added to a database at any time by importing the .VRL file(s) into VUE.

4.1 Viewing Detections

The Detections tab contains all detections in the open database and is only visible if a database is open (see section 2.1 for opening a database). While in the Detections tab, it's possible to graph detections, search data for tag residency, import and export files, filter data, add/edit station or transmitter information, and view data by receiver, transmitter, or station.





Selection Tree:

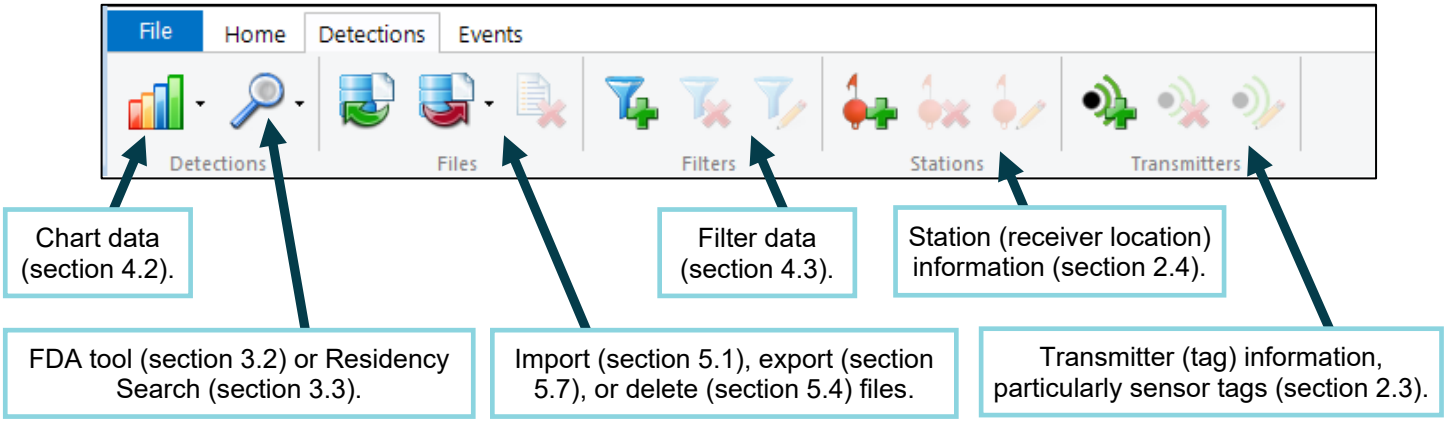
Select "All Detections", a receiver, a transmitter, a station, a log file, or a filter to display the associated data in the right side of the VUE window.

Each item in the list can be expanded so an individual receiver, transmitter, etc. can be viewed (see section 4.1.2).

The right side of the VUE window changes according to what's selected in the tree on the left side of the window. If a receiver is selected, then this section of the window reports which tags were detected by that receiver. If a tag is selected, all the detections in the database for that tag are shown. If a station is selected, all detections in the database recorded at that station are shown.

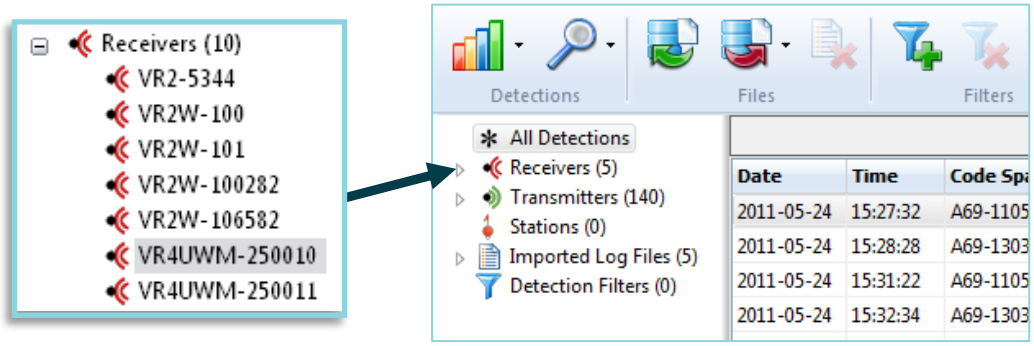
4.1.1 Detections Ribbon

Selecting the Detections tab will bring the Detections Ribbon to the fore, allowing any of the available features to be selected. Each feature is explained elsewhere in the manual – see the references below.



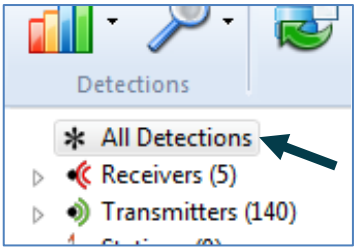
4.1.2 Detections in the Selection Tree

The selection tree on the left side of the window allows access to the detections of individual receivers, transmitter, stations, imported log files, and detection filters. Clicking on the ▷ symbol next to a category will open the expanded view, as shown below.



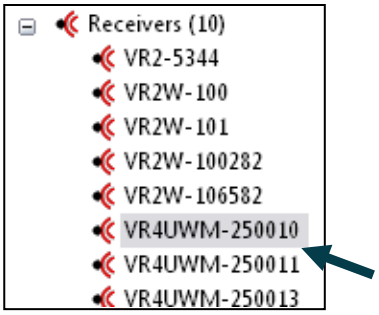
4.1.3 Viewing All Detections

To view all detections in a database, first select the Detections tab at the top of the window. This tab is only visible when a database is open. Select "All Detections" at the top of the selection tree on the left hand side of the VUE window. All detections, sorted by date, will be listed on the right-hand side of the screen.



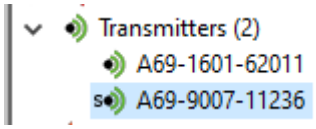
4.1.4 Viewing Detections by Receiver

Receivers are uniquely named according to their model and serial number, for example, VR2W-100282. To view detections collected with a specific receiver, select the receiver in the selection tree on the Detections tab. All detections from that receiver, sorted by date, will be listed on the right-hand side of the screen.



4.1.5 Viewing Detections by Transmitter

To view detections of a specific transmitter, select the transmitter in the selection tree on the Detections tab. All detections from that transmitter, sorted by date, will be listed on the right-hand side of the screen.



4.1.6 Viewing Transmitter Detections

Each transmitter is provided an ID number at the factory. The transmitter data sheet which was shipped with the transmitter will provide the transmitter serial number, the transmitter code space, and the ID number. Within VUE, the default transmitter name will be displayed as a combination of the code space and the ID number. A Code Space is a term used to describe the type of message transmitted by a tag. It is important to note that tags with the same ID number but different code spaces (e.g., A69-1601-2056 and A69-9001-2056) do NOT represent the same tagged animal. It's important to include both Code Space and ID (ex: A69-1601-2056, referred to as the "full ID") when analyzing detection data to avoid any ambiguity in identifying your tagged animals.

By selecting the transmitter name in the list on the left side of the VUE detections window, VUE will show all detections found in the current database for that transmitter.

Default Transmitter Name: ***code_space*** **– ID#**

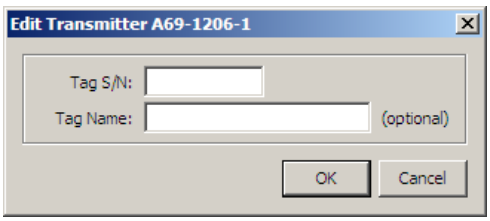
example: **A69-1601-**

Date	Time	Code Space	ID	Transmitter	Receiver
2020-11-13	16:29:17	A69-1601	62011	A69-1601-62011	VR2Tx-483190
2020-11-13	16:29:26	A69-9007	11236	A69-9007-11236	VR2Tx-483190
2020-11-13	16:30:01	A69-9007	11236	A69-9007-11236	VR2Tx-483190
2020-11-13	16:30:31	A69-9007	11236	A69-9007-11236	VR2Tx-483190

For more information on receiver Code Maps and transmitter Code Spaces, please visit the **Code Spaces and Code Maps** topic at support.fishtracking.innovasea.com.

4.1.6.1 Transmitter name

A transmitter can also be assigned a user-defined name. To do this, highlight the tag in the selection tree and click the *Edit selected transmitter* in the Transmitter section of the Detections ribbon (shown at right), or right-click on the tag in the selection tree and select *Edit transmitter*. Either method will open the *Edit Transmitter* window shown below. The serial number and a user-defined name can be entered to be assigned to that tag.



The user-defined transmitter name will appear in the "Transmitter" column on the right hand side of the VUE window when "All Detections", "All Events" or a receiver, station, log file, or filter is selected on the left hand side. The database columns "Code Space" and "ID" will still contain the code space and transmitter ID.

Date	Time	Code Space	ID	Transmitter	Station
2008-02-14	17:12:09	A69-1303	1	A69-1303-1	
2008-02-14	17:12:17	A69-1303	3	A69-1303-3	
2008-02-14	17:12:31	A69-1303	3	A69-1303-3	
2008-02-14	17:12:44	A69-1303	3	A69-1303-3	
2008-02-14	17:12:59	A69-1303	1	A69-1303-1	
2008-02-14	17:13:27	A69-1303	9	Salmon 58	
2008-02-14	17:13:39	A69-1303	9	Salmon 58	
2008-02-14	17:13:56	A69-1303	9	Salmon 58	

Default transmitter name

User-defined name

4.1.7 Viewing by Station

As receivers are mobile units easily moved from one location to another, VUE has provided the option to associate a receiver with a station (location) for a particular deployment. The station specifies a location, including latitude and longitude (if desired), which is assigned and recorded in the receiver's memory during initialization. More information on stations is found in section 2.4.

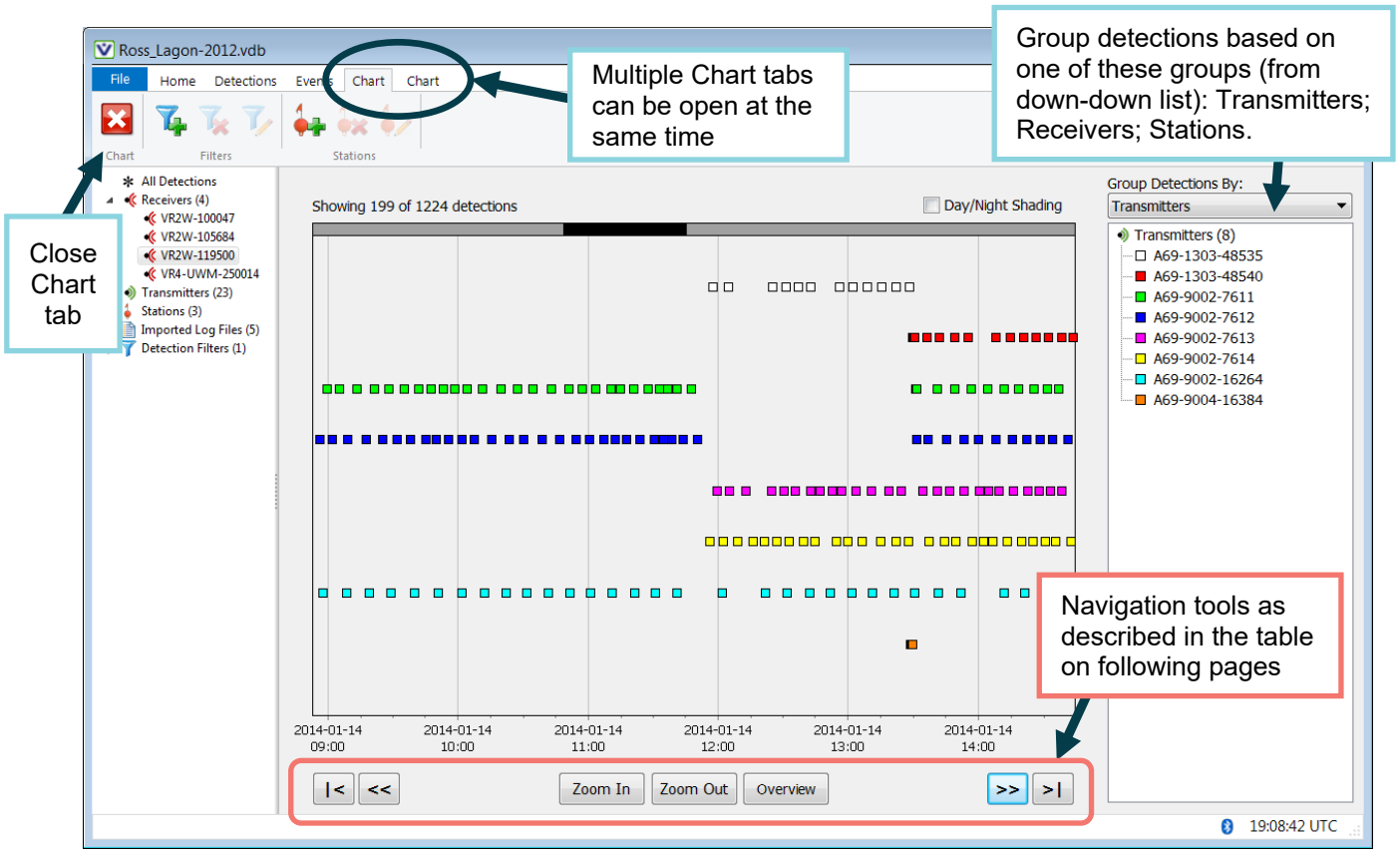
A station is used to identify the location of the receiver during deployment.

