Tutorial: Simulated Bathymetric Survey

This tutorial provides you with a brief introduction to some of the basic capabilities offered by the WinFrog integrated navigation and data management system. It also uses step-by-step directions to guide you through the configuration and use of some basic navigation and survey functions in WinFrog. These instructions assume that you have installed WinFrog (at the root level of the **C:** drive) and are ready to begin demonstration exercises. It is also assumed that you are familiar with the operation of **Microsoft Windows** and have some familiarity with the use and purpose of integrated navigation systems. See the appropriate chapters in the **WinFrog User's Guide** for more details regarding all aspects of WinFrog operation.

At the beginning of each new project, essential components of the WinFrog integrated navigation software must be properly configured. Though each project or application has different requirements, some standard procedures must be followed before WinFrog can be used successfully.

In this tutorial, you are guided through the procedures used to set up a typical WinFrog configuration and will then generate data for a simulated project. The goal of this tutorial is to give you a "feel" for the program and how you would use it in the field.

Procedural Steps

Here are the steps to follow in WinFrog to collect data in a typical bathymetric survey:

- Configure Geodetics
- Configure Units of Measure
- Create Working Files
- Create Working Directories
- Configure Peripheral Devices
- Configure Vehicles
- Configure Displays
- Create Survey Lines
- Configure Events
- Collect Data
- Check Data
- Process Data (using Ribbit)

Sample Project

Your client requires a bathymetric survey of a specific region of San Diego Bay, California. This project will be identified as **Project1**.

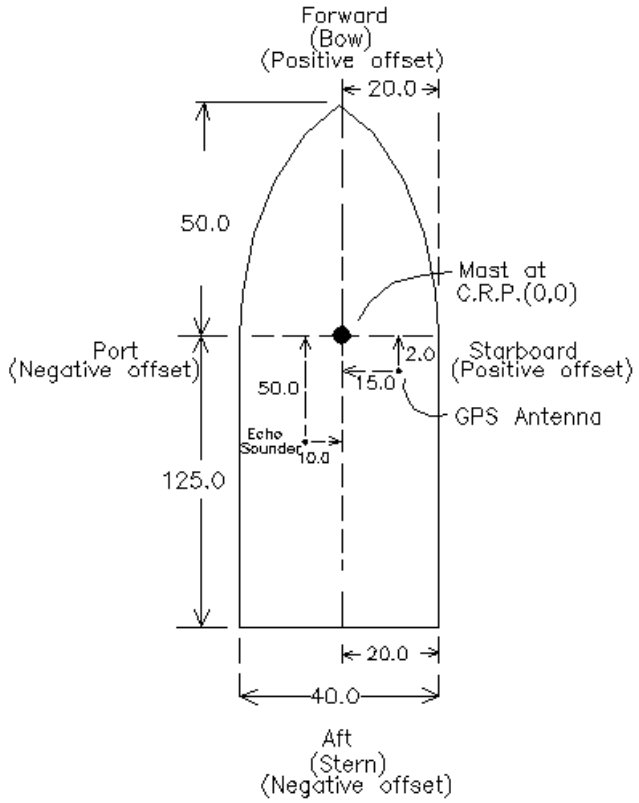
The **Geodetic Datum** and **Map Projection** to be used are the **North American Datum 1927** (aka **NAD27**) with the **California State Plane Coordinate System** (**SPCS**) **Zone 6**. **Datum Shifts** to be used are as follows (**Working to WGS 84**):

dX: -8.000m **dY: 159.000m** **dZ: 175.000m**

The client has specified data collection at **20** foot intervals along lines spaced every **20** feet. The survey boundaries are specified as follows (**SPCS CA Zone 6**):

Northwest corner: **N 244 000.0, E 1 734 000.0**
Southeast corner: **N 243 000.0, E 1 733 000.0**

The figure below represents the dimensions of the survey vessel, **LOCATOR**.



There are three peripheral devices on the vessel: a simulated GPS receiver, a simulated gyro, and a simulated echosounder.

First Steps

Before initiating any data collection, you must configure WinFrog for the project. Although each project has its own unique demands and requirements, there is a common approach used for the WinFrog configuration. **Note:** Although this tutorial utilizes simulated devices, you would still follow the same routine to configure a real project.

The first step is to launch the program either in "demo" or "real-time" mode. (See **Starting WinFrog** in **Chapter 1: Introduction** for more details.) Many of the pre-project configuration requirements (such as configuration of **Geodetics** and creation of **Working Files**) can be completed before getting onboard the vessel by using WinFrog in "demo" mode. Only the addition of devices to a vehicle's position is prohibited.

If this pre-project work is performed on a computer other than the one to be used on the project, you must remember to transfer all required files (including the **WinFrogini.wfg** file) to the appropriate (similar) location on the working computer system.

Geodetics

"**Geodetics**" are the parameters that describe the mathematical shape of the earth and need to be configured in WinFrog early in any project's preparation stages. A "**Geodetic Datum**" is a specific coordinate reference frame to which geodetic positions are referenced. A **Geodetic Datum** is defined by its **Reference Ellipsoid** and the location of its origin. If you are using a GPS receiver for positioning and have selected to use a datum other than **WGS84** (the datum to which the GPS coordinates are referenced), you must also enter the **Datum Shift** values. See more information on **Datum Shifts** below.

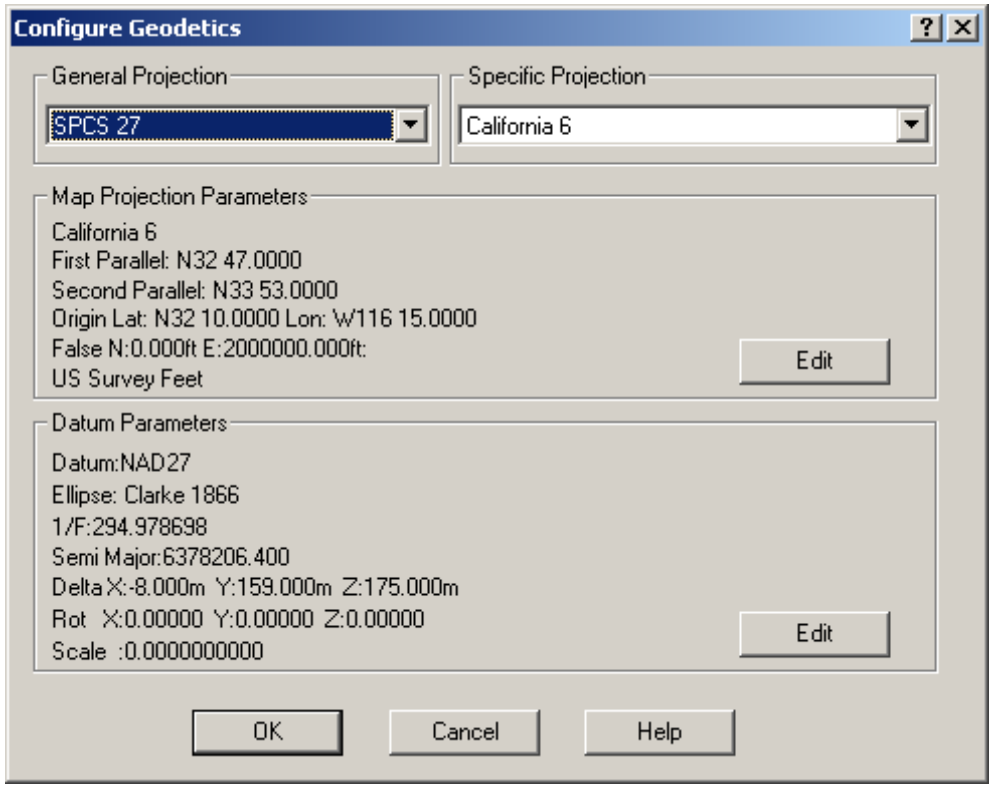
It is necessary to know which **Geodetic Datum**, as well as which **Map Projection** will be used on a project. **Map Projections** are used to convert coordinates from the earth's spherical shape to a flat (plane) surface.

Several common **Geodetic Datums** and **Map Projections** are available as pre-configured options in WinFrog. WinFrog also has the capability to accept user-defined systems. Configuring the geodetics must be done at the start of the project so that all **Survey Lines**, **Waypoints**, **Picture** data, and **Vehicle Positions** entered refer to the correct reference system.

The importance of setting geodetics properly cannot be overstated. Setting geodetics improperly results in surveying an erroneous location or surveying a location different from the location you believe you are surveying. Errors made in specifying geodetic constants will be carried throughout an entire survey and may be very difficult, if not impossible, to undo. Therefore, it is imperative that you understand the implications when configuring or modifying the geodetic constants and ensure that all values are set correctly. It is **crucial** that the geodetics are configured carefully before the project begins.

To Configure Geodetics

1 From the **Configure** menu**,** choose **Geodetics**.



Start in the **General Projection** dropdown menu. Scroll through the menu to see the nine pre-configured selections. Notice that these selections are really **Datum** selections (map projections in conjunction with commonly used geodetic ellipsoids). One of the available options is **User**, which allows you to configure your own custom projection/datum parameters as required.

2 For our sample project, it was specified that the **NAD27 Datum** will be used with the **California State Plane Coordinate System (Zone 6)** . Scroll through the **General Projection** dropdown menu and select **SPCS 27**.

3 Scroll through the **Specific Projection** dropdown menu and select **California 6.**

This zone is used for work in the area around San Diego, California. The **Map Projection Parameters** portion of the **Configure Geodetics** dialog box shows the particular parameters of the **SPCS Zone 6** projection. These are fixed parameters and do not require any editing or modifications.

Note: the unit of measure used with this datum is the **US Survey Foot.**

Because you are using the **NAD27** datum and not the **WGS84** datum (as specified in the **General Projection**), it is now necessary to edit the **Datum Parameters** in the **Configure Geodetics** dialog box, particularly to define the working ellipsoid parameters and its relationship to the **WGS84** Ellipsoid. The **SPCS 27** datum uses the **Clarke 1866** Ellipsoid as its reference model and no modifications are required to this ellipsoid's parameters (i.e.: semi major axis and inverse flattening).

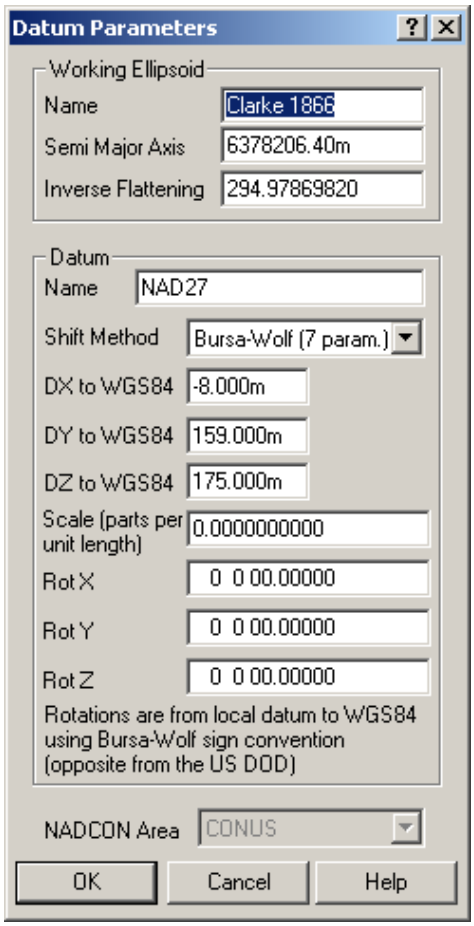
The **Datum Shifts** between **NAD27** and **WGS84** are different for every location and are required in WinFrog to correct the positional information received from the GPS receiver (which refers to WGS 84) to the **Working Datum**, in this case NAD27**.** Datum shift values

are sometimes specified by the client to provide consistency with previous projects. Other projects may require you to derive the datum shifts by using GPS observations on a local datum monument, or by referring to a **National Imagery and Mapping Agency (NIMA)** publication.

The following datum shifts are specified for our project: (Working to WGS 84):

dX: -8.000m **dY: 159.000m** **dZ: 175.000m**

To view the entered **Datum Shift** values, click the **Edit** button in the **Datum Parameters** portion of the **Configure Geodetics** dialog box to see the **Datum Parameters** dialog box.



When the NAD27 and SPCS Zone 6 options are chosen (as described above), WinFrog provides default datum shift values for NAD27 in the San Diego area, as per NIMA specifications.

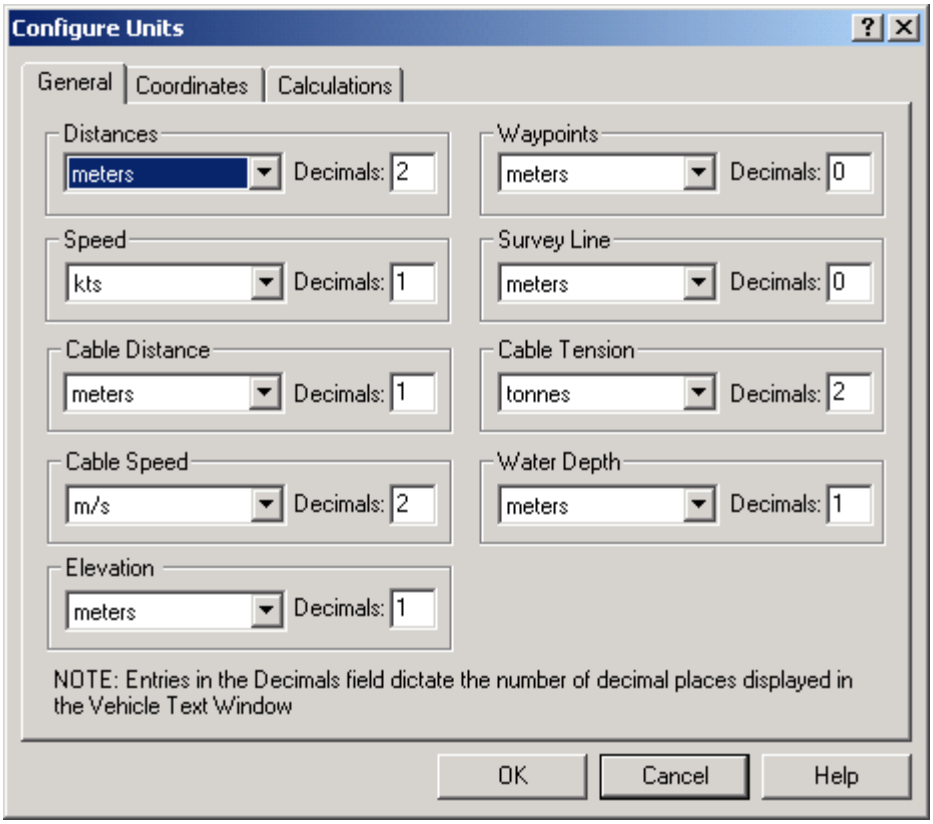
In this case, the default values match those specified in the project outline, so no changes are required. You must always confirm that you are using the correct signs (positive or negative) for all datum values.

Note: some datums may require scale and rotation corrections, as well as the datum shifts.

