



GPS Navigator

GPS navigation software package



User's Manual

GPS Navigator System User's Manual

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Table of Contents

TABLE OF CONTENTS	3
1 INTRODUCTION	5
1.1 GPS Navigator	5
1.1.1 GPS Navigator System Description	6
1.2 GPS Navigator Options.....	6
1.2.1 GPS Navigator Compass Option.....	7
1.2.2 GPS Navigator Alarm Option	7
1.2.3 GPS Navigator Dual Antenna Option	7
1.3 GPS Navigator Software Installation and Setup	7
2 GPS NAVIGATOR PROGRAM OPERATION	8
2.1 GPS Navigator Program Setup	8
2.2.1 Project Settings	13
2.2.1.1 Load and Clear Images	14
2.2.1.2 Load and Clear Receiver Flags	15
2.2.1.3 Load and Clear Source Flags	16
2.2.1.4 Load and Clear Trace	16
2.2.1.5 Load Completed	16
2.2.1.6 Map Image Tools.....	17
2.2.1.6.1 Google Map.....	17
2.2.1.6.2 Show MAP Extent	18
2.2.2 Map Layers	19
2.2.3 Data Source Settings	20
2.2.4 Vehicle Setup	22
2.2.5 Import/Export.....	23
2.2.5.1 Export Project Data	23

2.2.5.1.1 Export Project to Flash	23
2.2.5.1.2 Export Completed Points to File	23
2.2.5.1.1 Export Logs to Flash	23
2.2.5.2 Import Project Data	24
2.2.5.2.1 Import Project from Flash.....	24
2.2.5.2.2 Import Completed points from Flash	24
2.2.6 Alert Setup	25
2.2.6.1 Alert Zone Setup.....	25
2.2.6.2 Alert Zone Alarms.....	26
2.2.6.3 Target Point Setup.....	28
2.2.6.4 GPS Alert	28
2.2.6.5 Neighbor Distance Alert.....	29
2.2.6.6 Vibrator QC Alert.....	29
2.2.7 Output Setup.....	30
2.2.8 Deployment Setup.....	31
2.3 Shape Editor	32
2.4 Vehicle Trace	33
3.0 Quick Start.....	35
3.1 Using External GPS.....	35
3.2 Connecting to Force 3 unit.....	36
3.2.1 F3 Wired Option.....	37
3.2.2 F3 Meshed WiFi Option.....	38
3.2.3 F3 Connection	39
3.3 Show Messages.....	40
4.1 Initial Setup and Deployment.....	41
4.2 Typical Operation Example.....	44
5.0 Geophone Deployment Mode	45

1 Introduction

1.1 GPS Navigator

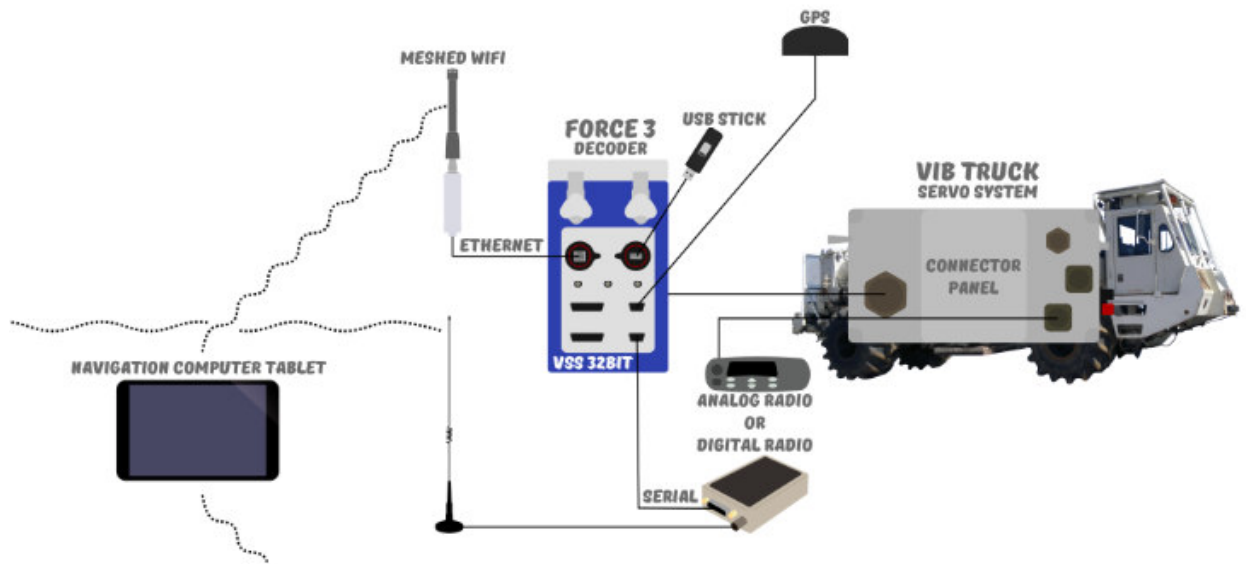
The GPS Navigator package has been designed for the Seismic Industry for Vibroseis and Vehicle navigation and tracking.

Main features of the program include:

- Dual Screen support for “zoomed” view and complete view of prospect
- Source and Receiver FLAGS can be loaded into the MAP package using standard formats.
- Source Flags are easily selected as waypoints
- Next Flag and previous Flag selected by single keystroke
- Real-time display of Bearing and Distance to next waypoint
- Multiple map layers can easily be enabled or disabled
- Keep out zones can be displayed on Map
- Optimized for use with Touch Screen
- Routes and trails can be recorded and loaded for “drive around” guidance
- External Compass option for reliable direction information
- Google Earth Support for quick downloads of background maps
- Display of Vibrator Group information
- Distance separation warning for DS4 operation
- Deployment Option for deploying actual position of geophones and Nodes

The Navigator Software runs on a Tablet or Notebook computer with Windows XP or newer operating system. The software can be setup to receive the GPS positioning data directly from a GPS receiver or it can be setup to receive the data from The Force 3 vibrator control unit.

The Navigator tablet can also be connected to the Force 3 unit via the Force 3 WiFi Mesh system.



1.1.1 GPS Navigator System Description

Basic Navigator system



Dual viewing screen allows a “Zoomed” view of the distance and direction to the next waypoint and a larger view of the prospect.

Left click any “Source Point” to select the next active Waypoint.

After selecting a valid waypoint the program displays the “Active Waypoint” in Left screen

The Blue left arrow will select the next “Source Point” as the active Waypoint,

The Blue right arrow will select the previous “Source Point” as the active Waypoint

The left screen shows the “Distance” and “Direction” to the selected Waypoint

The “+” and “-“ on each screen can be used to zoom in or out of either screen.

1.2 GPS Navigator Options

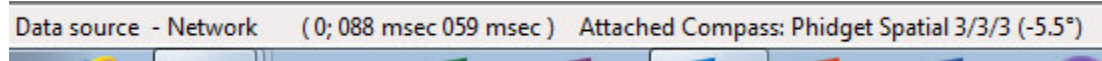
Various Options are available for the Navigator System

1.2.1 GPS Navigator Compass Option

The compass option provides accurate bearing information.

When the compass is installed the bearing from the Compass is always used.

The bottom line of the screen will show if the Compass is attached



1.2.2 GPS Navigator Alarm Option

The Alarm option.

1.2.3 GPS Navigator Dual Antenna Option

Dual Antennas Option for the Trimble GPS receiver provides very accurate bearing information.

The GPS Navigator accepts the \$GPHDT message from the Trimble GPS receiver. This message will contain the heading information.

1.3 GPS Navigator Software Installation and Setup

Install the Navigator CD

2 GPS Navigator Program Operation

2.1 GPS Navigator Program Setup

The GPS Navigator Program file in Windows Explorer.

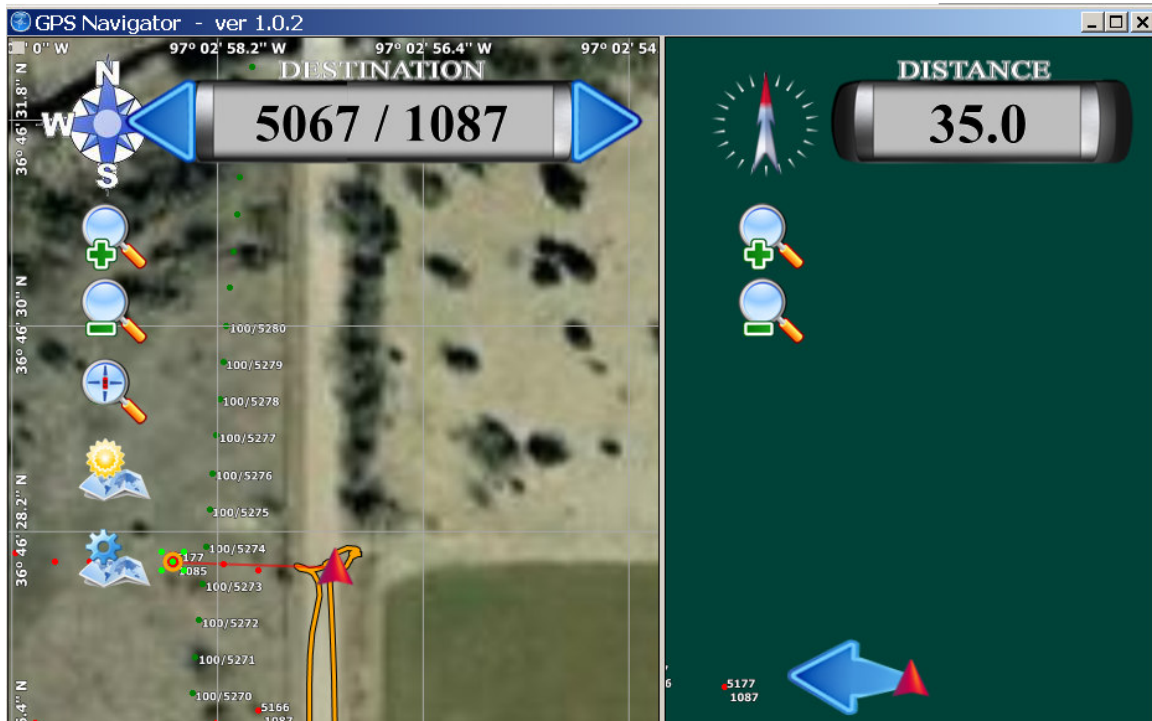
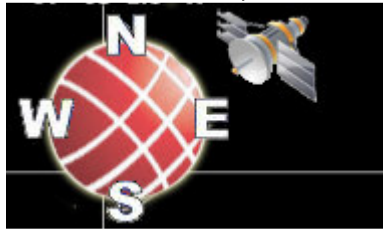


Figure 4.1 Device Configuration

The Top Left part of the Screen will display a Green Globe with the GPS quality and number of satellites



If the Globe is RED, then the GPS signal is not valid.