4.2 Plotting Data

Any data displayed in the Detection tab can be plotted by time. The plot can be viewed by selecting the "Chart Detections" icon in the Detections ribbon (shown at right). The detections plotted are selected using the selection tree on the left. Selecting a transmitter will plot all the detections from that transmitter, grouped by receiver. Selecting a receiver will plot all the detections from that receiver, grouped by transmitter. Selecting "All Detections" will plot all database detections, grouped by transmitter.

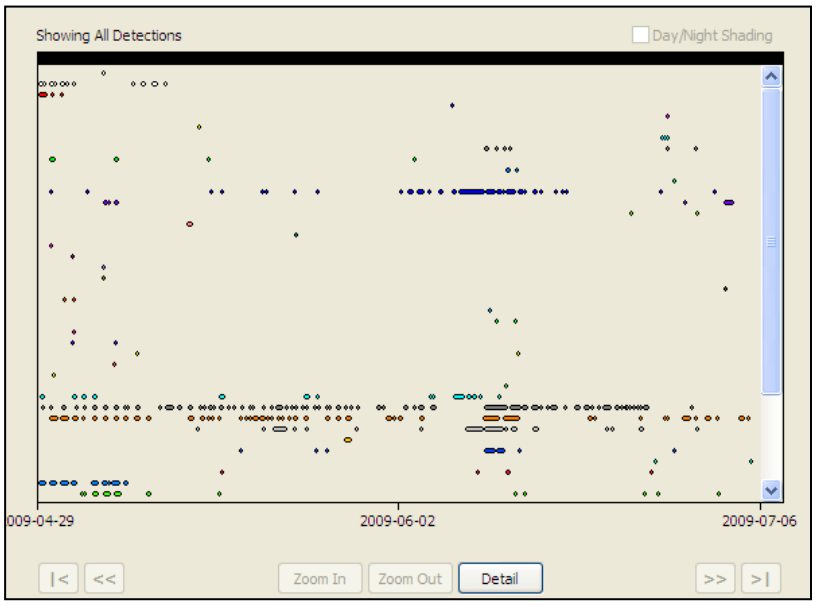
Adding or removing data from the database automatically updates the plot.

There are two plot display modes in VUE: a detail mode and an overview mode. When you first generate a plot, the data are shown in Detail mode. In this mode, the plot window is capable of simultaneously displaying just under 8, 200 detections. The number of detections currently displayed, as well as the total number of detections in the selected data are shown on the top left of the plot window. The black section of the grey bar at the top of the plot indicates which portion of your selected data you are currently viewing. In the example below, the plot shows the first 199 of all 1,224 detections for the receiver VR2W-119500.



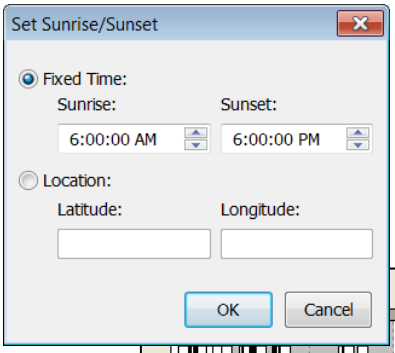
Detections can be grouped by transmitters, receivers, or stations. The legend on the right hand side of the window provides a list of the transmitters, receivers, or stations for which detections are currently visible on the plot.

To view all detections in your database simultaneously, click on the “Overview” button in the navigation tools (below the chart). Overview mode will display all detections but will not display the details of each detection.

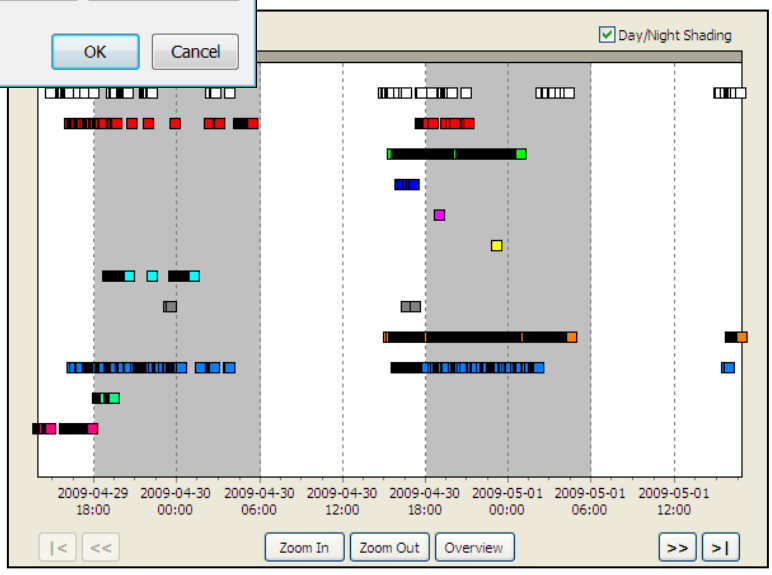


To return to detail mode, click on the “Detail” button at the bottom of the plot window.

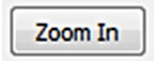
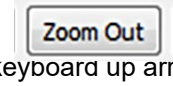
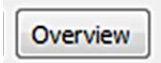
For large datasets, overview mode may take considerable time to display. For this reason, VUE provides the option to abort loading the overview plot. To do so, click on the “Abort” button at the bottom left of the plot window.



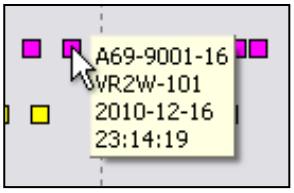
To more easily distinguish the time of day each transmission was detected, you can opt to select the Day/Night Shading box above the chart. When selected, a dialog box initially appears where you can set the sunrise and sunset times or use latitude and longitude values. The plot will then show any night detections with a shaded area, as shown in the sample below.



The Chart tab contains several navigation tools to help browse your data. These are listed and described in the table below.

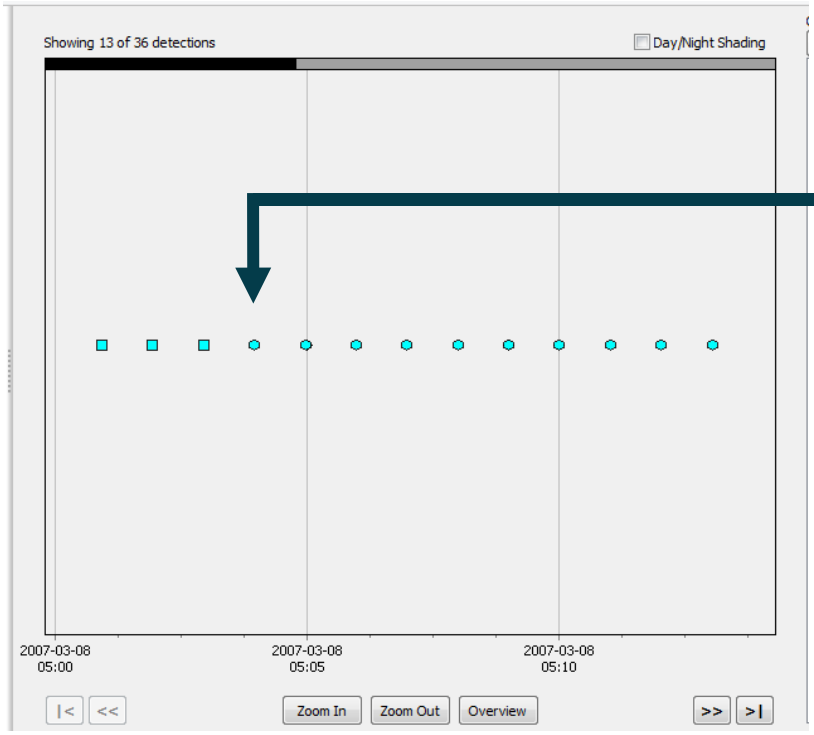
Button	Description
	Go to the beginning of the data selection
	Go to the end of the data selection
 (or keyboard left arrow)	Skip back one display page (keyboard left arrow)
 (or keyboard right arrow)	Skip forward one display page (keyboard right arrow)
 (or keyboard down arrow)	Display a shorter time range. You can also zoom in on a particular area by clicking anywhere on the graph and dragging to define a time range.
 (or keyboard up arrow)	Display a longer time range (keyboard up arrow)
	Display entire dataset at once

In both detail and overview modes, moving the mouse pointer over any point on the plot will display the transmitter ID number, the receiver it was stored on, and the date and time details of that detection (see example at right).



4.2.1 Visualizing predation events

For tags in the VUE database that have been identified as predation sensors (refer to Section 2.3.3, *Predation Sensor Tags*), the Detections chart allows visualization of the state of the sensor tag at the time the tag was detected. A predation sensor tag is represented in the chart by a square as long as it is in either an "untriggered" or "triggering" state. Once the tag has triggered and begins its count of time since triggering, tag detections are represented by a hexagon.



This chart demonstrates a Predation Event.

Where the square symbol changes to a hexagon symbol, this indicates that a predation event has occurred.

4.3 Filtering Data

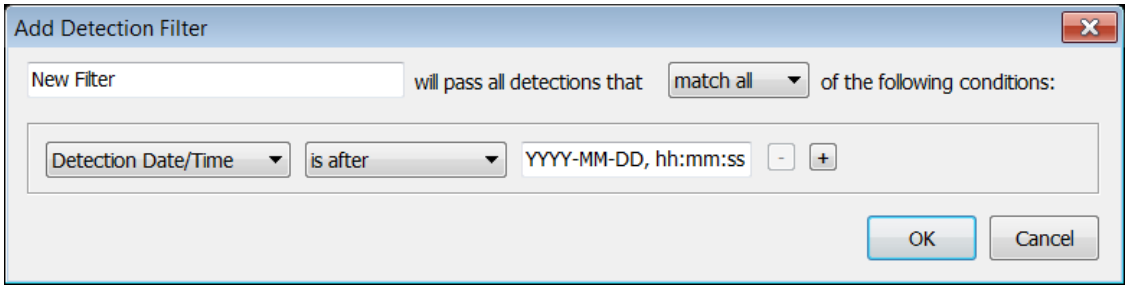
As well as allowing you to view detection data by receiver, transmitter, station, or log file, VUE provides the capability to view your data by detection filter. You can create detection filters to look at subsets of your data that meet particular criteria such as date, time, transmitter ID, transmitter frequency, receiver, station, number of detections, and transmitter/receiver combination. For example, if you are interested in looking at all of the detections in your database for transmitter Tag ID #3 that occurred *after* March 5, 2006 at 2:00 pm and excluding detections at "Big Red Rock" station, then VUE makes it easy to create a filter with those definitions. Detection filters provide an easy way to view, plot, and export subsets of your database.

4.3.1 Creating Detection Filters

To create a detection filter, follow the steps listed below.

1. Select the Detections tab.

2. Select the *Add Detection Filter* icon (shown at right) in the Detections ribbon or right-click on "Detection Filters" in the selection tree and choose "Add Filter". The "Add Detection Filter" window will appear (shown below).



3. Enter the filter name in the box labelled "New Filter".

4. Choose either "Match all" or "Match any" from the drop-down list to the right of the New Filter box. If you filter your data using more than one criterion you can control whether the data must match all of your chosen criteria or at least one of the chosen criteria.

5. Using the drop-down menu in the box labelled "Detection Date/Time", choose your first criterion. VUE provides thirteen different options for filter criteria. These criteria are listed and described in section 4.3.3.

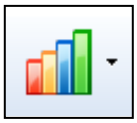
6. In the next drop-down menu box, choose your desired "qualifier" for the filter criterion that you have selected. The qualifiers available will depend on the filter criterion that you have selected. For example, if you choose to filter by Detection Date/Time, the available qualifiers are "is after" or "is before". Refer to section 4.3.3 for a complete list of qualifiers for each filter option.

7. In the box on the bottom right of the Add Detection Filter window, type the desired data value to use in the filter.

8. To add another filter criterion to the same filter, click on the + sign on the right-hand side of the window. A new row will appear for you to enter the next filter criterion.

9. When you are finished adding filter criteria, click OK.

Filters that have been created are shown in the selection tree under "Detection Filters". Your filtered data can be viewed by expanding the detection filters branch and clicking on the filter of interest in the selection tree. The data are displayed in the detection window on the right hand side of the screen. When your data are displayed, they can be plotted by selecting the *Chart data* icon (shown at right) in the Detections tab.

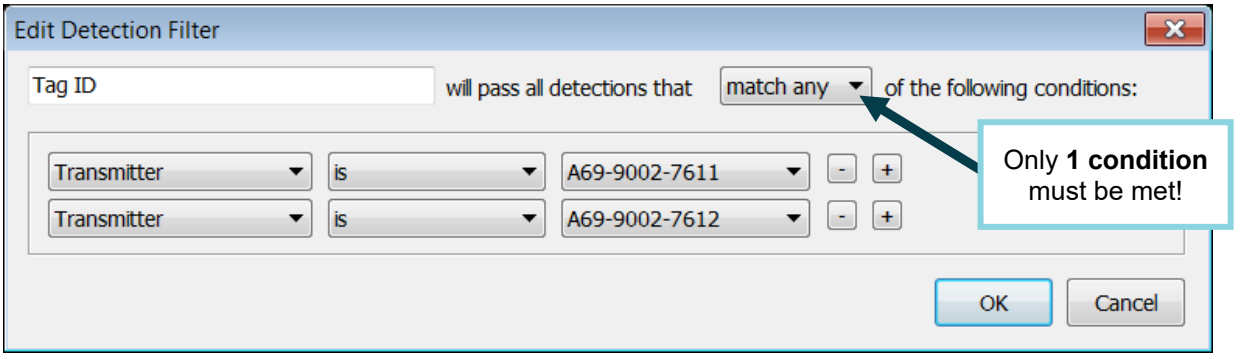


To export your filtered data, select the *Export File* icon under the Detections tab (shown at right). Metadata associated with your filtered detections can also be exported, by selecting *Export Metadata*. Details on exporting and importing metadata are found in section 5.8.2.