4 Click **OK** to close this dialog box and **OK** again to close the **Configure Geodetics** dialog box.

Units of Measure

Rather than having to specify a unit of measure or coordinate type each time you make an entry, you can configure WinFrog to default to the correct type of value. It is best to do this at the beginning of the project.



To Configure Units of Measure

1 From the **Configure** menu, choose **Units**.

2 On the **General** tab in the **Distances** area, click the **US Survey Feet** option. This allows us to be consistent with the units used in the specified SPCS Zone 6 datum/projection.

Note: the US Survey Foot differs very little from a standard foot.

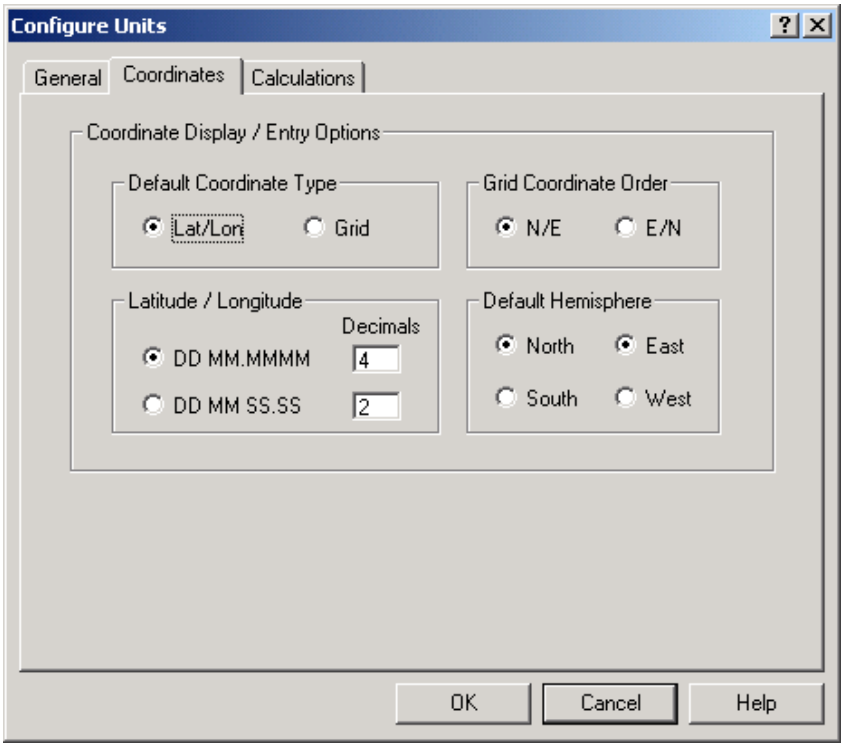
1 US Survey Foot = (12/39.37)m = 0.3048006 meters

1 Standard Foot = 0.3048 meters

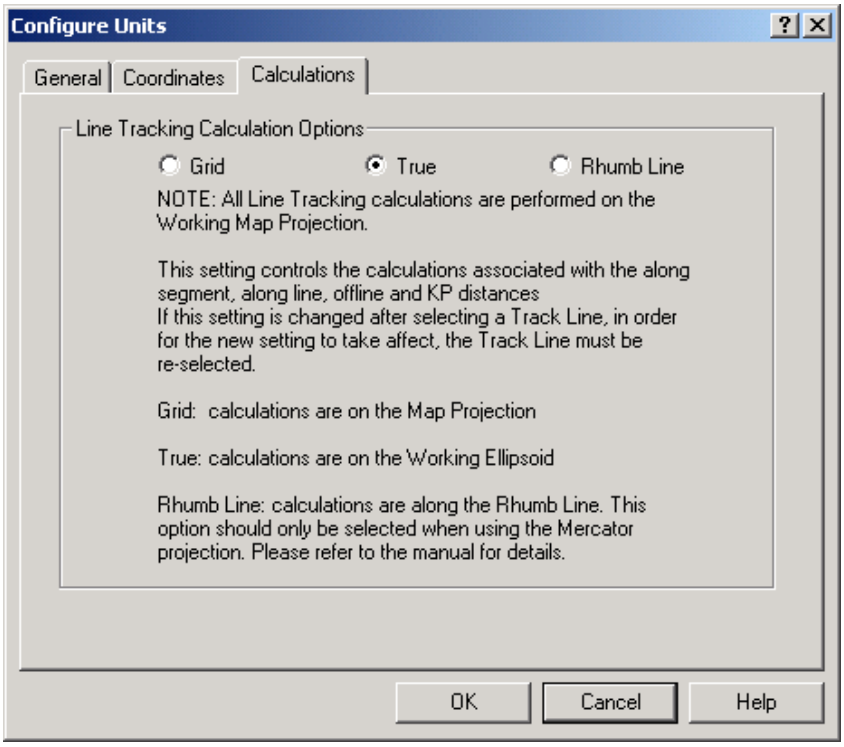
The difference between these units of measure is only 0.01 feet at distances of 10,000 feet. Obviously, for most entries, this difference will have little affect.

Choose the **US Survey Feet** option for **Waypoints** and **Survey Line** too.

3 **Grid** (Northing and Easting) coordinates were provided for this project, rather than geographical coordinates (latitude and longitude). The default coordinate type is **Lat/Lon** and needs to be changed for this project. Select the **Coordinates** tab of the **Configure Units** window and click the **Grid** radio button to change the **Default Coordinate Type**.



4 Select the **Calculations** tab. All line tracking values, specifically **Distance Down Line** and **Offset** tracking, should typically refer to **True** calculations. Click the **True** radio button to change this option.



5 Click **OK** to save the changes and close the **Configure Units** dialog box.

Working Directories

Before a project starts, it is prudent to setup and organize your **Working Files** and **Working Directories** so project data can be easily found and retrieved.

The **Working Directories** are where WinFrog stores and retrieves **raw data** and generates data for **Networked Smart Remote systems**.

You can select an existing directory or create a new directory to be a **Working Directory.** Again, in terms of organization, it is best to have just one main **Working Directory** for each project. In WinFrog, this is referred to as the **Filing directory**. Subdirectories can be added within this file, if required.

To Define a Working Directory for a New Project

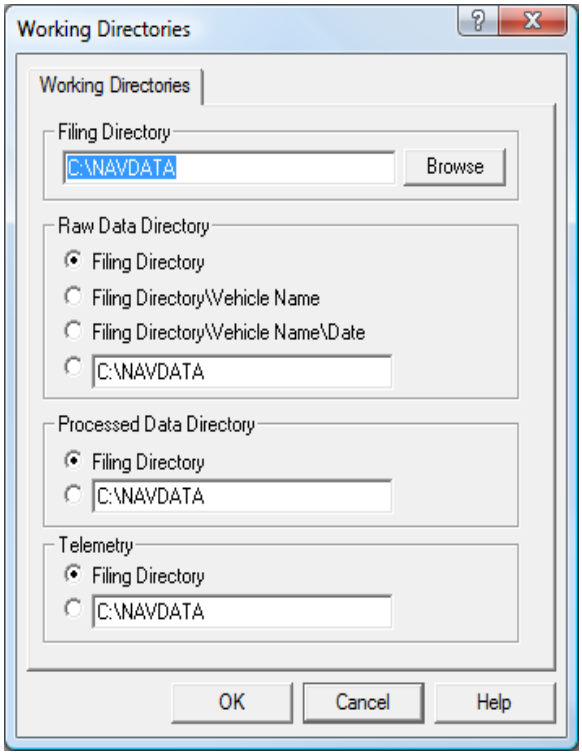
1 From the **File** menu, choose **Select Working Directories**.

The **Working Directories** dialog box is used to tell the program where to store your data. Looking at the **Filing Directory** field, you notice that there is already a default directory for data storage, **C:\NAVDATA**. The default directory for all data storage is **C:\NAVDATA** because the **Filing Directory** radio button in each data area is clicked. Notice that other radio buttons could be clicked in the data areas and that any directory, or directories, could be named to store these data. For this sample project, you will assign one specific directory for all data storage - **C:\Project1**.

2 In the **Filing Directory** field, type **C:\Project1.**

3 Click **OK**. WinFrog now creates a new directory named **Project1** on the C drive.

4 From the **File** menu, choose **Select Working Directories** again.



Confirm that the name of the **Filing Directory** in each data field now reads **C:\Project1**.

5 Click **OK** to close the **Working Directories** dialog box.

Working Files

After setting up the **Working Directories**, you must choose or create the "**Working Files**." Working Files are used by WinFrog to store data and to provide waypoint and survey line information, etc. WinFrog creates different types of **Working Files** to contain these different types of information. All files created by WinFrog are easily identified by their unique three letter file extensions.

Types of Working Files	File Extensions
Survey Lines	PTS
Waypoints	WPT
Data files list (list of Data [.DAT] files)	ALG
Seismic_Receiver (list of Receiver [.RCV] files)	ALL
Seismic_Source (list of Source [.SRC] files)	ASC
Logs	LOG
Picture	PIC
Charts	RML
CRDD Database	MDB

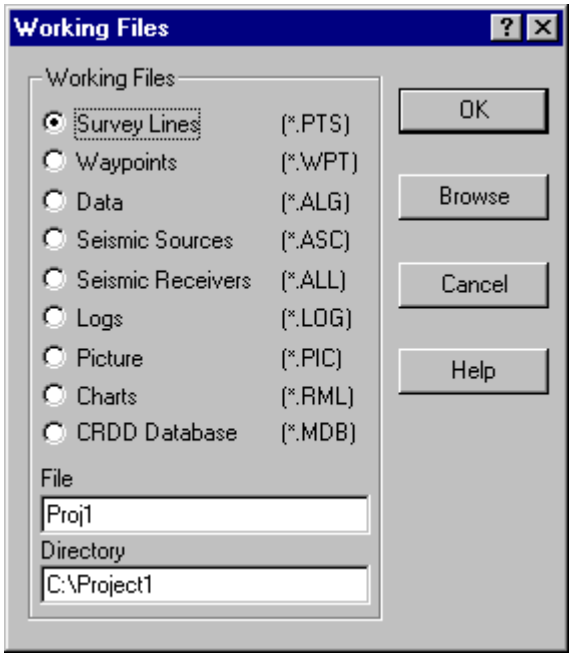
These files (with the exception of the chart and CRDD database files) are all text based (ASCII) data files created by WinFrog with the data written in a WinFrog-specific format.

Some files, specifically graphics and database files, are not WinFrog-specific. The format of the data in these files was specified by their third party creators. WinFrog was modified to use these "industry standard" formats.

WinFrog can access **Working Files** from anywhere on the computer, but it is best to place the **Working Files** in the **Working Directory** in order to keep the project organized.

To Define the Working Files

1 From the **File** menu, choose **Select Working Files**.



By default, the **Survey Line** radio button is selected.

At the bottom of the **Working Files** dialog box, notice the default name of the survey lines file (**surline**) and in which directory it is stored (**C:\ NAVDATA**). You will want to change both. You've already set up a specific directory for our sample project called **Project1**; that's where you will create the **Working Files**.

It is usually not necessary to create all of the listed **Working Files**. For this tutorial (and most simple hydrographic projects) you need to create only the following Working Files: **Survey Line (.PTS)**, **Waypoint (.WPT)**, and **Data (.DAT)**.

2 With the **Survey Line** radio button still selected, type **Proj1** in the **File** field.

3 In the **Directory** field, type **C:\Project1**.

4 Click the **Waypoint** radio button.

5 Type **Proj1** in the **File** field.

6 Type **C:\Project1** in the **Directory** field.

7 Click the **Data** radio button.

8 Type **Proj1** in the **File** field.

9 Type **C:\Project1** in the **Directory** field.

10 Click **OK**.

Note: If you had already created the required file types, it may be quicker to use the **Browse** function to locate the files and specify them as **Working Files**.

I/O Devices (Peripheral Devices)

The next step is to define which **I/O devices** (also referred to as peripheral devices) you are going to use in your project. WinFrog uses the computer's serial ports to input information from many devices. For example, if the computer is configured with a 16-port Digiboard™ serial card, WinFrog can read data from 16 different devices. The devices must be correctly wired to the serial port (typically using the RS232 protocol) and correctly (internally) configured to output the desired information with the desired communications protocols.

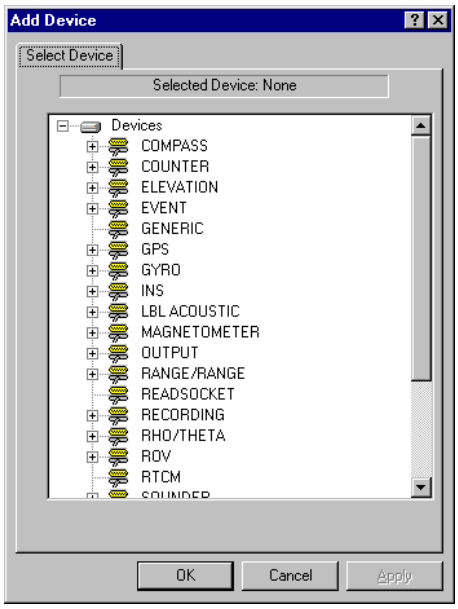
For this tutorial, we will add three **I/O Devices**: a **Simulated GPS Receiver**, a **Simulated Gyro,** and a **Simulated Echosounder (Sounder)**. (The terms sounder and echosounder are used interchangeably throughout this document and the industry.) Since WinFrog has the capability to configure more than one vehicle, the process of adding devices requires two distinct steps.

First, the devices are added to WinFrog. Some I/O devices may require a "generic" configuration at this point. Next, the I/O devices are added to the desired vehicle. Most I/O devices must be edited again at this point to suit the unique application on this vehicle.

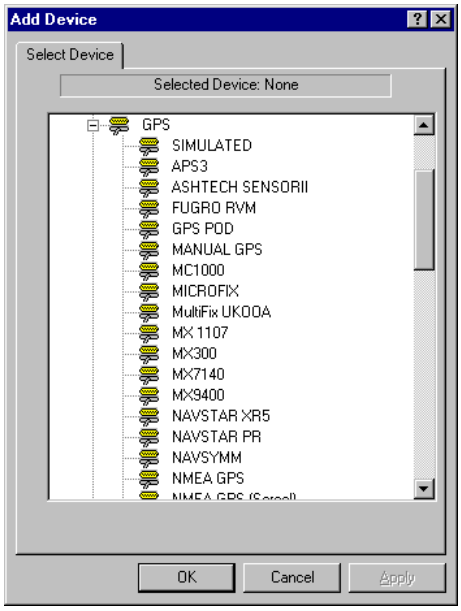
To Add Peripheral Devices to WinFrog

Although we are using simulated devices for this exercise, the steps indicated below are the same for adding "real" devices to WinFrog.

1 From the **Configure** menu, choose **I/O Devices… > Add**. The **Add Device** window appears, as seen below.



2 In the **Select Devices** scroll box, click on the "+" symbol beside the **GPS** group name. A list of all the GPS receivers that can be used by WinFrog is presented.



3 Double-click on the **SIMULATED** device (or click once on the device and then click the **OK** button).

You've just added the **Simulated GPS** device to WinFrog. If you had added a "real" GPS device, a **Device I/O Parameters** window would have opened at this point, requiring you to select the specific communication parameters (baud rate, data bits, parity, and stop bits) for that device.