Zoom in and out using the + and – icons



Zoom to display complete project with the icon below



Center the map to your current position use the icon below



Turn the background Map on and off or dim the display use the following icon



Turns the display of all the shape files on/off
Does not affect the alerts



To access the setting Menu



Adjust the Font size



To make the map Full Screen



Press the Track up/North Up button to switch the Map orientation.

If the bearing from the vibrator is not correct, then the Map will sometimes spin around when Track up is selected



The following icon is used to change direction of the Vibrator or Vibrator Group



Any Flag can be selected as a destination. Click on a Flag # and it will be displayed as the next destination.

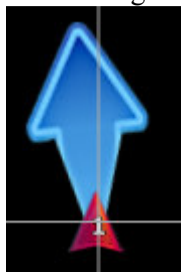
The Right and Left arrows can be used to increment or decrement the Destination Flag #



Once a Flag number is selected the current Distance to the Flag number will be displayed.



Once a Flag number is selected the direction to travel to the point is shown as a blue Arrow.



2.2 Settings Dialog

Press the  Icon on the main display to open the Settings Dialog Window.

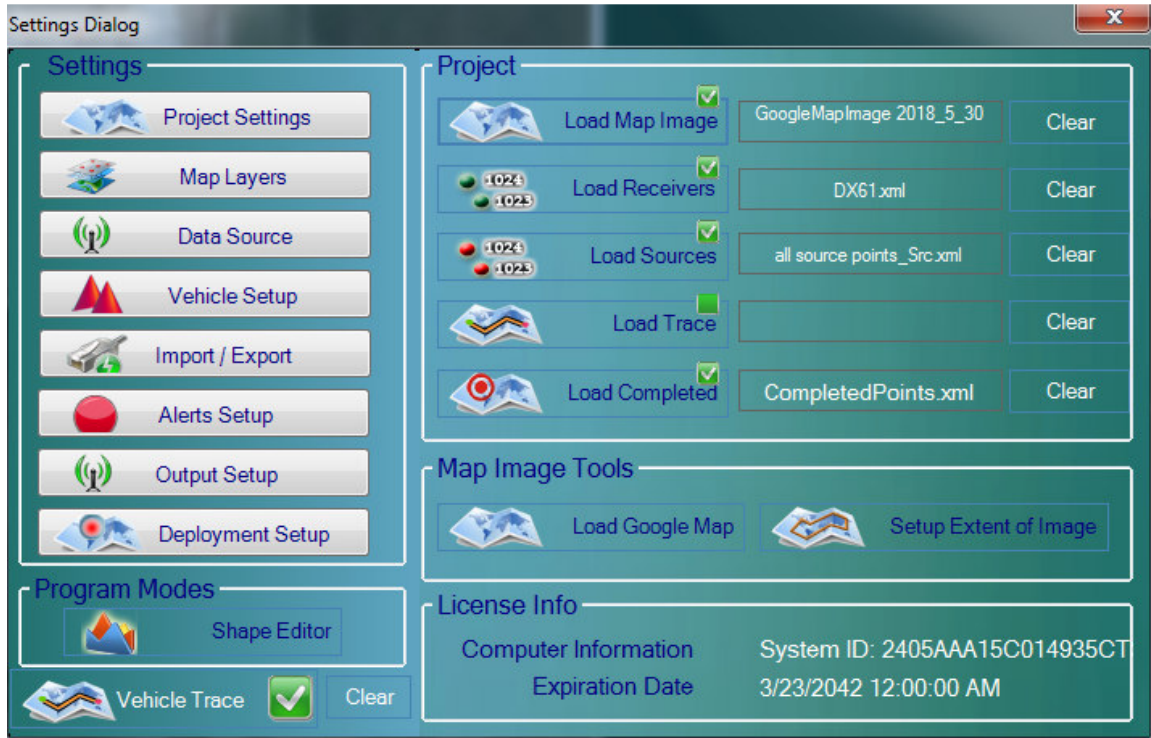


Figure 2.2 Settings Dialog

2.2.1 Project Settings



The Project Settings Menu



Figure 2.2.1 Project Settings

2.2.1.1 Load and Clear Images

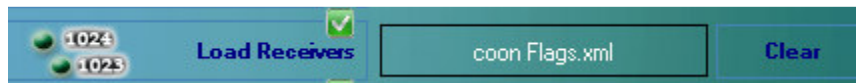


The Load and Clear image Menu

Load new image by selecting the Load Map Image Icon. The image map must be tagged with correct geometry.

Clear button – clears the existing image file

2.2.1.2 Load and Clear Receiver Flags

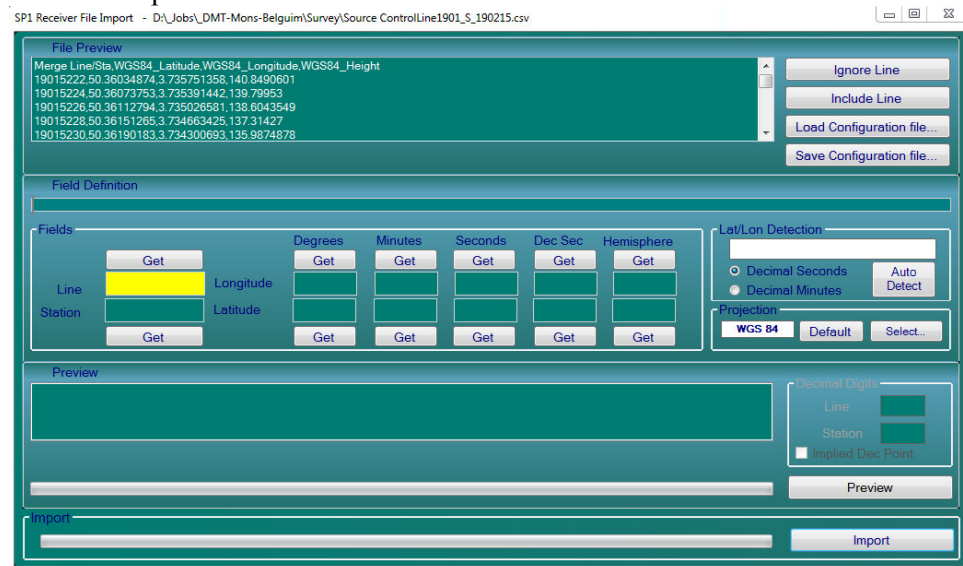


The Load and Clear Receiver Flags

Load new Receiver Flags image by selecting the Load Receiver Flag Icon.

Clear button – clears the existing receiver flags

Ver 2.41 Import



2.2.1.3 Load and Clear Source Flags



The Load and Clear Receiver Flags

Load new Source Flags image by selecting the Load Source Flag Icon.

Clear button – clears the existing receiver flags

2.2.1.4 Load and Clear Trace

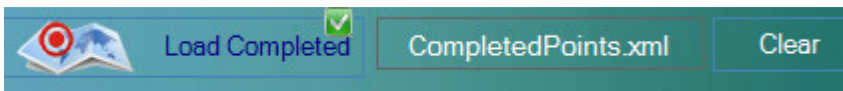


The Load and Clear Trace

Load new Trace by selecting the Load Trace Icon.

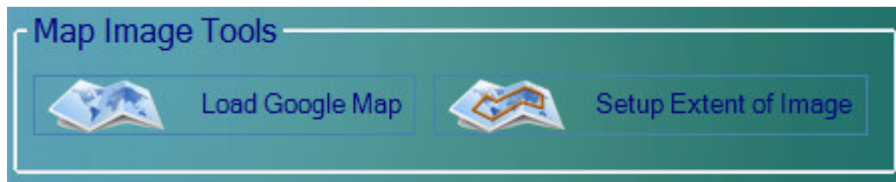
Clear button – clears the existing Trace File

2.2.1.5 Load Completed

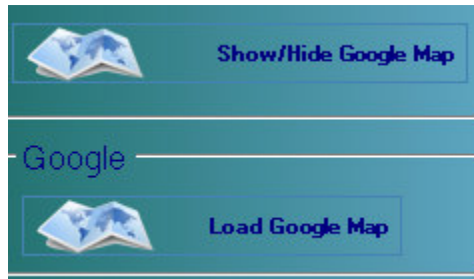


Allows loading of Completed Points. This allows the points that have been shot by other Vehicles to be loaded onto the map.

2.2.1.6 Map Image Tools



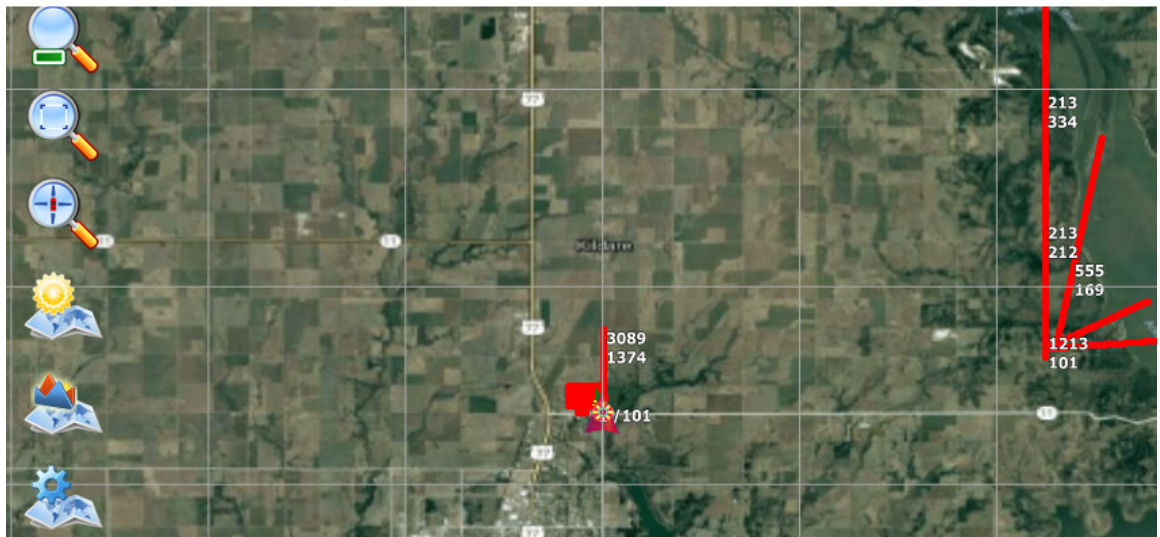
2.2.1.6.1 Google Map



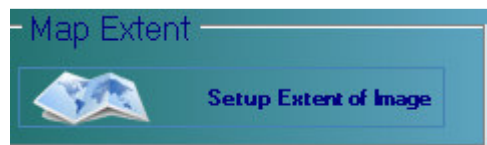
When connected to the internet a background map can be added.

Press Load Google Map to load Map

After Loading the Map, the Map is saved to disk and can be loaded from disk at a later time without an internet connection needed.