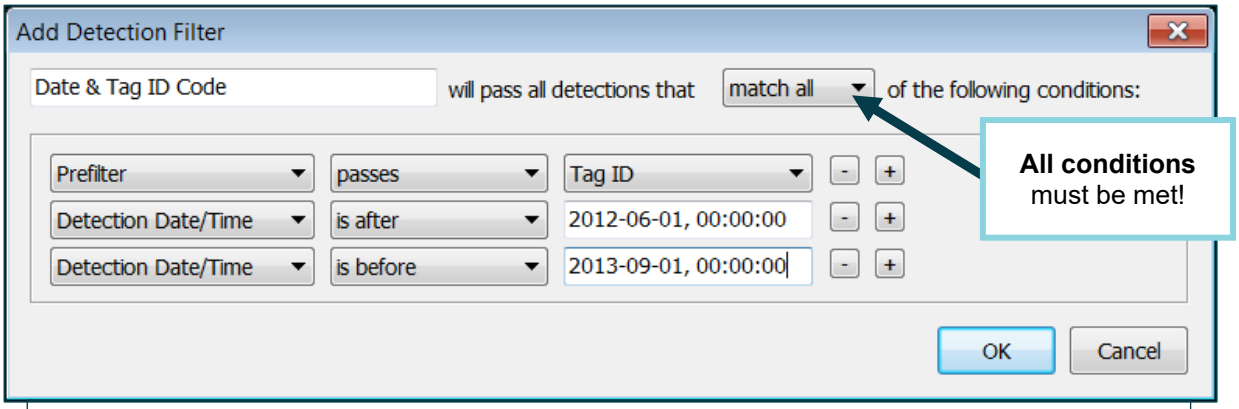
4.3.2 An Example of a Common Filter

How do I create a filter that queries all detections of a transmitter with two IDs (such as a TP tag) between two dates?

Step 1: Create a filter that displays all detections for two IDs.



Step 2: Create a filter that displays all detections for 2 IDs between 2 dates using the filter created in Step 1 as a prefilter.



FILTER DEFINITION: Display ID numbers A69-9002-7611 **OR** A69-9002-76120 (1 tag) **AND** after June 1, 2012 0:00 hrs **AND** before September 1, 2013 0:00 hrs.

4.3.3 Filter Options

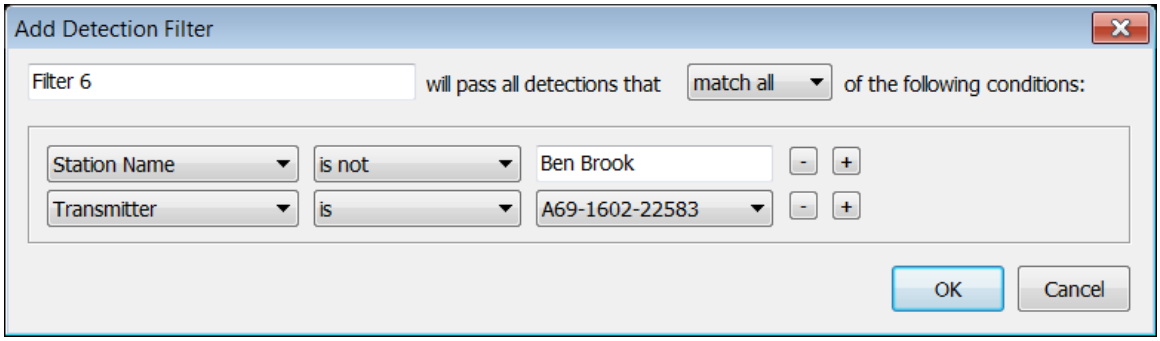
VUE provides thirteen different options for filtration criteria that you can use to build your detection filters. The table below lists and describes the options.

Filter Criteria Options		
Filter Criterion	**Qualifiers**	**Description**
Detection Date/Time	• is after • is before	Displays all detections in the database occurring after (or before) a given date and time. If no time is specified, the default is 00:00:00 on the date given.
Transmitter	• is • is not	Displays all detections from (or not from) a given transmitter selected from a list of all transmitters in the current database. For example, “A69-1303-9” (transmitter with a default label) or “Salmon 58” (a user-named transmitter).
Transmitter Name	• is • is not • contains • does not contain • begins with • does not begin with • ends with • does not end with	Displays all detections of transmitters matching or not matching the specified Transmitter Name, or portions of the Transmitter Name. This criterion only searches *named* transmitters, i.e. transmitters that have been manually named in VUE. Transmitters that have not been assigned a name other than the default will be ignored by this filter. To filter by the default transmitter label assigned by VUE (e.g. “A69-1303-9”), use the “Transmitter” filtration criterion above.
Transmitter Code Space	• is • is not	Displays all detections from (or not from) the specified Coding ID. Transmitter Code Space refers to the last 4 digits found in the “Code Space” column of the VUE window for each transmitter. For example, to find all detections for transmitters in the 1601 code space, set the Transmitter Code Space filter to “is” and its value to “1601”.
Transmitter Tag ID	• is • is not • is greater than • is less than	Displays all detections for transmitters matching, not matching, greater than, or less than the specified Transmitter Tag ID. The transmitter tag ID is shown in the “ID” column of the VUE window.
Transmitter Frequency	• is • is not • is greater than • is less than	Displays all detections for transmitters of the specified frequency. The transmitter frequency is contained in the first 3 characters if the “Code Space” column in the VUE window. For example, if the Code Space is A69-1601, the transmitter frequency is 69 kHz.
Transmitter Detection Count	• is • is not • is greater than • is less than	Displays all detections from any transmitter for which the database contains (or does not contain) a given number of detections. You can also search for transmitters with detection counts above or below a given value.

Filter Criteria Options		
Filter Criterion	**Qualifiers**	**Description**
Receiver	• is • is not	Displays all detections recorded by (or not recorded by) a given Receiver selected from a list of all Receivers in the current database.
Station	• is • is not	Displays all detections that occurred at (or not at) a given Station, selected from a list of all Stations in the current database.
Station Name	• is • is not • contains • does not contain • begins with • does not begin with • ends with • does not end with	Displays all detections at Stations matching or not matching the specified Station Name, or portions of the Station Name
Rxr/Txr Detection Count	• is greater than • is less than • is • is not	Displays all detections from any receiver/transmitter pair for which the database contains (or does not contain) a given number of detections. You can also search for receiver/transmitter pairs with detection counts above or below a given value.
Rxr/Txr Detection Separation	• is less than • is greater than	Displays all detections that are within less than or greater than a given number of minutes of another detection from the same receiver/transmitter pair.
Prefilter	• passes • does not pass	Displays all detections that pass or do not pass an existing filter in the database. The Prefilter provides a way to string together a series of filters that you have already created for your database. It is the only way to combine filters that use the “Matches all of” and “Matches any of” options. For example, you have defined a filter called “Recent Salmon Detections” that returns all detections from Transmitter Names containing “salmon” AND occurring after March 6, 2007 (using the “Matches all of” option), and another filter called “Shallow Stations” that returns all detections that occurred either at Station 1 OR at Station 2 (using the “Matches any of” option). Now you can use the Prefilter option to create a third filter called “Recent Salmon Detections, Shallow” that returns all the detections that pass both your “Recent Salmon Detections” and “Shallow Stations” filters.

4.3.4 Editing and Deleting Detection Filters

To edit an existing filter, select the *Edit Filter* icon in the Detections ribbon (select Detections tab to see Detections ribbon), or right-click on the filter name in the selection tree and select "Edit Filter". The *Edit Detection* Window, shown below, will appear to allow any of the filter options to be edited.



To delete a filter, select the *Delete Filter* icon in the Detections ribbon, or right-click on the filter name in the selection tree and select "Delete Filter." You may also delete all filters in your database by selecting "Delete All Filters" after right-clicking on a filter name in the selection tree.

4.3.5 Exporting Detection Filters to Another Database

Filter definitions can be exchanged between databases using the Metadata Import and Export options. To transfer existing filters from one database to another, follow the steps listed in Section 5.8.2, "Transferring Metadata between Databases."

5. MANAGING DATA

5.1 Importing Data

A VRL file (see section 1.1.2) is created every time data are offloaded from an Innovasea receiver. Choosing not to automatically import the data into a database at the time of offloading can save you time in the field. If this is the case, or if you need to import a VRL for another reason, then follow the instructions below. VRL files can be imported into any number of databases depending upon your needs.

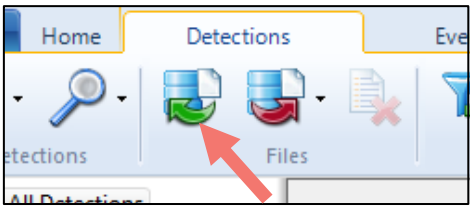
Reduce retrieval time in the field by offloading data files first and importing into the database later.

Note that importing a VRL file from anywhere other than the default directory will cause that file to be copied into the default directory. This ensures that you always have a local copy of every imported file. This feature of the VUE software is enabled by default, but can be disabled by un-checking "Copy imported VRL files into this folder" on the Offload tab of the *Options* window (see section 7.4.2 to open *Options*).

Innovasea **recommends** making a copy of your VUE database prior to making significant edits, since database **changes are irreversible**. See section **2.2, Saving a database copy.**

STEP 1

Select the Import file icon on the Detections tab. If the Detections tab is not visible, open or create a database (see section 2.1).

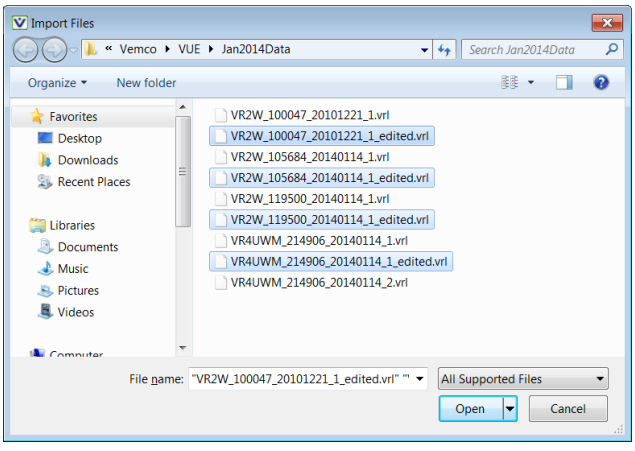


STEP 2

Select one or more VRL files to import and click "Open". Multiple files can be selected by pressing and holding the CTRL key while left clicking on each desired file.

The VRL files selected in the example shown here have all been time corrected before being imported into the database. This procedure, found in section 3.1, is strongly recommended by Innovasea.

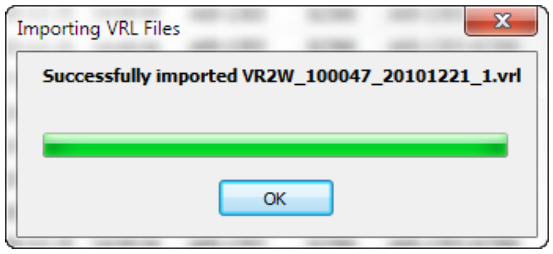
Hold the CTRL key to select multiple files.



VRL files with the RLD identifier in the filename (RLD data file, as in "VR2AR-RLD_545565_20141216_1.VRL") cannot be imported into VUE.

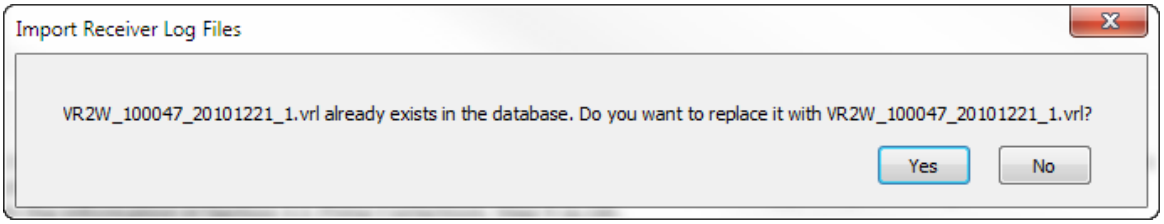
STEP 3

The files are immediately imported into the database (single file import shown).

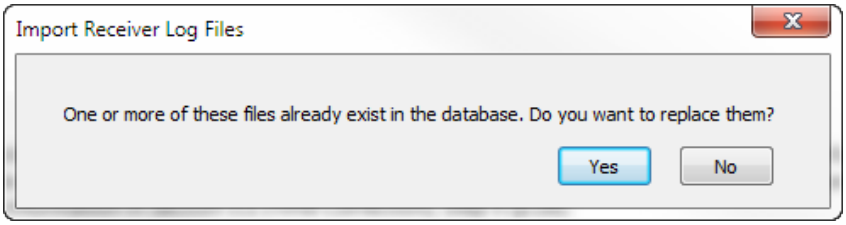


If you attempt to import one or more VRL files that have already been imported into VUE, VUE will ask whether you want to replace the existing file(s) with the one(s) that you are importing. This may happen if, for example, you are replacing a VRL file in the database with an edited version of the same file. Click **Yes** to replace the file(s), and **No** to keep the file(s) that are already in the database.