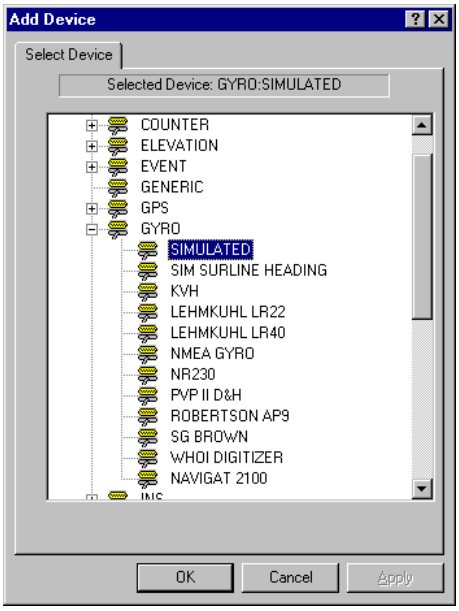
Add the two other devices in a similar manner.

6 Select **Configure > I/O Devices… > Add**.

The same **Add Devices** dialog box opens as it did in **Step 1**.

7 In the **Devices**: scroll box, click on the "**+**" symbol beside the **Gyro** group name. A list of all the gyros that can be used by WinFrog displays.

8 Double-click on the **Simulated** gyro device.



9 Repeat these steps to add the **Simulated Sounder** receiver from the **SOUNDER** device group.

Once the **I/O Devices** are added to WinFrog, they must also be added to the vehicle. This step occurs after the vehicle is configured and is detailed below in the section titled **Defining the Vehicle's Data Source and I/O Devices.**

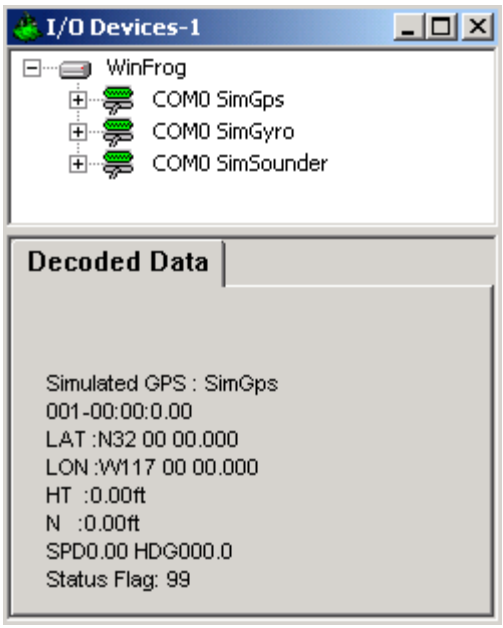
Viewing the I/O Device Data

WinFrog's **I/O Devices** window displays the data being received from the interfaced devices. This window should always be visible to ensure that the correct data are being consistently received by WinFrog.

This window also provides you with a right-click shortcut to add a new **I/O Device (Add I/O)**, edit the device's communications parameters (**Edit I/O**) or use the generic configuration (**Configure Device**) should the device's configuration require modification. Until you are familiar with the devices in WinFrog, it is wise to check the configuration of all devices added to WinFrog.

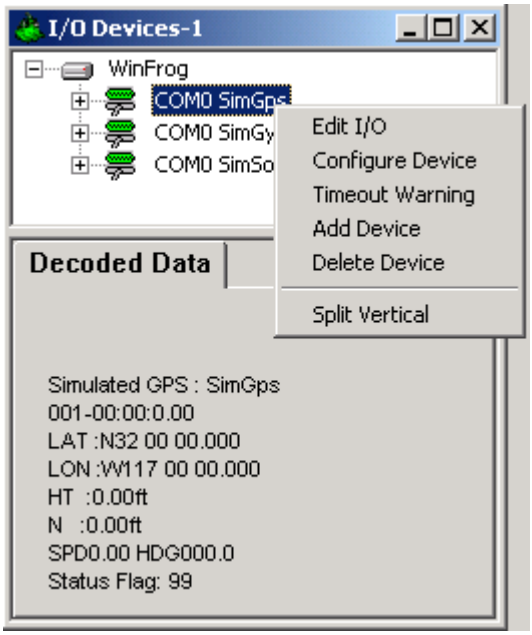
To View the I/O Devices Window

1 Select the main menu item **View > I/O Devices**.



The top section of the window displays all of the I/O devices that have been added to WinFrog. The bottom section shows data from the currently highlighted device.

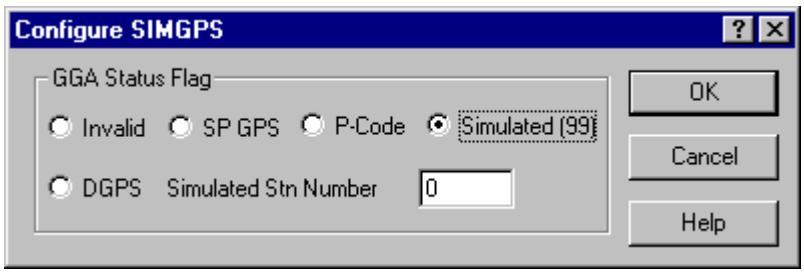
In order to configure a device, edit its I/O parameters, or delete the device, highlight the device and then click the right mouse button. Choose the appropriate option from the dropdown list.



As mentioned above, you should check the configuration of each device when you add it. **Note:** not all devices will require configuration at this level. For this sample project the only device that can be configured is the SimGPS device.

2 Right-click on the SimGPS device and select **Configure Device**.

3 Choose the default **Simulated (99) GGA Status Flag** option.



4 Click **OK** to save your selection.

5 In real-time operations, you should leave the **I/O Devices** window open so that you can quickly check to ensure that the devices are updating correctly. If you feel that you need to see the data from more than one device at the same time, you can open additional **I/O Devices** windows.

Configure the Vehicle

The next step is to configure the vehicle. WinFrog's default configuration contains only one vehicle, aptly named **Vehicle 1**. WinFrog supports up to 25 independent vehicles, each of which can have their own name, size, color, offsets, and devices.

There are no limits to the number of I/O devices that can be added to a vehicle. You can have multiple GPS receivers, gyros, etc. attached to a vehicle. In those cases where there are more than one of the same I/O device type, you must decide which device will be the **Primary** and which will be the **Secondary** device.

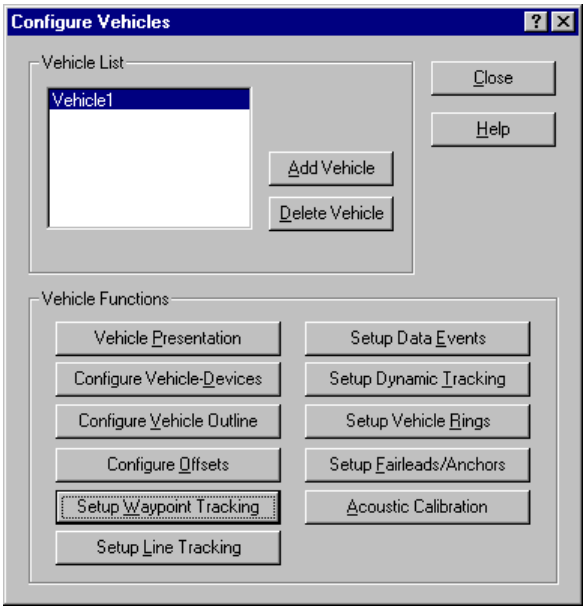
Note: an I/O device can also be added to more than one vehicle. This functionality is rarely used for anything other than simulated devices.

For this sample project, rather than adding a new vehicle you will modify the default vehicle.

To Configure a Vehicle

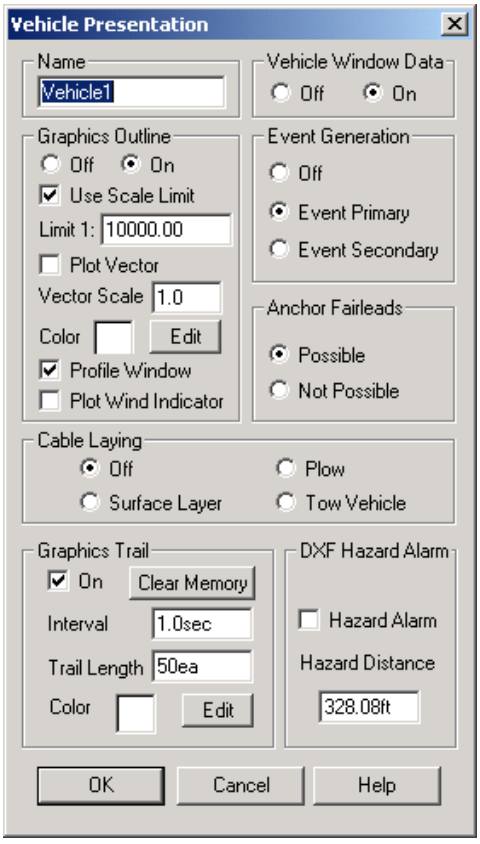
1 From the **Configure** menu, choose **Vehicles**. **Vehicle 1** is highlighted in the **Vehicles** window. (A vehicle must be highlighted in order to be edited.)

There are 11 configuration options presented in the **Configure Vehicles** dialog window. For typical (simpler) projects it is not required to select all options. The following paragraphs detail only those options that must be addressed now, specifically **Configure Offsets**, **Configure Vehicle Outline**, **Configure Vehicle-Devices**, and **Vehicle Presentation**.



The **Setup Data Events**, **Waypoint,** and **Line Tracking** features are addressed in the sections discussing real-time eventing and tracking. See the appropriate sections in the **WinFrog User's Guide** for more information on the other configuration options.

2 Click the **Vehicle Presentation** button to display the **Vehicle Presentation** window, as seen below. **Note:** most of the options in the **Vehicle Presentation** window default to the desired settings.



The **Vehicle Window Data** field defaults to **On**, which enables you to see this vehicle's information in the **Vehicle Text** window.

The **Event Generation** field defaults to **Event Primary** to specify that this vehicle will be used to generate automatic events.

The **Cable Laying** field defaults to **Off**. This requires change only if the **Cable Management Module** is being used.

3 In the **Name** field, type the name of the vehicle. In this case enter **Locator**.

4 In the **Graphics Outline** section **Color** field, select **Edit** and choose the desired color.

5 The **Graphics Trail** field defaults to **On**. This specifies that the "trail" will be drawn on the **Graphics** screen, showing where the vehicle has been. Modify the values in the **Interval** and **Trail Length** windows as desired.

6 The settings of the other presented options (such as **Profile Window, Anchor Fairleads** and **Hazard Alarm**) are of no consequence for this tutorial. See the appropriate sections in the **WinFrog User's Guide** for details about these features.

7 Click **OK** to close the **Vehicle Presentation** window.

Vehicle Dimensions

The next step is to define the dimensions of the **Locator** vehicle. WinFrog is pre-configured with a default vehicle shape, but you should always measure the dimensions for the vessel you are using and enter them into WinFrog. This aids the pilot in real-time navigation and also helps confirm **Device** and **Tracking Offset** entries. In this case, we are provided with the **Locator's** dimensions (see the sample project page).

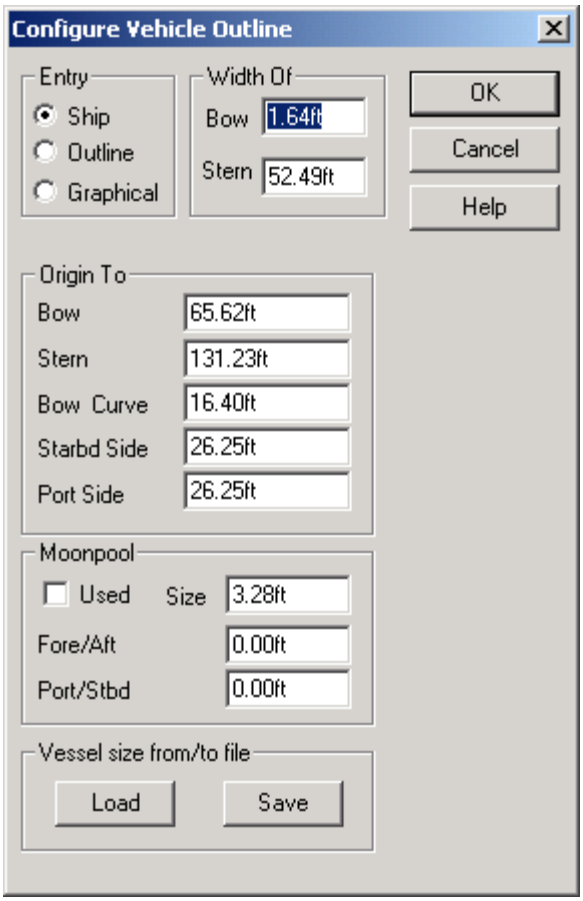
All dimension (and offset) measurements entered in WinFrog are made from a reference position on the boat, referred to as the **Common Reference Point (CRP).** Typically, this is the position of the GPS antenna, but it can be any point on the boat. For example, it could be referenced to the echosounder transducer, the main mast, the center of the boat, etc. Once the location of the **Common Reference Point** has been established, all **Dimension** and **Offset** measurements must be made from that location.

To Configure a Vehicle's Dimensions

1 With the **Configure Vehicles** window still open, click the **Configure Vehicle Outline** button. The **Configure Vehicle Outline** window appears.

2 In the **Entry** area, select the **Ship** radio button. This allows for a simplified entry of a generic ship shape. The **Outline** and **Graphical** options allows you to enter a very detailed shape, but this is a much more involved process and is usually not necessary.

3 Change the values in the **Width Of** and **Origin To** fields so they match those settings from the vessel's specification sheet, as provided.



Note: the word **"origin"** in **Origin To** refers to the **CRP** and that all values in this window are entered as **positive** values.

4 Click **OK** to close the **Vehicle Outline** dialog box and save the entries.

Defining the Vehicle's Data Source and Devices

The next step is to define the vehicle's **Data Source**. The **Data Source** selection tells WinFrog from where it will receive its information. A vehicle can obtain its data from real-time devices, radio telemetry networks, computer networks, simulators, previously recorded files, or from layback calculations relative to another vehicle.

