C-Nav®

C-Scape Quick Start Guide

Revision 6

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OCEANEERING®

Release Notice
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2	06/11/2015	Updated for version 7.2.2	C. Thompson
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Manual Organization

This is a short tutorial explaining the minimum steps required to configure a fresh C-Scape installation. Sections are organized in a manner that facilitates quick operator orientation.

Section 1 - Sentinel Dongle Driver Installation (Page 10) details how to install the Sentinel Dongle driver, which is required to run C-Scape.

Section 2 - C-Scape Installation (Page 11) describes how to install C-Scape.

Section 3 - Running C-Scape (Page 16) explains how to configure and run C-Scape for a standard operation. This includes sections on Configuring Devices (Page 18), Configuring Settings (Page 32), and Configuring the Primary Vessel (Page 35).

Section 4 - Troubleshooting (Page 50) explains two common methods for troubleshooting when contacting C-Nav[®] Support (cnavsupport@oceaneering.com).

Appendix A - C-Scape Work Flow (Page 53) explains the data flow and the positioning algorithm used by C-Scape.

Appendix B - Shortcut Keys (Page 55) lists common shortcuts and navigation controls for working C-Scape.

Appendix C - File Locations (Page 56) lists the locations of important files used by C-Scape.

Appendix D - UTM Zones (Page 58) provides a list of the UTM zones for easy reference.

Related Documents

CNAV-MAN-020.3 (Sentinel Driver Installation Manual)

Describes the process used to install the SafeNet Sentinel Dongle driver for use with C-Scape. It is available on the C-Nav[®] website at https://www.oceaneering.com/C-Nav/Software/Utilities/PDFDownloads/CNAV-MAN-020.3%20(Sentinel%20Driver%20Installation%20Manual).pdf.

CNAV-MAN-012.10 (C-Monitor Quick Start Guide)

The C-Monitor[®] Quick Start Guide provides the user with the necessary information to install and run the **Oceaneering[®] C-Monitor[®]** QA/QC software. It is available from the

C-Nav® website at https://www.oceaneering.com/C-Nav/Software/C-Monitor/PDFDownloads/CNAV-MAN-012.10%20%28C-Monitor%20Quick%20Start%20Guide%29.pdf.

CNAV-MAN-013.9 (C-Setup Quick Start Guide)

The C-Setup Quick Start Guide provides the user with the necessary information to install and run C-Setup. It is available from the C-Nav® website at https://www.oceaneering.com/C-Nav/Software/C-Setup/PDFDownloads/CNAV-MAN-013.9%20(C-Setup%20Quick%20Start%20Guide).pdf.

CNAV-MAN-004.5 (C-Scape MMS Appendix)

The C-Scape MMS Appendix provides the user with the necessary information to install and use the MMS database in C-Scape. It is available from the C-Nav® website at https://www.oceaneering.com/C-Nav/Software/C-Scape/PDFDownloads/CNAV-MAN-004.5%20(C-Scape%20MMS%20Appendix).pdf.

Manual Conventions

Arial font is used for plain text in this document.
Arial italic font is used for settings names.
"Arial quoted" font is used for settings values.
Arial Bold font is used for button names.
Arial Bold Italic font is used for menu items.
Arial Blue font is used for cross-references.
Arial Blue Underline font is used for hyperlinks.
Arial red italic is used for typed commands.
Arial Bold font size 10 is used for captions.

ARIAL BLACK ALL-CAPS font is used for port connection names.

⚠ This symbol means Reader Be Careful. It indicates a caution, care, and/or safety situation. The user might do something that could result in equipment damage or loss of data.

⚠ This symbol means Danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical and RF circuitry and be familiar with standard practices for preventing accidents.

Important notes are displayed in shaded text boxes.

Please note:
Such note boxes display important information that should not be ignored.

Simple file content is displayed in Courier New Black font in a text box.

```
#Sample File
Version 0.1
```

Section 1 - Sentinel Dongle Driver Installation

Sentinel Dongle Driver Installation

C-Scape is protected by a security dongle that must be installed before running the application. For instructions on how to install the Sentinel Driver, please see the document Sentinel Driver Installation Manual available from https://www.oceaneering.com/positioning-solutions/customer-access-and-resources/#sw-cscape.

Section 2 - C-Scape Installation

> ***Warning***:
> Updating from version 1.x to version 7.x requires a complete uninstallation of C-Scape. Failure to remove the previous version will produce unexpected results.

1. Download C-Scape from https://www.oceaneering.com/positioning-solutions/customer-access-and-resources/#sw-cscape.

2. Double-click the "C-Scape vX.Y.Z Installer.exe" file to start the installation wizard.

3. Choose the *Destination Location* then select **Next >** to proceed. The default installation location is:
   Windows Vista and higher:
   > *C:\Program Files (x86)\C-Nav\C-Scape*

   Windows XP:
   > *C:\Program Files\C-Nav\C-Scape*
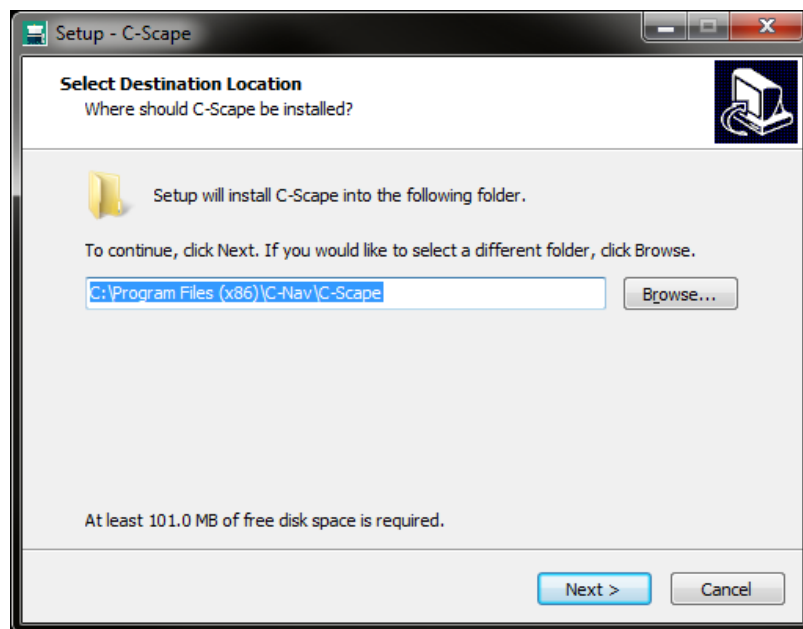
Figure 1: Selecting Installation Folder

4. Select a *Program Folder* to add a C-Scape shortcut in the Windows Start Menu and select **Next >** to continue. The default folder is "C-Nav".
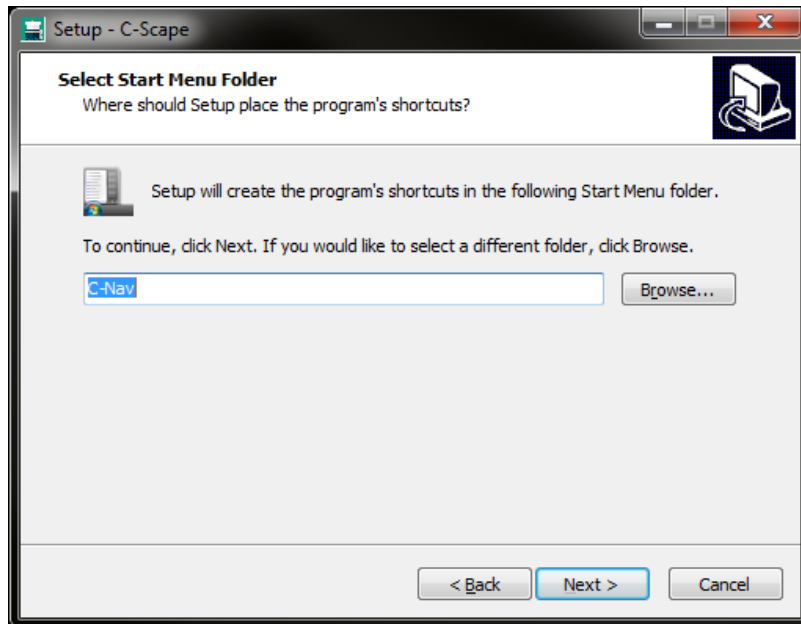
Figure 2: Selecting Installation Start Menu Folder

5. Optionally, check the *Create a desktop shortcut* box to create a Desktop shortcut to C-Scape. For Windows XP computers, there is also an additional option to *Create a Quick Launch icon*.
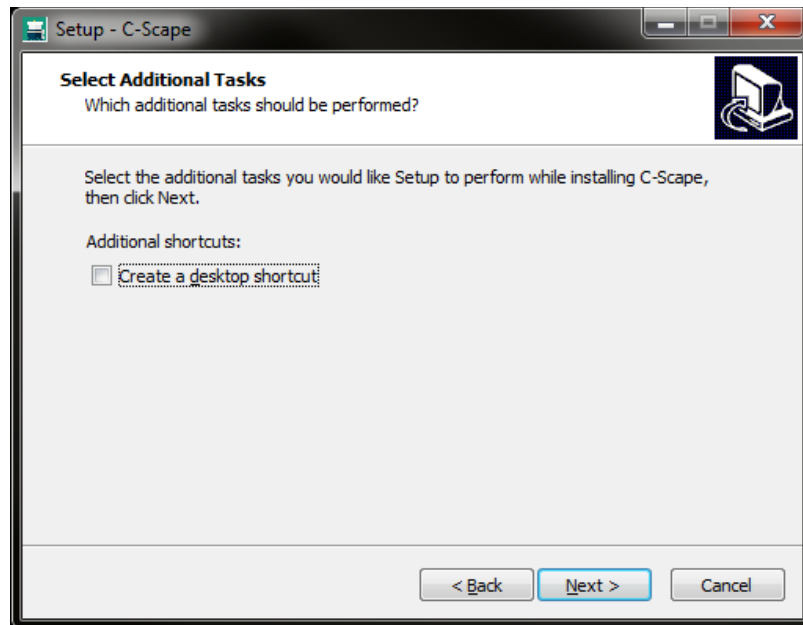
Figure 3: Selecting Shortcuts

6. Review the settings and press **Install** to start the installation.
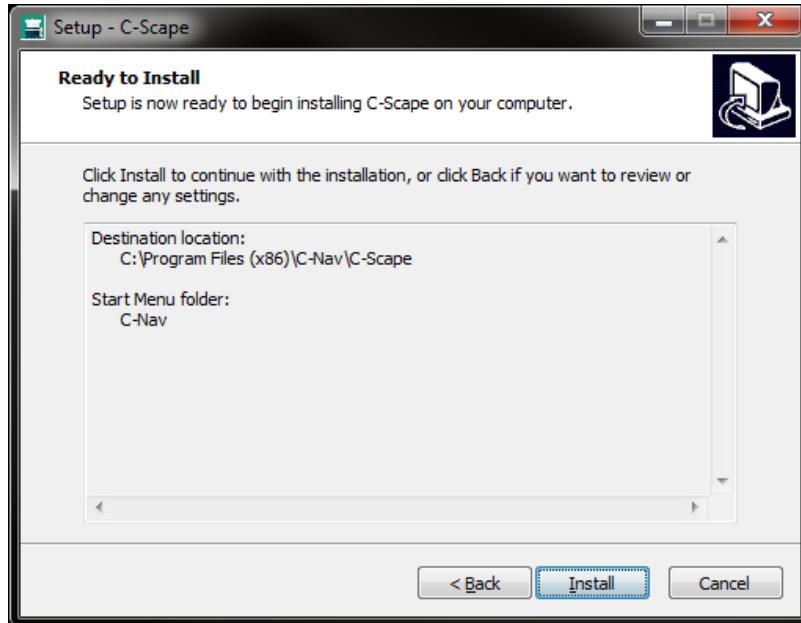
Figure 4: Configured Installation