2.2.1.6.2 Show MAP Extent

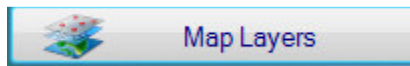


The World File Dialog



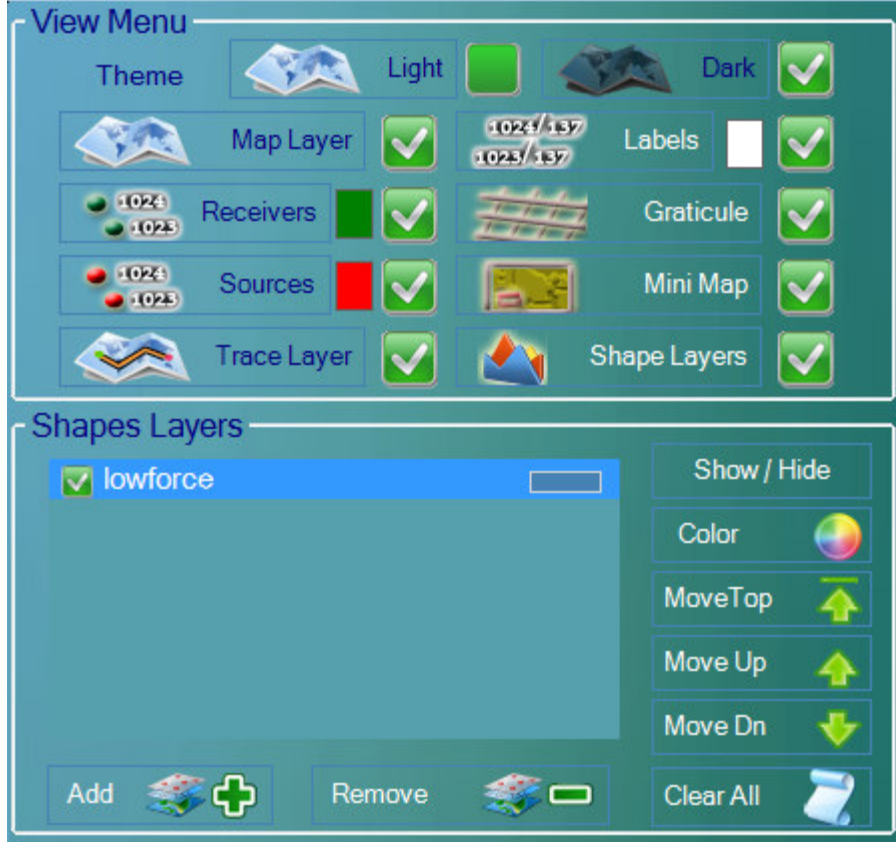
Figure 2.2.5 World File Dialog

2.2.2 Map Layers



The Map layer menu allows various layers to be displayed/hidden on the Map.

There is a selection for each layer that allows that layer to be viewed or hidden.



2.2.3 Data Source Settings



The Data Source Menu

Allows selection of the source of the GPS signal.

When connected directly to a GPS receiver the serial port is normally used. Select the Com port and the baud rate that is used to connect the computer to the GPS receiver.

When connected directly to the Force 3 vibrator control system, the Network port is normally used. Select the network port for connection to the Force 3. Do not select “WinPCap”.

To use the Force 3’s Meshed WiFi, the Wifi of the Tablet computer must be set to the Meshed Wifi.

Select Real Time to view the current position of the unit (Force 3).

Play Log File when viewing positions that have been previously recorded

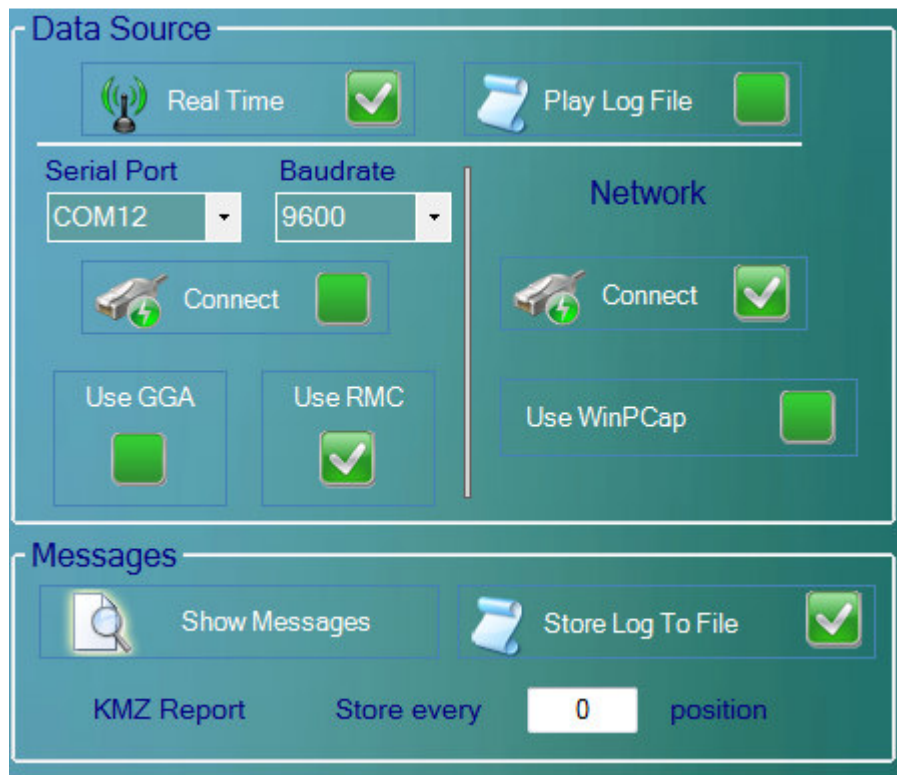
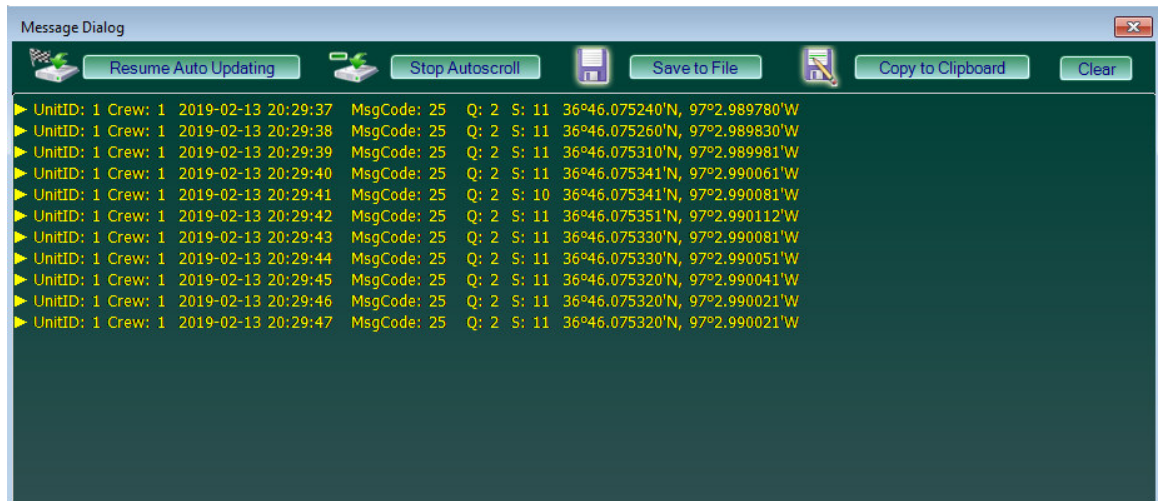
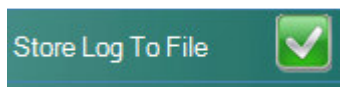


Figure 2.2.2 Data Source Menu

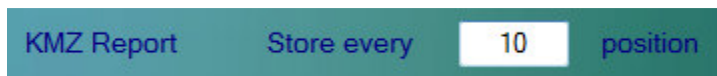
Show Message is useful for troubleshooting the setup. Select Show Messages to view the current GPS messages from the Force 3 unit



Select Store Log to file to store the current Log File (Snail Trail)



KMZ log file can also be saved



Select how often to save the position o the KMZ log file.

2.2.4 Vehicle Setup



The Vehicle Setup Menu

The 'Vehicle Setup' menu interface. At the top, there are two tabs: 'One Vehicle' (with a red triangle icon) and 'Group' (with a green checkmark icon). Below the tabs, there are input fields for 'Crew ID' (value 1), 'Vehicle ID' (value 1), and a 'Group Vehicle Numbers' dropdown menu (value 1, 2, 3, 4). Further down, there are 'Columns' (value 2) and 'Rows' (value 2) dropdown menus, each followed by a 'Distance (m)' input field (both set to 10). On the left side, there are two sections: 'Group Angle' with 'Bearing1' (0) and 'Bearing2' (180) input fields, and a 'View switch' button; and 'Group Shift' with 'Dist (m)' (0) and 'Bearing' (0) input fields. On the right side, there is a large dark green map area with a compass rose in the top left corner showing North (N), South (S), East (E), and West (W). The map displays four blue triangle icons arranged in a square pattern around a central yellow dot.

Figure 2.2.3 Group Setup Menu

The Crew ID and Vehicle ID must match the Force 3 unit to receive the positions on the main display.

For a single Vibrator select “One Vehicle” for a Vibrator Group select “Group”

When using a Vibrator Group select all of the vibrators in the group, also select the configuration of the Vibrator Groups. This allows selection for the vibrators to be in a single line or in multiple columns.

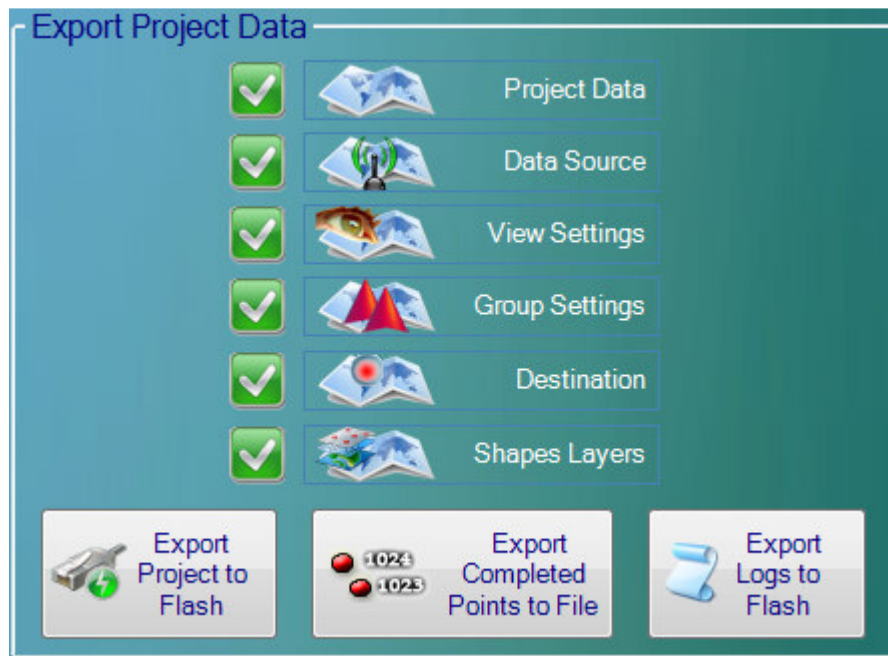
The Navigation destination point will automatically be offset from the source point depending on the Group setup and the position of the Vibrator in the Group.