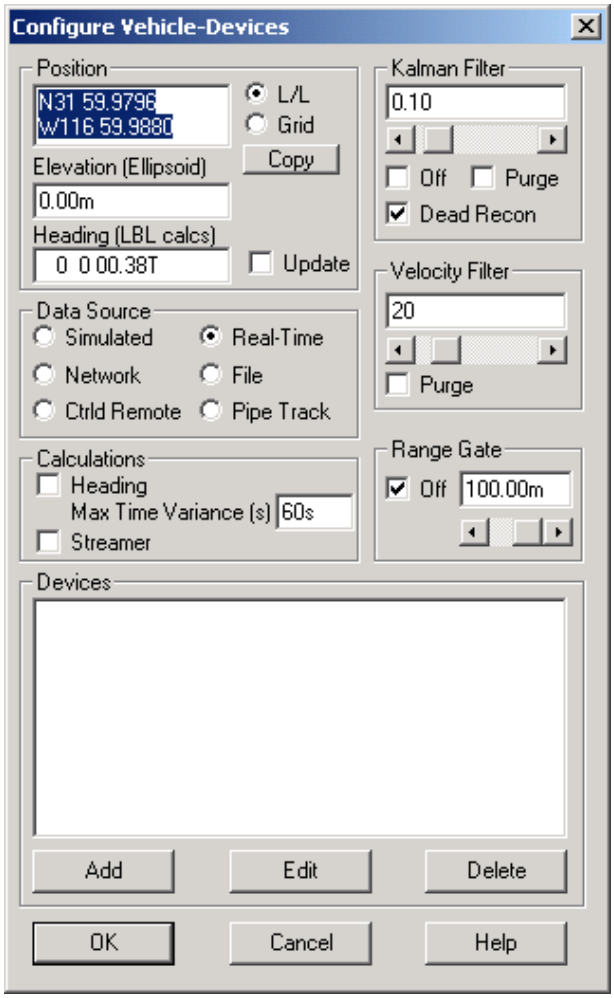
Usually, the data being used by a vehicle are from a real-time data source. On larger operations, where there are computers networked together, **Smart Remote** systems will use the **Network** data source. Some multiple vessel operations will utilize the radio telemetry systems to send and receive data. (In this case, the **Telemetry** data source is used).

To Define the Vehicle's Data Source

1 With the **Configure Vehicles** dialog box still open, click the **Configure Vehicle-Devices** button.

2 In the **Data Source** area, make sure the **Real-Time** radio button is selected.

With the **Data Source** now defined as **Real-Time**, you must define which of the real-time devices (previously added to WinFrog) will be added to the Locator's **Device** list.



3 Click the **Add** button at the bottom of the **Configure Vehicle-Devices** dialog box.

4 The **Select Data Items** window displays, showing all of the devices that were added to WinFrog in the **Available Data Items** list. In this case, we will add all of the listed devices to the Locator. Highlight the item that you want to add.

5 Click **OK** to complete the step. Repeat Steps 4 and 5 until all of the required devices (**SimGPS, SimSounder, SimGyro**) are listed in the **Configure Vehicle-Devices > Devices** window.

6 As mentioned above in the **Adding Devices to WinFrog** section, since no two vehicles are exactly alike (in terms of where the devices have been located or how they will be used), each device must be edited if it is added to a vehicle.

Different devices require different parameters to be modified to suit the particular application.

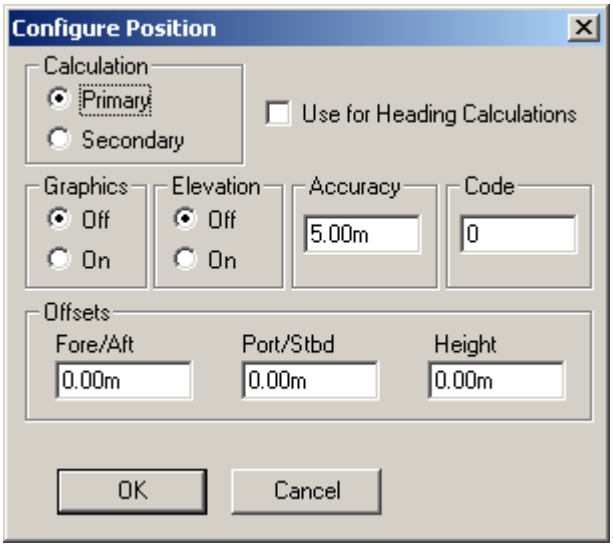
For example, in order for the incoming positional information to be related to the correct

location on the vehicle, you must tell WinFrog where the GPS antenna is located in relation to the CRP.

Highlight the **GPS, SimGps, Position** device in the **Configure Vehicle-Devices** dialog box, then click the **Edit** button.

7 The **Configure Position** dialog box displays. The **Calculation** options are for when more than one positioning device is added to the vehicle. Only **Primary** devices are used to provide a vehicle's position. Data from **Secondary** devices (of any type of device) are not used in calculations. The information from those devices is only monitored.

In our case, and in most cases, only one device of each type is added to a vehicle. Therefore, each device added to a vehicle should be designated as **Primary**.



8 Under the **Graphics** area, click the **On** radio button. This will display the GPS antenna's position on the ship in the **Graphics** window.

9 In the **Elevation** entry field, select **Off**. **On** is only used if you are using a high accuracy (mm level) RTKGPS system. This option relates water depth values to the GPS ellipsoid.

10 The **Accuracy** and **Code** values do not typically require change from the defaults.

11 In the **Offsets** area of the **Configure Positions** dialog box, you must enter the offset from the **CRP** to the GPS antenna. These **Offset** entries must also include the correct sign to indicate the direction of the offset.

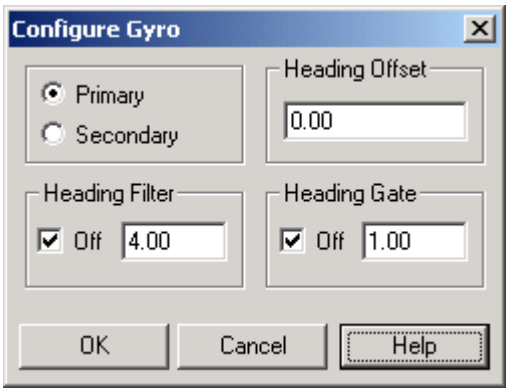
Referring to the provided vessel diagram, you see that the **Fore/Aft** offset is 2.0 feet aft of the CRP, so enter - (negative) **2.0** in the **Fore/Aft** entry window. Enter **15.0** in the **Port/Stbd** entry field.

12 In the **Height** entry field, type **10.0.** This is the height of the GPS antenna above the vertical reference. This is only used if an attitude sensor is attached to the vehicle in which case the GPS antenna position is reduced to the vertical reference "zero".

13 Click **OK** to confirm these entries and return to the **Configure Vehicle-Devices** dialog box.

14 From the **Devices** list, select **GYRO,SimGyro,HEADING** and click **Edit**.

15 The **Configure Gyro** dialog box displays, as seen below.



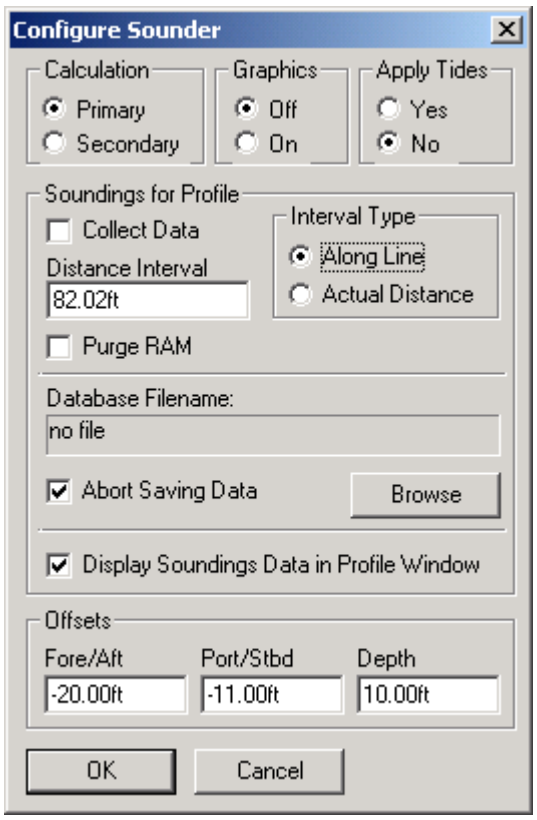
Ensure that the gyro is designated **Primary**.

A **Heading Offset** is usually required to make the data from the gyro match the vessel's actual heading. This is a result of the gyro device's "zero" reference mark not being perfectly lined up with the vessel's centerline. A simple method of determining the offset is to run the vessel at (or near) its maximum speed and compare the **Course Made Good (CMG)** to the vessel heading. Ideally, they will be the same. If they are not, calculate the difference and enter the value in the **Heading Offset** window. The **Offset** value is added to the value being received from the gyro device before the data are applied to the vessel. It is not necessary to enter a value in the **Heading Offset** field for the sample project.

The **Heading Filter** and **Heading Gate** are typically not required unless the data from the gyro is somewhat unstable. Leave these options set to **Off.**

Click **OK** to confirm the entries and to return to the **Configure Vehicle-Devices** dialog box.

16 Highlight the **Sounder, SimSounder, Bottom Depth** device in the **Configure Vehicle-Devices** dialog box, then click the **Edit** button.



17 The **Configure Sounder** window appears, as seen above. For a typical survey you can leave most of the options at the default settings, checking the following to ensure that they are correct:

- Designate the sounder as **Primary**.
- The **Apply Tides** button will only work if a tide gauge or predicted tide file is added to the vehicle. In this case, leave this set to **No**.
- The **Soundings for Profile** options configure the use of sounding data in WinFrog's **Profile** window. By default, the **Abort Saving Data** button is checked. This setting is fine for the sample project.
- The application of **Offsets** to an echosounder's data is often misunderstood. The **Fore/Aft** and **Port/Stbd** entries are used only for graphical representation purposes and are not used except to plot (in the **Graphics** window) where the echosounder is located. However, the **Depth** offset value is extremely important. Most echosounders are capable of outputting various types of depth data. **Depth Below Surface** (**DBS**), **Depth Below Transducer** (**DBT**), and **Depth Below Keel** (**DBK**) are the most common data types. You must know what data are being sent from the sounder, then enter the **Depth** value here to ensure that the depths recorded in WinFrog will be referred to the water surface.

  Note: sounder depths are entered as **positive** values. In this case, enter **10.0 ft.**

18 Click **OK** to close the **Configure Sounder** dialog box and return to the **Configure Vehicle-Devices** dialog box.

19 Click **OK** to close the **Configure Vehicle-Devices** dialog box and return to the **Configure Vehicles** dialog box.

Vehicle Tracking Offsets

Due to the physical restrictions often encountered when installing peripheral devices, such as a GPS antenna or echosounder on a vessel, it is usually required that a **Tracking Offset** be established and enabled for real-time tracking/data recording. **Tracking Offsets** allow you to correlate the GPS antenna position to any point on the vehicle.

For example, during data collection on our sample project, you will want to track and record the position of the echosounder. Another example might be if you were dropping divers into the water over a specific point on the bottom. In this case, you would want to track that point on the vessel where the divers jump off so that you can place the divers as close to the intended waypoint as possible.

Instead of constantly changing the required **Tracking Offset** values, WinFrog has an **Offset** table where you can configure and save up to 15 different entries. This allows you to quickly choose a **Tracking Offset** from the table as required.

Note: only one **Offset** can be tracked at a time.

Do not confuse the **Tracking Offset** with the **Vehicle Shape Offset** or **Device Offsets.** The **Vehicle Shape Offsets** are simply for the presentation of the vessel in the **Graphics** window, while the **Device Offsets** are used to relate all devices to the vessel's **CRP**. The **Tracking Offset** establishes what point of the vessel will be tracked and, hence, what coordinates will be stored during eventing.

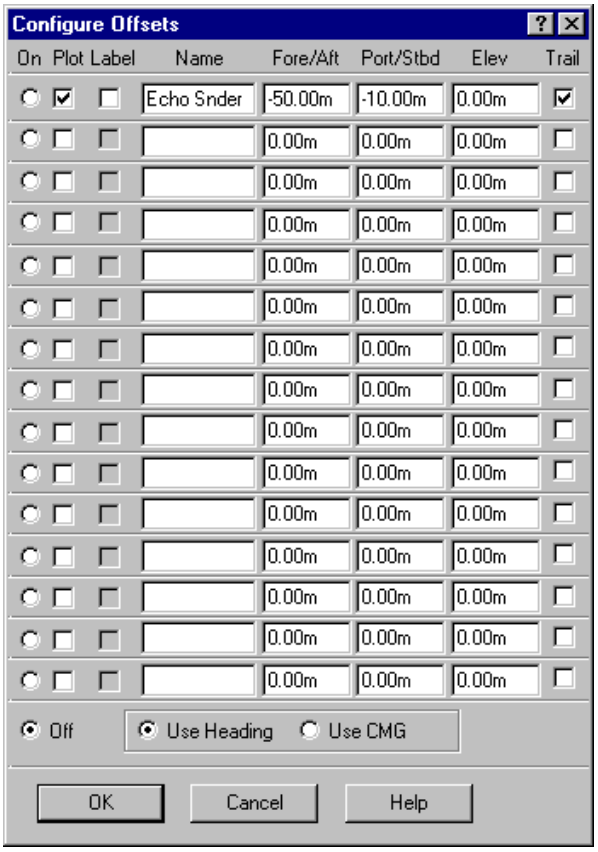
As mentioned previously, all of the offset and dimension measurements you enter in WinFrog are made **from** the CRP on the boat.

To Configure a Tracking Offset

1 With the **Configure Vehicles** window still open, click the **Configure Offsets** button. The **Configure Offsets** dialog box opens, as seen below. Initially, all of the offset entry windows are empty.

2 In the **Name** area, enter the name of the offset point. For our example, enter the name **Echo Sndr**. From the provided measurements (see the ship diagram), the **Fore/Aft** offset of the echosounder is **-50.0** ft, **Port/Stbd** offset is **-10.0 ft.** Enter **0.0** for the **Elev** offset.

3 Check the **Trail** option so that you can see a trail of "bread crumbs" coming from this point on the **Graphics** window. (See **Graphics Trail** configuration under the **Configure Vehicles > Vehicle Presentation** option for more **Graphics Trail** configuration options).



4 Check the **Plot** option so that you can see a small circle (along with the **Offset Name**) plotted on the **Graphics** display showing you where the **offset** is located on the vessel.

5 At the bottom of the **Configure Offsets** window, select the **Use Heading** radio button. This is the most accurate choice (and sometimes the only valid choice). Unless the vessel is constantly at speed and the **CMG** (**Course Made Good**) is the same as the vessel's heading, the **CMG** value will fluctuate in every direction, between positional updates. These fluctuating data cannot be used for accurate **Offset** position calculations.

6 Turn **On** the **Echo Sndr** offset.

Note: this has several implications:

- The coordinates displayed for this vessel in the **Vehicle Text** window now refer to this offset point.
- All tracking information (distance/bearing to a waypoint or line tracking SOL/EOL/Offtrack data) now refers to this **Offset** point.
- The coordinates recorded in the automatic events data (**.DAT**) files will refer to this **Offset** point.

7 Click **OK** to close the **Configure Offsets** dialog box and save the entries.

8 As mentioned above, the other options in the **Configure Vehicles** window are addressed further in the WinFrog User's Guide. For now, click **Close** to close the **Configure Vehicles** dialog box.

Vehicle Text Window

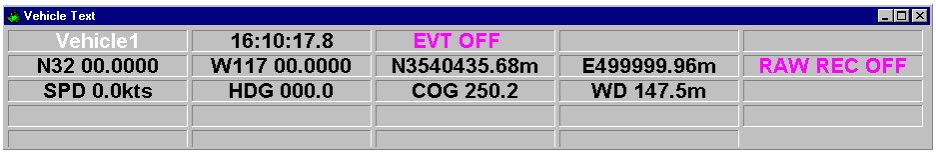
The **Vehicle Text** window displays real-time information in text form for all WinFrog vehicles. This window is user-configurable and can include information such as the vehicle's name, position, heading, and speed, as well as a host of other data. The **Vehicle Text** window also offers shortcuts to various configuration options.