7. Press **Finish** to complete the installation.
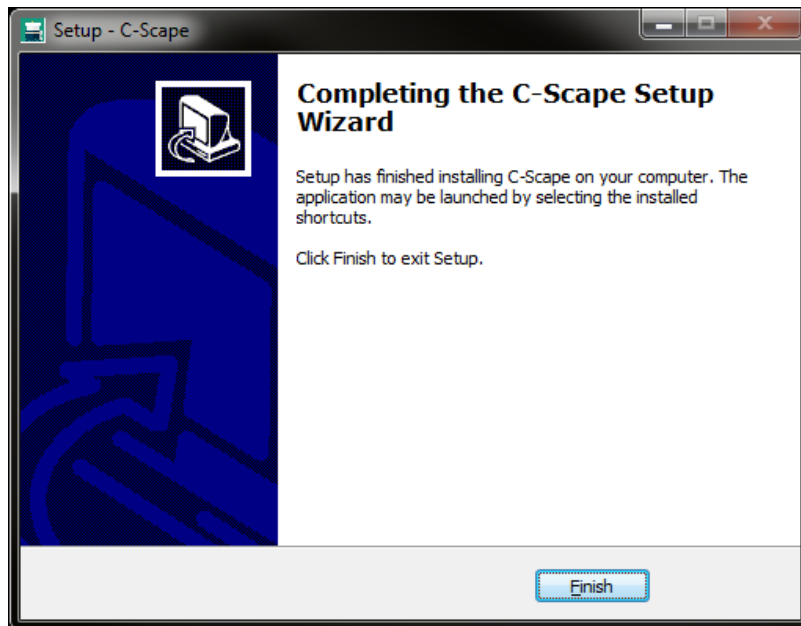
Figure 5: Finished Installation

Section 3 - Running C-Scape

The first time C-Scape is run after a fresh installation or update, the user must agree to the License Agreement. Read the license and press **Accept** to continue.

> **Note:**
> The full text of the License Agreement is available for reading in the installation directory of C-Scape:
>
> Windows Vista and higher:
>   *C:\Program Files (x86)\C-Nav* C-Scape\resources\C-Scape\LicenseAgreement.txt
> Windows XP:
>   *C:\Program Files\C-Nav* C-Scape\resources\C-Scape\LicenseAgreement.txt

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Grant and Termination of License.
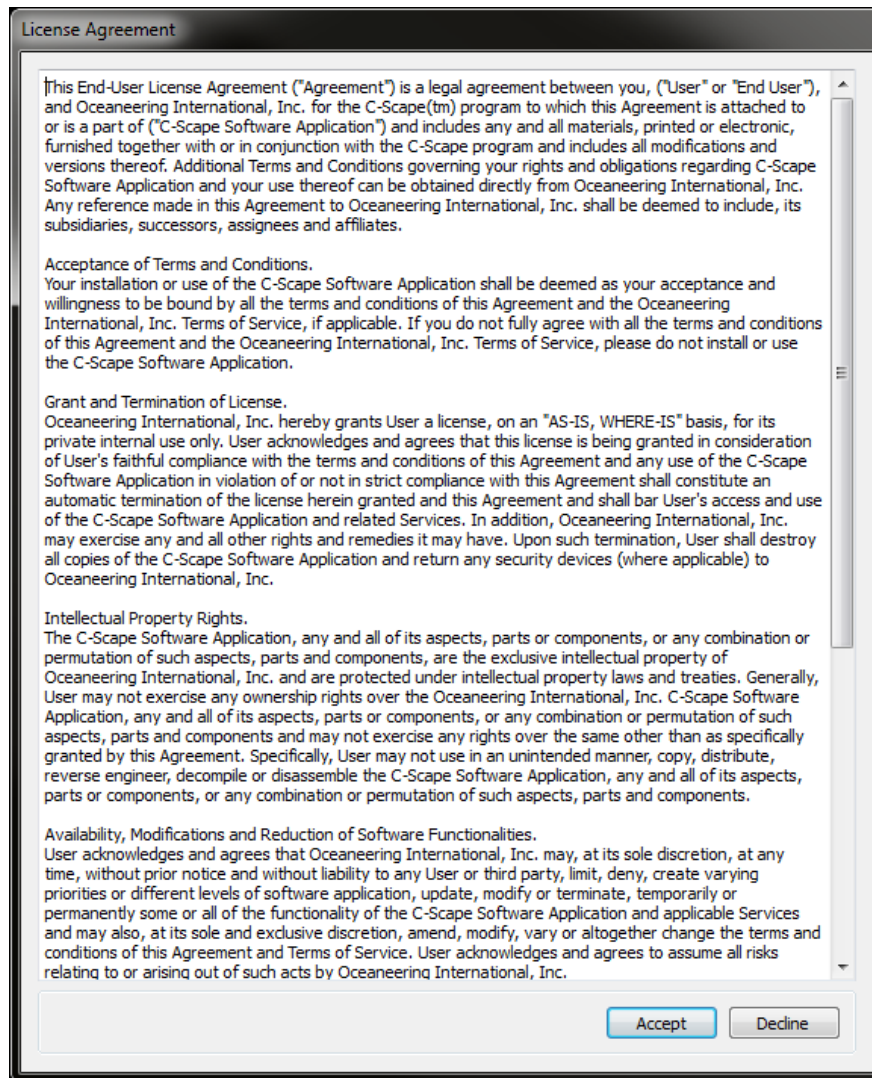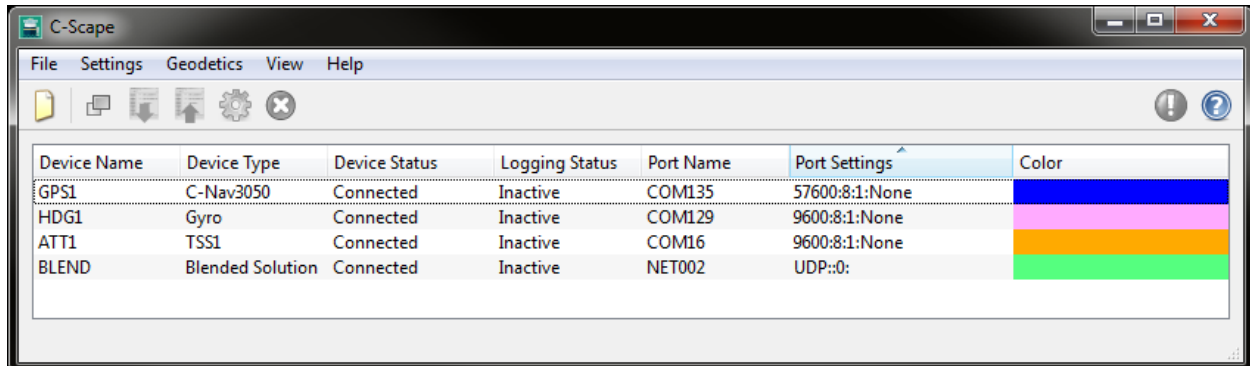Oceaneering International, Inc. hereby grants User a license, on an "AS-IS, WHERE-IS" basis, for its private internal use only. User acknowledges and agrees that this license is being granted in consideration of User's faithful compliance with the terms and conditions of this Agreement and any use of the C-Scape Software Application in violation of or not in strict compliance with this Agreement shall constitute an automatic termination of the license herein granted and this Agreement and shall bar User's access and use of the C-Scape Software Application and related Services. In addition, Oceaneering International, Inc. may exercise any and all other rights and remedies it may have. Upon such termination, User shall destroy all copies of the C-Scape Software Application and return any security devices (where applicable) to Oceaneering International, Inc.

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Accept   Decline

Figure 6: C-Scape License Agreement

Configuring Devices

Figure 7: Standard C-Scape Device List

A standard operation using C-Scape will require connecting to several devices: a GNSS receiver, a gyro, and possibly an attitude sensor. Once all of the input devices are configured, a Blended Solution device will need to be configured to blend all of the inputs to a single point on the vessel. For more information on how the Blended Solution blends the inputs, see Appendix A - C-Scape Work Flow (Page 53).

> ***Note:***
> The minimum configuration for C-Scape must include one position device, one heading device, and one Blended Solution device. It is acceptable to have one device provide both position and heading, like the C-Mariner. A Blended Solution device must always be created, even if there is only one position Source and one heading Source.

1. Connect the GNSS receiver to an available PC serial communications port or an active Ethernet switch.

2. Use *File / New* or push the **New** ( ) button on the toolbar to open the ***Add New Device*** dialog to create a new device.

3. Choose the correct *Device Type* of the GNSS receiver and then select a *Device Name* and *Device Color* to help differentiate connected receivers. The *Device Color* also helps distinguish the different GNSS inputs when the vessel is drawn on the **Overhead View** map or **Ship Shape** dialog (see Figure 28: Drill Ship Shape).
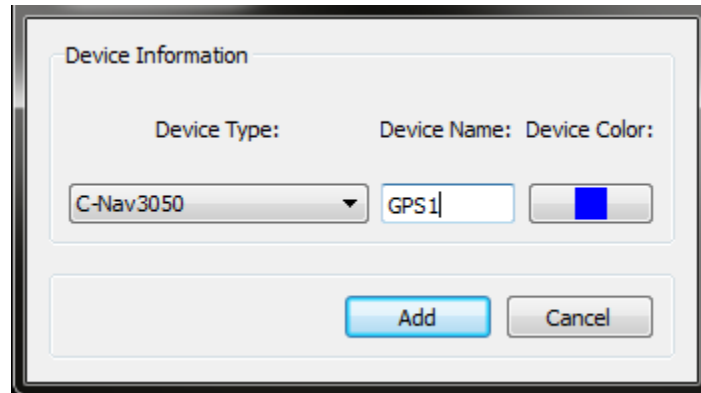
Figure 8: Adding a GNSS Device

4. After creating the new device, an empty device window will appear. Use *File /*

   Connect Port or press the **Connect Port** ( ) button on the toolbar to configure
   the communications settings.
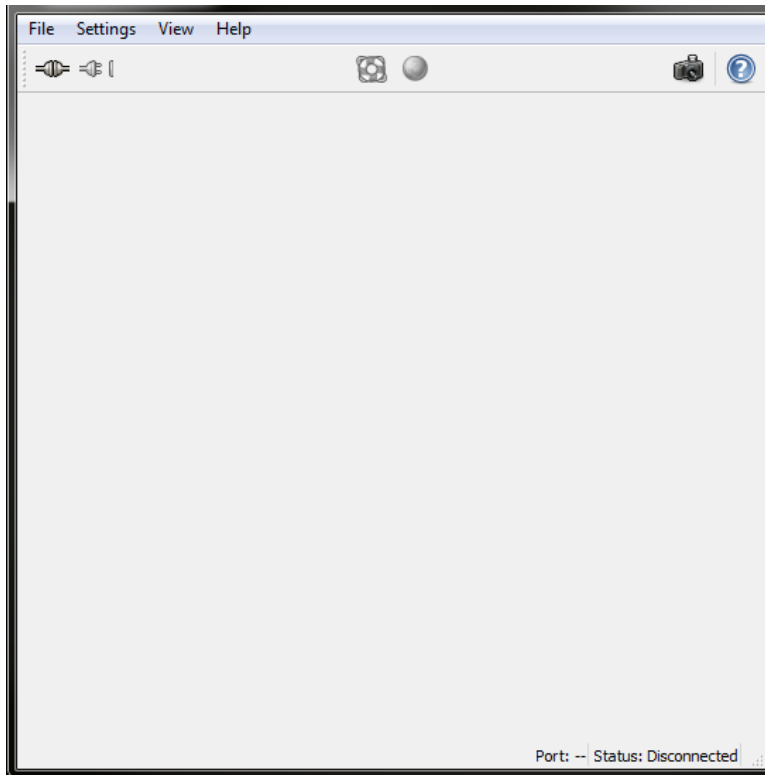
Figure 9: Disconnected GNSS Device

