OXTS

NAVdisplay
USER MANUAL

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Common abbreviations

Term	Definition
AB Dynamics	Anthony Best Dynamics
CAN	Controller Area Network
CEP	Circular Error Probability
CPU	Central Processing Unit
DGPS	Differential Global Positioning System
ECCN	Export Control Classification Number
EGNOS	European Geostationary Navigation Overlay Service
FTP	File Transfer Protocol
GAGAN	GPS Aided Geo Augmented Navigation
GLONASS	GLObal NAvigation Satellite System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
IMU	Inertial Measurement Unit
INS	Inertial Navigation System
LED	Light Emitting Diode
MFDD	Mean Fully Developed Deceleration
MSAS	MTSAT Satellite Augmentation System
NMEA	National Marine Electronics Association
NTRIP	Networked Transport of RTCM via Internet Protocol
PPS	Pulse(s) Per Second
RD	Raw Data (an OXTS file format)
RINEX	Receiver INdependent EXchange format
RTK	Real-Time Kinematics
SBAS	Satellite Based Augmentation System
SDCM	System for Differential Corrections and Monitoring
SPS	Standard Positioning Service
TCP	Transmission Control Protocol

TNC	Threaded Neill-Concelman
TTFF	Time To First Fix
TTL	Transistor-Transistor Logic
UDP	User Datagram Protocol
VUT	Vehicle Under Test
WAAS	Wide Area Augmentation System
WGS 84	World Geodetic System 1984
WLAN	Wireless Local Area Network

Table 1:
Common abbreviations

OXTS

Introduction

Thank you for choosing OXTS.

NAVdisplay is a digital dashboard application that provides real-time monitoring of INS and base station products and performs user-defined tests. It is intended to display information from one or more products in an easy to read, and easy to configure, manner using different display items called widgets.

Figure 1:
An example of an Analogue and digital widgets used to display measurements

There are seven different styles of widget available within NAVconfig, including analogue dials, numeric displays and programmable lights. Widgets can be freely added and positioned to create an unlimited number of custom templates, which can in turn be saved for quick access. The process of building and switching between templates makes it easy to create custom templates providing the correct feedback for different applications.

NAVdisplay interprets all OXTS data formats and works with real-time information being transmitted via Ethernet, CAN bus or serial RS232. It can also replay previously saved measurement files that are in OXTS formats.
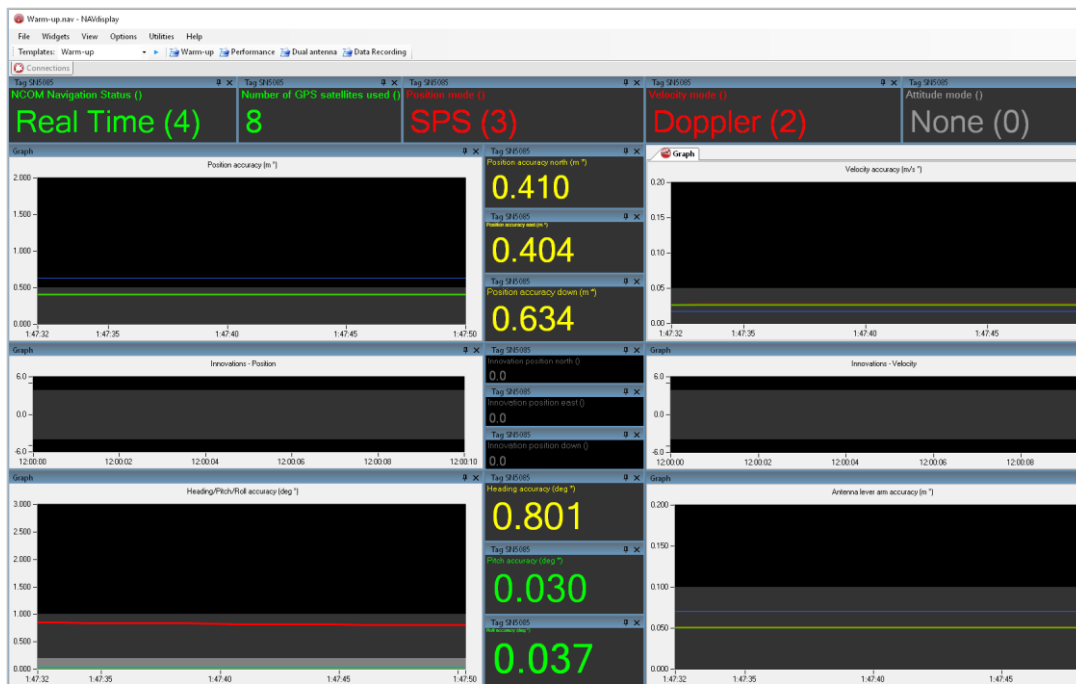
Figure 2:
NAVdisplay main interface

NAVconfig provides a quick and easy way to monitor the live output of devices.