Warning if importing a single file that already exists



Warning if importing multiple files that already exist

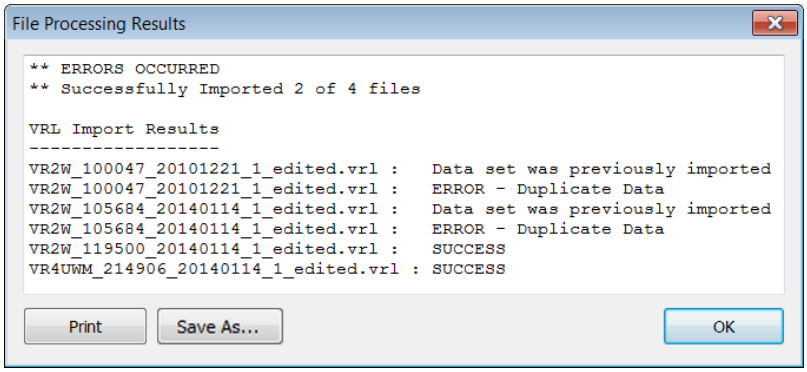


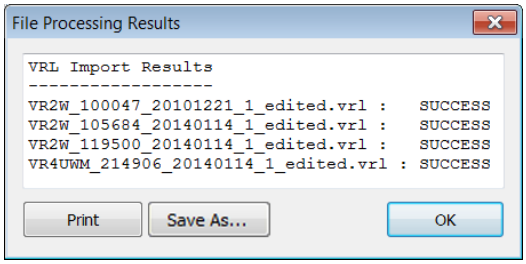
Note: If you import a VRL file multiple times, or import two or more VRL files which have overlapping data (for example, by offloading data from a receiver and redeploying the receiver without erasing the previous data), VUE will identify duplicate detections and remove them from the database.

Continued…

STEP 4

Check the results to verify the files imported as expected. The results will be different depending on what you selected in Step 3. For example, selecting “NO (do not import VRL)” option will give us the results on the left while using the “YES (you want to replace them)” option gives us the results on the right. The same VRL files were imported into the same database but the example of the left reported that two “error” messages alerting us to the fact that duplicate VRL files were not imported.





5.2 Editing a VRL file

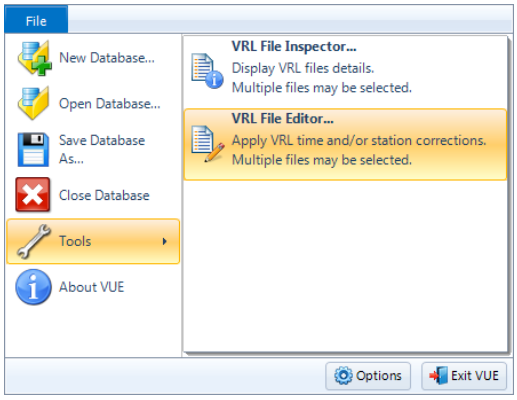
VRL files are a record of the information that was offloaded from a receiver. It's important that these original records be kept unaltered so that the validity of the original data remains intact. For this reason, when editing VRL files a new VRL file is created and the original file is left unaltered. Edited VRL files are labelled with "_edited" appended to the file name.

Original VRL files are never altered – edits are saved in a new VRL file with "_edited" added to the name.

Why would we need to edit a VRL file? The most common reason is to correct detection data for time drift (Time Correction); this is explained in detail in section 3.1. Correcting for an incorrect PC time during initialization, and/or to add or correct a station name are also reasons to edit a VRL file.

STEP 1

Open the File menu and select Tools → VRL File Editor.



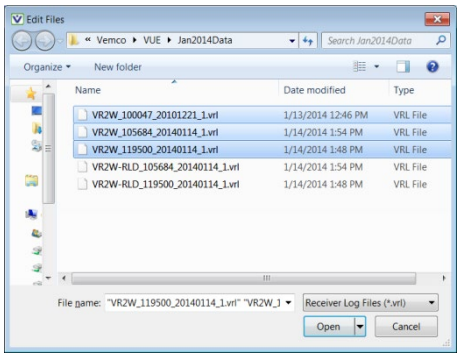
STEP 2

Select the VRL files you wish to edit.

You may edit multiple files at one time by holding the CTRL key while selecting multiple files with the mouse.

Click "Open".

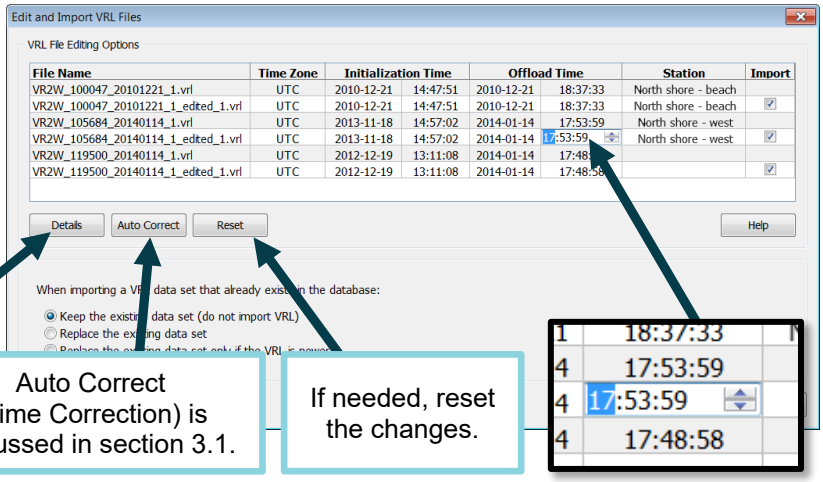
Your default location will open automatically.
See section 7.4.2 to change your default location.



STEP 3

Click on the incorrect information in the white line, corresponding with the edited file, and make the necessary change(s). This example shows an incorrect offload time being adjusted.

The existing VRL file is not altered but a new edited file will be created and stored with your existing VRL files.



View the details of all the selected files.

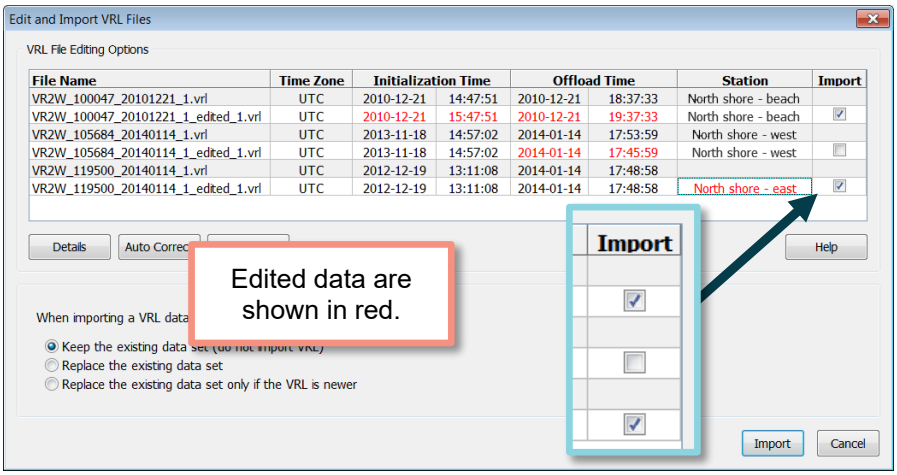
Auto Correct (Time Correction) is discussed in section 3.1.

If needed, reset the changes.

Continued…

STEP 4

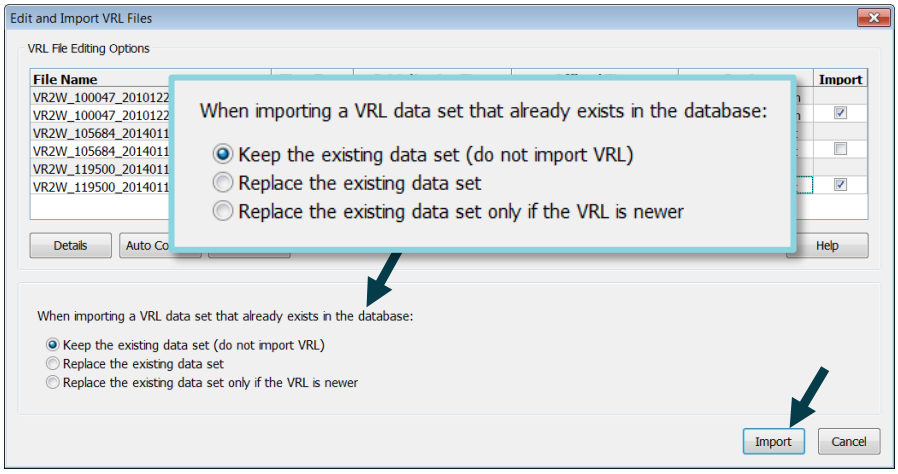
Select the edited files that will be imported into the open data base. If a file is unselected (no checkmark), the edited file will be saved in the selected directory (section 7.4.2) but the data will not be imported into the database. It can be imported at a later time (section 5.1).



STEP 5

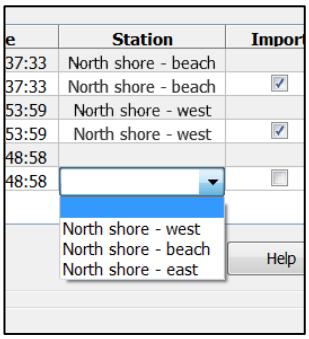
Select how you want VUE to handle any data conflicts upon import. These options are explained in section 3.1, Step 5.

Click the “Import” button to make the changes to the VRL files and import the selected files into the open database.



5.2.1 Correcting or Adding a Station Name to a VRL file

To change or add a station name to a VRL file, follow the instructions in section 5.2 and select the correct station name from the pull down menu under Station in the row(s) for the edited VRL file(s). You will only be able to select from a list of existing station names within your VUE database. If you need to add additional station names, you will need to exit this window and add a new station.



5.3 Managing Duplicate Tags in VUE

***Note**: The following section provides guidance on managing a database with duplicate tag ID numbers. This can occur if you combine data from multiple years or multiple users. This is typically only an issue for older transmitter code spaces sold prior to 2014 (ex: A69-1105) due to the limited numbers of unique IDs that these code spaces provided. Modern transmitter code spaces provide many more unique IDs and do not require ID duplication. If you don't expect your database to have duplicate tag ID numbers, you can skip this section of the manual.*

5.3.1 What is a duplicate tag?

If you are comparing older detection data from multiple years, multiple studies, or from multiple users, then it's possible that your data sets will contain duplicate ID numbers for different tags.

Duplicate ID numbers will often be separated in the database by date or location and therefore it is usually straightforward to distinguish one transmitter from another. For sensor tags, it is important to ensure that tag detections are associated with the correct sensor tag record within the VUE database. The correct sensor calibration (e.g., slope & intercept) information must be associated with each transmitter.

When a VRL data file is imported into the VUE database, VUE inspects each detection for a previous record of the ID number in the database. If a matching tag record exists in the database, the new detection is associated with that existing tag. If more than one tag exists in the database matching the detection's tag ID, the detection is associated with the *first* matching record in the database. If the new detection is the first entry of a given tag in the VUE database, then a new tag record is created using the tag type and ID number contained in the detection.

If you edited a sensor transmitter record to include a serial number and sensor calibration information, the raw sensor data (ADC) will be converted into meaningful units (e.g. degrees Celsius). If a transmitter database record has a serial number, then any new detections imported will be highlighted and marked as an *Unverified Transmitter*. This is a warning that the detection has been associated with an existing transmitter serial number and the association may be wrong if there are duplicate tag ID numbers within the dataset.

Two examples for managing duplicate tag ID numbers follow. The first is an example where duplicate tags are not present in the data, and the second is an example with duplicate tag ID numbers in the same dataset.

Example – No Duplicates

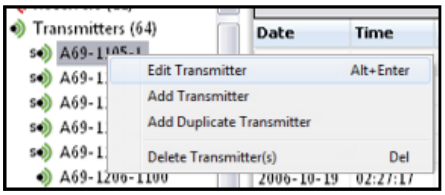
In the following case, we've created a new database and offloaded data from two receivers: a VR2 with serial number 7731 and a VR2W with serial number 100037. The detections from the receivers belong to the transmitters listed below at left.