5. Select the communications settings for the connected receiver.
   a. For a serial port, select the *Port Name*, *Baud Rate*, *Parity*, *Data Bits*, and *Stop Bits*; or let C-Scape determine the settings by selecting *Auto Baud*.
   b. Some devices, including the **Oceaneering® C-Nav3050®** GNSS receiver, can also be connected via an Ethernet connection. To connect via Ethernet, select the *Protocol* then enter the *Remote Address* and *Remote Port*.
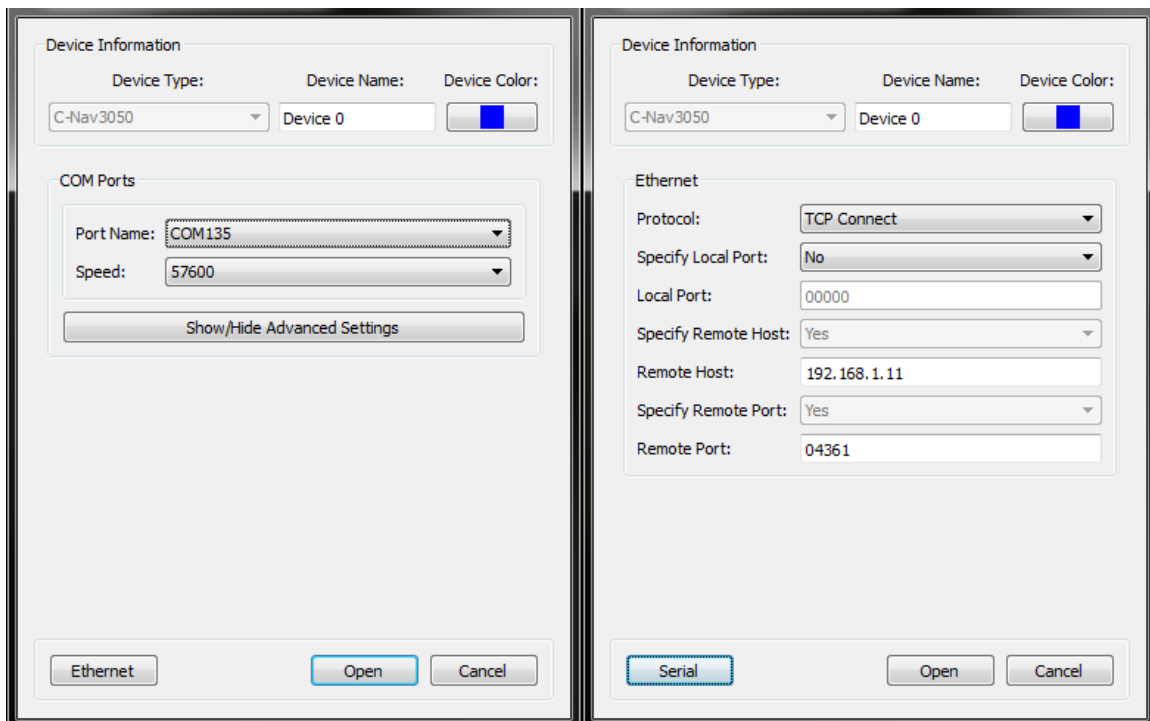
Figure 10: Configuring the GNSS Port Connection

6. Allow 2-5 seconds to establish communication with the device. Additional time may be required *Auto Baud* option was selected.

7. The status bar will read "Connected" once communication has been established.
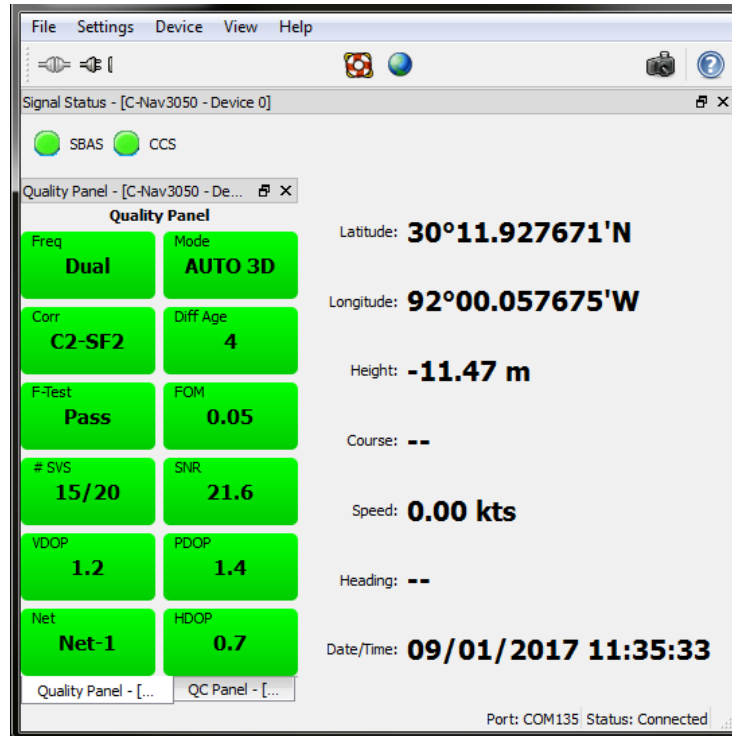
Figure 11: Connected GNSS Device

8. The main C-Scape window as well as each device window has a **Snapshot** ( ) button on the toolbar for convenience. This will create a human-readable report of the system, including information for each device. This file is helpful when communicating with C-Nav® Support for troubleshooting.

9. Repeat the steps 2-6 for the gyro and attitude devices.

10. Use **File / New** or the **New** ( ) button on the toolbar to open the **Add New Device** dialog to create the Blended Solution device.

11. Choose the *Device Type* "Blended Solution" and then select a *Device Name* and *Device Color*.
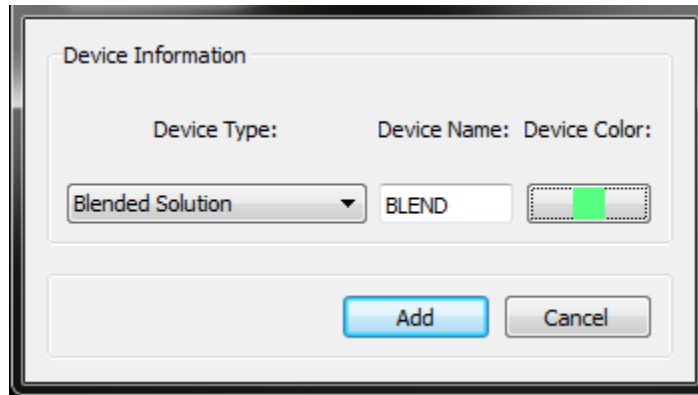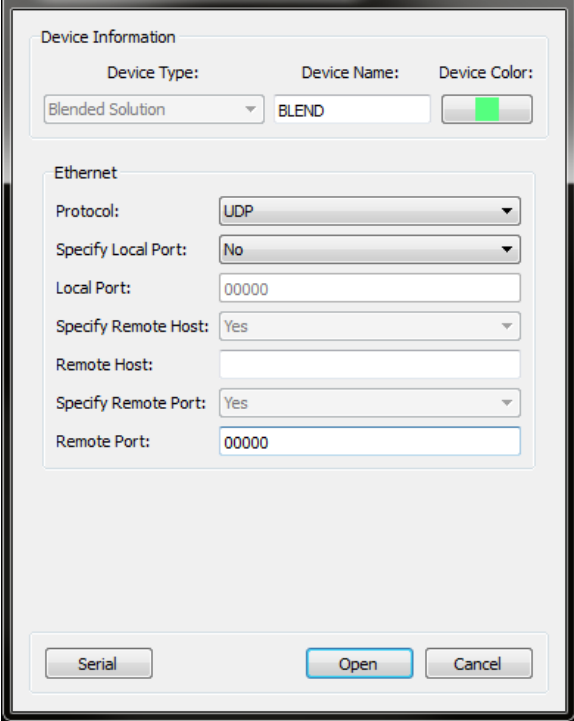
Figure 12: Adding a Blended Solution Device

12. Use *File / Connect Port* or press the **Connect Port** ( ) button on the toolbar to configure the communications settings. Even though the Blended Solution does not actually communicate with any physical device, it still requires a port to operate. Simply select any available COM port at any *Baud Rate*, or if none are available, configure an Ethernet port like the following example:

Figure 13: Configuring the Blended Solution Empty Port Connection

> ***Note:***
> Ensure the *Remote Port* is an unused port.

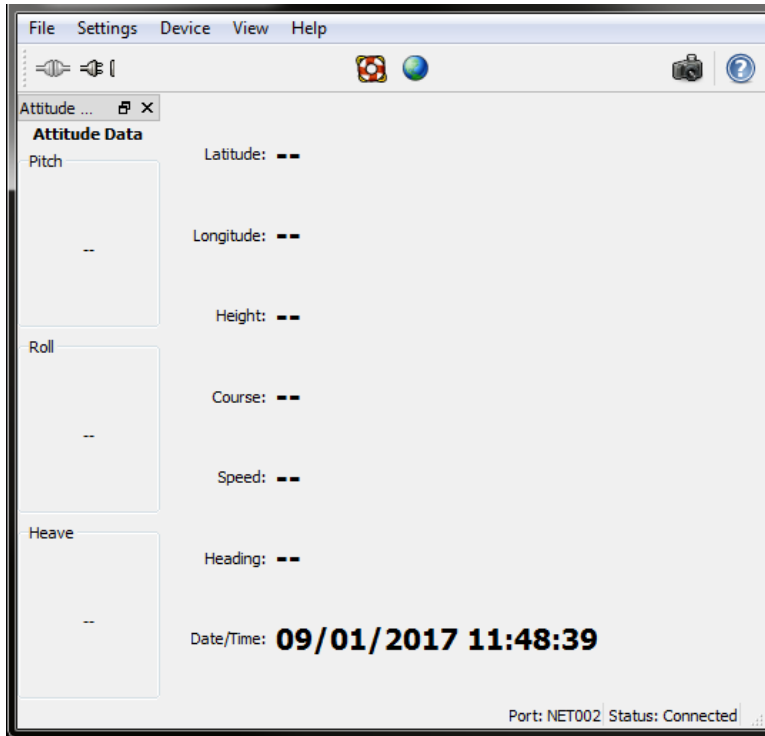13. Once opened, the device window will be blank.

Figure 14: Empty Blended Solution

14. Open the *Device / Configuration* dialog to configure the inputs to the Blended Solution.
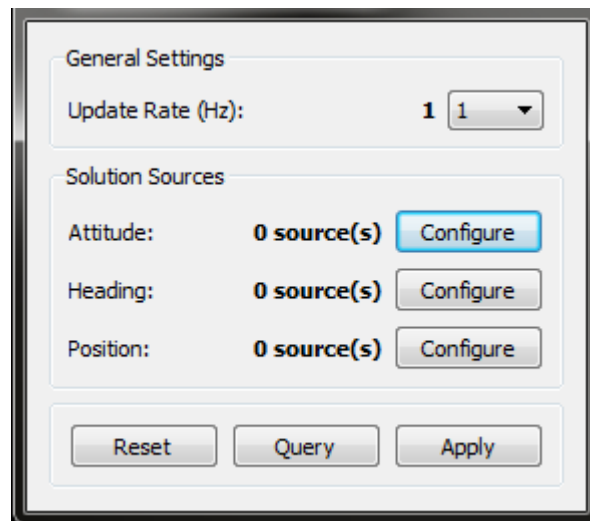

Figure 15: Empty Blended Solution Configuration

15. First, add the Attitude device (if present) to the configuration by pressing the **Configure** button alongside *Attitude*.