For online help, please visit our support website https://support.oxts.com and navigate to the software section.

NAVsuite software

NAVsuite is a collection of free software applications, including NAVdisplay, that support the use of OXTS inertial navigation systems and base stations. The following section describes the installation process and gives a brief description of the installed applications.

How to install

A USB memory stick containing the NAVsuite software package is supplied with each inertial navigation system or base station. If you don't have access to the USB memory stick, NAVsuite can also be downloaded from the support website (support.oxts.com) by navigating to the software section, then NAVsuite and following the download link.

To run the installer, double-click the NAVsetup.exe icon and then follow the on-screen prompts. If you have downloaded NAVsuite from the support website, you will need to unzip the saved file first.

Note: please restart the PC after the NAVsuite installer successfully completes

System requirements

NAVsuite installs and runs on PCs running Microsoft Windows 7, 8 or 10 (either 32- and 64- bit versions). Please ensure the latest operating system service packs are installed. The following components are also required to run NAVsuite and will be automatically installed if not detected.

+ Microsoft .NET Framework 4.6.1 or newer
+ Microsoft Visual C++ 2010 x86 Redistributable, 10.0.30319.1 or newer
+ Microsoft Visual C++ 2015 Redistributable (x86) 14.0.23026 or newer

While an Ethernet port is not required to launch NAVsuite applications, some features of programs that communicate with products will be unavailable or restricted without one.

Admin rights

For successful installation, administrative rights are required to configure the firewall for the FTP and UDP port, so you may need to contact your system administrator. Write access is also required for the following system folders:

+ Common Files
+ Program Files or Program Files (x86) depending on operating system
+ Program Data
+ Users\<current user>\Documents

To uninstall NAVsuite

NAVsuite can be removed from the PC by navigating to Control Panel > Programs > Programs and Features then selecting NAVsuite from the list and clicking Uninstall. It will then remove all files and applications for NAVsuite. The uninstall feature will not touch the data folder at the path C:\Users\<user name>\Documents\OXTS\NAVsolve.

NAVsuite applications

Table 2 lists the items installed by NAVsuite and gives a brief explanation of their purpose.

Icon	Software	Description
	NAVstart	A menu from which you can navigate between OXTS applications. This opens automatically when you are connected to a unit.
	NAVconfig	Used to create, send, and receive configurations from OXTS products. As configurations vary between products there is no manual for NAVconfig.
	NAVdisplay	Used to view real-time data from OXTS products via Ethernet or a serial port. It can also be used to transmit special commands and replay logged data.
	NAVsolve	Used to download raw data files from the RT and post- process the data. The configuration can be changed and differential corrections can be applied before the data is reprocessed. It can export NCOM, XCOM and CSV file formats.
	NAVgraph	Used to graph NCOM, XCOM and RCOM files created in post-process. It can display graphs, cursor tables and map plots and data can be exported in CSV or KML (Google Earth) format.
	NAVbase	Used to configure and manage RT-Base S and GPS-Base base stations, which can be used to achieve RTK integer level position accuracy.
	Manuals and documents	This folder contains PDF versions of relevant OXTS manuals. Other manuals can be downloaded from the OXTS website.

Table 2:
List of NAVsuite applications

Documentation

In addition to the main applications, the NAVsuite installer also copies a number PDF manuals and help documents to the computer's disk. The documents are located in *C:\Program Files (x86)\OXTS\Manuals* and can be accessed via the OXTS folder in the Start menu.

Communicating with the product

The main method of communication between OXTS products and the PC is Ethernet. As products are configured with static IP addresses, the PC's IP address must also be in the same range as the product IP address for communication to occur. Please see the Communicating with the product section of your product's manual for details on how to do this.