One **Vehicle Text** window can be toggled to display information for multiple vehicles or, alternatively, you can open multiple **Vehicle Text** windows to display this data for each individual vehicle. Typically, due to limited display space, only one **Vehicle Text** window is visible. Also, because of the importance of the data available, the **Vehicle Text** window is typically left "on display" throughout a project.

In the sample project, you will open only one **Vehicle Text** window.

To Display the Vehicle Text window

1 Select **View > Vehicle text**. The **Vehicle Text** window displays at the bottom of the WinFrog display, as seen below.



The **Vehicle Text** window configuration is saved in the **WinFrogini.wfg** file. Every time the **Vehicle Text** window is enabled, the same data are displayed in the same location of the window. By default, the **Vehicle Text** window is configured to display five rows and five columns of data.

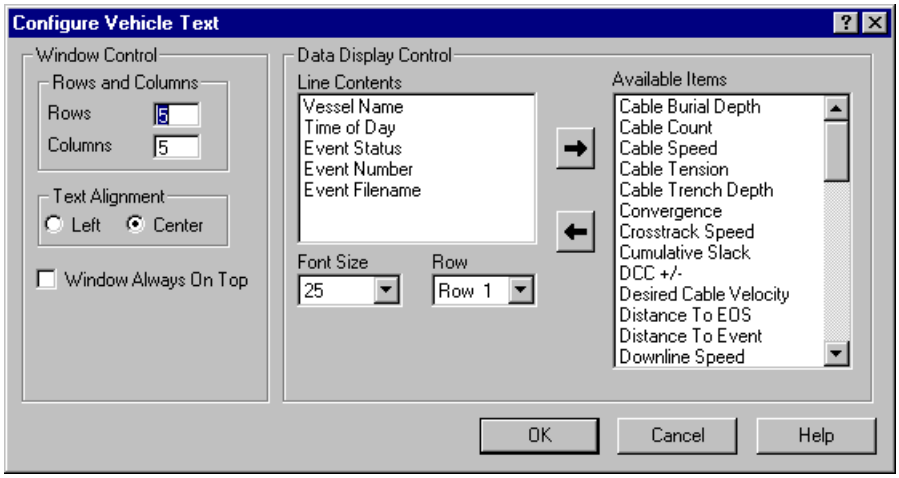
The data displayed in this window are also user-configurable to suit personal/operational preferences. Upon program shutdown, WinFrog will record this new **Vehicle Text** window configuration in the **WinFrogini.wfg** file.

For our sample project, we will add an extra item (**Line Bearing**) as it is not among the default items automatically displayed in the window.

To Configure the Vehicle Text Window

1 Select **Configure > Vehicle Text.** (Or, move the mouse pointer within the **Vehicle Text** window limits and click the right mouse button and choose the **Configure Vehicle Text** option.)

2 The **Configure Vehicle Text** dialog box displays with the **Data Display Control** area showing **Line Contents** on the left and the **Available Items** on the right, as seen below.



The **Vehicle Text** window is divided into five rows with **Row 1** located at the top of the window and **Row 5** at the bottom. The **Line Contents** window displays what data are displayed in the row displayed in the **Row** dropdown box. Change the **Row** to see its configuration in the **Line Contents** window. (See the **Operator Display Windows** chapter for definitions of the **Available Items**.)

3 Select **Row 5** from the **Row** dropdown box. By default, **Line Name, Distance to SOL, Distance to EOL,** and **Port/Starboard** data are displayed in this row.

4 From the **Available Items** list (the list on the right side of the window), select **Line Bearing**, then click the **left arrow** to move **Line Bearing** from the **Available Items** list to the **Line Contents** list.

5 Click **OK** to save the changes and close this dialog box.

Note: the window spaces allocated for these data items will remain blank until there are data to display.

Graphics Window/Display

The **Graphics** window is the main navigational display generated by WinFrog. It is a real-time, scaled, plan view representation of the WinFrog positional data. It provides a graphical representation of the positions of all vehicles, as well as any **Waypoints, Survey Lines, Picture Files, Charts,** and **Data Events**.

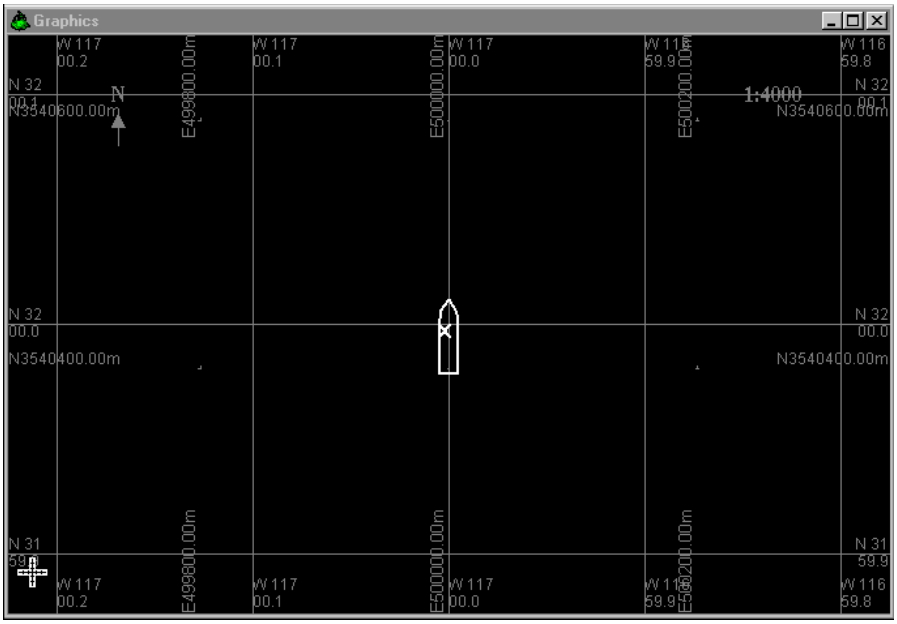
You can control the display of **Parallels of Latitude** and **Meridians of Longitude**, as well as **Map Projection Northing** and **Easting** gridlines. The **Graphics** window can be centered on a fixed point or follow any WinFrog vessel. The **Rotation, Scale** and **Color** of the **Graphics** display can also be configured to your preferences.

For multi-vehicle applications, more than one **Graphics** window can be displayed to show the data for each vehicle. Each of the **Graphics** windows can be independently configured.

In this sample project, you will display only one **Graphics** window and will configure it to display **Survey Lines**, **Waypoints**, a **North Arrow**, **Projection** and **Geographic Grids**, **Working Data (.ALG)** file contents, and **Working Log (.LOG)** file data. You will also configure the **Graphics** window to be oriented "North Up" and centered on the **Locator** vehicle.

To Display the Graphics Window

1 Select **View > Graphics**. The **Graphics** window displays.

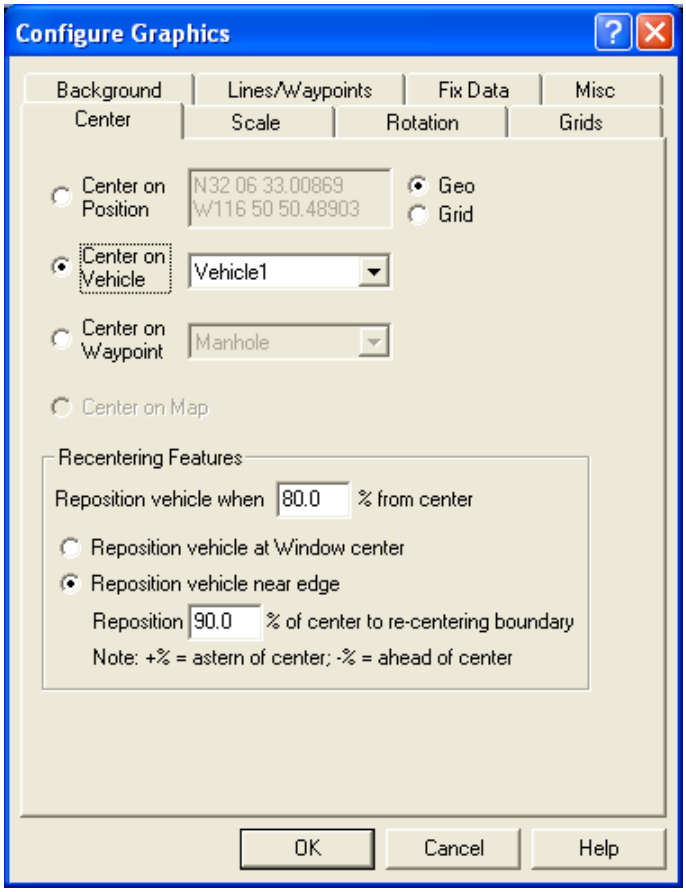


By default, WinFrog will center the **Graphics** window on the first vehicle listed. Since we have only configured one vehicle, the **Graphics** window is centered on the **Locator's CRP**.

To Configure a Graphics Window

1 Select the main menu item **Configure > Graphics**. (For a shortcut to the **Configure Graphics** menu, position the mouse pointer within the limits of the **Graphics** window, right-click and choose the **Configure** option.)

The **Configure Graphics** window has eight tabs offering multiple options on each page. Only those items mentioned above will be addressed here. (For more information refer to the **Operator Display Windows** chapter).



2 **Center** - Click on the **Center** tab and select the **Center on Vehicle** radio button. The **Re-Center Percent** indicates how far the vehicle can move from the center of the **Graphics** window before the display is re-drawn (and re-centered). The computer will slow down excessively if you enter a small value (less than say 50%). The default value of 80% is adequate for most applications.

3 **Rotation** - Click on the **Rotation** tab. The default **Manual Rotation Angle** is set to **0.00**.

Note: When you are tracking a survey line, you will want to change this to **Rotate to Survey Line**. This will ensure that the **Graphics** display will be oriented so that the current survey line segment will be "straight up" on the display. This makes it easier for the vehicle pilot to keep the vehicle on line.

4 **Grids** - Click on the **Grids** tab. The default settings have the **Enable Projection Grid** and **Enable Geographic Grid** options enabled. No changes need to be made for the sample project.

5 **Misc.** - Click on the **Misc** tab. The **Plot North Arrow** option defaults to enabled status, as typically desired.

6 **Fix Data** - Click on the **Fix Data** tab. The **Plot Data Files** and **Plot Log Files** default to enabled status, as typically desired. The colors ensure that the data will be visible on the black background of the graphics screen and can be edited as desired.

7 **Lines/Waypoints** - Click on the **Lines/Waypoints** tab. The **Plot Survey Lines** and **Plot Waypoints** options default to enabled status, as typically desired.

Look at the other **Configure Graphics** options, paying particular attention to the **Scale** tab. The **Zoom Factor** is the amount that the scale will change each time you click the **Zoom In** or **Zoom Out** button on the toolbar. You might want to change this value later to slow down the zooming effect, depending upon your personal preferences.

Because you haven't yet created any survey lines or waypoints, or collected any Data, only the **Vehicle, Grids**, **North Arrow** and **Scale** are currently visible in the **Graphics** window.

Graphics Display Zooming

At different times throughout a survey you will want to see different areas of the **Graphics** display. **Zoom Out** to see a larger area at lesser detail or **Zoom In** to see a smaller area at greater detail.

To Zoom Out

- On the toolbar, click the **Zoom Out** button (the second button from the left on the toolbar, the icon of a magnifying glass with a minus sign to the right of it). Based on the **Zoom Factor** value entered when you configured the **Graphics** window (default factor is 2.0), the scale of it will be multiplied by that value each time this button is clicked.

  Notice that the vessel's size does not change after you zoom out past a scale of 1:10000, which allows you to see the vehicle when at higher scales. This option is configurable in the **Configure Vehicle > Name > 1:10000 limit** option.

  You can also **Zoom Out** by placing the mouse pointer within the limits of the **Graphics** window then clicking the right mouse button. Select the **Zoom Out** option to **Zoom Out** once.

To Zoom In

- On the toolbar, click the **Zoom In** button (the first button from the left on the toolbar, the icon of a magnifying glass with a plus sign to the right of it).
- You can also **Zoom In** by placing the mouse pointer within the limits of the **Graphics** window then clicking the right mouse button. Select the **Zoom In** option to **Zoom In** once.

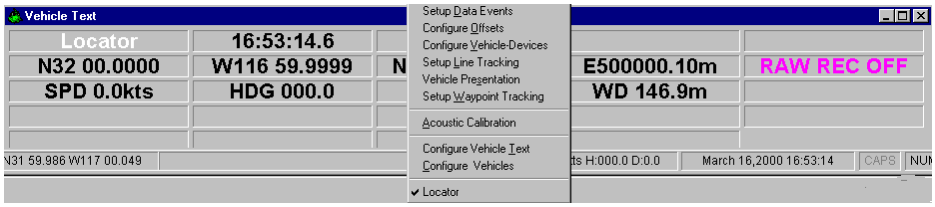
Vehicle Navigation in Simulation Mode

As previously mentioned , this tutorial relies on **Simulated Real-Time** devices for the vehicle's positioning, heading, and depth data. This section explains how to use the simulators to navigate the vessel. These skills are required later during **Survey Line Tracking** and **Data Collection**.

To Change the Position of the Vehicle

The coordinates for the project limits are defined on the sample project page. Since we had configured the **Graphics** window to be centered on the **Locator** vehicle, we must move the **Locator** to the same area so that we can see the work area. We will move the vehicle to approximately the center of the work area, at the following grid coordinates: **N243 500**, **E6295500**.

1 Position the mouse pointer within the boundaries of the **Vehicle Text** window and click the right mouse button. Choose the **Configure Vehicles** option and then click the **Configure Vehicle-Devices** button when the **Configure Vehicles** window displays.



2 In the **Position** entry area of the window, highlight the **Northing** value and type **N243500.** Next, highlight the **Easting** value and enter **E6295500.**

3 While still in the **Configure Vehicle Calculations** window, select the **Update** checkbox (immediately below the **Copy** button).

4 Click **OK** and close the **Configure Vehicles** window**.** Notice in the **Graphics** window and the **Vehicle Text** window that the **Locator** has moved to the newly-defined position.

Note: There is a shortcut to changing the vehicle's position, detailed below.

To Change a Vehicle's Position Using the Display Position Feature

1 First, ensure that only the **Display Position** button is highlighted in the **button toolbar**.

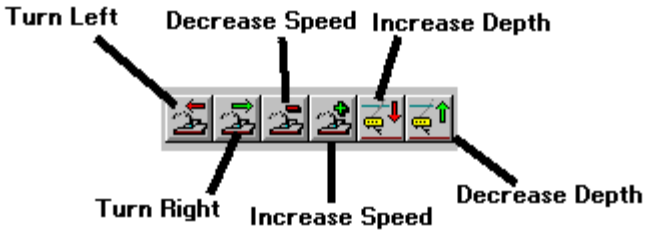
Now, when you left-click anywhere on the **Graphics** window you will see a "cross" drawn at that point. The coordinates of that point are displayed in the lower status bar at the bottom of the screen (just below the **Vehicle Text** window) and also recorded in the Windows "clipboard memory".