A69-1105-1
A69-1105-2
A69-1303-3
A69-1303-1
A69-1303-3
A69-1303-9

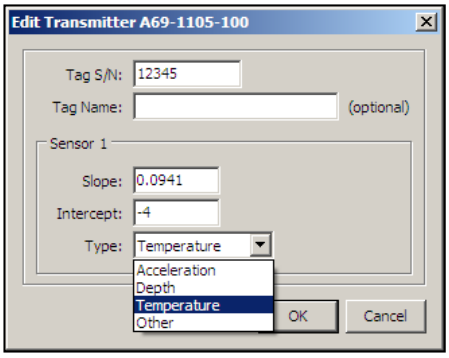
Date	Time	Code Space	ID	Transmitter	Receiver	Station	Data
2008-02-12	13:32:51	A69-1105	1	A69-1105-1	VR2W-100037	Ben's Brook	199 ADC
2008-02-12	13:33:05	A69-1105	2	A69-1105-2	VR2W-100037	Ben's Brook	0 ADC
2008-02-12	13:34:26	A69-1105	1	A69-1105-1	VR2W-100037	Ben's Brook	198 ADC
2008-02-12	13:34:40	A69-1105	2	A69-1105-2	VR2W-100037	Ben's Brook	0 ADC
2008-02-12	13:36:54	A69-1105	1	A69-1105-1	VR2W-100037	Ben's Brook	194 ADC
2008-02-12	13:37:08	A69-1105	2	A69-1105-2	VR2W-100037	Ben's Brook	0 ADC
2008-02-12	13:38:49	A69-1105	1	A69-1105-1	VR2W-100037	Ben's Brook	192 ADC

The detections for transmitters A69-1105-1 and A69-1105-2 are for sensor tags, so we add sensor tag calibration information. This converts the values in the data column from "ADC" (Analog-to-Digital Converter) units to measurement units (e.g. meters or degrees Celsius). The calibration information (slope and intercept) is found on the tag datasheets sent by Innovasea with the sensor tags.

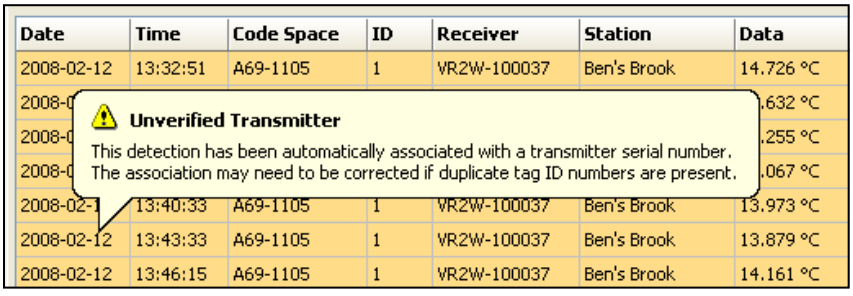
To calibrate, follow the instructions in Section 2.3.2 (*Edit Information for an Existing Sensor Tag*). Right-click on the selected transmitter in the selection tree list and select "Edit Transmitter" from the list that appears.



In the *Edit Transmitter* window, fill in the serial number, slope, and intercept from the datasheet provided by Innovasea and select the sensor type.



The data are converted to °C and all the detections will be highlighted and flagged as "Unverified Transmitter" as shown below. The highlighting is a warning that the detection(s) may or may not be associated with the correct transmitter record.



5.3.2 Verifying a transmitter and its data

In this case, we know that all of these detections are from one animal. Therefore, we can verify these detections are associated with the correct (and only) transmitter data record with this ID number. To verify an ID number and its data:

1. Select the desired transmitter in the selection tree.
2. Select all the detections for that transmitter in the right hand VUE window by pressing and holding the SHIFT key and clicking on the last detection in the list.
3. Drag and drop the detections onto the correct transmitter name under the transmitter selection tree. The detections will now be intentionally associated with this transmitter record and the highlighting and the warning will disappear.

Date	Time	Code Space	ID	Receiver	Station	Data
2008-02-12	13:32:51	A69-1105	1	VR2W-100037	Ben's Brook	14.726 °C
2008-02-12	13:34:26	A69-1105	1	VR2W-100037	Ben's Brook	14.632 °C
2008-02-12	13:36:54	A69-1105	1	VR2W-100037	Ben's Brook	14.255 °C
2008-02-12	13:38:49	A69-1105	1	VR2W-100037	Ben's Brook	14.067 °C
2008-02-12	13:40:33	A69-1105	1	VR2W-100037	Ben's Brook	13.973 °C
2008-02-12	13:43:33	A69-1105	1	VR2W-100037	Ben's Brook	13.879 °C
2008-02-12	13:46:15	A69-1105	1	VR2W-100037	Ben's Brook	14.161 °C

NOTE: If these detections are deleted from the database and re-imported from the VRL, the detections will need to be verified again.

Example – Duplicate IDs

How to separate duplicate ID numbers (different fish)

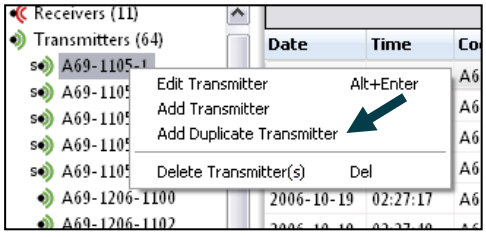
In this example, we have duplicate detections for sensor tag A69-1105-2. Most of these detections were offloaded from the receiver when it was at station "Ben's Brook" and the rest were offloaded from the same receiver when it was at "Big Red Rock". The ID 2 at "Ben's Brook" was determined to be a depth transmitter and the ID 2 detected at "Big Red Rock" was determined to be a temperature sensor. If we apply the temperature sensor calibration information to the depth sensor, all the detections will be converted to degrees Celsius. This would be an error, as some of these detections belong to another fish with a different sensor.

Date	Time	Code Space	ID	Receiver	Station	Data
2008-02-12	13:33:05	A69-1105	2	VR2W-100037	Ben's Brook	0 ADC
2008-02-12	13:34:40	A69-1105	2	VR2W-100037	Ben's Brook	0 ADC
2008-02-12	13:37:08	A69-1105	2	VR2W-100037	Ben's Brook	0 ADC
2008-02-12	13:39:03	A69-1105	2	VR2W-100037	Ben's Brook	0 ADC
2008-02-12	13:40:45	A69-1105	2	VR2W-100037	Ben's Brook	0 ADC
2008-02-12	13:46:08	A69-1105	2	VR2W-100037	Big Red Rock	0 ADC
2008-02-12	13:46:29	A69-1105	2	VR2W-100037	Big Red Rock	0 ADC

In order to apply calibration information separately, create a second transmitter record and associate the "Big Red Rock" detections with the new record.

To do this, add a duplicate transmitter record. Transmitter records are considered duplicates if their Code Space and ID are identical, in this case, A69-1105-2. The serial number and calibration information will be different.

Select the transmitter from the selection tree and right click the mouse and select "Add Duplicate Transmitter".



The newly created transmitter has no detections associated with it. All of the tag ID A69-1105-2 detections within the database are currently associated with the first A69-1105-2 record.

Next, select the "Big Red Rock" temperature sensor detections and drag and drop them onto the new transmitter record in the selection tree. This will remove them from the first transmitter record and associate them with the second transmitter record.

We can now edit each of the two transmitter records to add serial number, calibration information, sensor type etc. We suggest that you change the display name of the transmitters to help differentiate them.

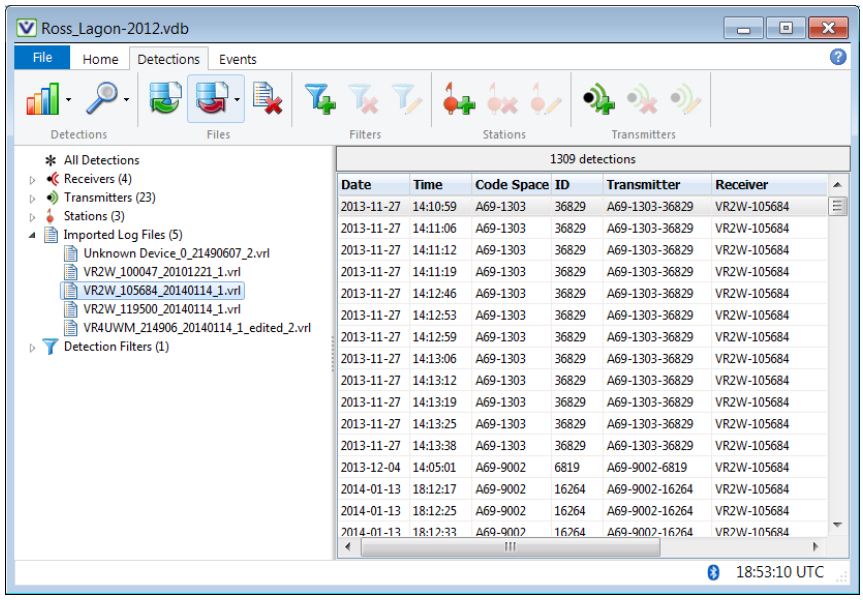
Change the display name of the duplicate transmitters to help differentiate them in the selection tree.

5.4 Removing files from VUE

Data that were imported from a VRL file but are no longer wanted in a database can be removed. Removing a VRL file from a VUE database does not remove it from its storage location on your computer's hard drive. The VRL file is unchanged and remains available for import at a later time.

To remove a file, it must be selected in the selection tree on the left side of the window when the Detections tab is selected (below). This enables the *Remove file* icon in the Detections ribbon (right). A file can also be removed by right-clicking on the desired file name in the selection tree and selecting *Remove file* in the list.

NOTE: All detections associated with the VRL file will be removed from the VUE database.



Removing a VRL file from a VUE database does not remove it from its storage location (VRL file) on your computer's hard drive.

All detections associated with the removed VRL file will be removed from the VUE database.

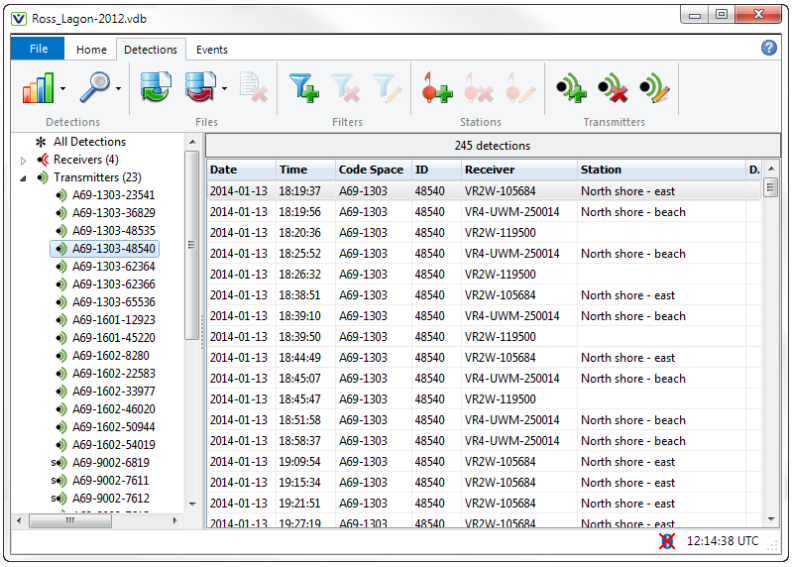
5.5 Removing Transmitters from VUE

In some cases, a database may contain detections that have been analyzed and identified to be *false*. False IDs or other transmitters that are no longer desired in a database can be removed by deleting the transmitter(s).

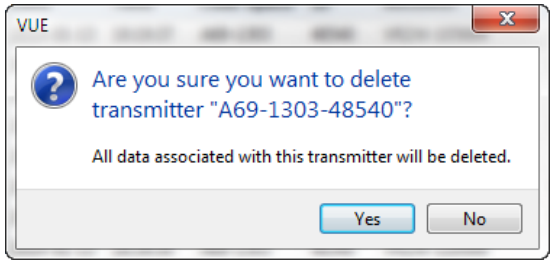
Removing a transmitter from VUE will remove all detections associated with the transmitter. While deleted transmitters can be restored by re-importing the source VRL file or files into the database, **it is recommended that you make a copy of your VUE database before performing any deletions** (see section **2.2, Saving a database copy**). This precaution can simplify restoring deleted data if it is determined at a later date that some of the removed detections were valid.

To delete one or more transmitters, select them in the selection tree on the left side of the Detections window and click on the "Delete the selected transmitter record" icon in the Detections ribbon (right). You may also right-click on any selected transmitter in the selection tree and then choose "Delete Transmitter(s)".

To select more than one transmitter for deletion, hold the CTRL key while selecting multiple transmitters with the mouse.



A Warning box appears, reminding you of the delete action you are about to perform. Verify that the transmitter number displayed is the one you want to delete, then click **Yes**.



NOTE: When multiple transmitters have been selected, the dialog box will ask: "*Are you sure you want to delete the selected transmitters?*"

5.6 Viewing Millisecond Timestamps

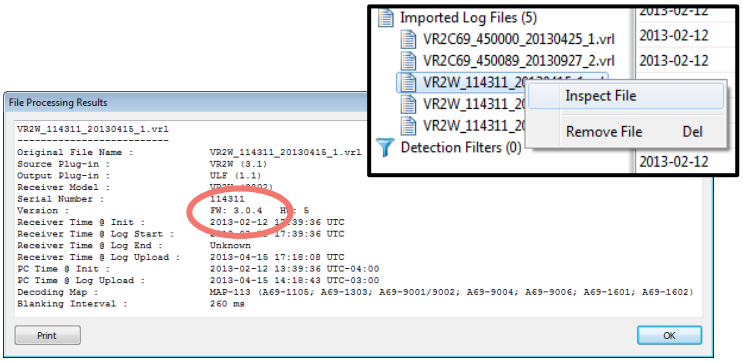
Detection data timestamps with millisecond precision can be exported from VUE and viewed if the VRL files were created with a VR2W receiver using firmware 3.0 or greater. To export millisecond timestamp information, follow the steps below.