16. When the *Attitude Sources* dialog appears, press the **Add** button to add a new attitude source.

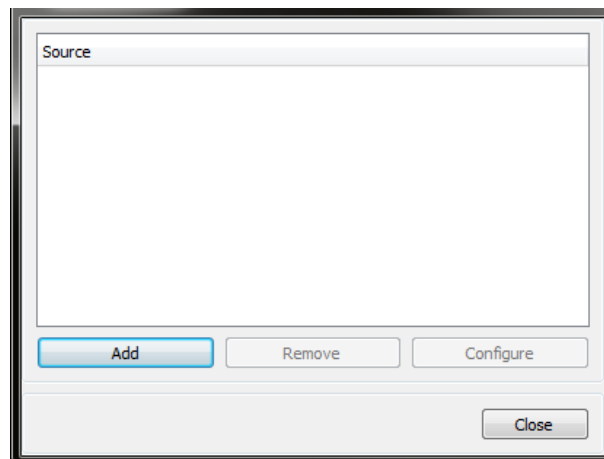

Figure 16: Attitude Sources Dialog

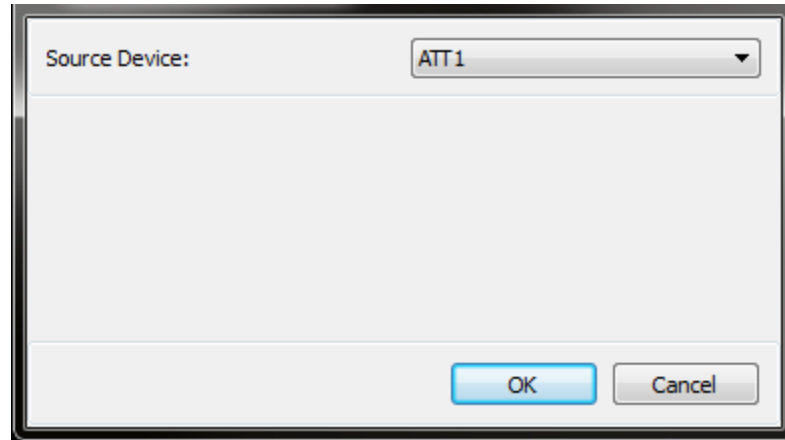17. Select the attitude device from the *Source Device* list and press **OK**.

Figure 17: ATT1 Attitude Source Configuration

18. Press the **Close** button in the *Attitude Sources* dialog and return to the in the *Configuration* dialog.

19. Next, add the heading device to the configuration by pressing the **Configure** button alongside *Heading*. A heading device is always required.

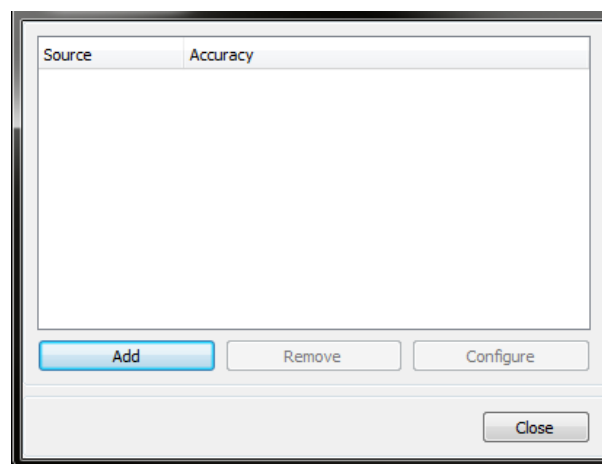20. When the *Heading Sources* dialog appears, press the **Add** button to add a new heading source.

Figure 18: Heading Sources Dialog

21. Select the heading device from the *Source Device* list. If desired, enter the *Nominal Accuracy* of the gyro device and any *Heading Correction*. Press **OK** when finished.

Figure 19: HDG1 Heading Source Configuration

22. Press the **Close** button in the ***Heading Sources*** dialog and return to the in the ***Configuration*** dialog.

23. Lastly, add the position device to the configuration by pressing the **Configure** button alongside *Position*. A position device, GNSS or INS, is always required.

24. When the ***Position Sources*** dialog appears, press the **Add Source** button to add a new position source.

Figure 20: Position Sources Dialog

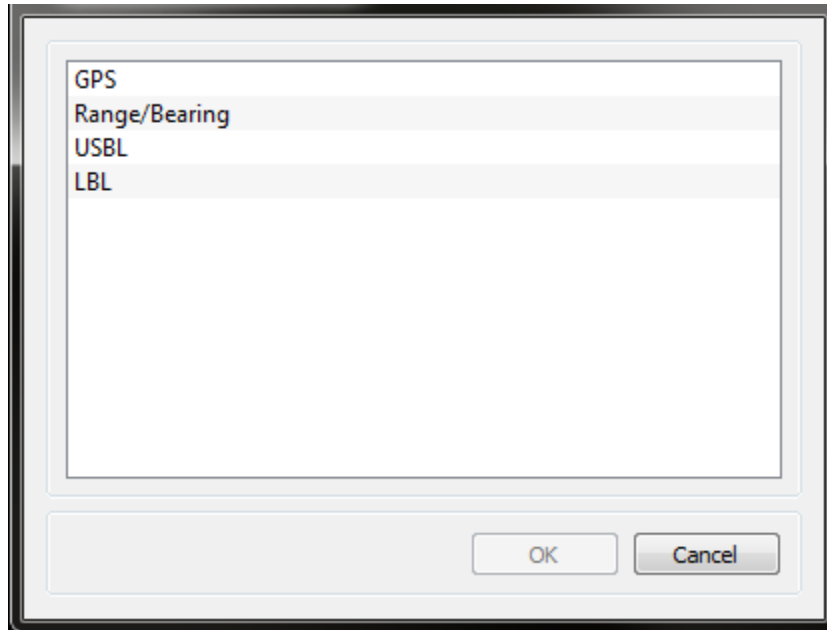25. Select the type of position source and press **OK**.

Figure 21: Position Source Type

26. Select the GNSS device from the *Source Device* list. Each Position source has *Position Offsets From Reference Point* and an *Expected Position Accuracy*.
    a. The offsets are the distance from the vessel's reference point **to** the position device.
    b. The *Expected Position Accuracy* is a weight associated with the GNSS' differential mode. The higher the weight, the worse the solution is. Standard C-Nav® CCS differential is considered a *High Quality Solution*.

> ***Note:***
> The Reference Point is the position on the vessel to which all offsets and ship shape data are referenced. It is typically the ship center or stern midpoint.

Figure 22: GPS1 Position Source Configuration

27. Press **OK** when finished.

28. Press the **Close** button in the *Position Sources* dialog and return to the in the *Configuration* dialog.

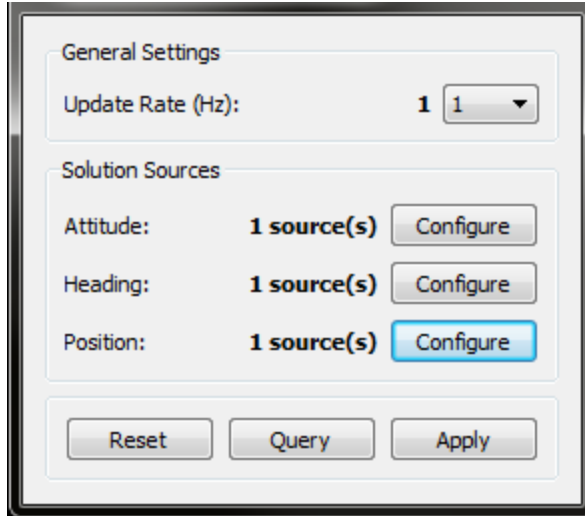29. Each source is modified immediately, so there is nothing more to do.

Figure 23: Complete Blended Solution Configuration

30. The Blended Solution is now configured and should be outputting the position of the vessel's reference point based on the input devices' data.
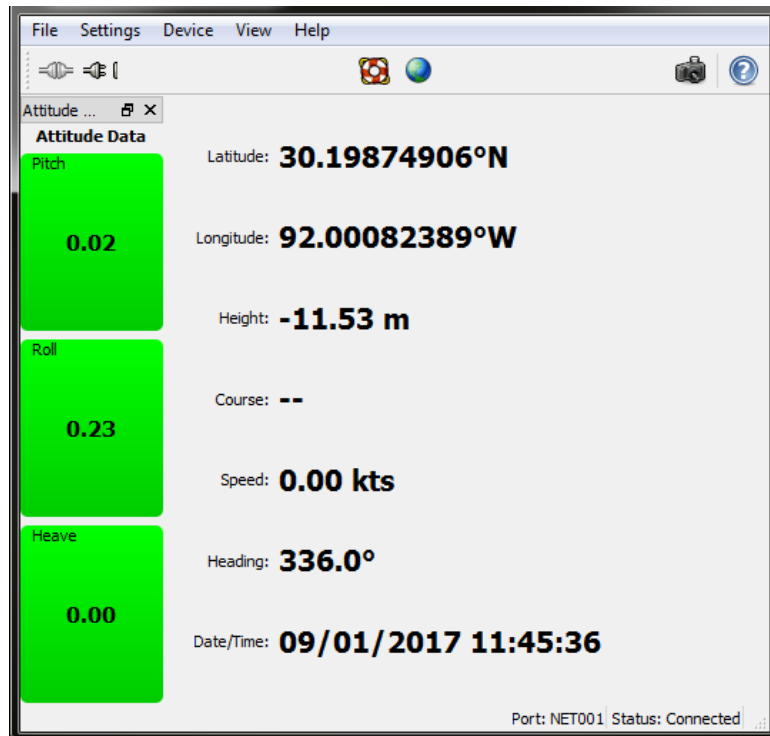
Figure 24: Fully Configured Blended Solution

Configuring Settings

There are three important settings when configuring C-Scape: *Distance Unit*, *Display Coordinate System*, and *Projects Directory*.

The distance units are set in the ***Settings / General Settings*** dialog of the C-Scape main window. There are other settings in this dialog that affect the display of C-Scape including: display *Lat/Lon Format*, Day / Night mode settings, and *Local Time Offset from UTC.* Configure as desired.

Figure 25: Configured General Settings

> ***Note:***
> Any points or objects imported into C-Scape must be using the same distance units as the selected *Distance Unit*.

The *Display Coordinate System* is configured in the **Geodetics / Geodetic Settings** dialog of the C-Scape main window. All positions, both Latitude / Longitude and Northings / Eastings, will be displayed in this coordinate system. Select the *Group*, *Zone*, and *Datum* desired and press **Apply**.

For test purposes, "WGS 84" for *Datum* and "UTM" for *Group* are a good choice. A table of UTM zone numbers is given in Appendix D - UTM Zones (Page 58).
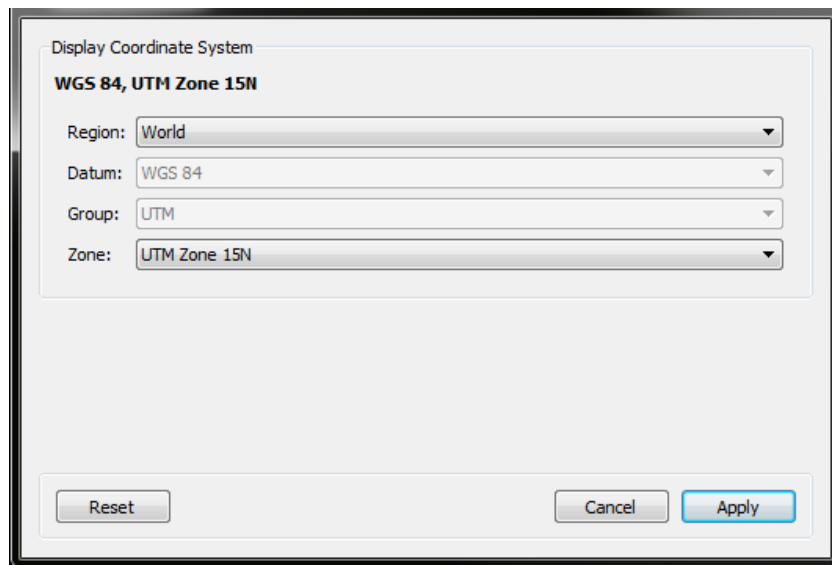
Figure 26: WGS84 UTM Zone 15N Coordinate System

> *Note:*
> Any objects imported into C-Scape must be in the same coordinate system as the selected *Display Coordinate System*. For example, AutoCAD files or a list of points.