2.2.5 Import/Export



Import/Export Menu

2.2.5.1 Export Project Data



2.2.5.1.1 Export Project to Flash

Select Data to be saved.

Insert a USB Flash drive and press the Export Project to Flash to save the selected items to the Flash Drive. When prompted a unique name can be given to the Exported File

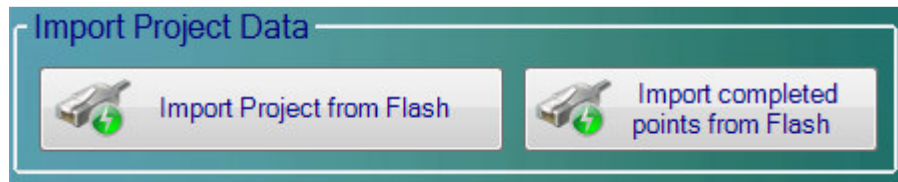
2.2.5.1.2 Export Completed Points to File

Press the Export Completed Points to file to save all of the Source Flags that have been completed.

2.2.5.1.1 Export Logs to Flash

Press the Export Logs to Flash to save the Log File (Snail's Trail) to the Flash Drive.

2.2.5.2 Import Project Data



2.2.5.2.1 Import Project from Flash

Insert Flash Drive with saved project.

Press the Import Project from Flash and the saved project with all of the Flags and saved layers will be loaded into memory

2.2.5.2.2 Import Completed points from Flash

Insert Flash Drive with saved Points.

Press the Import Completed Points from Flash and the data from the Flash Drive will be loaded.

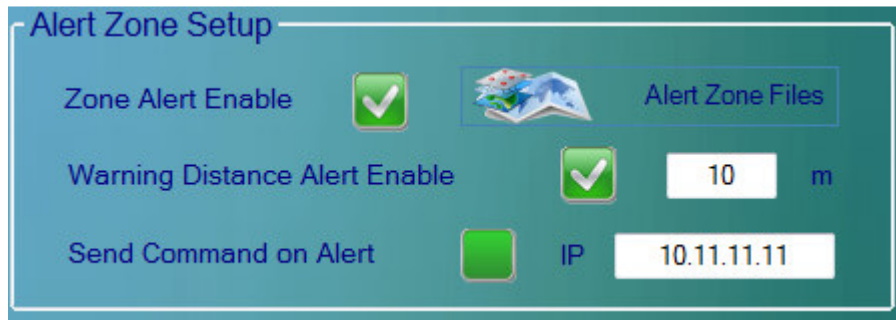
This allows loading points that other Vibrator units have completed into the Map.

2.2.6 Alert Setup



Alert Setup Menu

2.2.6.1 Alert Zone Setup



Multiple Zone Alerts can be setup. Enable Alerts by clicking the box.

Press the “Alert Zone Files” to setup which Zones should be used for alerts. When the Vibrator is in the alert Zone a RED message will appear on the Navigators Screen

Warning Distance Alert Enable. This feature allows an additional buffer Zone around the Alert Area. When the vehicle enters the Buffer Zone an alert will occur. Enter how many meters should be used for the buffer zone.

Bottom line of the Screen will show “Relay Attached” when system is setup and working properly

Data source - Serial Port: COM19 (0; 091 msec 102 msec) Attached Compass: Phidget Spatial 3/3/3 (2.5°) Relay Attached

2.2.6.2 Alert Zone Alarms

Send Command on alert allows and audible (Visual) alert to be setup in the unit. With this feature enabled an audible (Visual) alert will sound when the Vehicle enters or approaches the Alert Area. This feature requires additional hardware to be used with the navigator program please request quote from Seismic Source for this feature

The navigator software is setup to work with SeaLevel Data I/O module.

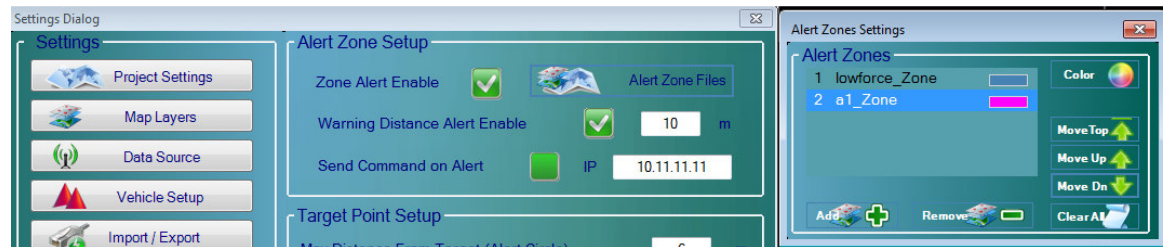
You set up the IP settings in the Alert Zone Setup.

Then the Sea Level unit that I have has 4 different outputs

Alert Zone #1 is relay #1

Alert Zone #2 is relay #2

Etc..



NOTE:

These are shape files that get loaded, these are saved in a different location then the normal viewing shapes, so you will have to load the same shape in each location for it to be an alert.

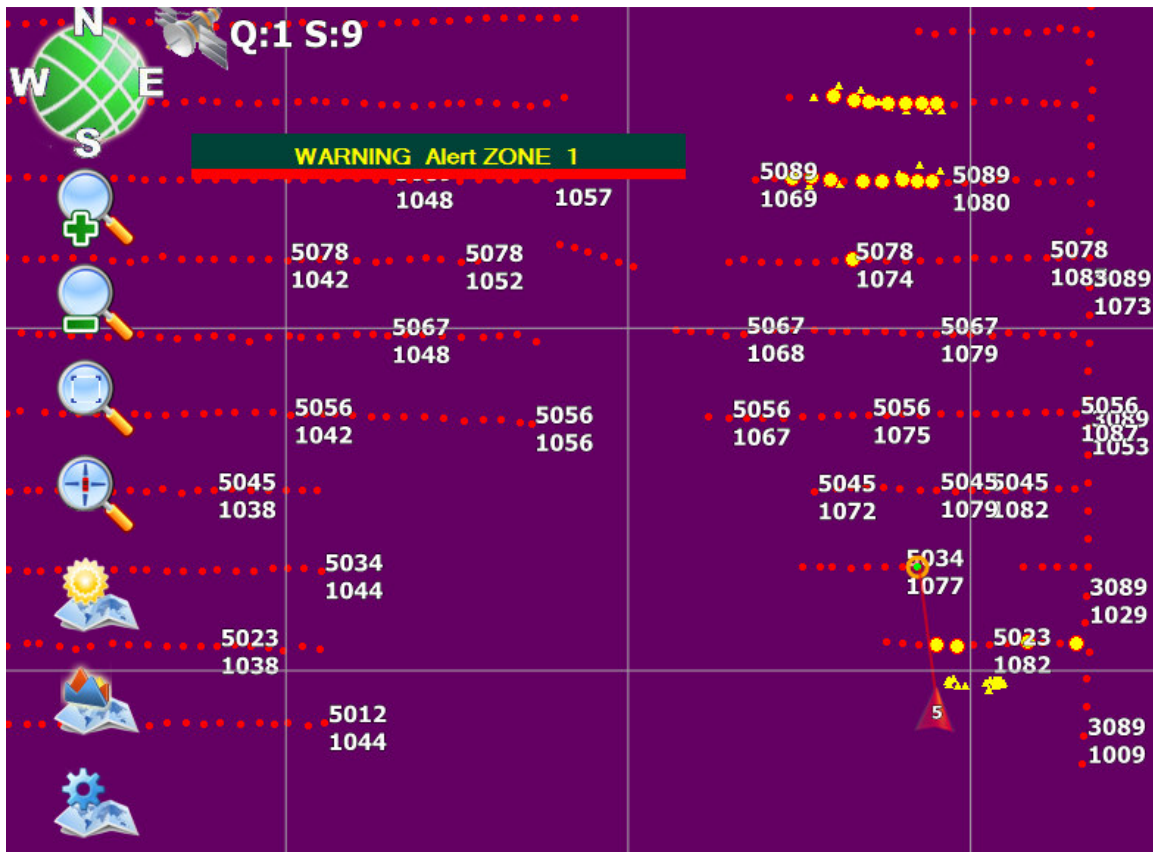
All Alerts will use the same Distance and IP send commands

These show alert banner to the operator and no control over the vibe, unless an added device to interact with the vibe itself.

All Alert shapes will be displayed on the map and cannot be turned on/Off as the normal shapes

Visual Warning is shown when entering Alert Zone

“WARNING Alert ZONE”



2.2.6.3 Target Point Setup



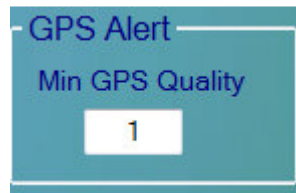
Target Point Setup

Max Distance From Target (Alert Circle) 6 m

Automatic Target Point Selection ☒

Target point alert allows any point to be setup as an Alert. An additional Buffer Zone can be added to the point by entering the distance in meters from the point.

2.2.6.4 GPS Alert



GPS Alert

Min GPS Quality

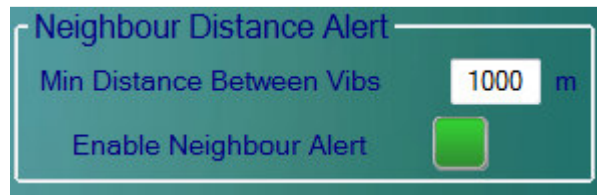
1

Alert Can be setup if the GPS Quality falls below an acceptable level.

Quality Level depends on the GPS manufacturer's definition. The following standard is usually practiced

- Quality=0 – Position is invalid
- Quality=1 – GPS has actual position
- Quality=2 – GPS is differential
- Quality=3 -
- Quality=4 – GPS - RTK fixed integers (Trimble only)
- Quality=5 - GPS – RTK float integers (Trimble only)

2.2.6.5 Neighbor Distance Alert



The screenshot shows a control panel titled "Neighbour Distance Alert". It contains a label "Min Distance Between Vibs" followed by a text input field containing the value "1000" and a unit "m". Below this is a label "Enable Neighbour Alert" followed by a green square button.

Alert can be setup when another Vibrator is too close. The Mesh WiFi is typically used to receive the position messages from all of the vibrators within range.

Enabling this Alert will notify the driver when another vibrator is too close.