Firewall warning

The first time some OXTS applications are run, a firewall warning message similar to that shown in Figure 3 may be triggered. This is because the program is attempting to listen for, and communicate with, OXTS products on the network. The firewall must be configured to allow each program to talk on the network, or programs will not work as intended.

Sometimes a warning will not be triggered, but the firewall may still block certain functions. If a program fails to display the IP address of a connected product, check the firewall settings for that connection. Ensure both Private and Public networks are selected to ensure the software can continue functioning when moving from one network type to another.
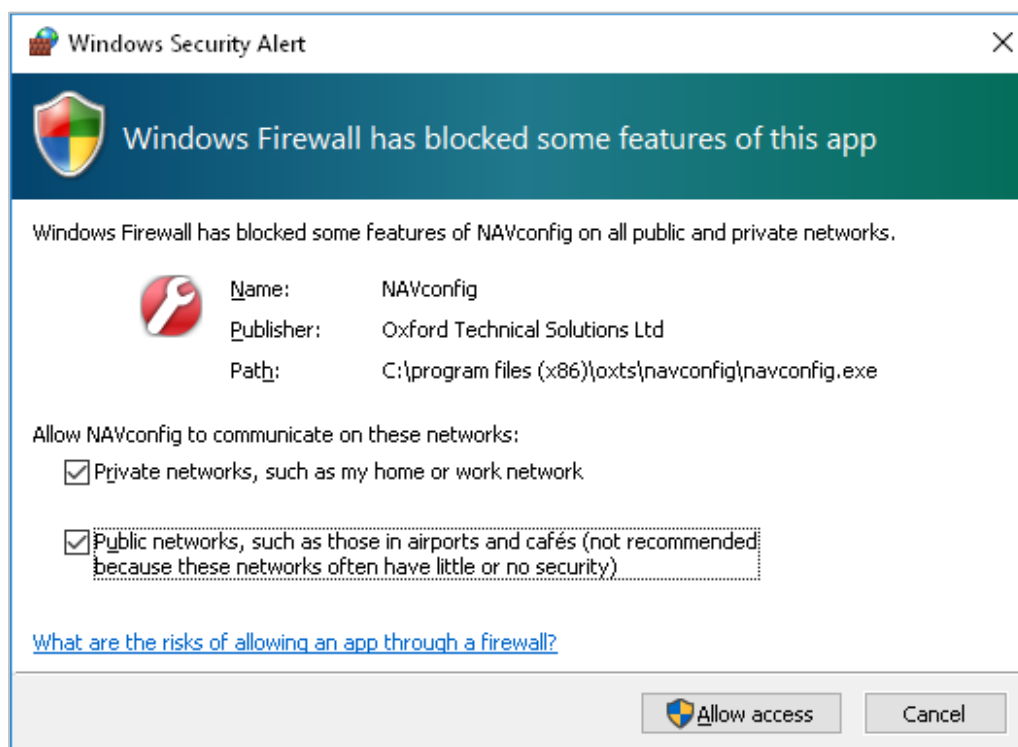
Figure 3:
Windows Firewall warning message

A firewall warning message may be triggered the first time OXTS software is run.

Getting started

When NAVdisplay starts, the first screen displayed is the Device association window shown in Figure 4. This window is used to tell the widgets included in the template that is about to be opened which data stream they should extract measurements from. Once a stream has been selected, the Device association window will close and the main NAVdisplay window will open.

In cases where only one data stream will ever be used, this screen can be skipped by selecting Only display this screen if device not found. The next time NAVdisplay is started, it will automatically load a template and assign the selected product to it.
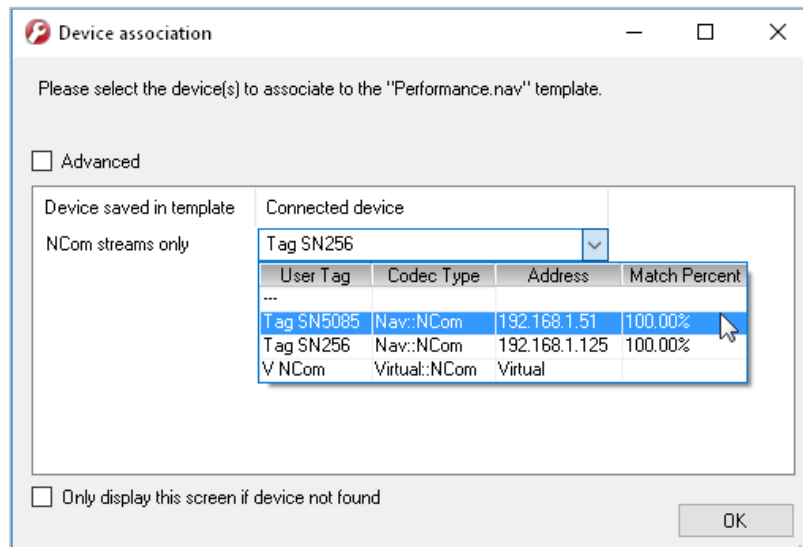
Figure 4:
Device association window