The *Projects Directory* is the location of all projects and their data. This must be set before creating or using any project. The first attempt to open the **Overhead View** will automatically prompt the user to set this directory. It can be changed at any time by selecting the **Projects / Project Settings** dialog in the **Overhead View**.
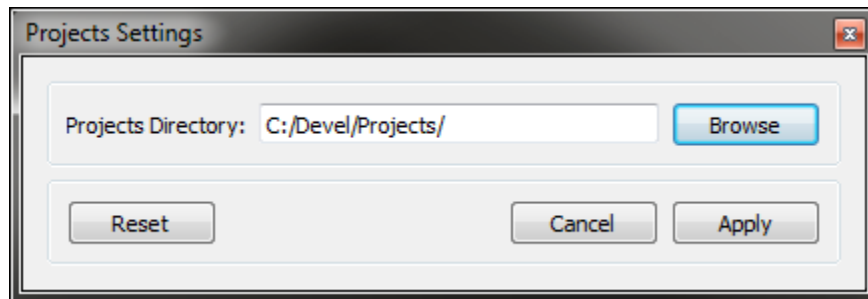
Figure 27: Configured Projects Directory

Configuring the Primary Vessel

There are several types of vessels available in C-Scape, but the most important is the Primary Vessel. It represents the user's position in the *Overhead View* and all alerts, calculations, and *Overhead View* displays use the Primary Vessel's position.

The first step in configuring the Primary Vessel is to configure its shape in the *Vessels / Primary Vessel / Ship Shape* dialog of the *Overhead View*. There is a list of default ship shapes or the user can create a customized shape by manually adding each point of the vessel. Once the ship shape is configured, press **Apply** and the close the dialog.
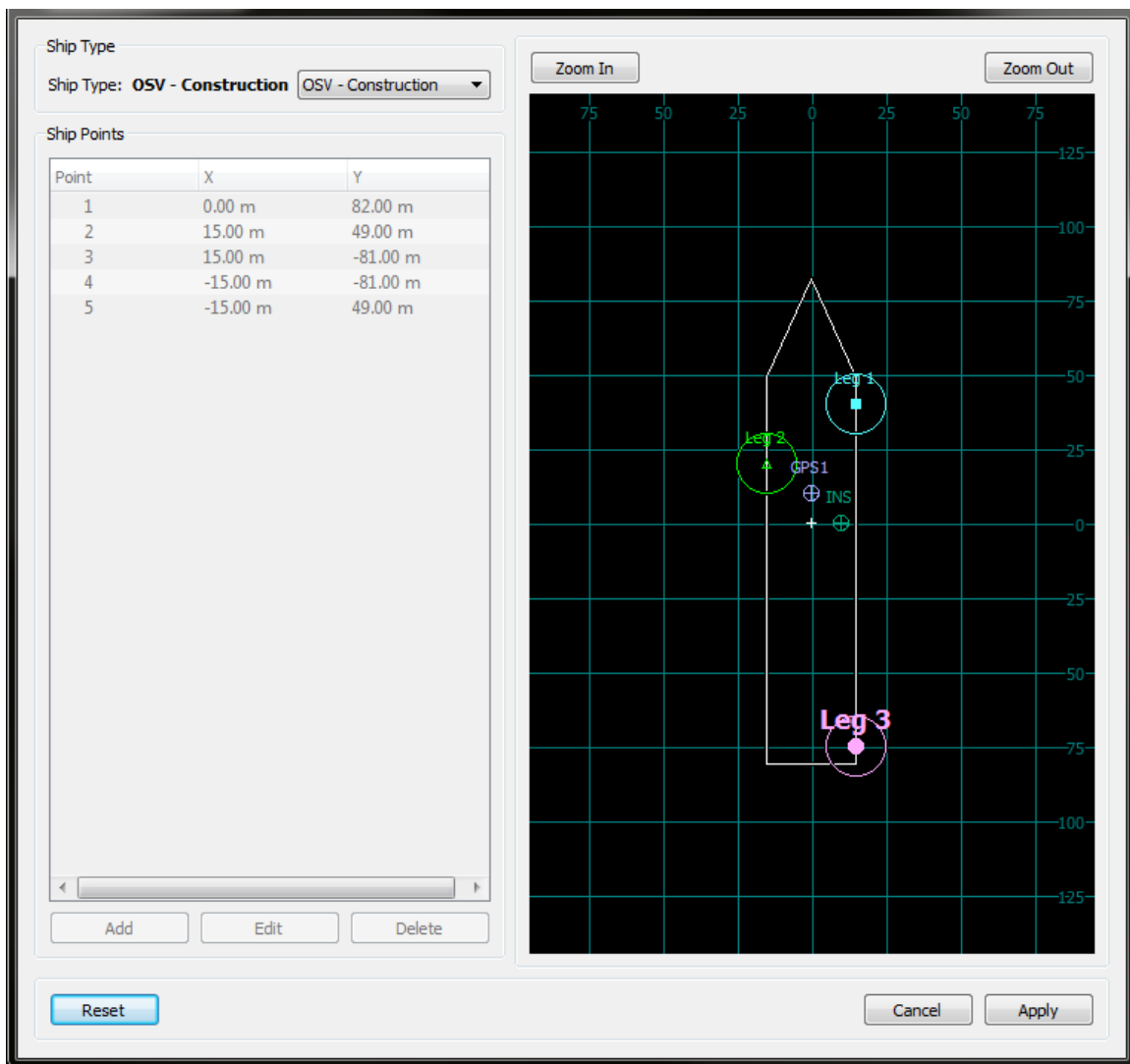
Figure 28: Drill Ship Shape

> **Please note**:
> For reference, any *Position Sources* or *Offsets* of the vessel will be shown on the map.

Next, configure the Primary Vessel's offsets in the **Vessels / Primary Vessel / Offsets** dialog of the **Overhead View**.
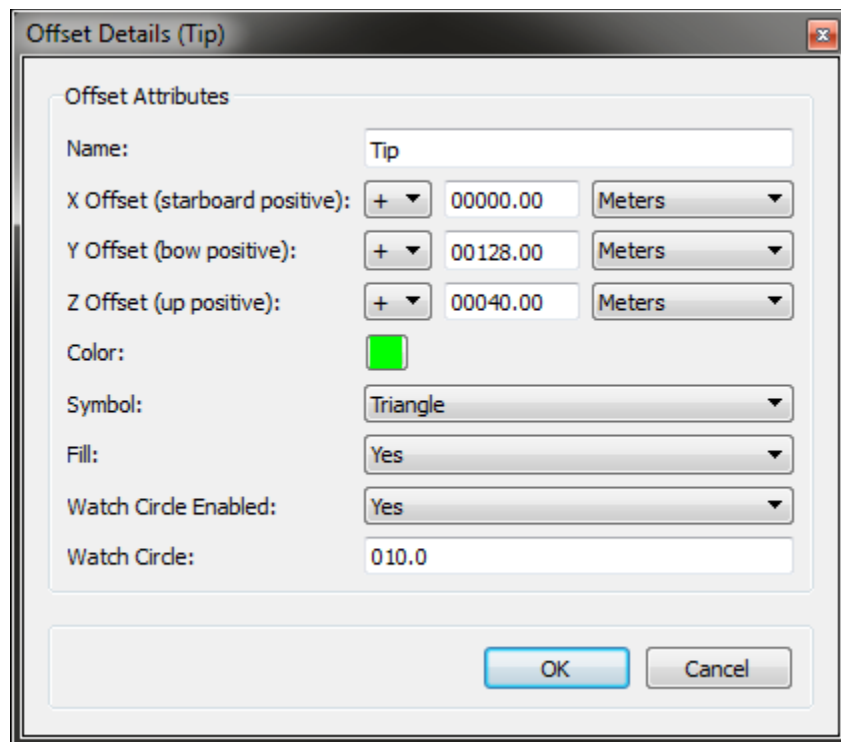
Figure 29: Sample Offset Details

Once all offsets have been defined, press **Apply** and close the dialog.

The last step in configuring the Primary Vessel is the **Vessels / Primary Vessel / Ship Settings** dialog of the **Overhead View**.

There are many settings available for each vessel, but the most important ones are the *Input Device* and *Primary Offset*.

The Input Device is the vessel's data source, which should be the Blended Solution device as each vessel needs position and heading data. Select "BLEND" from the *Input Device* drop-down.

> **Please note**:
> Once the *Input Device* has been selected, the *Position Sources* of the selected device will be drawn on the vessel.

The *Primary Offset* is the location on the vessel from which all calculations are derived. Select the *Primary Offset* to be one of the previously created offsets.

Configure other settings as desired and press **Apply**. The vessel will now start positioning correctly in the **Overhead View**.

Figure 30: Primary Vessel Settings

> **Important**:
> The position shown with the **Overhead View** is that of the *Primary Offset*.

Configuring the Project

> **Warning**:
> Any projects created using C-Scape 1.x are not compatible with C-Scape 7.x.

C-Scape allows the user to create a project to store all related data in one location. By default, there will always be the "StdProj". There two ways to create a new project:
1. **New Project** dialog
2. **Import Project** menu item

The **Projects / New Project** dialog of the **Overhead View** allows the user to create a new project based off an existing project. Open the dialog and give the new project a *Name*. Base it off the "StdProj" project and press **OK**.
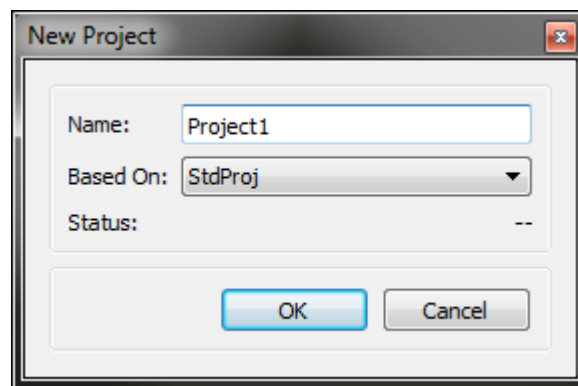
Figure 31: Creating Project1

This will create a new project called "Project1" and store the data in the *Projects Directory* configured earlier.