NOTE:

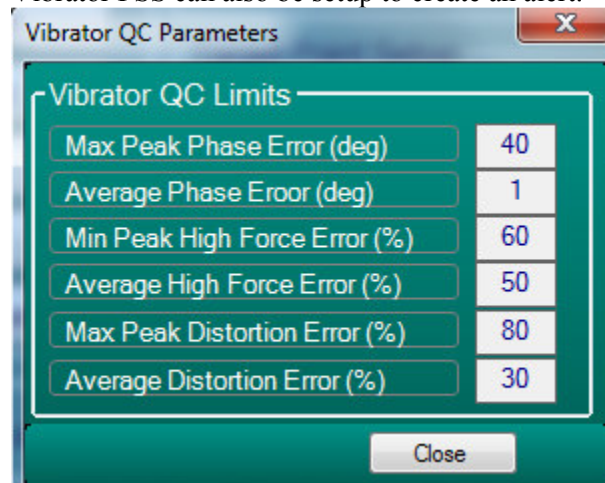
Just a proximity Alert, does not show the state of the Neighboring ie.vibe Shaking or not, and will not control the Vibe as to be able to start or delay shaking

2.2.6.6 Vibrator QC Alert



The screenshot shows a control panel titled "Vibrator QC Alert". It contains a label "Enable VibratorQC Alert" followed by a green checkmark icon. To the right is a button with a document icon and the label "Parameters".

Vibrator PSS can also be setup to create an alert.



The screenshot shows a dialog box titled "Vibrator QC Parameters". It contains a section titled "Vibrator QC Limits" with a table of parameters and their values:

Max Peak Phase Error (deg)	40
Average Phase Error (deg)	1
Min Peak High Force Error (%)	60
Average High Force Error (%)	50
Max Peak Distortion Error (%)	80
Average Distortion Error (%)	30

At the bottom of the dialog is a "Close" button.

The user sets up acceptable limits for each of the PSS parameters. When these values are exceeded an alert will occur.

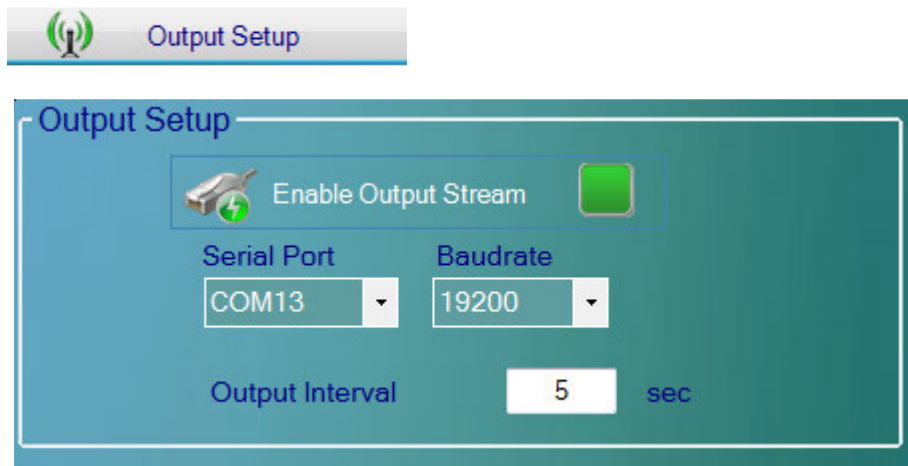
The Phase QC limits set a maximum allowable limit before an alert occurs.

The Force QC limits set a minimum allowable limit before an alert occurs.

The Distortion QC limits set a maximum allowable limit before an alert occurs.

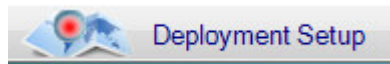
If a Vibrator QC limit is reached or exceeded, then an alert will be displayed on the screen. If multiple alerts occur only 1 will be displayed.

2.2.7 Output Setup

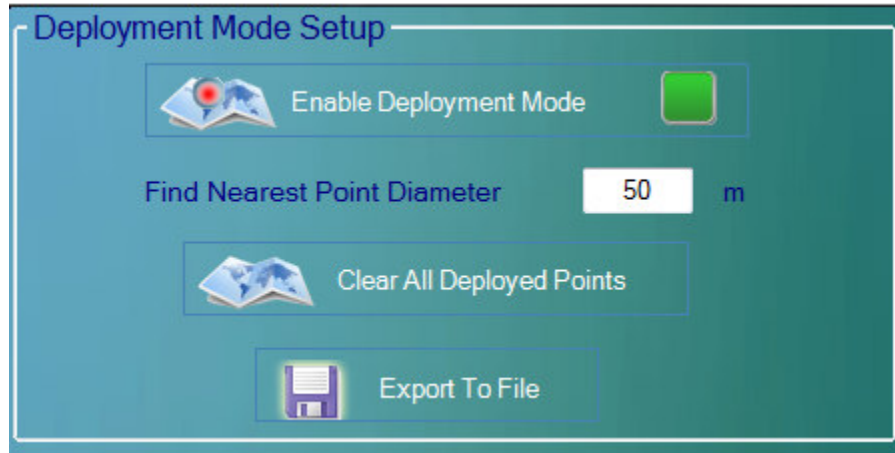


Output Setup Menu allows the serial position messages to be output on a serial port on the navigation computer. This feature is often used when connected to a digital radio used for position Tracking

2.2.8 Deployment Setup

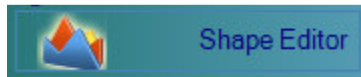


Deployment Menu can be used to Deploy Geophones or Nodal Seismographs to the spread



Once the geophones are deployed, the deployed points should be Exported to File.

2.3 Shape Editor



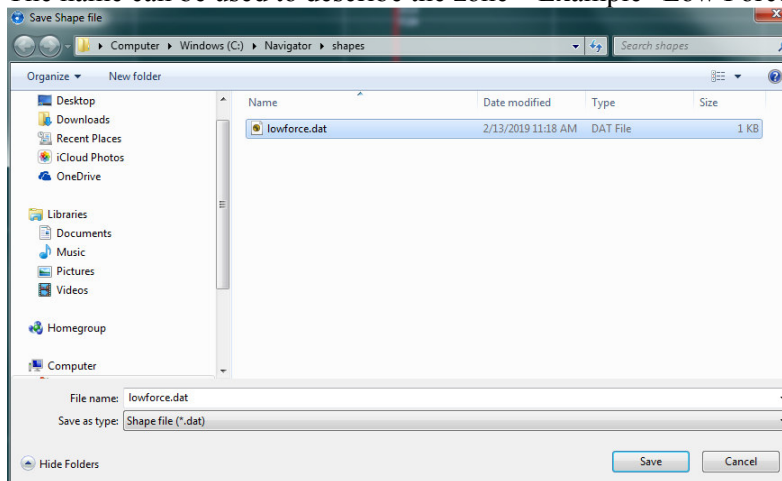
The Shape Editor allows to manually define Shapes, Save Shape files, Load Shape Files, and to modify existing shape files.

These shape files can be used to define hazards and special zones on the map



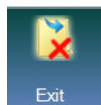
After defining the Shape, the Shape file should be saved to disk.

The name can be used to describe the zone – Example “Low Force Zone”



Once the shape files have been defined, they can be loaded into the program as an Alert Zone. See Alert setup for loading Shape files as alert zones.

Press the Exit button to Exit the Shape Editor



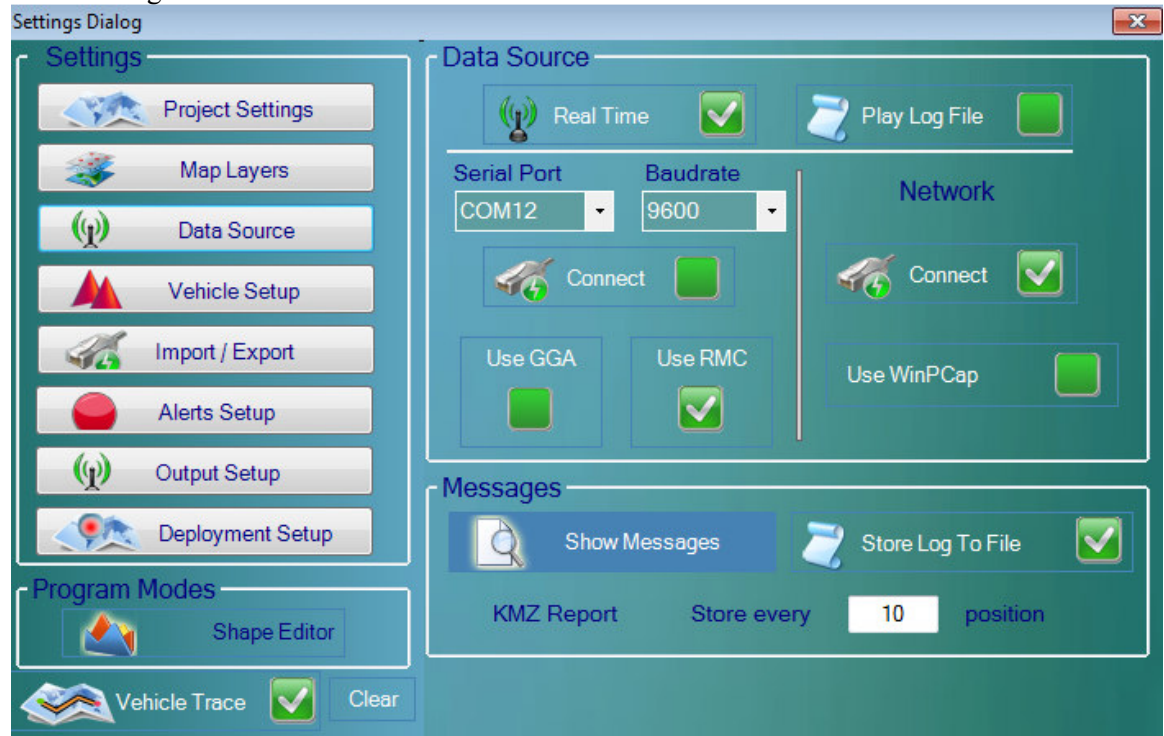
2.4 Vehicle Trace



The Vehicle's "Snail Trail" can be enabled or disabled with this menu.

The previous Snail Trail can be cleared with the "Clear" button

GPS Message



Message



Note:

When on the Mesh WiFi Network the Message Dialog will show all units that are active, you will have to look see that the F3 you are in is displayed, then you can setup the vehicle id to get the correct position from your vibe.

3.0 Quick Start

The Navigator Tablet can be connected directly to a GPS receiver or it can be connected to the Force 3 vibrator control system via wired or wireless Ethernet connection.

3.1 Using External GPS

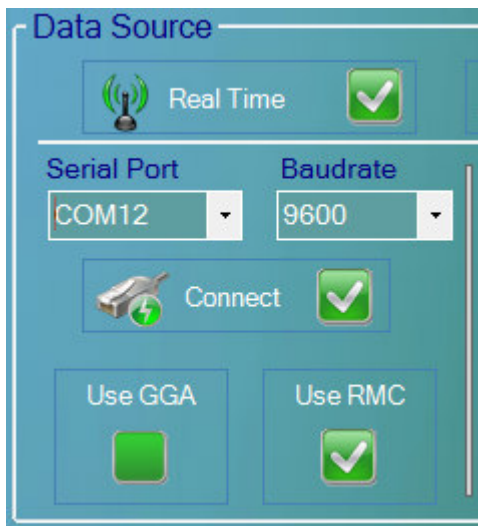
The Navigator Tablet can be connected directly to an external GPS receiver.