2 To move the vehicle to the newly recorded position, repeat **Step 1** of the previous steps (to open the **Configure Vehicle-Devices** dialog). Next, simply click the **Copy** button in the **Position** group at the top left corner of the dialog box. The mouse pointer coordinates are copied to the **Position** entry window and the **Update** option is automatically checked. Now click **OK** to make the **Locator** move to that position.

Driving the Vehicle in Simulation Mode

To Configure the Simulator

WinFrog has simulator tools that allow you to "drive" the boat while sitting at your desk. By default, WinFrog has **Turn Left (Port)**, **Turn Right (Starboard)**, **Speed Decrease**, and **Speed Increase** buttons along the button toolbar, as seen below:



1 Select the main menu item **Configure > Simulator** to change the effect that the simulator buttons have on the vehicle. In the **Configure Simulator** dialog box you can specify the incremental values as desired. You may find the **Heading** increment more useful set to **1 degree** per mouse "click" rather than the default of **5 degrees**.

2 Click **OK** to close this window.

You can observe the vehicle's simulated **Speed, Heading** (and water depth) data updating in the **Vehicle Text** window.

To Drive the Vehicle in Simulation Mode

1 Zoom in sufficiently so that you can see the outline of the **Locator** in the **Graphics** window.

2 Click on the **Turn Right** and **Turn Left** buttons, as needed, to steer the vessel. Each time you click on these buttons the heading will increase or decrease by the amount set in the **Simulator Configuration**.

3 Click the **Increase Speed** button to send the **Locator** forward or the **Decrease Speed** button to slow the vessel.

Note: If you click the **Decrease Speed** button too many times, the vessel will start moving backwards.

Survey Lines and Waypoints

During the planning stages of a typical survey, you are provided with the coordinates of the specific location (or limits of) the area to be surveyed. From these coordinates, you will prepare a series of "tracks" for the vessel to follow in order to collect data. In WinFrog, these tracks are called "**Survey Lines**". Basically, **Survey Lines** are a series of points joined together to make a line. The **Working Survey Line File** can contain an unlimited number of individual survey lines.

In addition to the survey lines, you may want to display and track various points of interest found in the survey area. These single points are referred to as **Waypoints**. You can enter as many waypoints into the **Working Waypoint File** as you like, but you can only track **one** waypoint at a time.

Survey Lines

As mentioned above, a **Survey Line** is basically a series of points joined together in consecutive order to create a line.

A **Survey Line** is made up of the following components:

1 **Start of Line** (**SOL**)

2 Points where the line direction changes, referred to as **Alter Courses** (**A/C**s). **A/C**s are also referred to as **Segments** in the **Survey Line** coordinate entry window.

3 **End of Line** (**EOL**)

You can create a **Survey Line** as long as you like, with as many **A/C** s as you wish. You can also add a **Radius** to a point to create a curved line. The line color can also be modified to help differentiate one line from another.

All **Survey Lines** are stored in the **Working Survey Line** (**.PTS**) file. Each **Survey Line** in the file is treated independently, identified by a user-entered name.

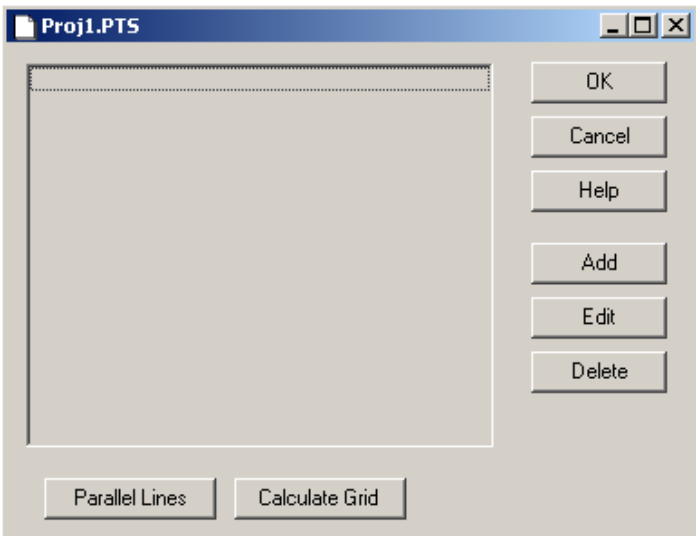
Note: it is possible, but not advisable, to have two lines with the same name in the same **Working Survey Line** file.

Once a **Survey Line** has been defined in the **Working Survey Line** file, it can then be displayed in WinFrog's **Graphics** window. You can also track any survey line with any WinFrog vehicle. Once you have selected which survey line to track, WinFrog calculates such information as distances from the **SOL** and **EOL**, as well as cross-track distance (perpendicular to the survey line). This information can then be displayed in various WinFrog windows to assist the helmsman in keeping the vessel on course. (See the **Operator Display Windows** chapter of the WinFrog User's Guide for more information on displaying **Line Tracking** information).

Note: A vehicle can track only one **Survey Line** at a time. Multiple vehicles can track the same (or different) **Survey Lines** simultaneously.

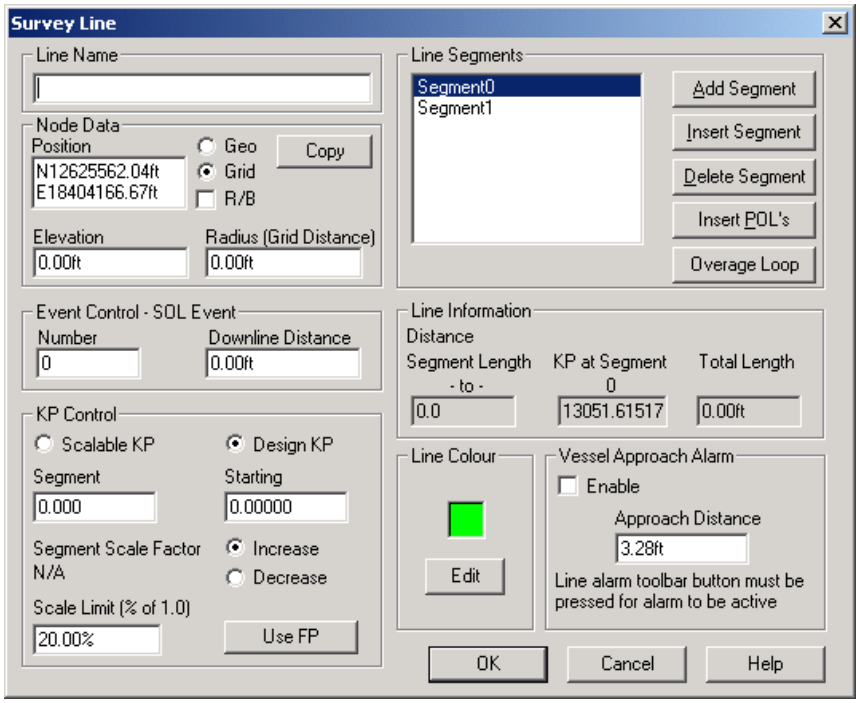
To Create New Survey Lines

1 From the **File** menu, click **Edit Working Files... > Survey Lines**.



WinFrog opens the **Proj1.PTS** dialog box because you had earlier specified **Proj1.PTS** to be the **Working Survey Line** file (**File > Select Working Files**). The file is empty at startup.

2 Click the **Add** button.



3 Type **Line1** in the **Name** field at the top of the **Survey Line** dialog box.

4 Make sure **Segment0** is selected in the **Line Segments** area.

5 You can enter coordinates in either **Geo** or **Grid** coordinates. In our example, we were provided with **Grid** coordinates. We defined units (**Configure > Units)** during configuration so the **Coordinate** defaults to **Grid** in this window.

6 Highlight the value beside the "**N**" in the **Coordinate** entry window.

The sample provided coordinates for the Northwest and Southeast limits of the site. We will create survey lines that are oriented North to South within these limits.

7 For the first coordinate, type in a Northing of **244000**. (The full entry should read "N244000.")

8 Highlight the value beside the "**E**" in the **Coordinate** entry window.

9 Enter **1734000**. You've just defined the North end of **Line1**.

10 Select **Segment1** in the **Line Segments** area.

11 Highlight the value beside the **"N"** in the **Coordinate** entry window.

12 Enter **243000**.

13 Highlight the value beside the "**E**" in the **Coordinate** entry window.

14 Enter **1734000.** You've just defined the South end of **Line1**.

Note: The order in which the coordinates are entered is significant because it determines the direction of the survey line, as well as which side of the line will be considered the **Starboard** and **Port** side of the survey line. The significance of this will be apparent when you create other survey lines parallel to this survey line and when you enable **Survey Line Tracking**.

15 In the **SOL (Start of Line) Event** part of the window, enter **100** in the **Number** window and **0.0** in the **Downline Distance** window. These are default values that will appear when you start recording **Automatic Events**.

16 Click **OK** to close the **Survey Line** window. Note that **Line1** has now been added to the contents of **Proj1.PTS**

To create other survey lines, you would just repeat this process, giving the new survey lines unique names. You can edit existing lines to add new segments or curves to them. For this project, you will create survey lines parallel to **Line1**. You could do this manually, by repeating the above process, but it is quicker to use WinFrog's **Parallel Lines** function.

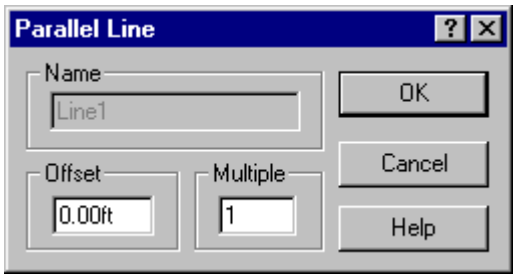
To Create Survey Lines Parallel to an Existing Survey Line

You must now create more **Survey Lines** to fill up the survey area defined by the client. Remember that the client specified that the survey lines be spaced **20.0** feet apart. You must complete a simple calculation to determine how many lines will be required to fill the area. In this case, the survey lines are running true North to South, so we can simply subtract the lesser Easting from the greater Easting to get the East-West dimension. (1734000.00-1733000.00=1000.00 feet) Now, by dividing 1000.00 feet by the 20 foot spacing, we know the number of survey lines we'll need equals 50.

Because we entered the survey lines from the North end to the South end, North to South is now considered to be the survey line's "forward" direction. This means that when we create other survey lines, parallel to this one, we must put in a **negative** offset value to have them be created to the left (**East**) of the chosen line.

1 With the **Proj1.PTS** dialog box still open **(Edit Working Files...Survey lines**), select **Line1** (if it is not currently selected).

2 Click the **Parallel Lines** button at the bottom of the dialog box.



Because **Line1** was highlighted when you clicked the **Parallel Lines** button in the **Proj1.PTS** dialog box, the line that you're about to create will be parallel to **Line1.** If there were other lines available to choose from in the **Proj1.PTS** dialog box, you could have selected one of those and you would be creating a new survey line parallel to that one.

3 Highlight the **Offset** field.

4 Type **-20**.

5 Highlight the **Multiple** field.

6 Type **50**.

This specifies that you will create fifty survey lines twenty feet to the port side of **Line1**. In WinFrog, **Starboard** offsets are entered as **Positive** values and **Port** offsets are entered as **Negative** values. If you had created **Line1** from South to North instead of from North to South, then **Line1** would be oriented in the opposite direction and you would have entered a **positive** offset to create the fifty parallel survey lines in the correct location (to the east of **Line1**).

7 Click **OK** to close the **Parallel Line** creation window. You've just created fifty new survey lines. Note the names of the new survey lines. WinFrog takes the original survey line name and appends it with the offset value. You can now highlight and edit any of these as you wish.

8 Click **OK** to close the **Proj1.PTS** dialog box. Notice that the survey lines now appear as green lines in the **Graphics** window.

Waypoints

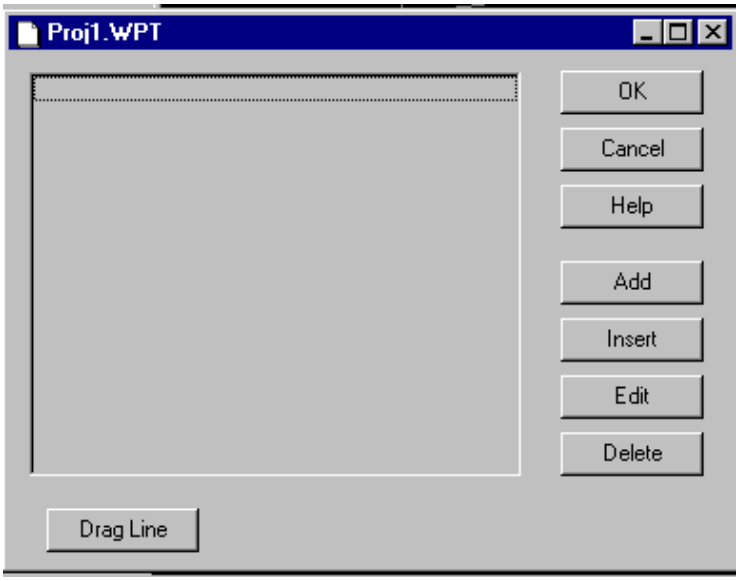
A **"waypoint"** is a single point of specific interest. For example, a waypoint could be the position of a shoal, a shipwreck, a pier, etc. WinFrog can be configured to calculate and display the **Range** and **Bearing** from a vehicle's **Tracked Offset** to a **waypoint**. As the vehicle moves, WinFrog automatically re-calculates the **Range** and **Bearing** and updates the vehicle information in the **Vehicle Text** window.

You can also configure WinFrog to sound an **Alarm** if the vehicle gets within a certain distance of a **waypoint** or if the vehicle gets a certain distance away from a **waypoint**.

The **Working Waypoint** (**.wpt**) file can contain hundreds of waypoints.

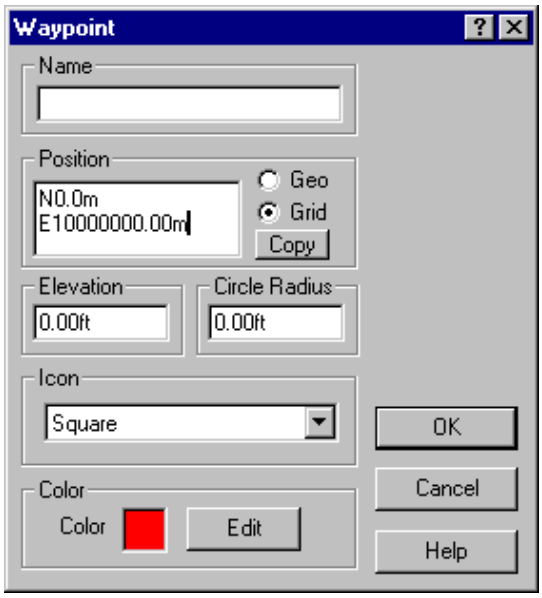
To Create New Waypoints

1 From the **File** menu, click **Edit Working Files... > Waypoints**.



WinFrog opens the **Proj1.WPT** dialog box because **Proj1.WPT** is the name you originally gave the **Working Waypoints File**.

2 Click the **Add** button.



3 In the **Name** field, type **Shoal.**

4 Because we were provided with **Grid** coordinates and set those in the configuration, the **Grid** radio button should already be selected by default.