STEP 1

Determine if the .VRL file(s) can be exported with millisecond timestamps:

1. View the .VRL file in VUE
2. Right-click on the file name
3. Select “Inspect file”
4. Check for the FW value in the file information listed – version 3.0 or greater
5. Close the File Processing Results window

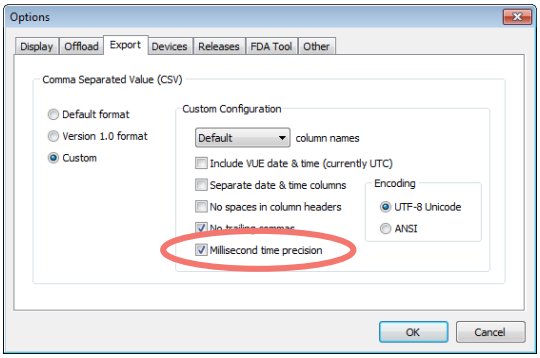
Repeat for any other files involved



STEP 2

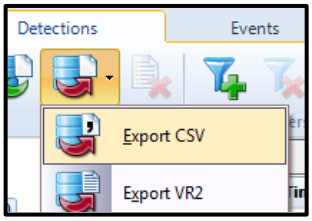
Enable millisecond exporting (see also section 7.4.3)

1. Open the *Options* window
2. Select the Export tab
3. Select “Custom” from the list on the left
4. Click “Millisecond time precision” if a checkmark is not already present
5. Click “OK”



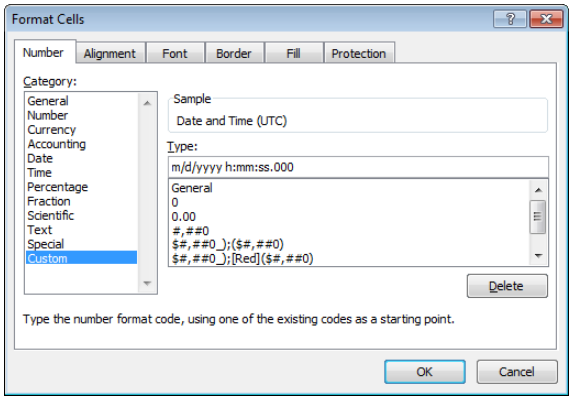
STEP 3

Export a CSV file (see section 5.7 for details).



5.6.1 Viewing millisecond timestamps in MS Excel

The CSV file contains the millisecond timestamps, but if you choose to open the file in MS Excel then an adjustment must be made to the cell formatting in Excel for the milliseconds to become visible. To make this adjustment, select the "Date and Time (UTC)" column and open the Format Cells window (right-click, select "Format Cells…"). Setup a custom numbering format by selecting "Custom" and entering **m/d/yyyy h:mm:ss.000** in the Type line. Select "OK".



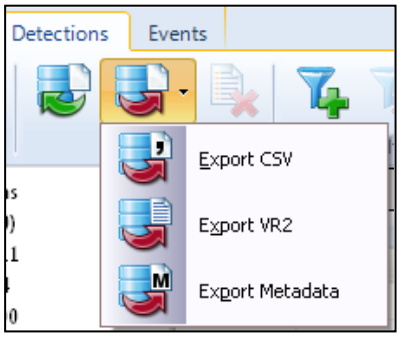
Viewing the CSV file in an ASCII reader, such as Notepad, will display the millisecond times without requiring a formatting adjustment.

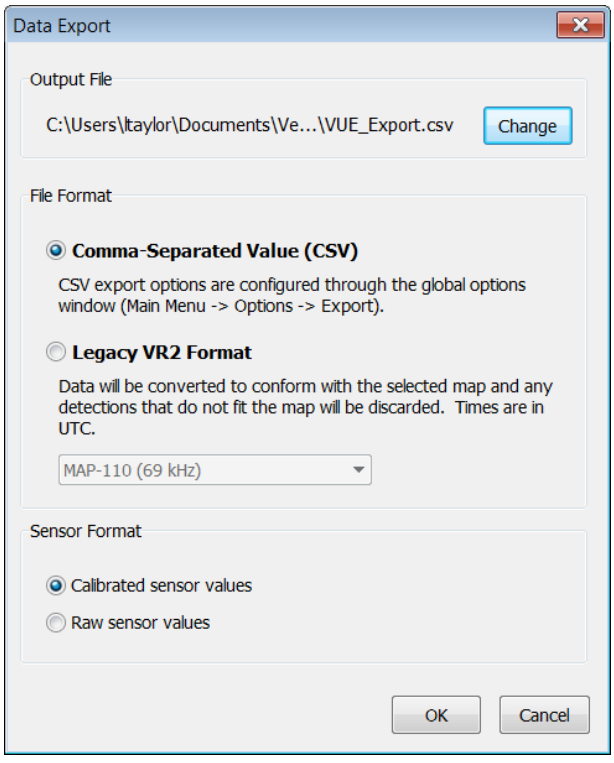
5.7 Exporting Data

Data can be exported from a VUE database for use in other applications. VUE provides two format options for exporting detection data: comma-separated value (.csv) format and legacy VR2 format.

CSV files can be read by most spreadsheet, database and statistics applications; therefore, this export format should be used if you intend to analyze the detection data in another application. Alternately, you may wish to export your data from VUE in Legacy VR2 format similar to what was provided by VR2PC software.

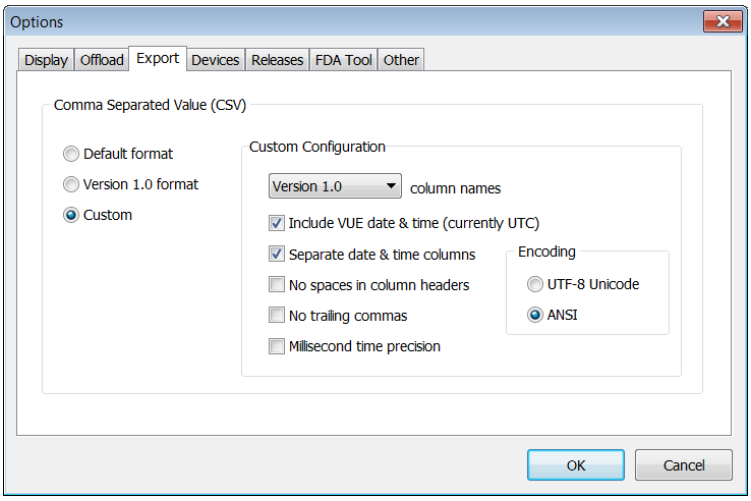
To export detection data, select the detections you wish to export using the selection tree on the left hand side of the window (Detections tab or Events tab). Choose the Export file icon in the ribbon (shown below) and select your desired export format. Selecting CSV or VR2 formats will open the Data Export window, shown at right (VR2 format is not available in the Events tab). Note that regardless of the time zone display option you have selected in VUE, all detection data will be exported in UTC time, unless your Export options are configured to also export in display time (see Custom format below).





To set your CSV file format export options, open the *Options* window (see section 7.4.3) and select the Export tab. The following describes the various formats available when exporting CSV files:

- **Default Format:** Output detection data are in the default CSV export format ***(recommended setting).***
- **Version 1.0 Format**: Output detection data are in the original CSV format. Use this setting for compatibility with older versions of VUE (prior to Version 1.8).
- **Custom Format**: Output detection data uses custom settings:
  - Column names may be based on the default or Version 1.0 CSV format
  - A column can be added for the time zone currently displayed in VUE. This column is in addition to the UTC time column, which is always output.
  - Date and time may be split into separate columns.
  - Spaces may be eliminated from column names. If in doubt, disable this option.
  - Trailing commas may be eliminated for rows. If in doubt, enable this option.
  - The output file may use ANSI or UTF-8 Unicode character encoding. Changing this option may eliminate garbage characters when viewing the file in an external application. If in doubt, select UTF-8 Unicode.



If you are exporting your data in Legacy VR2 format, you will need to select a Code Map to complete the process. In the old VR2PC format, the code map setup information is defined in the header of each file. To be compatible with the VR2PC format, the legacy format can only be supported for code maps with 4 types of coded tags. If the set of data, you have chosen contains more than four types of tags then you will not be able to export all of them into a single VR2 text file. You will get a warning describing the data that were not exported. Choose the remaining detections and an alternate map that is suitable for these detections to export the remainder of your data.

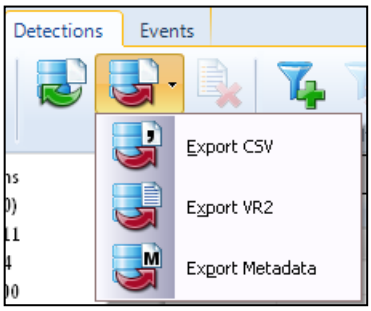
5.8 Metadata

5.8.1 What is Metadata?

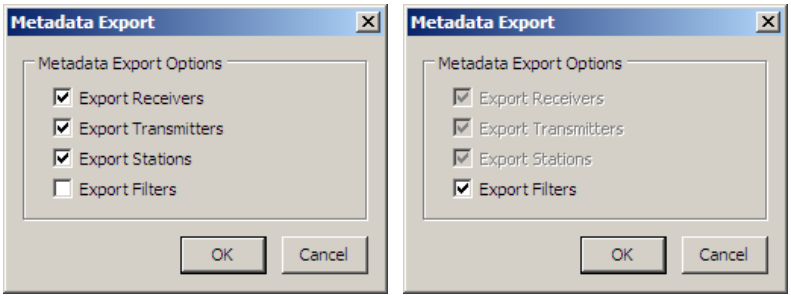
Metadata consist of any calibrations and configurations that you have manually entered into VUE, such as transmitter sensor calibrations, transmitter names, stations names and locations, and filter definitions. Transferring metadata between databases that contain many of the same receivers, transmitters, and stations can save you appreciable time since you do not have to manually re-enter your definitions into the new database. In addition, because the information is transferred by VUE, you eliminate the possibility of introducing new typographical errors into the database that is receiving the information.

5.8.2 Transferring Metadata Between Databases

To transfer metadata to a new database, you will first need to export it from your existing database. Follow the steps below to **export** metadata.



1. Select the Detections tab and then the Export file icon (shown at right).
2. Choose Export Metadata from the drop-down list.
3. Enter the desired file name for your metadata in the "Export File Name" window and click Save.
4. Check the boxes next to the items that you wish to export when the Metadata Export window appears. If you select the "Export Filters" option, then all receiver, transmitter and station metadata are also exported by default.



5. Click OK. A message box will appear indicating that your metadata were successfully exported.

VUE exports metadata in a custom XML file format (*.vxm). The default folder for VUE metadata files is "My Documents\Vemco\VUE\" when VUE is first opened. Every subsequent time, it will be the folder you last exported to.

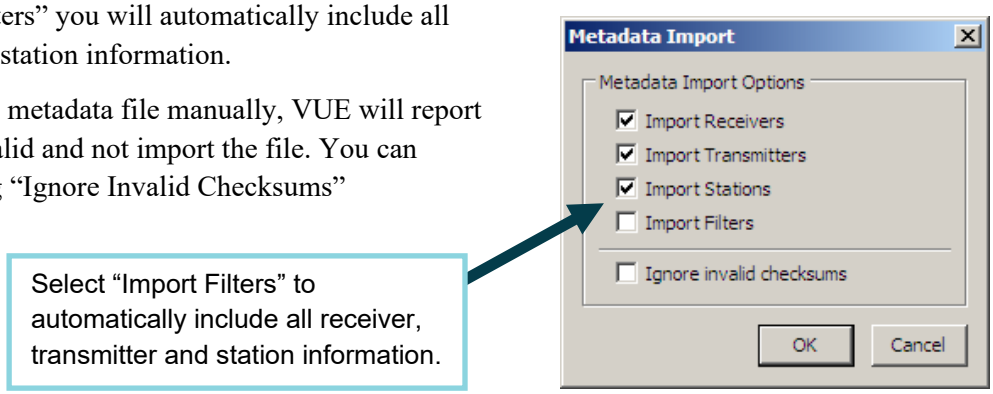
Next, you will need to **import** the metadata into your target database. Follow the steps below to import metadata.

1. Open the target database for import (see section 2.1 for how to open a database).
2. Choose the Import file icon from on the Detections tab (shown at right).
3. In the "Import Files" window, locate the desired metadata file. Select the file and click "Open".

4. Select the item definitions that you wish to import when the Metadata Import window appears. By selecting “Import Filters” you will automatically include all receiver, transmitter and station information.

5. If you have altered the metadata file manually, VUE will report that the checksum is invalid and not import the file. You can override this by selecting “Ignore Invalid Checksums”

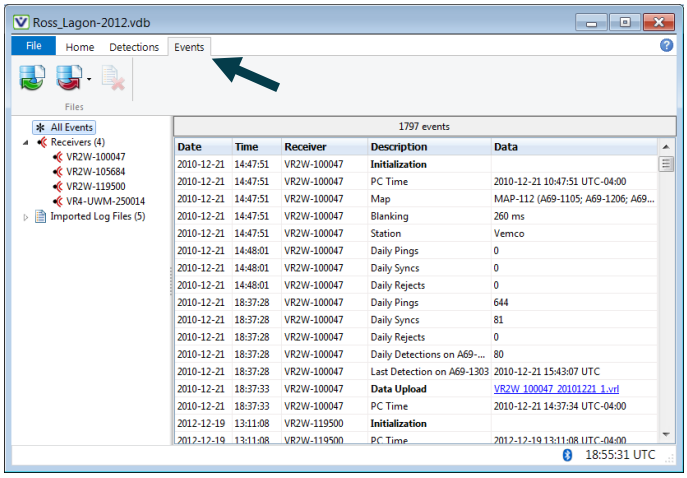
6. Click OK.