This is normally a serial connection on the Tablet to the GPS receiver.

The GPS receiver should be setup to output either GGA or RMC messages

Go to the Data Source menu and setup the Navigator for Serial communication

Select the Serial Port, baud rate and if the GPS is using GGA or RMC messages.



NOTE:

When using the direct Serial connection, and not connected thru the F3 unit Full functionality for marking and grabbing next point is not available.

When used in the Vibe it is better to connect thru the F3 instrument.

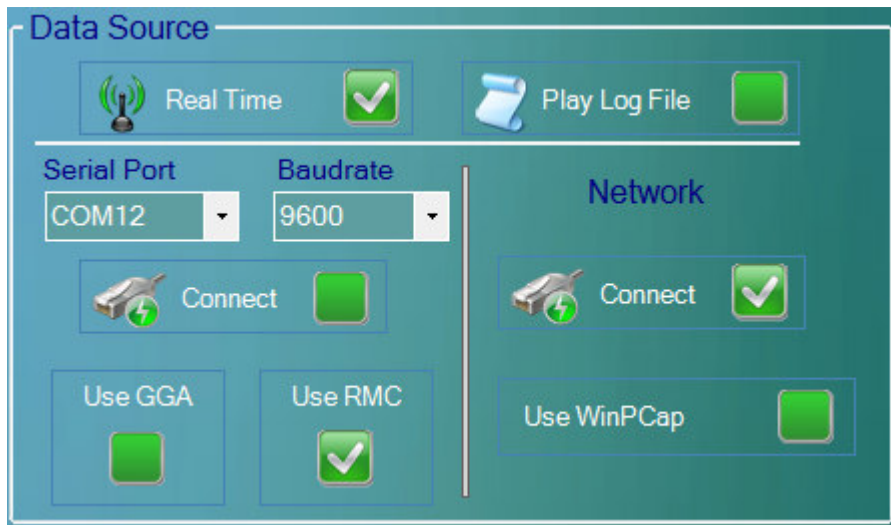
PSS is used to mark point, Pad Up/Down controls picking the next point.

3.2 Connecting to Force 3 unit

The Navigator Tablet can be connected directly to the Force 3 unit.

Go to the Data Source menu and select the Network connection

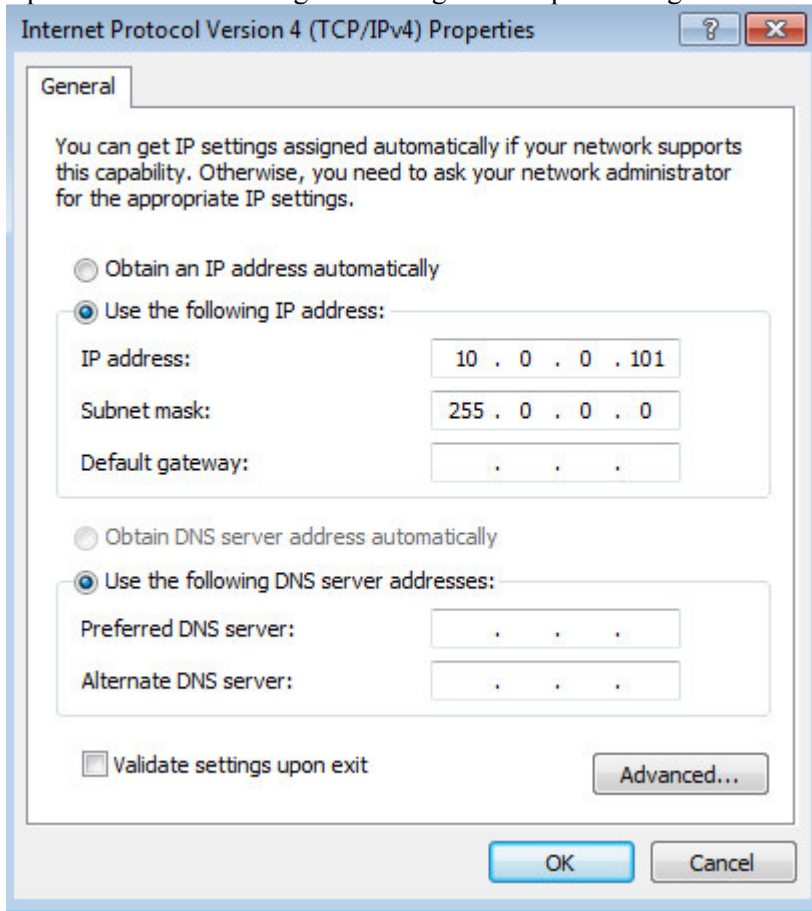
DO NOT ENABLE WinPCap



3.2.1 F3 Wired Option

The Ethernet port must be first setup to receive the data from the Force 3 system. Normally the computer's Ethernet port must be setup for a fixed IP address. must be an external GPS receiver.

Open the Network settings and change the adapter settings.



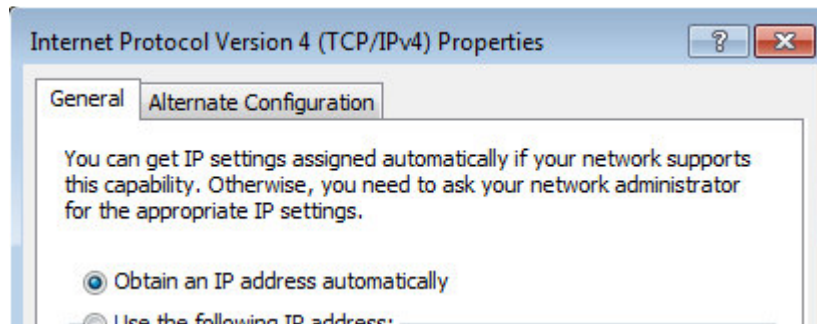
Connect the Ethernet cable from the Tablet to the Force 3 Ethernet connector.

3.2.2 F3 Meshed WiFi Option

When using the Force 3's Meshed WiFi option, the Tablet is connected to the Meshed WiFi. No cables are required between the Tablet and the Force 3 electronics.

Open the WiFi connections on the Tablet Computer and connect to the Force 3 Mesh Network.

The IP address of the WiFi can be set to obtain the IP address automatically



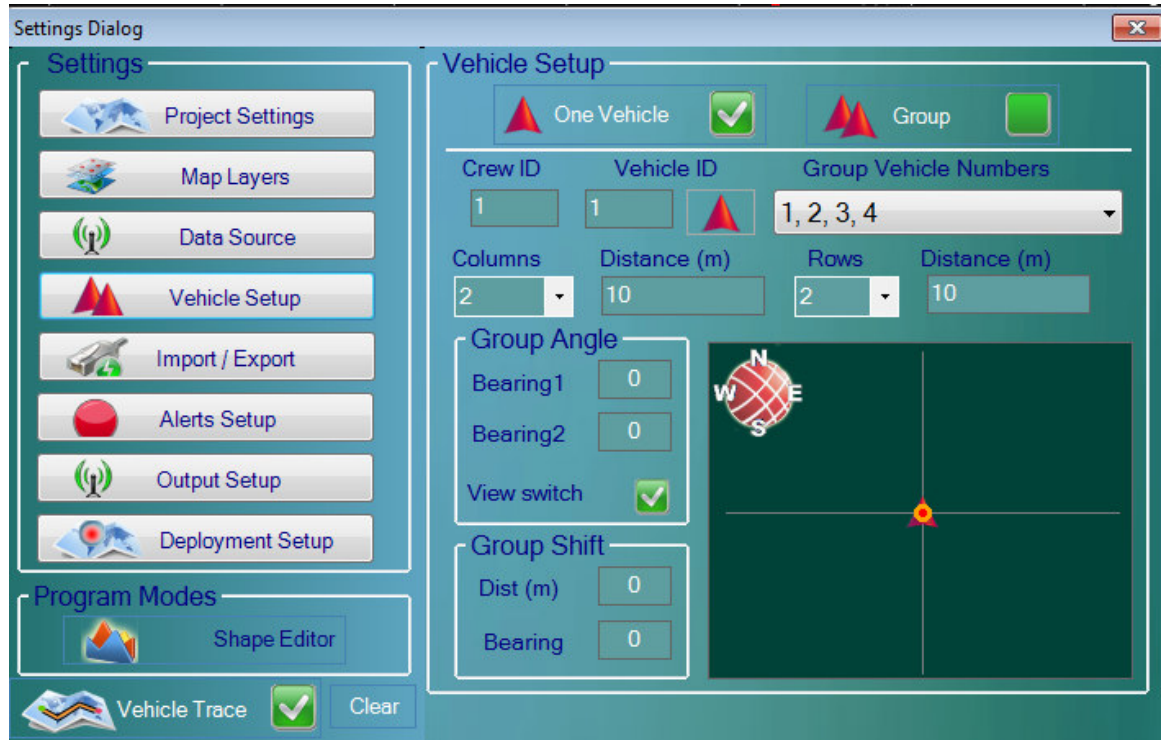
With this setup the Mesh WiFi will assign the IP address to the computer.

A fixed IP address can be used, but care must be taken to prevent any duplicate IP address on the network.

3.2.3 F3 Connection

After connecting the Force 3 either via WiFi or directly connected via Ethernet Cable, the correct unit ID must be selected.

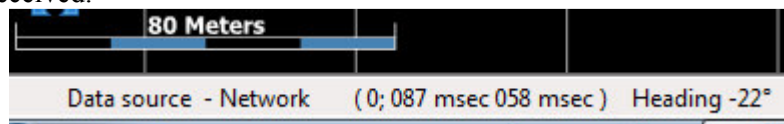
Go to the Vehicle Setup menu and select the Crew ID and Vehicle ID of the Force 3 unit to be monitored



Additional Menu selections allow the Force 3 Vibrator Unit to be part of a fleet. This allows the Vibrator units Target location to be offset of the Source Flag.