Alternatively, if the project already existed on another computer, it can be imported by using the **Projects / Import Project** menu item of the **Overhead View**. Once C-Scape has imported the project, the user will be prompted to switch to the new project. Select "Yes" to do so.
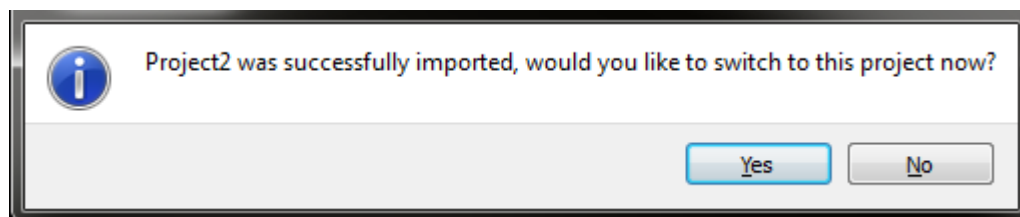
Figure 32: Import Project Prompt
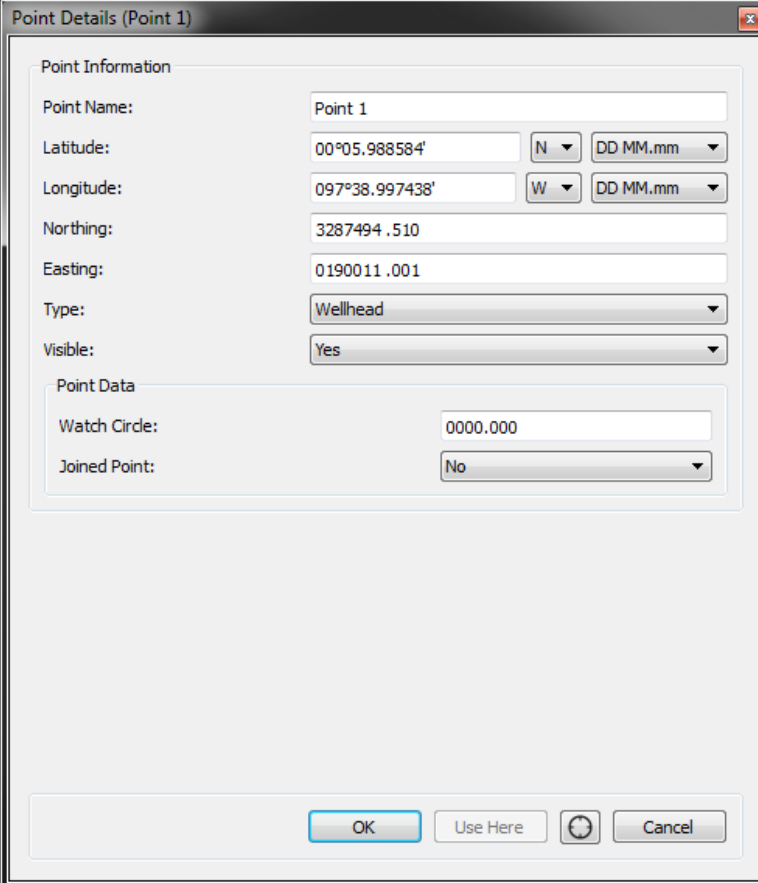
> **Note:**
> When C-Scape imports or creates a project, the name of the directory will be the same name as the project.

Now that the project has been created, all of the project details need to be created. Each project will likely have a series of Points, Objects, and Layers.

Points

If the list of points has been previously created, they can easily be imported using the ***Points / Import Points*** menu item of the ***Overhead View***. Otherwise they will need to be created manually.

In the ***Points / Points*** dialog of the ***Overhead View***, create a new point by pressing the **New** button. Give the point a unique name and enter its coordinates. Alternatively, by pressing the **Get Point** (⭕) button the user can click on in the ***Overhead View*** map to select the coordinates of the point. Selecting the *Type* of point will determine how the point is drawn in the ***Overhead View*** (its color and shape).

Figure 33: Sample Point Details

After all points have been created, press **Apply** and close the dialog.

Objects

Objects are similar to points, with the difference that an object is a series of connected points. The objects can either be imported via the *Points / Import Objects* menu item of the *Overhead View* or manually added in the *Points / Objects* dialog of the *Overhead View*.
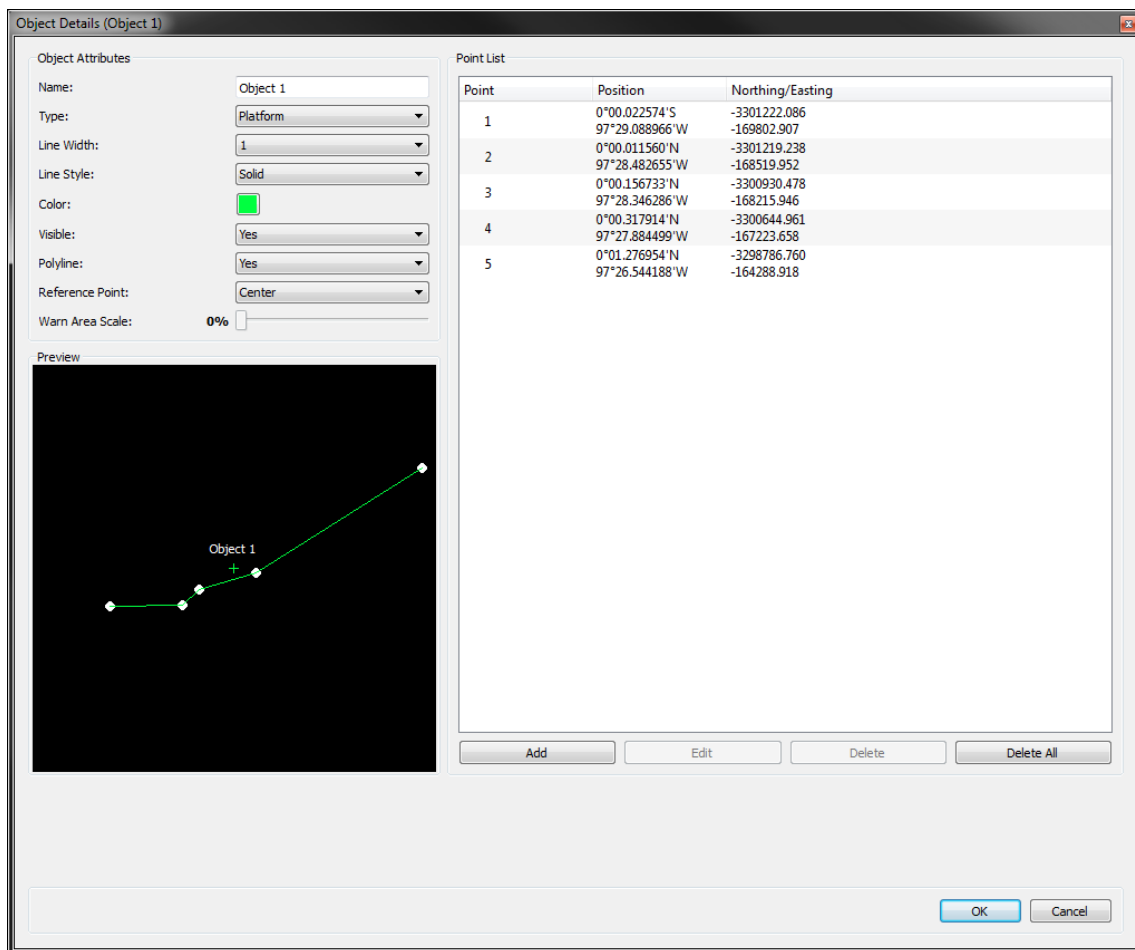
Figure 34: Sample Object Details

Layers

A layer is a representation of an AutoCAD file. They are useful for displaying large amounts of pre-determined points and objects in the work area.

C-Scape supports the following AutoCAD files:
- ASCII or Binary
- Versions 2.5 to 2014
- Three file formats:
  - .dxf
  - .dwg
  - .bdxf

The following AutoCAD object types are currently supported:
- Arcs

- Attribute text
- Block references
- Circles
- Ellipses
- Hatches
- Simple lines
- Points
- Polylines
- Solids
- Text

The following AutoCAD object types are currently not supported:
- Faces
- Linear and rotated dimensions
- Raster images
- Splines
- Wipeouts
- Viewports

Note:
While there is no artificial limit on the size and complexity of the AutoCAD files supported, there is a real-world limit based on the processing power of the computer C-Scape is running on. This limitation will also vary depending on other aspects of the *Overhead View* configuration such as the *Map Settings* or the number of *Auxiliary Vessels*.

To add layers to a C-Scape project, open the *View / Layers* dialog. Press the **New** button and select the AutoCAD file. When C-Scape is finished importing the file, it will display a list of any errors that occurred during the import (unsupported object types for example).

Note:
Any layers imported into C-Scape must be in the same coordinate system as the selected *Display Coordinate System*. If this does not match, the layer will not be imported to the correct location.

Configuring Alerts

There are four types of alerts in the *Overhead View* of C-Scape:
- Proximity Alerts
- NoGo Alerts
- Navigation Alerts
- Heading Deviation Alerts

Proximity Alerts are used to keep the vessel within a certain range of the desired target. If the vessel strays from the target, increasing alerts are generated. There are three levels of Proximity Alerts:
- White
- Yellow
- Red

Each alert has a distance and sound associated with it. As the vessel strays past the alert distance, the sound is triggered and the Navigation Alert Panel will flash.

Figure 35: Normal vs Flashing Red Alert

To configure each alert, open the **Settings / Alerts / Alert Settings** dialog in the **Overhead View**. Select the desired *Alert* from the table and set the *Distance* and *Sound*. Press **Apply** after configuring each alert.
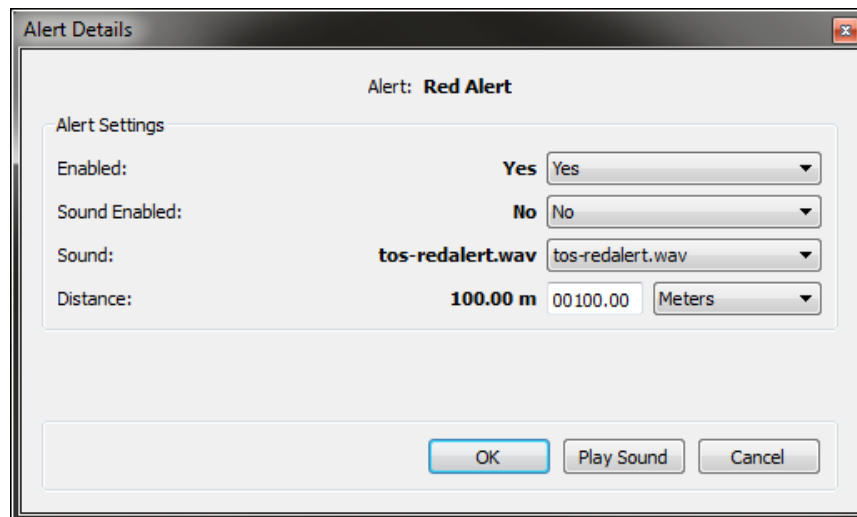
Figure 36: Configured Red Alert

New sounds can be added to the list of options by placing *.wav files in the Sounds directory of the C-Scape installation. By default this is located at:
> C:\Program Files (x86)\C-Nav\C-Scape\resource\C-Scape\sounds

Each sound file can be tested by selecting the file in the *Sound* drop-down and pressing the **Play Sound** button.

The Navigation alerts are triggered when there is an issue with navigation. Currently there are three navigation alerts:
- No Position
- No Heading
- Coverage

No Position alerts are generated when the *Input Device* of the vessel loses position. Similarly, the No Heading alert is triggered when the *Input Device* of the vessel loses heading. The Coverage alert is used in conjunction with the Ghost Ship, and is beyond the scope of this document. Please read the full C-Scape manual or the help files for more details.

Like Proximity Alerts, the Navigation alerts have an alert sound associated with them. To configure this sound, open the **Settings / Alerts / Alert Settings** dialog in the **Overhead View**. Select the "Navigation Alert" from the drop-down and set the *Sound*. Press **Apply** and close the dialog.

Figure 37: Configured Navigation Alert

Heading Deviation alerts are used to keep the vessel's heading within a certain range. Like Proximity Alerts, there are three levels:
- White
- Yellow
- Red

Each alert has a deviation and sound associated with it. As the vessel strays past the heading deviation limit, the sound is triggered and the Heading Deviation Alert Panel will flash.