5 Highlight the value beside the **N** in the **Position** field.

6 Type **243500.**

7 Highlight the value beside the **E** in the **Position** field.

8 Type **1733500.**

9 We will enter an **Elevation** as well, although this is not always required. Note that you are entering an **Elevation**, so depths must be entered as negative values. Enter a value of **-5.0** ft.

Entering an elevation value allows you to see the point in its correct vertical position in WinFrog's Profile Window. (See the **Operator Display Windows** chapter in the WinFrog User's Guide for more information on the Profile Window.)

Entering an elevation will not affect the **Range** calculated to the waypoint because this is always the **Horizontal** distance value.

10 In the **Circle Radius** field, highlight **0.00**.

11 Type **20**. This instructs WinFrog to draw a circle of 20 feet radius around the waypoint in the **Graphics** window. **Note:** this is simply for graphical purposes, and not an alarm radius. A radius alarm will be configured below.

12 In the **Icon** field dropdown menu select **Rock**. This instructs WinFrog to draw a unique icon at the defined coordinates. This helps identify the waypoint in the **Graphics** window.

13 Edit the color as desired. Again, this will help identify the waypoint in the **Graphics** window.

14 In the **Waypoint** dialog box, click **OK.** The **Shoal** waypoint is now added to the **Working Waypoint** file. If necessary, repeat these steps to add more waypoints in a similar manner.

15 When finished adding Waypoints, click **OK** to close the **Proj1.WPT** dialog box.

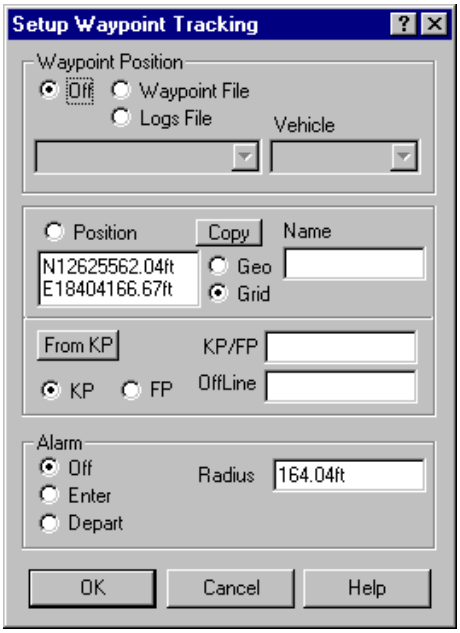
The **Shoal** now appears in the **Graphics** display at the specified coordinates.

Tracking a Waypoint

Now that you've identified where a potential hazard is, you'll want WinFrog to warn you if **Locator** comes too close to this location.

To Track a Waypoint

1 With the mouse pointer in the **Vehicle Text** window, click the right mouse button and select the **Setup Waypoint Tracking** option. The **Setup Waypoint Tracking** dialog box opens, as seen below:



2 In the **Waypoint Position** area, click the **Waypoint File** radio button.

You now select the waypoint that you want to track. In this case, there is only one waypoint in the **Working Waypoint File** (**Shoal**), so it automatically appears in the dropdown menu.

3 In the **Alarm** area, click the **Enter** radio button. This specifies that the alarm will sound when the vehicle enters the specified distance.

4 Enter **50** in the **Radius** field.

5 Click **OK.**

The **Name** of the Waypoint, along with the **Range** and **Bearing** from the **Locator**, now appears in the **Vehicle Text** window. Now, if **Locator** approaches within twenty feet of the shoal, an alarm will sound.

Notice that the waypoint is now displayed in the same color as **Locator**, the vehicle tracking that waypoint. This lets you know which vehicle is tracking which waypoint in the **Graphics** window.

Collecting Data: Events

During a survey, you will want to record information concerning the vehicle's position, speed, heading, course made good/course over ground, water depth, etc. This information can be recorded **automatically** at a set time or distance downline interval or **manually** at the click of a button. Regardless of how the collection of data is initiated (automatically or manually), the actual instant that data is recorded is termed an "**event.**"

When **Eventing** is activated, WinFrog writes various types of information to files. In hydrographic surveying, the term **fix** is used to represent the same event. In seismic operations the term **shotpoint** is used. The three terms are used interchangeably in WinFrog.

The following sections detail **Automatic** and **Manual Eventing** in WinFrog.

Automatic Eventing

WinFrog can be configured to **Automatically** generate an **Event** at a given **Time** or **Distance** interval, recording the following information:

Event Number
Vehicle Name
Position
Time and Date
Height
Depth
Layback
Speed
Heading
Course Made Good/Course Over Ground
Offset
QC - Quality Control value
Alongline Distance
Offline Distance
KP value

Raw Data

In addition to the above-mentioned **Event** information, WinFrog can be configured to automatically record "**Raw**" data from interfaced peripheral **I/O Devices.**

There is an important difference between event data and raw data. The data recorded in **Automatic** or **Manual Event** files may have geodetic offsets, positional offsets, tracking offsets, and positional filtering applied, whereas, **Raw** data has **no** offsets or filtering applied.

Raw data allows you more freedom in processing because you have better knowledge of the status of the data. **Raw I/O Device** data is written to a **.raw** file, which is distinctly different from **Automatic** or **Manual Event** data files. The .**raw** ASCII files contain a line-by-line list of all of the data from each individual device that is interfaced to WinFrog, logged record-by-record, and preceded by an identifying **Device Code**, the **Name** of the device, and a **Time-Stamp**.

You have the ability to record **raw** data at varying intervals: **With Events**, **At Events**, and **Always**.

Recording raw data "**With Events**" means that raw data will be recorded for the entire time that **Automatic Eventing** is active. In other words, it does not matter what kind of recording interval has been set, raw data will be collected from the instant that eventing is made **Active** to the moment you disable **Automatic** data collection.

Recording raw data "**At Events**" means that raw data will be recorded only at those instants when an **Automatic Event** is taken. In other words, if you have set WinFrog to record an event every 10 seconds, raw data will also be recorded only at those same 10 second intervals.

Recording **raw** data "**Always**" means that **raw** data will be recorded from the instant that you select **OK** to close the **Event Configuration** window. Recording **raw** data **Always** does not require **Automatic Eventing** to be enabled.

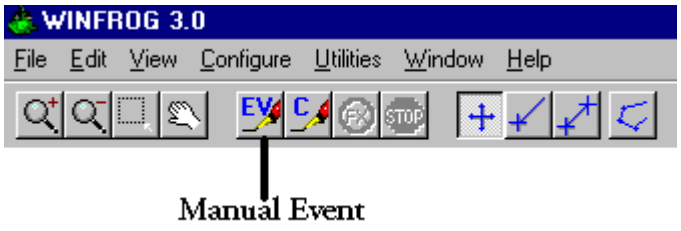
Note: It is strongly suggested that you record **raw** data during a project as a backup to automatic or manual event data.

Manual Fixing

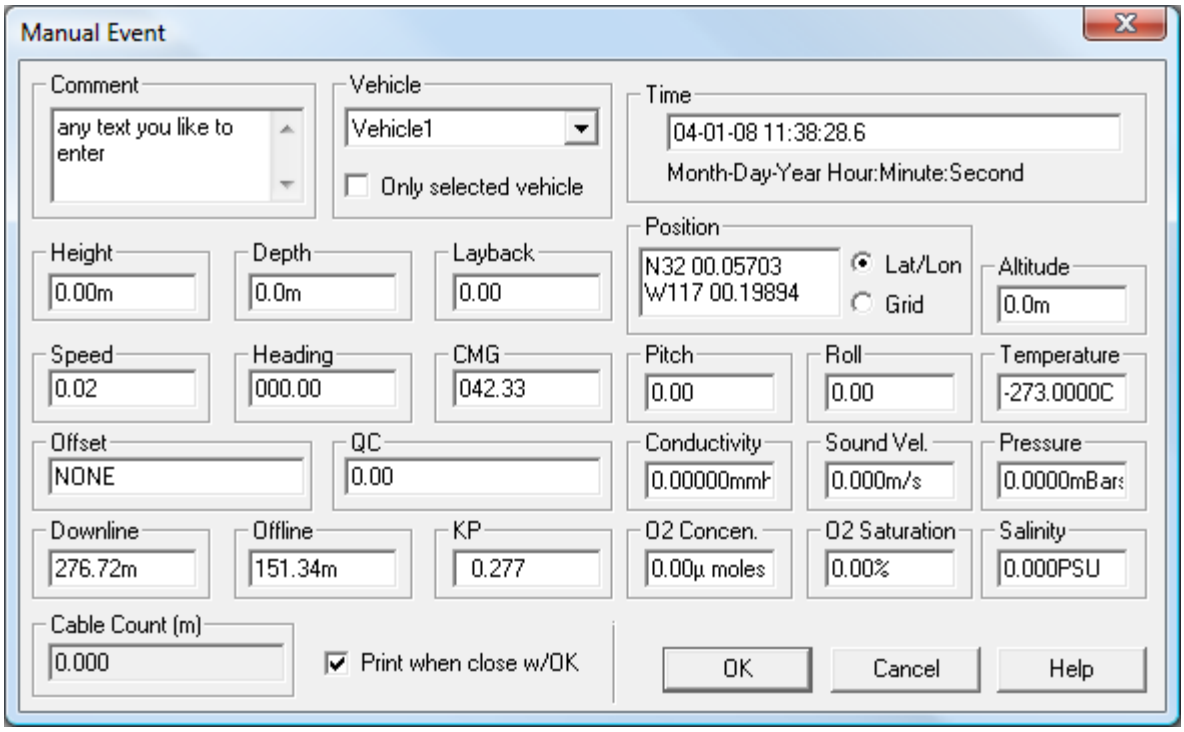
You can manually tell WinFrog to record an **event** by clicking on a button, recording the following information:

User-Entered Comment
Vehicle Name
Position
Time and Date
Height
Depth (of water)
Layback
Speed
Heading
Course Made Good/Course Over Ground
Offset
Quality Control value
Alongline Distance
Offline Distance
KP - (Kilometer Post value. The distance downline in kilometers)

Both **Automatic** and **Manual Eventing** can be used together. For example, you can configure WinFrog to record **Automatic Events** at a set time or distance interval while you also simultaneously record **Manual Events** by clicking a button. There are three ways to generate a **Manual Event:** select **Configure > Manual Event**, hit the **F10** key, or click on the **Manual Event** button, as seen below.



Regardless of which method is chosen to initiate a **Manual Event**, the same **Manual Event** dialog box opens, as seen below.



Type in a **Comment** to describe the **Manual Event**. This should be a unique comment to help easily identify this event. If you want to record only one vehicle's position, select that vehicle name from the dropdown menu, then select the **Only selected vehicle** checkbox. Select **OK** to close this window and save the **Manual Event**. **Manual Events** are recorded in the **Working Logs** (**.log**) file.

You can access the contents of the **Working Logs File** at any time by selecting the main menu item **File > Edit Working Files... > Logs**. Highlight any entry and select **Edit** to review the information recorded for that particular **Manual Event**.

Configuring a Vehicle for Automatic Events

In order to configure WinFrog to automatically record event data, you must define one vehicle as the **Event Primary** vehicle. The information for any number of vehicles can be recorded using automatic events, however, only one vehicle (the **Event Primary** vehicle) can **trigger** them. If you want to record information for any other configured vehicles, the additional vehicles must be configured as **Event Secondary** vehicles.

When the **Event Primary** vehicle triggers an event, information for that vehicle (along with all **Event Secondary** vehicles) will be recorded to one of three **Record types**, as defined by the user. Regardless of the **Record Type** chosen (be it **.DAT**, **.SRC**, or **.RCV**), this file will contain the following information:

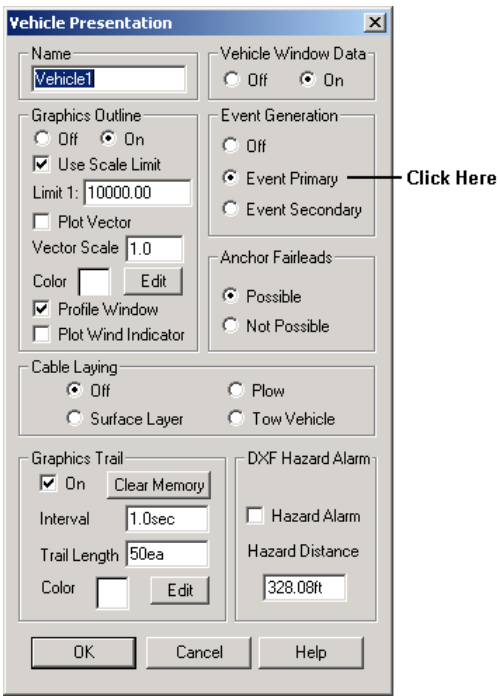
Event Number
Vehicle Name
Position
Time and Date
Height

Water Depth
Layback
Speed
Heading
Course Made Good/Course Over Ground
Offset
Quality Control value
Alongline Distance
Offline Distance
KP (Kilometer Post) value

To Define the Event Primary Vehicle

1 Select the main menu item **Configure > Vehicles** then click the **Vehicle Presentation** button.

2 In the **Event Generation** area, click the **Event Primary** radio button.



3 Click **OK** to close the **Vehicle Presentation** dialog box.

Configuring Automatic Events

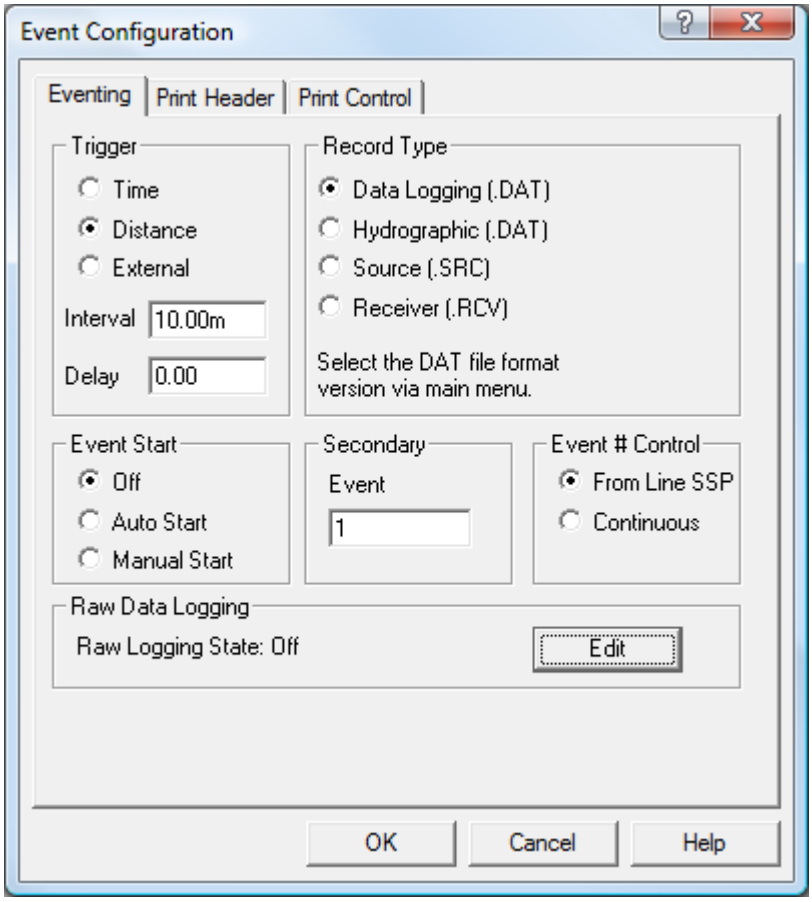
Now that you've notified WinFrog that **Locator** is the vehicle that will trigger events, you need to tell WinFrog how you want the events to be triggered. In our sample project, we will record data at the client-specified interval of 20 feet along the survey line.