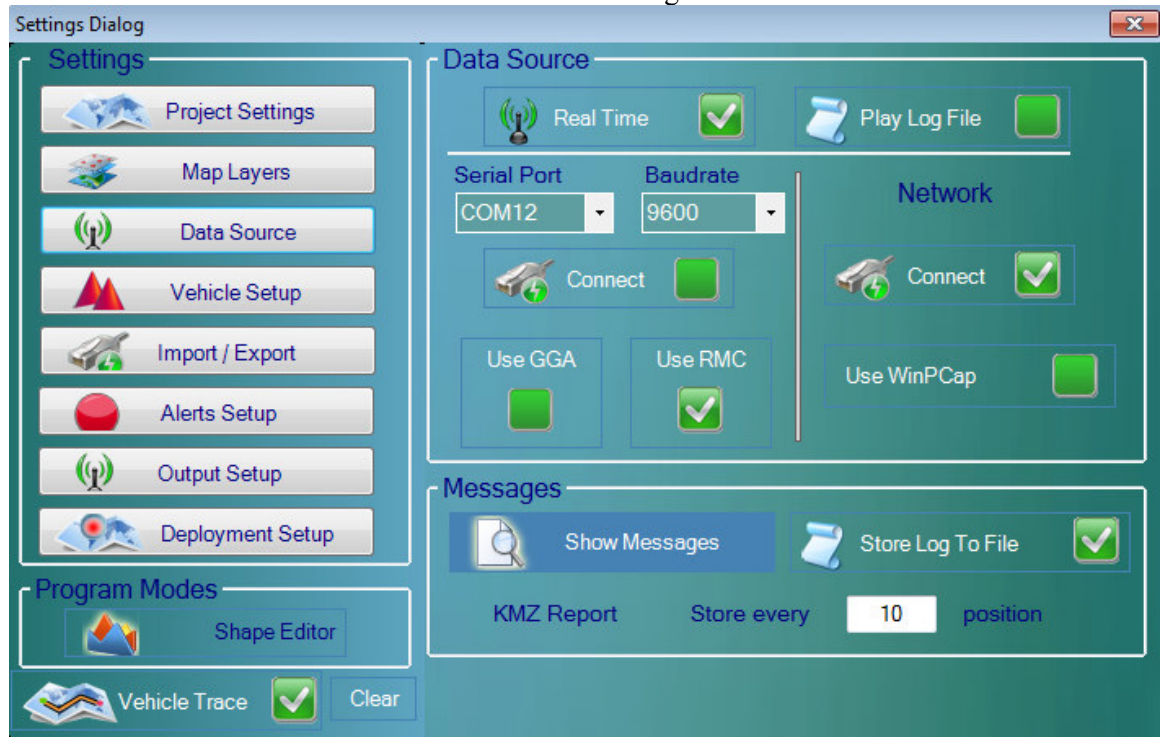
After Selecting the correct unit ID, The Navigator program should start receiving messages if a valid GPS signal is received by the Force 3 unit.

After Connecting to the correct unit the bottom line of the display should show that data is being received.

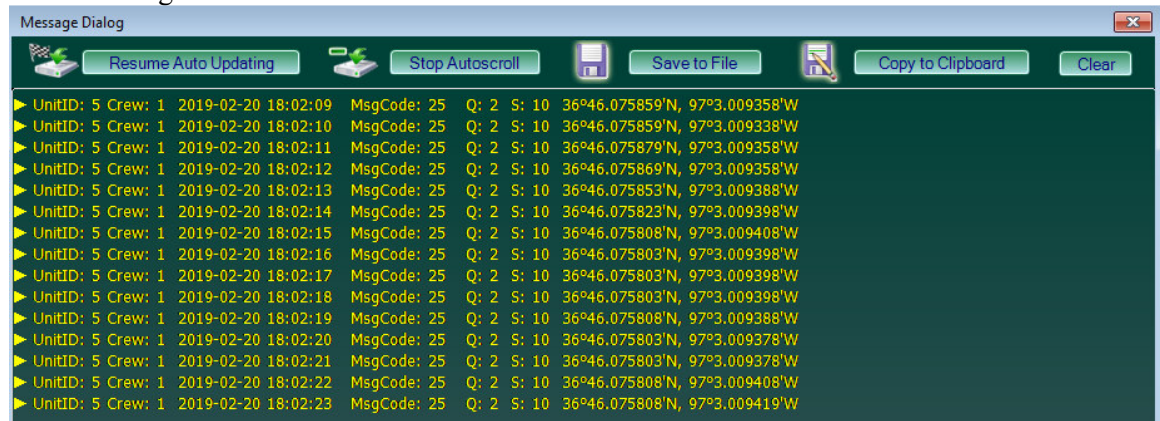


3.3 Show Messages

The Show Messages option allows a quick way to verify that the GPS messages are being received. Go to the Data Source Menu and select “Show Messages



Show Messages



When connected to the Force unit, the show messages will show the Unit ID and Crew number of the unit plus the GPS position

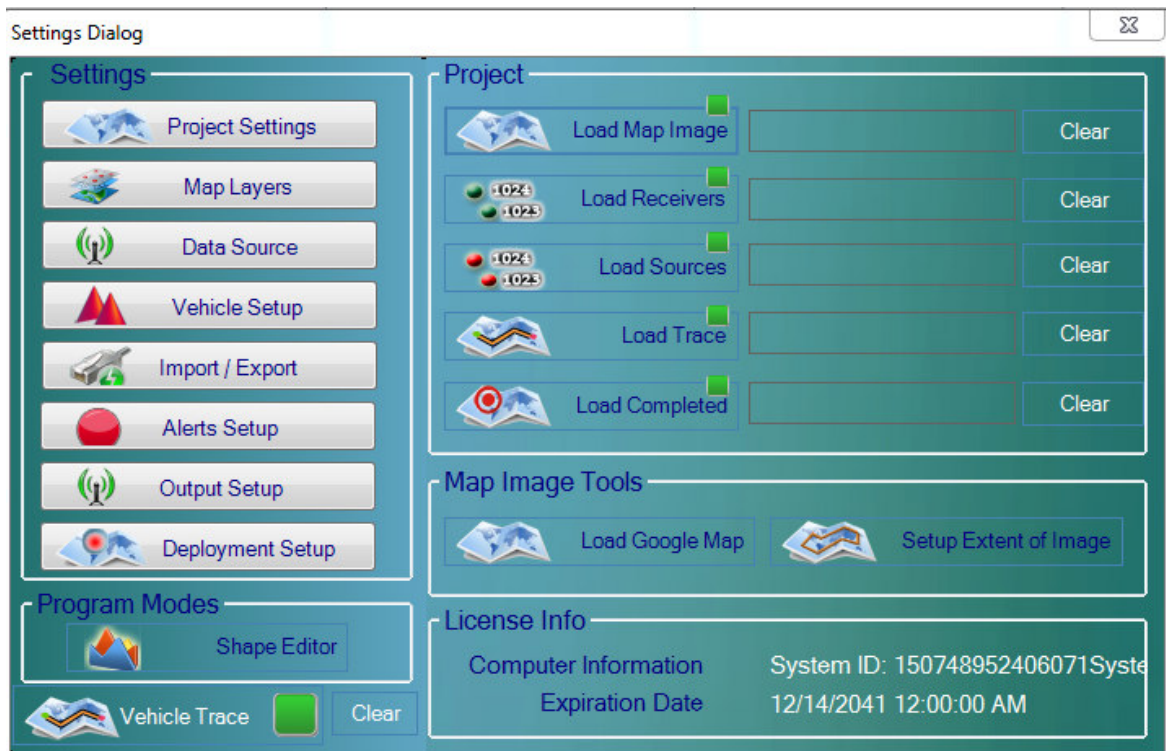
Note:

When on the Mesh WiFi Network the Message Dialog will show all units that are active, you will have to look to see that the F3 UnitID you are working with is displayed, then you can setup the vehicle id to get the correct position from your vibe to Navigator.

4.1 Initial Setup and Deployment

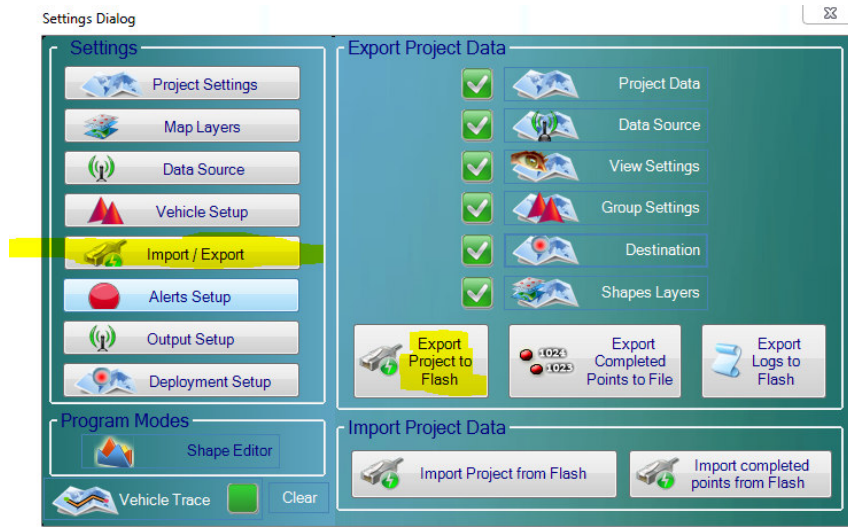
Navigator will install and Run on any OS (XP or later) that has the .Net environment Laptop, Desktop or Tablet (with a higher resolution display)

After installing the program, it is fully functional and you will be able to load all the needed files Source/Receiver SP1, Shapes, Alerts and Google images.
All needed initial Source Patterns, Crew# , Data Source etc..

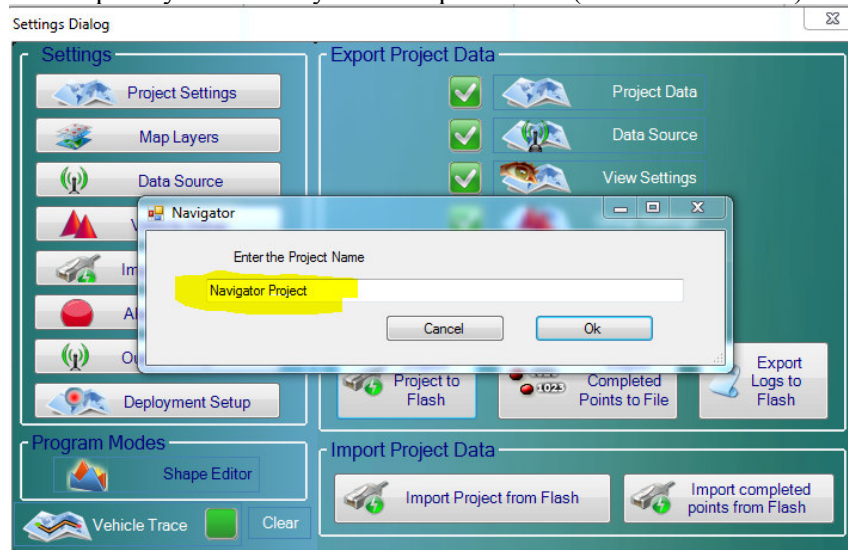


This can all be done by a selected individual or Department with a working knowledge of the survey and permit issues. To make sure all data loaded is the Latest and accurate.