The *Desired Heading* is set in the ***Vessels / Primary Vessel / Ship Settings*** dialog of the ***Overhead View***.
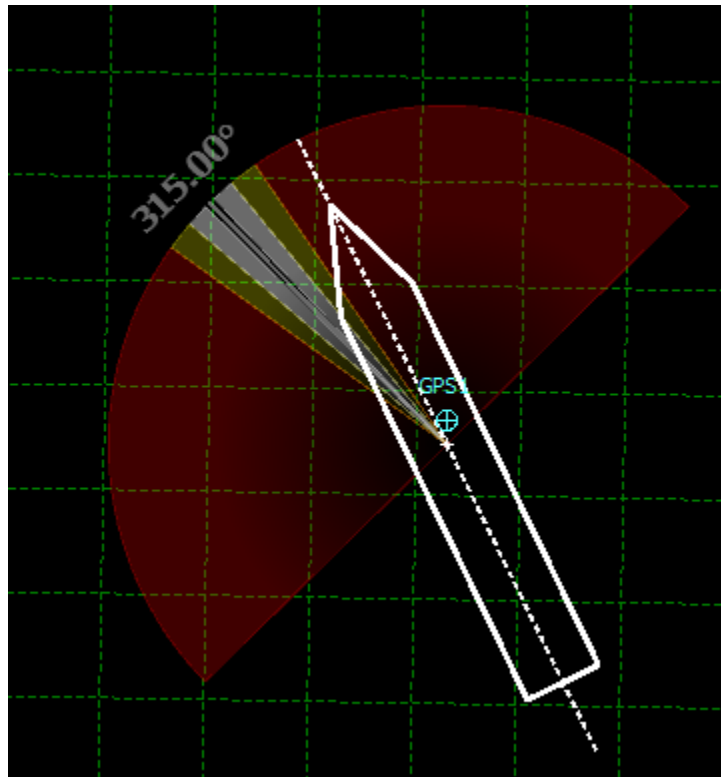
Figure 38: Heading Deviation Alerts

Note:
The heading deviation alerts are only active when the heading is within ±90° of the *Desired Heading*.

Selecting the Current Point

The final step in configuring C-Scape is to select the *Current Point*. The *Current Point* is the destination target of the vessel and is used in the *Range* and *Bearing* calculations shown in the **Overhead View** and the Proximity Alerts. It can be either a point or an object and is selected in the **Points / Current Point** dialog of the **Overhead View**. To select the *Current Point*, highlight the desired point or object in the list and press **Apply**.

Name	Position	Northing/Easting	Type
Point 3	30°11.880000'N 92°00.540000'W	3341140.659 595391.714	Template
Point 2	30°12.349722'N 92°00.091690'W	3342014.516 596103.368	Wellhead
Point 1	30°12.330237'N 92°00.197764'W	3341977.036 595933.513	RBS Target
Object 2	30°11.854623'N 91°59.945685'W	3341102.126 596345.633	Flowline
NoGo 2	30°11.922652'N 92°00.189895'W	3341224.339 595952.726	NoGo
NoGo 1	30°12.011816'N 91°59.699462'W	3341395.939 596738.110	NoGo

Reset   Cancel   Apply

Figure 39: Selected Current Point

After selecting the *Current Point*, C-Scape is now ready for operation. In the following screenshot, the vessel is using the offset "Crane" as the *Primary Offset*, and is navigating to "Point 2". Drawn around "Point 2" are the proximity alert ranges.

Currently there is a red proximity alert as shown in the Navigation Alert Panel, the status bar, and the alert messages scrolling across the bottom of the dialog.
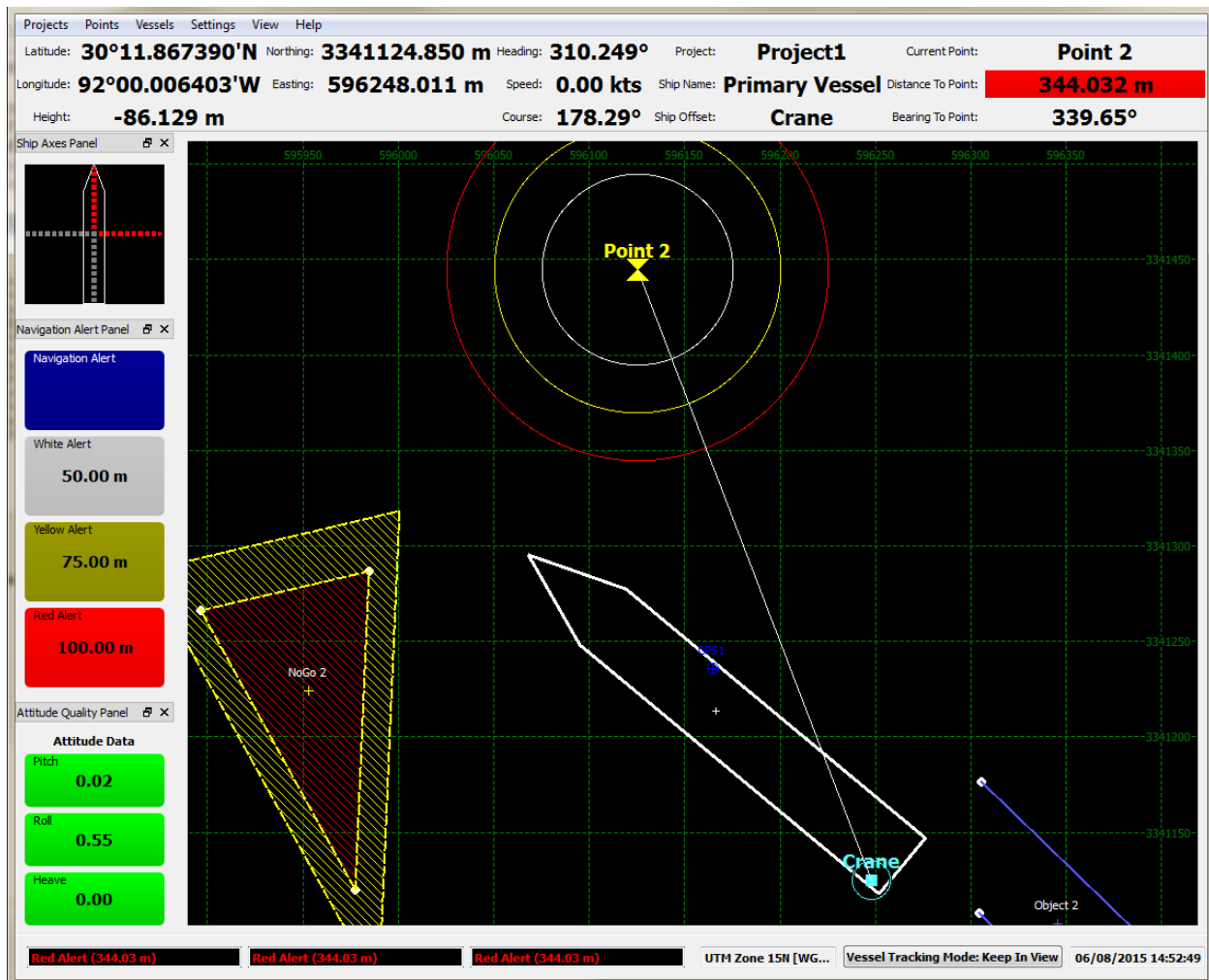
Figure 40: Fully Configured C-Scape

Project Report

Once C-Scape is fully configured, the user can generate a Project Report for their records. Open the ***Projects / Project Details*** dialog in the ***Overhead View***. Enter the desired information and press the **Generate Report** button. C-Scape will output an HTML file containing all of the pertinent project information.

Figure 41: Project Report Details

> **Note:**
> The report is designed to fit on one side of an A4 sheet of paper, but is dependent on the length of various sections.

Section 4 - Troubleshooting

Snapshot

In the event of an issue, the first step when contacting C-Nav® Support is to create a snapshot of the system. The snapshot is a human-readable report of the system, including information and settings for each device, C-Scape settings, and general configuration information. This file will detail to C-Nav® Support how the user's system is configured.

There are multiple ways to save a snapshot. In the main window or any device window, the user can select *File / Save Snapshot* or press the **Snapshot** button on the toolbar.

Figure 42: Snapshot Button in Toolbar

The system will prompt for a location to save an .html file. After saving the file, the user can send it in to C-Nav® Support along with a description of the issue.

> *Note:*
> A snapshot with no data indicates that C-Scape is not communicating with the connected device(s).

Log Data

1. In order to troubleshoot certain issues, C-Nav® Support will need raw logged data. Each device can log its own data using the *File / Log Data*.
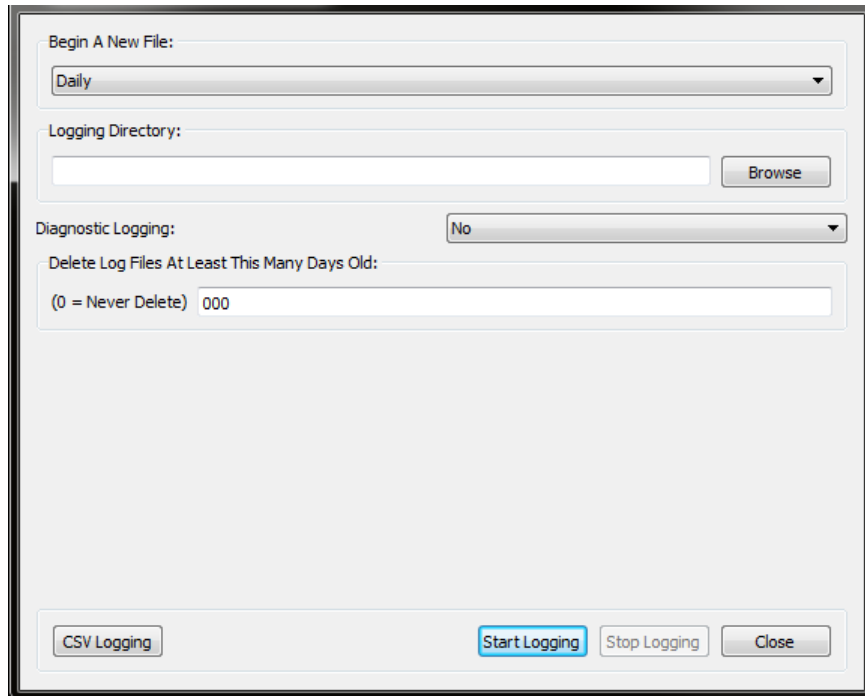
Figure 43: Log Data Dialog

2. Select the logging regime in the *Begin A New File* dropdown.

Regime	Function
Daily	Generates a new log file at midnight UTC each day.
Hourly	Generates a new log file at the top of each hour.
Each Time Start Logging	Generates a new log file each time the **Start Logging** button is pressed.
Never (Fixed File Name)	Saves to a single file, no matter how long logging is active.

Table 1: Logging Regimes

3. Select the *Logging Directory* to write the log files to. If "Never (Fixed File Name)" is selected as the logging regime, this will be the file name to save to.

4. Certain devices like the C-Nav3050® GNSS receiver can add diagnostic data to the log file. This extra data is useful in a small number of situations but causes

the log files to be significantly larger in size. It is not necessary to enable *Diagnostic Logging* unless asked by C-Nav® Support.

5. If disk space is limited, the user can set the device to only keep a limited number of days of log files. After the desired number of days has passed, log files that are older will be deleted. If disk space is not an issue, leave this setting at "0".

6. Certain devices have the ability to log data in both raw binary and CSV format. For troubleshooting purposes, always use raw binary. Raw binary is the default format when opening the **Log Data** dialog.

7. Press the **Start Logging** button to begin logging. Logging will continue until C-Scape is closed or the **Stop Logging** button is pressed. If C-Scape is closed while logging is active, it will begin again when C-Scape is re-opened.