The VXM Import Results window will appear, showing the number of successfully imported station, receiver, transmitter, and filter records as well as the number of rejected duplicate and incomplete records. Duplicate records are records for things that already exist in the database. Incomplete records are for things that were not completely defined in the exporting database. For example, transmitters without defined serial numbers are incomplete.

6. VIEWING EVENTS

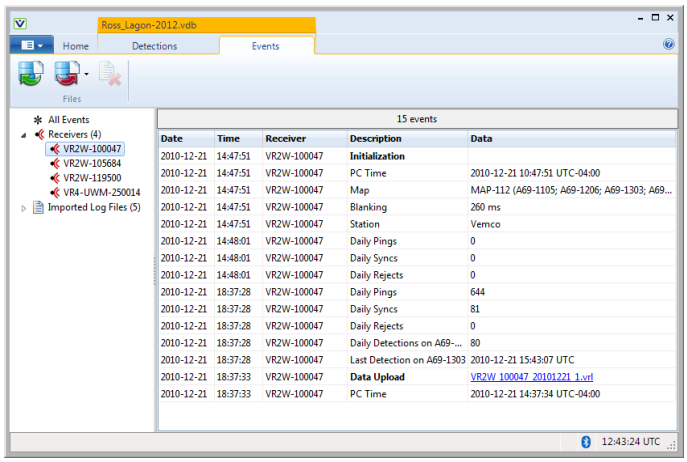
Innovasea receivers record when certain events occur to the receivers, such as when a new study was started (initialized), or when data were offloaded. These events are shown in the VUE Events Tab.



6.1 Events Tab

The VUE event log describes a receiver's operational history over the span of a study. Each event records receiver status information for a time period.

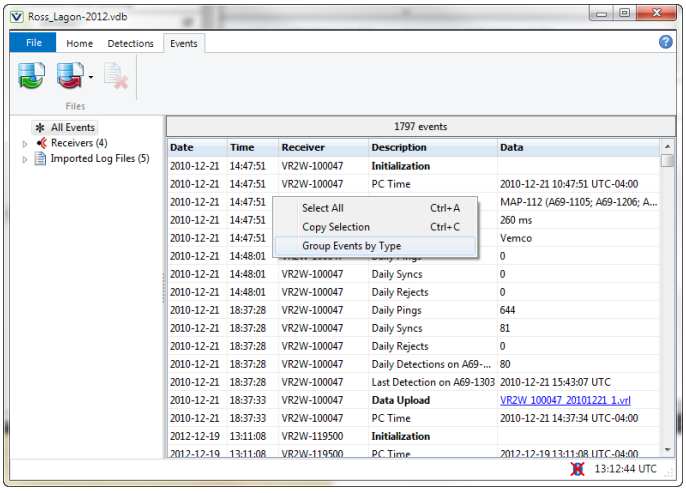
If a database is open, an Events tab will be visible at the top of the window. To see the events for all the receivers combined, select “All Events” at the top of the selection tree (above right).



If a particular receiver is selected in the selection tree (left side of window), then the events related to that receiver or VRL file are listed on the right side of the window (right).

6.1.1 Grouping Events by Type

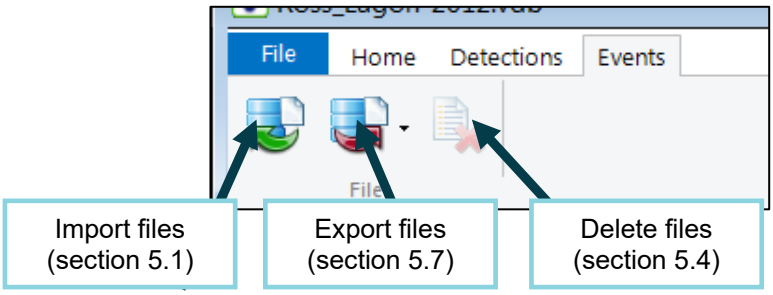
To view events grouped by event type, right click anywhere on the right side of the event window and select “Group Events by Type” (below right).



To return to default sorting behaviour (by Date and Time), right click in the window again and deselect “Group Events by Type”.

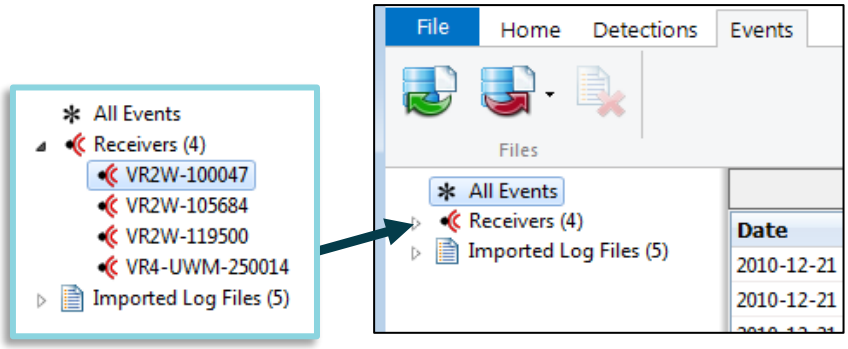
6.2 Events Ribbon

Clicking the Events tab will bring the events ribbon to the front, allowing you to select from the icons shown.



6.3 Events in the Selection Tree

The selection tree on the left side of the window allows access to the events of individual receivers and imported log files. Clicking on the ▷ symbol next to a category will open the expanded view, as shown below.



6.4 Events Common to all Receiver Types

6.4.1 Reset Event

Reset events occur when the receiver internal software initializes and are described as “Normal Restart”. This will occur if the battery is replaced or possibly if the battery connection is loose. Other Reset Events include "WATCHDOG RESET", "FLASH ACCESS VIOLATION" or "UNIDENTIFIED RESET". If you see any of these events, please contact Innovasea as they may indicate a receiver malfunction.

6.4.2 Initialization Event

Initialization events are created each time your receiver is initialized. When you import your VRL files into VUE, you will see the following information displayed in the Events tab for each receiver initialization.

Description	Data
PC Time Zone	Time zone of PC used to initialize the receiver, referenced to UTC time (e.g. UTC-04:00)
Map	Displays Code Map and associated Code Spaces used for receiver initialization
Blanking	Receiver blanking time. This is the time for which the receiver stops listening after receiving a detection (to avoid detecting echoes)
Station	Station name entered during initialization
Study Description	Study Description text entered during initialization

6.4.3 Memory Capacity Event

The Memory Capacity displays amount of receiver memory, as a percentage, that has been used. For VR2W receivers, this is recorded each day along with all other receiver status information. For VR2Tx and VR2AR receivers, this is recorded when the data are offloaded from the receiver. For VR4-UWM receivers, memory capacity used is recorded with all other status information at the interval selected at the time the study was initialized.

6.4.4 Receiver-Specific Data Summaries

Innovasea receivers generate detection data summaries, which can be found in the Events log, at specific intervals depending on the receiver type. These events are stored along with the detection data in the receiver and are added to the VUE database when the VRL file is imported.

For VR2W, VR2Tx, and VR2AR receivers (with firmware version 5.0.1 or later), data summaries are recorded every hour. For firmware versions prior to 5.0.1, VR2W, VR2Tx, and VR2AR receivers record data summaries every 24 hours at midnight UTC. An entry containing a "partial hour" (or "partial day") of summary data is also recorded when data are offloaded. These "partial" data summary entries can be identified by noting the time the summary was created.

Data summaries are recorded every hour and when data are offloaded from a VR2W, VR2Tx, or VR2AR.

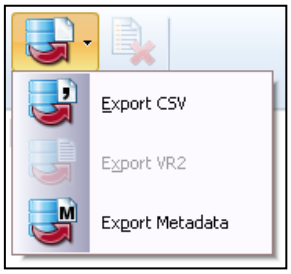
Receiver-Specific Data Summaries				
Data Summary Field	**VR2W, VR2Tx, VR2AR***			
	Descriptor	Data Summary Logging		
		Every hour	Every 24 hours (midnight UTC)	On data offload (partial interval)
Battery level	Battery		✔	✔
Number of pings received during time interval	Hourly Pings / Daily Pings / Pings / Study Pings	✔	✔	✔
Number of detections logged during time interval	Hourly Detections	✔		
Number of syncs logged during time interval	Daily Syncs / Syncs		✔	✔
Number of rejects (check sum errors) received during time interval	Daily Rejects / Rejects		✔	✔

*The above table refers to log files from receivers using firmware version 5.0.1 or later.
Log files from receivers using earlier firmware versions may have different data summary events.

VR4-UWM receivers record data summaries at an interval selected at the time the study was initialized. VR4-UWM data summaries can be stored at an interval of between 1 to 14 days; the default is 1 day (24 hours).

6.5 Exporting Events

To export Event logs for use in other applications, first select the Events tab and then select a receiver or “All Events” in the selection tree on the left hand side of the VUE window. Next, select the “Export file” button (shown at right) in the Events ribbon near the top of the window and choose to export the information as either a CSV file or as a Metadata file. Event times are exported in UTC, regardless of the time zone display option selected in VUE.



VUE Events format got you down? Try converting your VRL files to CSV using our Fathom Connect software (visit the Downloads section of support.fishtracking.innovasea.com or our online Export tool at fathomcentral.com. The new Fathom CSV format contains detection and events data in a single file and is designed for easy parsing.

7. ADDITIONAL INFORMATION

7.1 Installing the VUE software

The VUE software requires either Windows VISTA, Windows 7, Windows 8, or Windows 10.

NOTE: *Bluetooth* is required for communication with the VR2AR, VR2Tx, VR2W, and VR4-UWM receivers. Use of your computer's built-in *Bluetooth* adapter is recommended, although a USB *Bluetooth* dongle may be used if required. See section 7.2 for details.

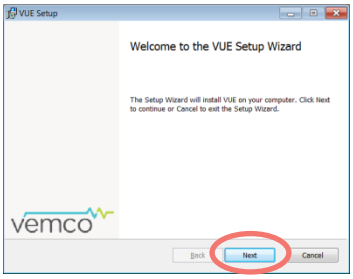
STEP 1

Download the VUE software at: https://support.fishtracking.innovasea.com/s/downloads

STEP 2

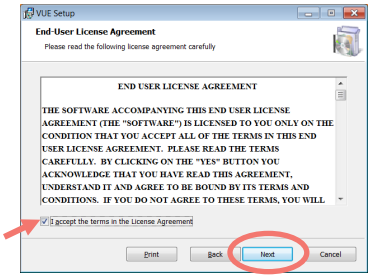
Unzip the VUE download, then double-click the VUE install file.

Click "Next" when the Install Shield Wizard begins.



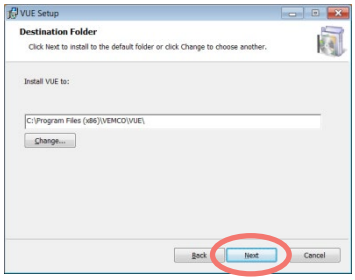
STEP 3

Read the license agreement and select "I accept" and "Next" if you agree to the terms.



STEP 4

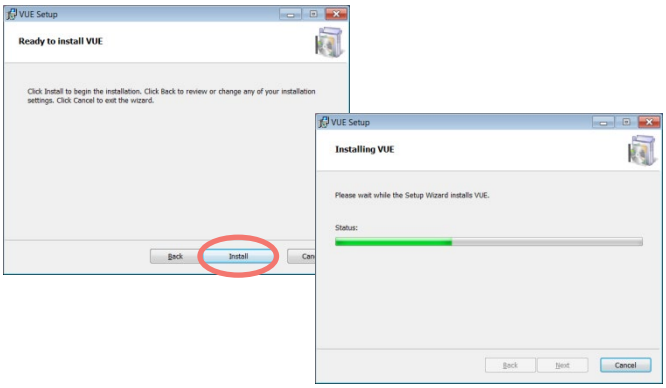
Click "Next" to install VUE in the folder shown or click "Change" to select a different folder.



STEP 5

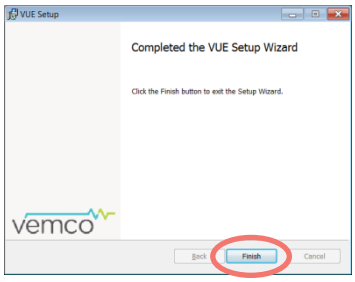
Click the "Install" button and wait while the VUE software is installed.

Click "Next" when it becomes enabled.



STEP 6

Click "Finished" to exit the setup wizard.



7.2 Connecting with Bluetooth

There are two ways to connect your PC or laptop through Bluetooth for communication with your receiver. Use the method that suits the equipment you have.

7.2.1 Using INTERNAL Bluetooth

There are a number of Windows Operating Systems (OS) PCs, laptops, and tablets equipped with **internal Bluetooth** capable of communicating with Innovasea receivers through the VUE software. **Use of internal Bluetooth is strongly recommended where possible.**

> **IMPORTANT:** If you are using internal Bluetooth, **DO NOT INSERT** an external Bluetooth adapter into your device. Doing so may cause Bluetooth driver conflicts resulting in inability to communicate with your receiver.