Before we start eventing, we should move the boat outside of the survey line area, somewhere near to N244500, E1734000. This will ensure that eventing will not inadvertently start before we are ready. (See the section above for details on moving the vessel).

To Configure Automatic Events

1 Select the main menu item **Configure > Data Events > Setup**, or right click in the **Vehicle Text** window and select the **Setup Data Events** option.

2 In the **Trigger** area of the **Event Configuration** window, click the **Distance** radio button.



3 Highlight the value in the **Interval** window and type in **20.0** feet.

4 In the **Record Type** area, select the **Hydrographic (.DAT)** radio button to create a data file with a **.DAT** file extension. The **Hydrographic Record Type** is chosen because it (as well as **Source (.SRC)** and **Receiver (.RCV)** record types) automatically requests that a **Survey Line** be subsequently selected, which is what we require for our sample project.

5 At the bottom of the **Event Configuration** dialog box, in the **Event Start** area, click the **Auto Start** radio button. This instructs WinFrog to go directly to **Eventing Active**, as opposed to going to **Eventing Enabled** first. If you chose **Manual Start**, you must manually activate eventing. (More details on this in the **Data Collection** section below.) With **Eventing Active**, our data recording will start when the vehicle crosses the beginning of the survey line.

6 In **Event #Control**, click **Line**. This tells WinFrog that we desire the **Event Numbers** along every line to default to the same number at their respective **SOL**s. Remember that this is just a default which can be changed when we configure eventing, as you'll see shortly.

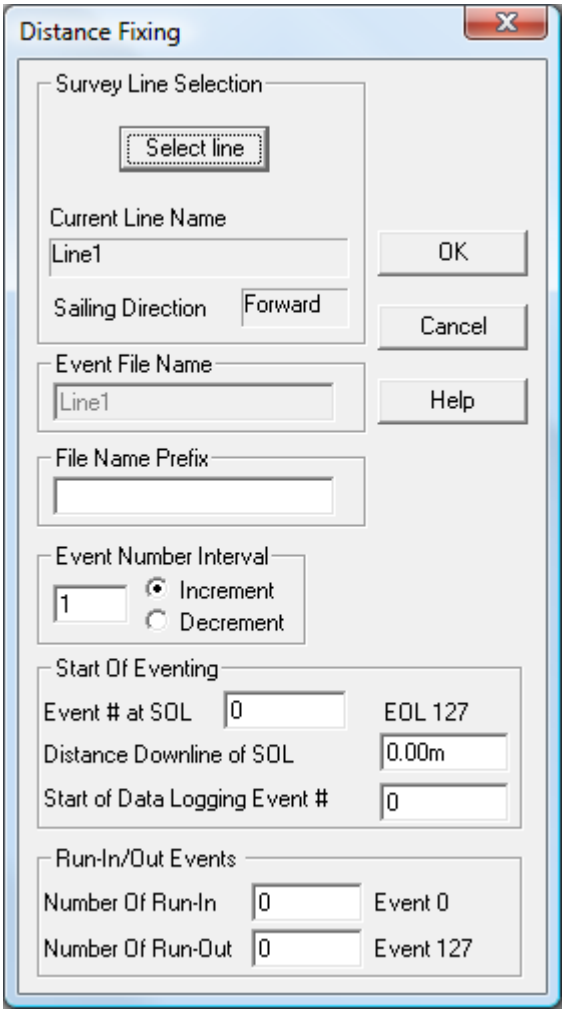
7 Select the **Raw Data** tab, then in the **Logging Control** section of the window, click the **With Events** radio button. This instructs WinFrog to record all raw data received from peripheral devices for the duration of automatic event data recording.

8 In the **Raw File Control** section, click the **Use Julian Date/Time** radio button and leave the **Max File Size in KB** set to **200**. These settings tell WinFrog to store the raw data in a file named after the Julian date (1 through 365 Julian days in a year)and time. For example, a .**raw** file recorded at 9:00am on September 27, 1999, would be written as **270-0900.raw** and would be a maximum of 200KB in size. Once the specified file size has been reached, another .**raw** file would be automatically created by WinFrog, again reflecting the date/time in its name.

Creating multiple **.raw** files offers a degree of safety in that if all **.raw** data were recorded to a single file and that file was somehow corrupted, all data would be lost. Also, depending on the number of devices and the amount of data collection undertaken, a single **.raw** file may reach an unwieldy size. For example, in a typical survey (using just a GPS receiver, gyro, and an echosounder) a new 200 KB file is created every two minutes when either **raw with events** or **raw always** is used.

9 The **Raw Navigation Record (Type 300)** window refers to the generation of a data record that is not typically required.(This record compiles raw data from some of the I/O devices to a new, single **Type 300** record in the **.raw** file). For this sample project (and most "real" projects) the **Logging Interval** can be left at the **0.00** sec default value.

10 Click **OK** to close the **Event Configuration** window. As mentioned previously, the **Distance Fixing** dialog box now opens automatically because we had chosen the **Hydrographic Record Type**.



11 You must now select which **survey line** to track. As mentioned above, **Eventing on Distance** requires that a survey line be tracked.

Important: The **Event Distance Interval** is not necessarily the distance that the vessel travels, but is the **downline distance** of the tracked **survey line.** For example, if the vessel travels at a right angle to the direction of the survey line, no events will take place. Also, note that no events will take place until the vessel's **Tracked Point** crosses the start of the Survey Line.

Select **Line1** and **Forward**. **Forward** means that the **Start of Line** is the point that was entered first when you created the **survey line**.

12 The **Event Filename** entry is used to define the name of the **.dat** file that will be created. WinFrog uses the survey line name by default. You would typically leave this as is.

Enter a **Filename Prefix** if you are re-shooting the line and do not want to overwrite or append an existing file of the same name.

13 In the **Event Number Interval** grouping, type **1** and select the **Increment** option.

14 In the **Start of Eventing > Event #at SOL** window you will see **100**, which is the value that you entered as the **SOL Event Number** when you created the survey lines. Ensure that the **Distance Downline of SOL** is **0.00** and that the **Start of Data Logging Event #** is **100**. This means that data logging will start at the beginning of the line with event number **100**. These options are for those situations when you want to start data recording at some point other than the start of the survey line.

15 In the **Run-In / Run Out Events** window, set both values to **0**. This defines additional events at the start and end of the survey line.

16 In the **Graphics Extension** window, select **On** and enter a length of **500** feet. This instructs WinFrog to draw a 500 foot long dashed line before the actual (defined) start of the **Survey Line**. This extra distance gives the pilot a chance to get the boat lined up and steady on the survey line before data recording begins.

17 Click **OK** data to close the **Distance Fixing** dialog box. **Eventing** is now **Active**.

Eventing is Active

Several things are different on your screen. In the button toolbar, the **Event Stop** button is now highlighted in red.

In the **Graphics** window, the survey line that you are tracking, **Line1**, is now the color of the vehicle that is tracking that line.

In addition to the general navigation data that was previously displayed, the first line on the **Vehicle Text** window indicates that **Eventing Status** (**EVT ACTIVE**), the **Active Fix Number** (**FIX 100**), and the **File Name** (**File Line1.DAT**).

The second line shows the **Raw Record Status** (**Raw With Events**).

The fifth line indicates which **Survey Line** is being tracked (**Line1**), the (downline) distance **Locator** is from the **Start of Line**, the (downline) distance **Locator** is from the **End of Line**, and the perpendicular distance **Locator** is off the survey line to Port or Starboard.

Although the **Eventing mode** is **Active**, we are not actually recording data yet. We must be between the **Start of Line** and the **End of Line** for this to happen. Before we start eventing, we'll enable and modify some WinFrog features to help the pilot keep the Locator on line.

Tracking up the Screen

It's a lot easier for the helmsman to keep the boat on course if the **Graphics** display is configured so that the outline of the vehicle tracks straight "**up**" the screen, instead of constantly

trying to refer to which way is North and which way the boat is heading.

You can change the orientation of the **Graphics** display by changing its **Rotation**. You can tell WinFrog to rotate to the active survey line segment or you can enter any rotation you wish (measured in degrees clockwise from North).

To Change the Rotation of the Graphics Display

1 From the **Configure** window, choose **Graphics**.

2 Select the **Rotation** tab and choose **Survey Line** in the **Rotate to** area.

3 In this case, since the survey line coordinates were entered from North to South and we are tracking the survey line in this forward direction, the **Graphics** screen will now flip the graphics to have South at the top of the screen.

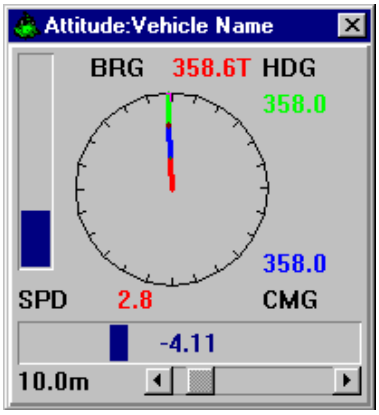
4 Click **OK**. Notice the shift in the **Graphics** window, including the direction of the **North arrow**.

Attitude

Another display that your helmsman can find useful for keeping the vehicle on course is the **Attitude** window.

To View the Attitude Display

1 From the **View** menu, choose **Attitude**.



This window provides a graphical representation of the vessel's navigation parameters with comparisons of the **Vehicle's Heading** (green), the **Vehicle's Course Made Good** (blue), and the **Bearing** of the **Survey Line** (red).

There is also a horizontal bar graph indicating the **Offtrack Distance.** The slider bar at the bottom of the screen can be used to change the **Scale**. A vertical bar graph in the left portion of the **Attitude** window indicates **Vessel Speed**.

The **Attitude** window is very useful for **Survey Line** tracking operations. It often proves to be a better tool for the helmsman to maintain tracking rather than trying to find the information in the **Vehicle Text** window.

Starting to Record Automatic Events with Autostart

With **Autostart** activated (as it is now in your sample project), automatic eventing commences when the vehicle crosses the beginning of the **Survey Line**.

To Record Automatic Events with Autostart Activated

1 Using the menu bar **Simulated Heading** button, turn the **Locator's** heading to **180.0** to match the survey line's heading.

Click on the menu bar **Simulated Speed Increase** button to start the **Locator** moving downline at approximately. 4 knots.

In the **Graphics** display, **Zoom in** to a scale to make it easy to navigate the **Locator** along **Line1** (ratio of approximately 1:2000).

Note: the **SOL** value is currently a negative value and is getting closer to zero as you approach the Start of Line. Regardless of how far offtrack you are, when the **SOL** value reaches **0.0**, eventing will start.

All displayed position and survey line tracking information refers to the **Vehicle Offset** point being tracked. As detailed above, for our exercise we have configured WinFrog to track an offset called **Echo Sndr**. This means that eventing will not start until that point on the ship crosses over the **SOL**.

2 Watch the **Graphics** window while **Locator** automatically records events. You can **zoom in** or **zoom out** to obtain a clearer view of the data. The individual **Data Events** will be discernible as yellow, fix-number-labeled squares.

Keep the **Locator** within a reasonable offtrack distance by watching the **Graphics** screen, **Attitude** window, and the **Vehicle text** window and adjusting the vehicle's **Heading** to suit. Continue down to pass the end of the survey line.

Stopping/Re-starting Eventing

To Stop Eventing

1 You can click the red **Event Stop** button (in the toolbar) to cease recording events at any time, but for our example, wait until the vehicle has crossed the **EOL** to stop data collection.

To Re-start Eventing

By default, WinFrog will return you directly to the **Distance Fixing** dialog box. This is done under the assumption that you will want to collect data using the same parameters used on the line just completed. In our case, we had eventing based on a **Distance** of every 20 feet and collection of **Raw Data with Events**. If you do not wish to record any more data, you would select the **Cancel** button at this point. For our example, we will setup the vessel to collect data going down another survey line, this time in the opposite direction.

1 Select a different survey line from the one last used. You will have to configure the survey line tracking to be **Reverse** to now track it in the opposite direction. When you select **Reverse**, WinFrog automatically calculates the appropriate **Starting Event Number** and

also selects the **Decrement** option. These are calculated to make the event numbers for all survey lines match up. In other words, all of the event numbers on each of the survey lines will line up across the **Graphics** screen.

Note: as you select **OK** to close the **Distance Fixing** window, **Eventing Status** is now **Enabled**, not **Active**. You must now press the green **Event Start** button (just to the left of the **Event Stop** button) to change the status to **Event Active**. Failure to do so will result in no data being collected.

Notice that the **SOL** is now the South end of the survey line. Navigate the **Locator** to the **SOL** and beyond, collecting data while navigating along the survey line.

Checking the Survey Data

It is wise to check early on in the survey that data are in fact being recorded, that the files contain the desired information, and that data are being recorded at the desired rate. Remember that we had configured WinFrog to record both automatic event (**.DAT**) and raw (**.RAW**) data during eventing. You should check to ensure that both types of data are being recorded and at the rate of recording that you intended.

To Check the Recorded (.DAT) Data

1 Select **File > Edit Working Files.... > Data**. This will bring up a display showing you the contents of the **Working Data (.ALG)** file. The **.ALG** file is basically just a directory listing the names of the recorded **.DAT** files.

2 Highlight any one of the **.DAT** file names in the **.ALG** file and select **Edit**. You will now see the contents (i.e. the individual events) contained in that individual **.DAT** file.

3 Highlight any one of the individual events and select the **Edit** button. You now see the information for that specific event including Position, Time, Speed, Heading, CMG, and Survey Line tracking information.

To Check the Raw (.RAW) Data

Earlier in this exercise, you specified where the .**raw** data would be written to on the hard drive. This was done under **File > Select Working Directories > Raw Data Directory**. In order to check this data:

1 Navigate to the **Raw Data Directory**.

2 Open one of the **.raw** files using an editing program. The easiest way to do this is to associate the raw file with the program **WordPad** or **NotePad**.

Once you open a **.raw** file (which is simple a comma delimited ASCII text file), read the individual lines to ensure that a record exists for each type of device that was added to the vehicle, and that the data being received from the device are realistic. In particular, look out for "zero data." Occasionally certain I/O devices output data containing nothing but zeros, which obviously isn't what you want. The **.raw** files are admittedly rather cryptic in nature, but you should be able to figure out if the correct number of devices are there and if the data from each device is more than just "zero data."

Completing the Survey

Essentially, you repeat these data collection steps until your survey is complete. The most common mistake made is forgetting to select the correct tracking direction each time a new survey line is selected. In other words, making sure that if the currently selected survey line is being tracked in the **Forward** direction, the next survey line must be tracked in the **Reverse** direction.