Appendix A - C-Scape Work Flow

This shows the work flow and methodology of the data displayed on C-Scape.
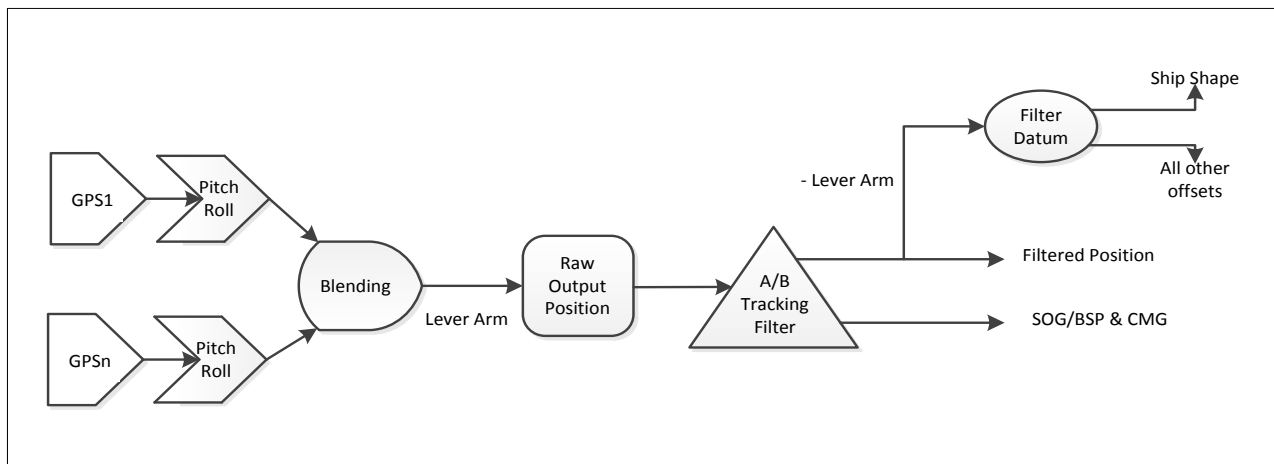
Figure 44: C-Scape Work Flow

1. The Blended Solution device averages all of the pitch and roll values from the *Attitude Sources*.

2. The Blended Solution device averages all of the heading values from the *Heading Sources*.

3. The Blended Solution device then applies blended pitch, roll, and heading values to each *Position Source* of the Blended Solution device. Pitch is applied as an along ship adjustment with the roll being applied as an across ship adjustment. The heading adjustment uses the *Position Offsets From Reference Point* of each *Position Source* to rotate the position around the datum.

4. Each *Position Source* is given a weight based upon several quality metrics of its data and its configured *Expected Position Accuracy*.

5. All the *Position Sources* are then blended together to provide a single position. The Blended Solution device will output this position.

6. The vessel will read the raw blended position as the position of the *Primary Offset*.

7. Raw values are instantaneous and if plotted would result in sudden jerky movements so they are passed onto an Alpha Beta filter to smooth the data.

Alpha Beta filters are simplified Kalman filters but do not require a detailed system model. It uses previous sampled values as inputs to calculate current values thus smoothing out as it goes.

8. This results in a smoothed output position, Speed Over Ground (or Bottom Speed), and Course Made Good values at the location of the *Primary Offset*.

9. C-Scape will then use the *Primary Offset*'s offset values to calculate the position of the vessel datum.

10. From the calculated datum position, C-Scape will calculate the position of all other defined Offsets using their offset values.

11. The Blended Solution device will also give a Northing and Easting value within its *Status* dialog to represent the error between the calculated offset position and the observed position.

Blended Solution Status

Solution:					Position					
Status Time:									Tue May 9 18:22:53 2017 UTC	
Position:									596145.328, 3341234.874	
Source	Allow	Status	Weight	X	Delta X	Y	Delta Y	Across	Along	Details
INS1	Yes	Used	0.31	596149.214	3.886	3341233.913	-0.961	3.445	2.040	
GPS1	Yes	Used	0.69	596143.550	-1.778	3341235.313	0.439	-1.575	-0.933	

Toggle Allowed

Figure 45: Blended Position Status

Appendix B - Shortcut Keys

C-Scape has a number of shortcut keys that are useful when navigating and operating the **Overhead View**. The functionality of several shortcuts are not discussed in this document, but are listed for completeness.

Key	Function
*	Toggles the visibility of the Cursor Position toolbar
-	Toggles the visibility of the Measurement toolbar
Page Up	Zooms the **Overhead View** map out one step
Page Down	Zooms the **Overhead View** map in one step
F1	Opens the Help file
F5	Creates a new point at the *Primary Offset*'s current location
F6	Allows the user to create a new point by clicking on the **Overhead View** map.
F10	Creates a Man Overboard Fix at the *Primary Offset*'s current location
Home	Cycles through the available *Vessel Tracking* modes
End	Centers the map on the Current Point

Table 2: Shortcut Keys

Other useful functions include:
- Scrolling the mouse wheel will zoom in and out of the *Overhead View* map.
- Left-clicking on the *Overhead View* map and dragging the mouse will pan the map.
- Hovering the mouse over any point, object, or vessel will display detailed information about the point, object, or vessel.
- Clicking on a point or object will allow the user to open the details dialog for that point or object, or to set it as the Current Point.
- Clicking on a vessel will allow the user to open any of the vessel's settings dialogs.
- Left-clicking on an active alert indicator will silence the alert sound. The sound will remain silenced until the alert is no longer active. The sound will start again if the alert becomes active again.

Appendix C - File Locations

There are several files used by C-Scape that are in various locations on the computer. The on-disk location of each of these files is determined by the version of Windows the computer is running.

Settings File

C-Scape automatically saves all device configuration data, and all data not specifically related to a project, to a single settings file. Each user has their own version of the settings file. This file is located at:

Windows Vista and higher:
C:\Users\{USERNAME}\AppData\Local\C-Nav\C-Scape\ConnSetting.ini

Windows XP:
C:\Documents and Settings\{USERNAME}\Local Settings\Application Data\
C-Nav\C-Scape\ConnSetting.ini

This file can be exported or imported using the **Settings / Export Settings** or **Settings / Import Settings** menu items of the main window.

Project Settings Files

Each project contains a directory of the same name and all projects are stored in the *Projects Directory* configured by the user. Inside of each project folder, there are several files and folders.

- ProjectSettings.ini contains the settings specific to a project. These include:
  - o Geodetics
  - o Ghost Ship settings
  - o Logging Settings
  - o Map Settings
- Points.ini is a list of all points defined for this project
- Objects.ini is a list of all objects defined for this project
- data\ is a subdirectory that contains all automatically generated log files for this project. This includes:
  - o *.msgs are daily log files that contain a list of all alert messages generated by C-Scape.

- o *.rpt are daily log files that contain the periodic reports generated by C-Scape

Note:
Alarms generated in C-Scape are not written to the *.msgs files; only alerts generated in the ***Overhead View***.

All files in the project folder are imported, exported, or backed up when using the various ***Project*** dialogs.

Configuration Files

C-Scape has several files that are not user-specific, so are stored in a common directory. These two files control the CCS OTI server list and the Corrections Satellite Configuration list. Besides these two configuration files, this directory is the location of the backups folder for creating backups of projects.

The directory for these files is:

Windows Vista and higher:
C:\ProgramData\C-Nav\C-Scape\

Windows XP:
C:\Documents and Settings\All Users\Application Data\C-Nav\C-Scape\
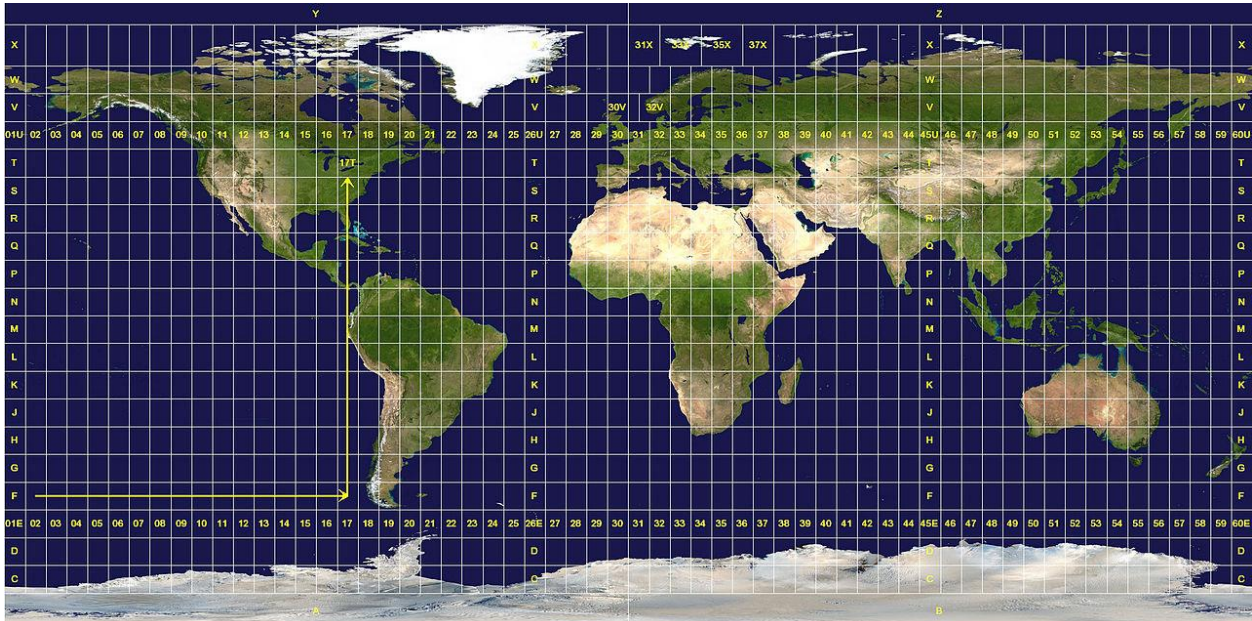
Appendix D - UTM Zones

Figure 46: Map of UTM Zones

> **Note:**
> The above image was created by the United States Government. The image is for informational purposes only and Oceaneering International, Inc. is not responsible for its accuracy.

Zone	Starting Longitude	Ending Longitude	Zone	Starting Longitude	Ending Longitude
01	180° W	174° W	31	000°	006° E
02	174° W	168° W	32	006° E	012° E
03	168° W	162° W	33	012° E	018° E
04	162° W	156° W	34	018° E	024° E
05	156° W	150° W	35	024° E	030° E
06	150° W	144° W	36	030° E	036° E
07	144° W	138° W	37	036° E	042° E
08	138° W	132° W	38	042° E	048° E
09	132° W	126° W	39	048° E	054° E
10	126° W	120° W	40	054° E	060° E
11	120° W	114° W	41	060° E	066° E

12	114° W	108° W		42	066° E	072° E
13	108° W	102° W		43	072° E	078° E
14	102° W	096° W		44	078° E	084° E
15	096° W	090° W		45	084° E	090° E
16	090° W	084° W		46	090° E	096° E
17	084° W	078° W		47	096° E	102° E
18	078° W	072° W		48	102° E	108° E
19	072° W	066° W		49	108° E	114° E
20	066° W	060° W		50	114° E	120° E
21	060° W	054° W		51	120° E	126° E
22	054° W	048° W		52	126° E	132° E
23	048° W	042° W		53	132° E	138° E
24	042° W	036° W		54	138° E	144° E
25	036° W	030° W		55	144° E	150° E
26	030° W	024° W		56	150° E	156° E
27	024° W	018° W		57	156° E	162° E
28	018° W	012° W		58	162° E	168° E
29	012° W	006° W		59	168° E	174° E
30	006° W	000°		60	174° E	180° E

Table 3: List of UTM Zones