To allow templates to be created when live streams are not available, NAVdisplay includes virtual streams. Once a live or virtual stream has been selected in the Device association window, the OK button can be clicked to shut the window and launch NAVdisplay.

NAVdisplay comes with a number of preconfigured templates. Upon closing the Device association window, the application loads its default template (Perfomance.nav) as shown in Figure 5, and assigns the selected data stream to all of the widgets in the template. Figure 5 also shows the same NAVdisplay template when loaded with a live and virtual NCOM stream.
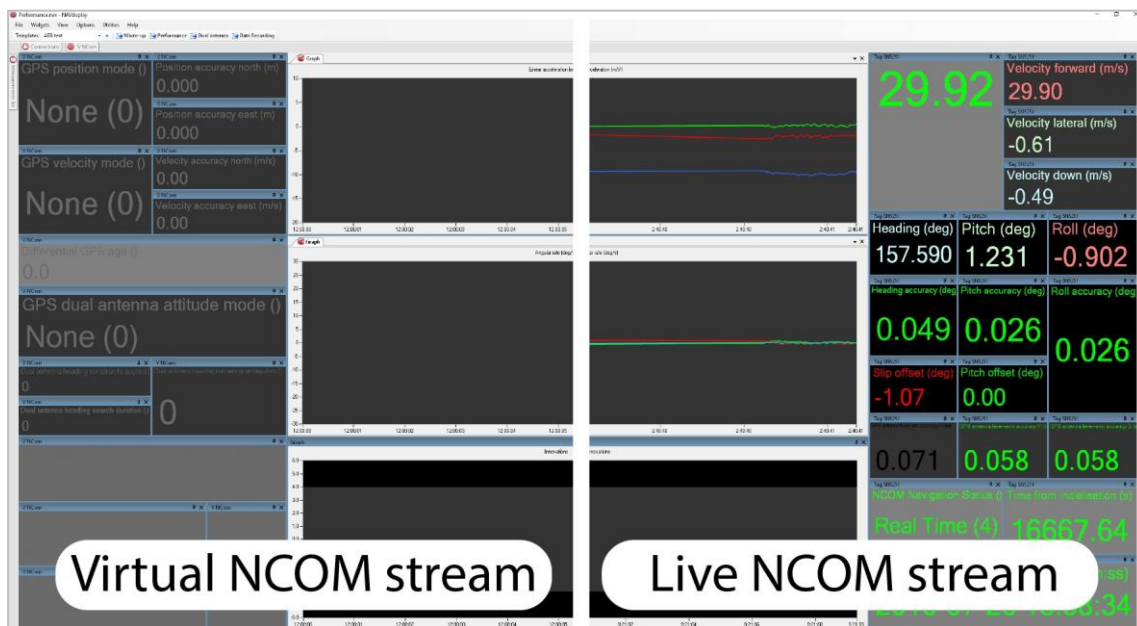
Figure 5:
Initial view of NAVdisplay

This image shows the same template when opened using a virtual (left) and live (right) NCOM stream.

Once NAVdisplay is open, switching between existing templates is easy using the File > Open, or Template Launch Bar—which can be found under the View menu. As well as loading existing templates, it is also possible to edit them by adding or removing widgets, or reconfiguring existing widgets.

The preconfigured templates generally provide the information required by most users, however full details of how to create and control templates and widgets, along with details of the more advanced tools NAVdisplay offers are included in this manual. To take full advantage of the powerful capabilities of NAVdisplay, we recommend reading it thoroughly.