Once the setup is checked and ready to deploy to the crew
Vibes, Vibe Scout, Mechanics etc. Plug in USB Stick
The Prospect can be “Exported Project to Flash” - Choose all the options

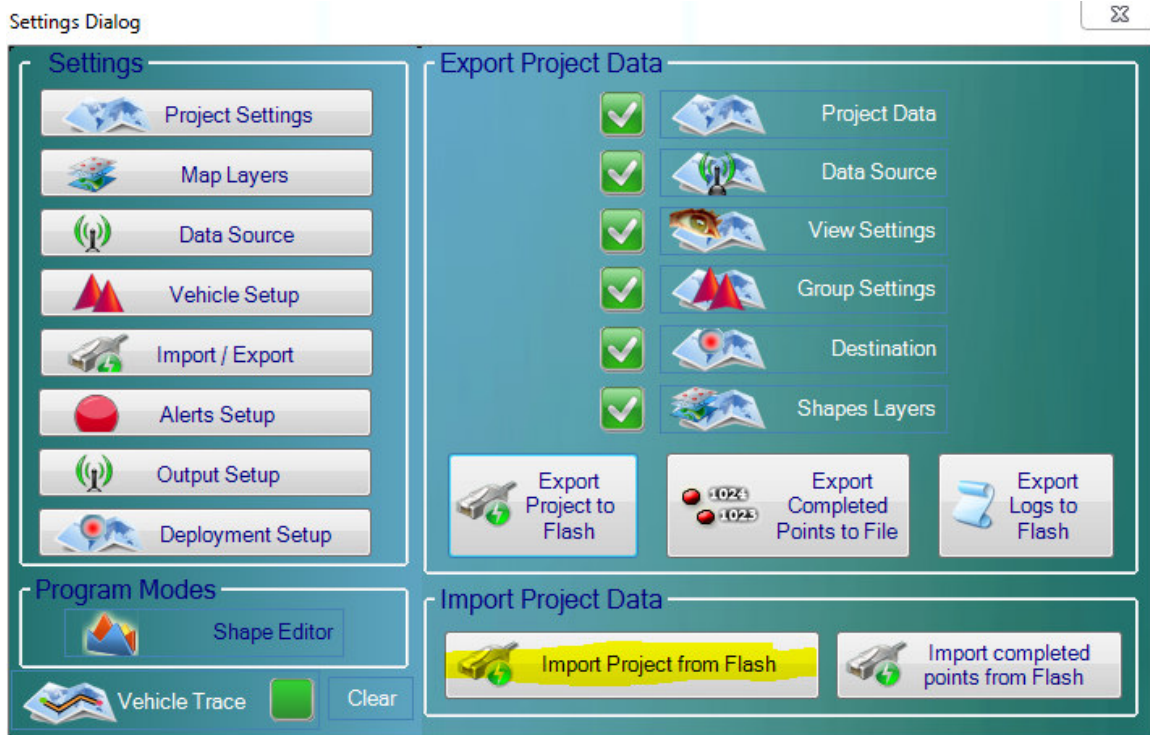


This can be Output to multiple USB drives as needed.
At this point you can add your “Prospect Name (add Date to Name)”

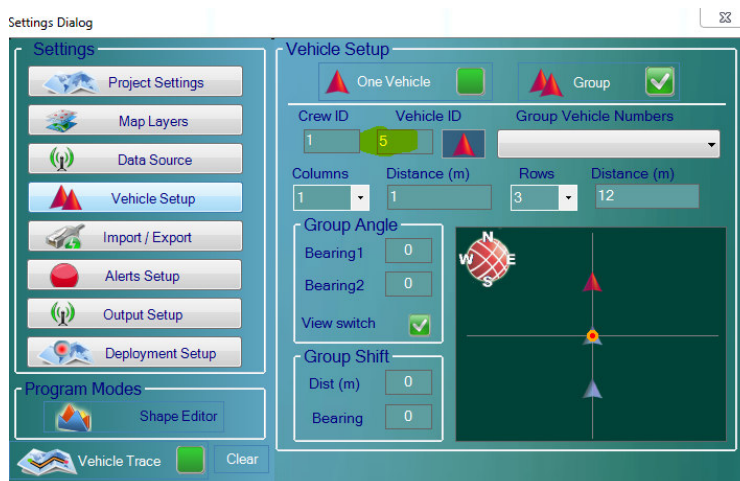


It will create a Folder on the USB called “NavigatorData”

At this point You will open Navigator on all the Field Units and “Import Project from Flash”
You will see the Project Name in the main screen Banner after Import



At this point all Navigator Data will be Identical, For the Initial deployment
When the Navigator tablets are installed in the Vibes and other vehicles
This is when the individual information needs to be setup per Navigator Unit
The Data Source, and the Vehicle Setup for each
For the vibes you need to tell Navigator the F3 UnitID and where the unit is in the Fleet Pattern



4.2 Typical Operation Example

Now that you have the Navigators in the vibes

The Vibe Fleets go into Production

As the fleets Navigate to the Source point and the point is marked as Acquired

The Acquired point are saved in Navigator –

This data can be exported to Flash for each Navigator from the vibes Or at least one per fleet.

This data can be brought into the Main Setup navigator and uploaded for each fleet

IMPORTANT NOTE:

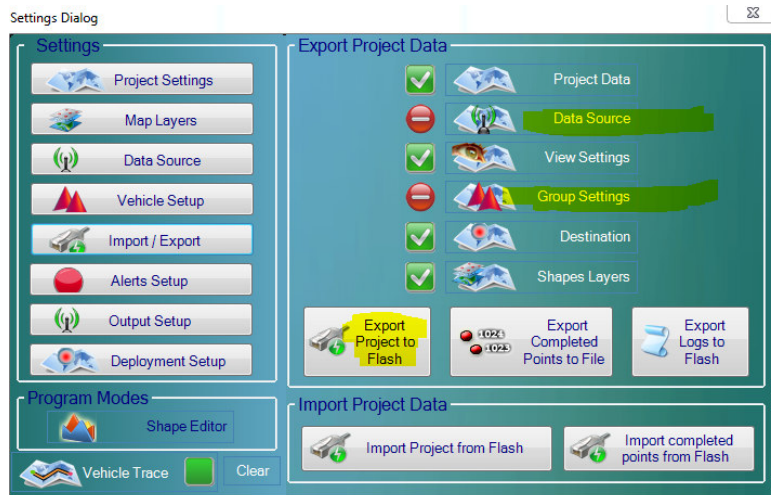
If you are starting the fleets using the SourceLink program then Under the “REPORTS” dropdown you will find the option “Export Acquired Points to Navigator” this will copy all the Acquired points to a USB drive, it creates a folder called “NavigatorLogs”

The file “CompletedPoints.xml” is also found the General Reports output folder from Source Link daily if needed.

With this file from SourceLink then you need no data from the individual Vibe Navigator tablets.

Now with the Acquired points data from the day – you can then update the Main Navigator system with these points, Update any new SP1, Shape Alerts etc.. for the next Day/Shift of Production

At this point you will again output the “Export Project to Flash” but uncheck the “Data Source” and “Group Settings” as to not disturb the individual settings in each Navigator



NOTE:

When you are exporting the Project to flash each day when it asks for the Project name be sure to add the New date so you can keep track of the latest project update. By looking at the top Banner.

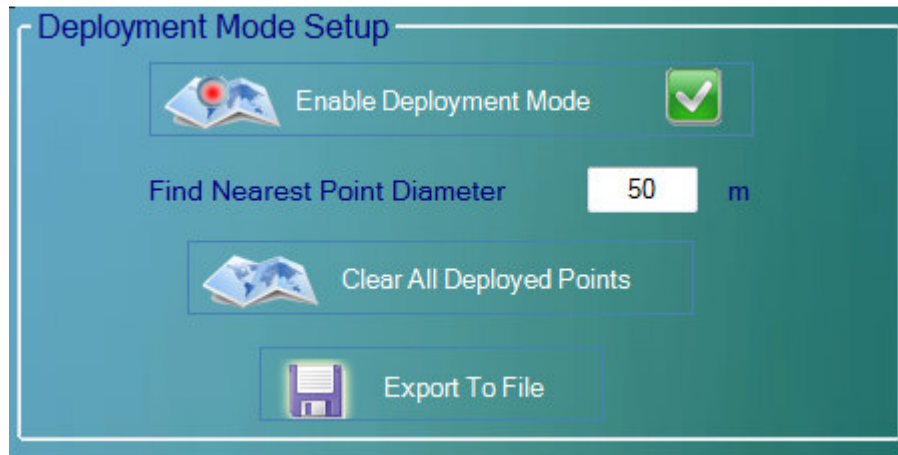


5.0 Geophone Deployment Mode

The Navigator Program can be used to accurately deploy the Geophones to their actual positions.

Load the Receiver Preplot into the Navigator Software.

Go to Deployment Setup and Enable Deployment Mode



Navigate to the Geophone Location.

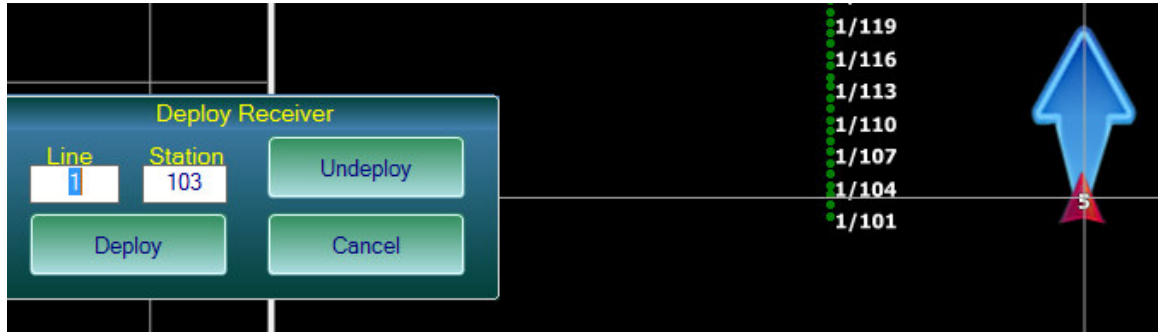
The preplot receiver point can be selected and the program will show the distance and direction to that receiver point



Press the Deploy Button

Deploy

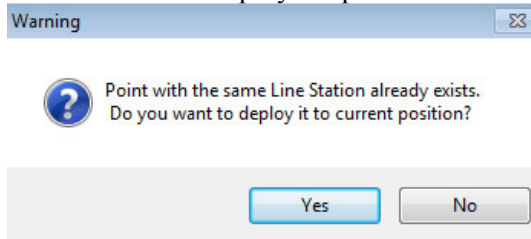
The program will find the nearest Flag from the preloaded Receiver Points.



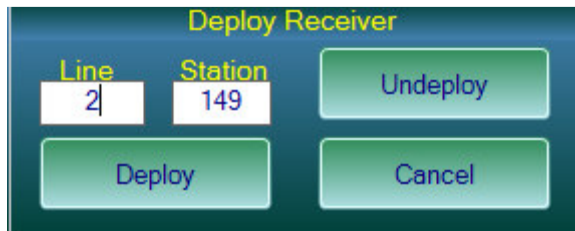
If this is the correct Flag number, then press Deploy Button.

A warning will appear on the screen if the point has already been deployed

Answer Yes to redeploy the point



Any Line and station number can be manually entered to override the near Flag.



The Deployed Points will be shown on the Left Screen

The Deployed Points will be shown in blue

The original Pre-Plot points will also be shown