1. Open VUE software (latest version available from support.fishtracking.innovasea.com).
2. Observe the Bluetooth icon at the bottom of the window. In most cases, it will look like the Bluetooth icon shown at right, indicating that you're ready to communicate with Innovasea Bluetooth receivers. If VUE is not able to perform Bluetooth communication, you will see a **red "X"** through the icon.

NOTE: Communication difficulties may occasionally occur when the red "X" is not present. If this happens, please contact Innovasea Support at support.fishtracking.innovasea.com.

3. Connect to the receiver. Instructions are found in the receiver's user manual. If a Bluetooth connection cannot be established with the receiver, try using an external Bluetooth USB adapter as described in the next section.

7.2.2 Using the EXTERNAL Bluetooth Adapter

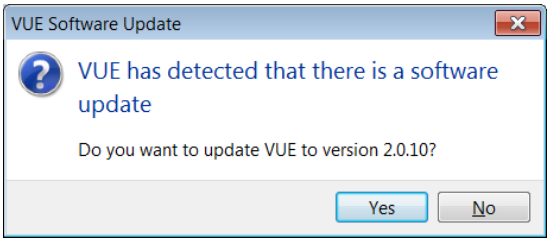
If your computer does NOT have internal Bluetooth capability, use an external USB Bluetooth adapter, as described here.

Attach the Bluetooth adapter (may not be as shown) to any USB port on your computer.

Follow Steps 1 – 3 above.

7.3 Auto Updates

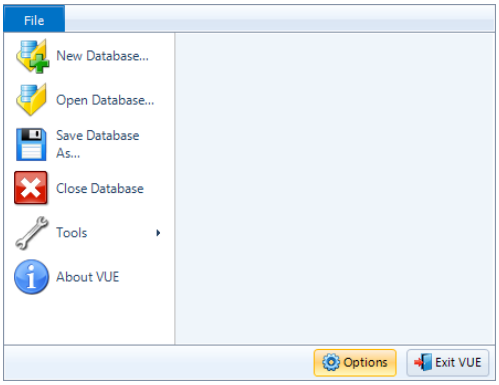
If you see the VUE Software Update window (shown here), select "Yes" to install the new version immediately. If you select "No", the version of VUE that is currently installed on your PC or laptop will open and you will be prompted again the next time you open VUE.



7.4 Select VUE *Options*

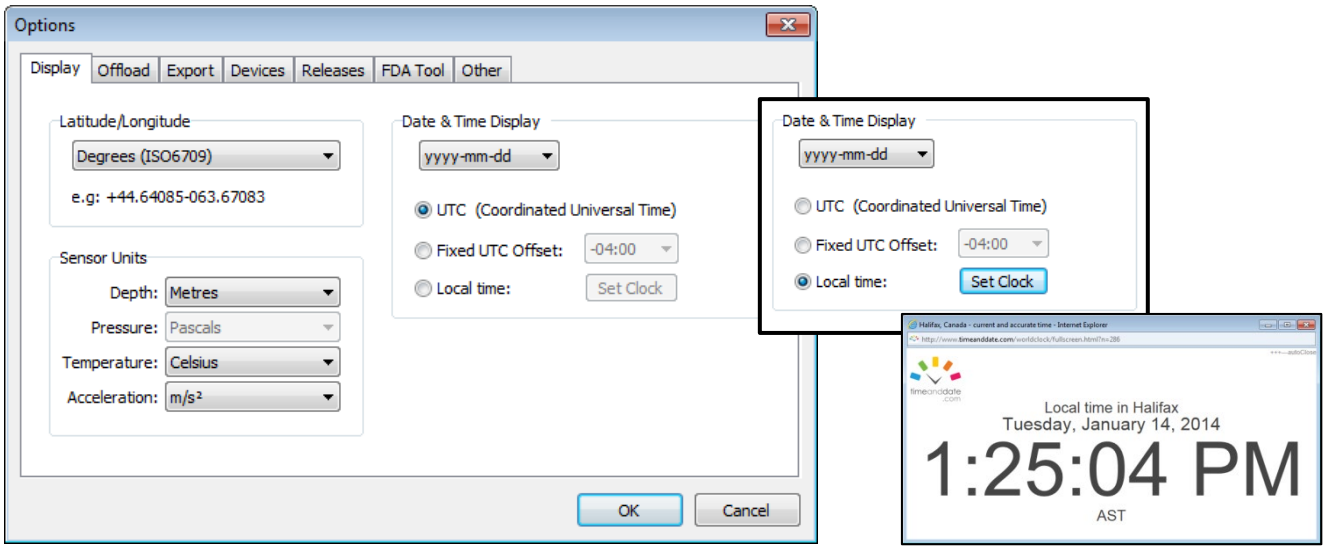
There are options in VUE that can be changed according to your preference, accessed through the *Options* window.

Select the File tab and click the "*Options*" button at the bottom of the menu box to open the *Options* window.



7.4.1 Display Settings

How the latitude/longitude, the date and time, and the sensor units are displayed in VUE is set in the *Display* tab of the *Options* window. The options are found in the corresponding drop-down lists. There is also an option to select which time will be displayed in VUE, the UTC (Coordinated Universal Time), the time with a fixed offset, or the local time. If you choose to view the local time, be sure to set the time on your PC/laptop to the correct local time, using a reliable time source such as a GPS device or a timekeeper website.

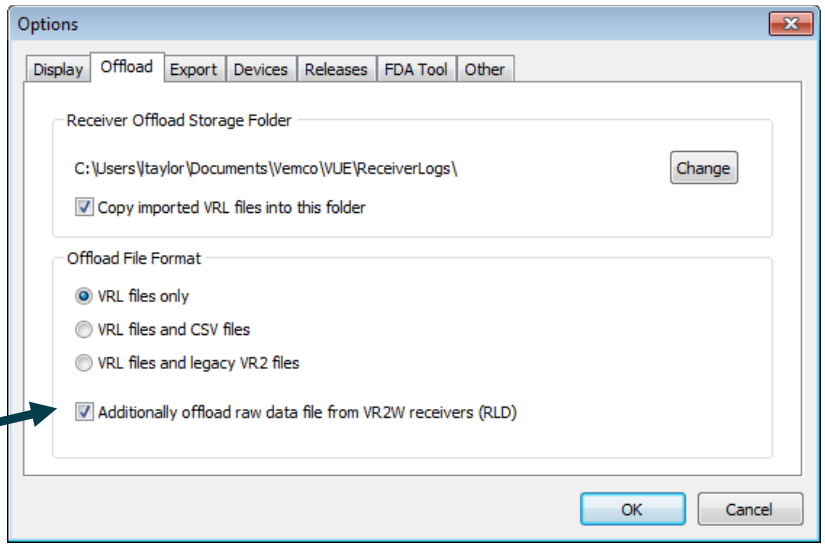


7.4.2 Offload Settings

Before offloading any data from your receivers, you may wish to change the directory location to which the data are offloaded. To change the storage folder, select the *Offload* tab in the *Options* window and click the "Change" button in the Receiver Offload Storage Folder section. The data files created when data are offloaded from a receiver will be stored in this new storage location. If this location is not changed, then the default directory is created at *...\Documents\Vemco\VUE\ReceiverLogs* and the data files will be stored there.

Offload file format can be selected from the choices listed in the Offload File Format section: VRL files only, VRL files and CSV files, or VRL files and legacy VR2 files. The option to additionally offload the raw data files from VR2W receivers is also found in this tab.

Keep this checked as these files contain diagnostic information that may be useful in the future.

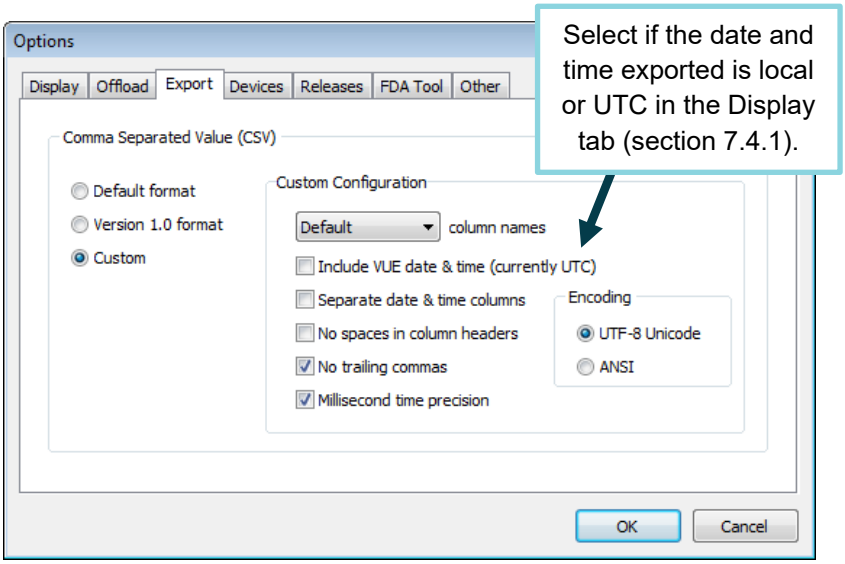


7.4.3 Export Settings

The format a CSV file takes when it is exported from VUE (see section 5.7) is determined in the Export tab of the *Options* window. The three options are the default format, the Version 1.0 format, and the custom format.

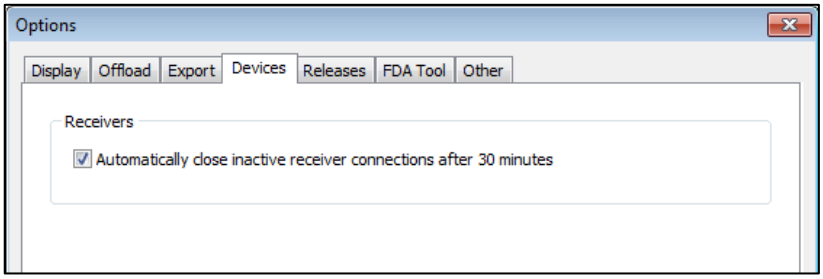
Detection data timestamps with millisecond precision can be exported from VUE and viewed if the VRL files were created with a VR2W receiver using firmware 3.0 or greater. The ability to export this millisecond precision is available using the Custom format. Instructions are located in section 5.6.

Select if the date and time exported is local or UTC in the Display tab (section 7.4.1).



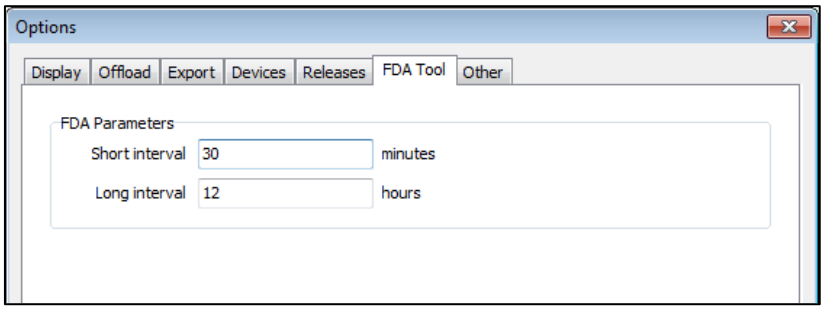
7.4.4 Devices

The Devices tab in the *Options* window offers the option of automatically closing Bluetooth communications with a receiver if communication with that receiver has been inactive for 30 minutes. This is a power-saving feature since more receiver battery power is needed to keep the communication open that is used for detecting and recording tags.



7.4.5 FDA Tool Settings

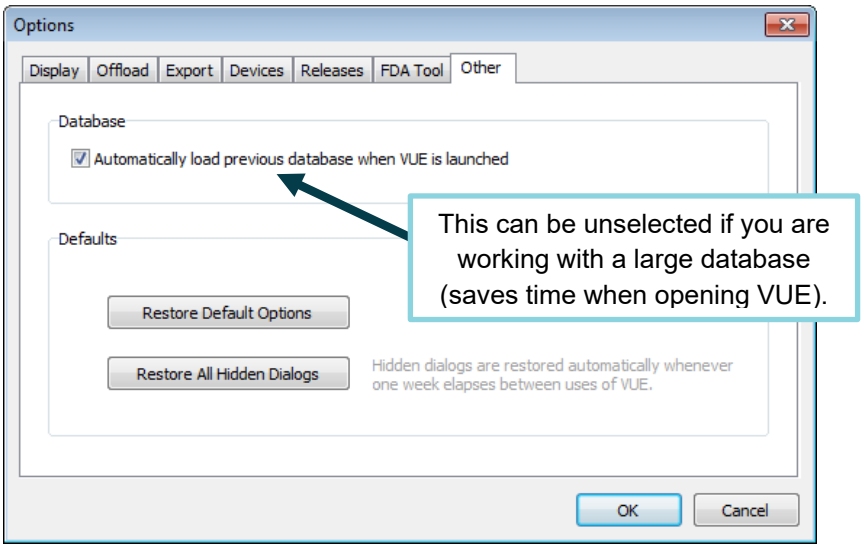
When using the FDA tool (see section 3.2.1), the interval parameters can be altered depending on the needs of your data. The default values are shown here.



7.4.6 Other VUE Settings

When VUE is launched, it will automatically open the last database used if "Automatically load previous database when VUE is launched" is selected in the *Other* tab. This is a useful tool if you are using the same database or if your database is not large. Simply unselect the option and VUE will not load a database when it is launched.

The *Other* tab also gives you the option to restore the VUE settings to their default values and to restore all the hidden dialogs (see receiver manual for more information on hiding dialogs).



8. APPENDICES

8.1 Contact Information

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