NAVconnect

The NAVconnect window shown in Figure 6 shows any data streams (including virtual ones when enabled) that are visible to NAVdisplay. Virtual streams are disabled by default, to display them select Options > Connections > Show virtual streams. The NAVconnect window provides useful information about the available products.

By default, the NAVconnect window is docked to the top of the NAVdisplay window, but its visibility can be toggled on/off by selecting View > Connections.

Table 3 explains the fields listed in the NAVconnect window. The fields that are shown, and their default sort behaviour, are set using the Stream identification Options ().

Tag id	Address	Codec	Product name	Firmware id	Serial num...	Conn...	Bytes receiv...
Tag SN256	192.168.1.6	Nav::NCom	RT3003	150710qp	256		1004040
Tag SN5085	192.168.1.186	Nav::NCom	Survey+2	160317qp	5085		1057320
Tag SN5251	192.168.1.176	Nav::NCom	Survey+2	170815qp	5251		1051056

Figure 6:
NAVconnect window

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Field	Description
Tag id	Information displayed here will appear in each widget's header for easy identification of the source of the measurement. The Tag id can be renamed by double clicking on it and typing the new name
Address	Displays the device's IP address when data is transmitted via Ethernet and CAN. Serial connections show up as Serial: {stream ID}-{device Id}. Serial connections do not show the device's IP address
Codec	Displays the packet container type and the codec being used (e.g. Nav::NCom). In that case Nav stands for navigation information and NCom is the codec
Product name	Displays the product family name of the device
Firmware id	Displays the firmware version currently running on the device
Serial number	Displays the serial number of the device
Connection lag	The connection lag bar represents a delay of 10 seconds. If the delay is too great NAVdisplay disables the device in the list
Bytes received	Displays the number of bytes received

Table 3:
Description of all fields in NAVconnect window

NAVconnect window context menu

A context-sensitive menu to quickly access key features is available within NAVconnect. It is accessed by right-clicking on any cell (except Tag id or Connection lag).
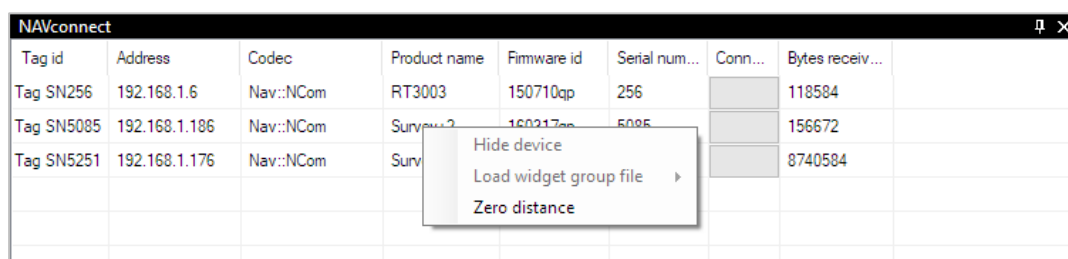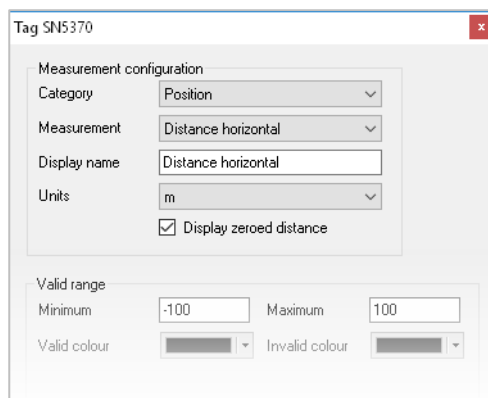
Figure 7:
Connections window context menu

Access the context menu by right-clicking on any column in a highlighted row.

+ Hide device. This command is disabled unless the device's connection lag has timed out. It removes devices that have dropped off the network from the list.

+ Load widget group file. This command is currently not implemented.
+ Zero distance. This command zeros the distance at the current time. To display the zeroed distance in a widget, select the Display zeroed distance option on the widget configuration window as shown in Figure 8.

Figure 8:
Display zeroed distance option

Working with templates

NAVdisplay does not have a fixed user interface. Instead, it allows users to create an unlimited number of custom layouts (called templates) using seven different styles of widget. This approach allows users to create interfaces that best suit their application.

Each template can implement a large number of widgets—and in any combination. By default, new widgets are created outside of the main NAVdisplay window. By dragging widgets by their title bar they can be repositioned within existing widgets, ordocked inside the main NAVdisplay window.

Docking and undocking items

To undock a window, simply click and drag with the mouse on its title area. Once a window has been undocked it can be placed anywhere on the desktop, and will remember its position. You can also undock a window by double clicking its title bar.
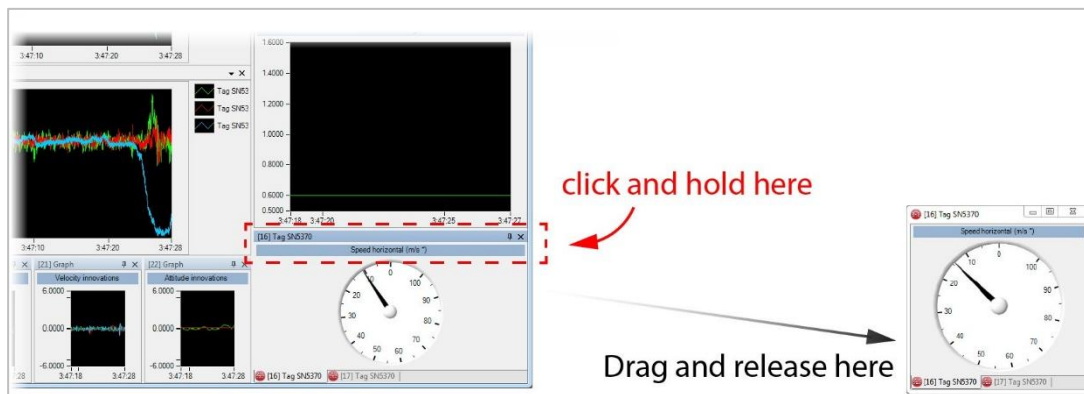
Figure 9:
Undocking windows

To undock a window, click and hold on the window's title area then drag it out of its container.

To dock a window, click and hold on the title area of the window you want to dock, and drag it to where you would like to place it. When a dockable window is dragged onto a suitable container, a position anchor will appear in the container to help you place the widget. The docking process is shown in Figure 10.
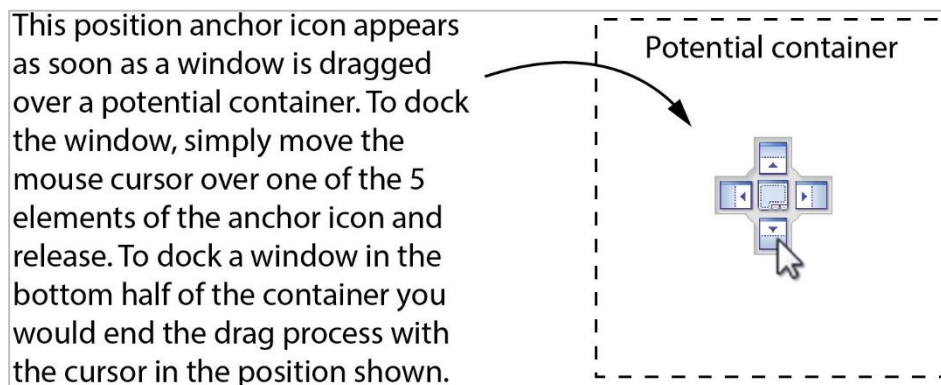
Figure 10:
Docking windows

After a window has been undocked it behaves like a normal window and can be moved, resized, minimised and maximised as normal—it can also act as a container for other windows. This means an undocked window can be dragged onto another undocked window- creating a single undocked window that now contains two items.

Pinning and unpinning windows

Some dockable windows have the ability to be pinned and unpinned. Windows that can be pinned feature an extra icon on the right-hand side of their title bar, as shown in Figure 11. Clicking the pin icon toggles the feature on and off. When enabled, the pinning feature collapses the item into a tab on the edge of its parent container. As soon as the mouse pointer hovers above the tab, the item will spring open to its original position.

Figure 11:
Pinning icon

Windows that feature the pin icon in the title bar can be collapsed into a tab to save space.

Create a template

1. Close current temple by selecting File > Close.
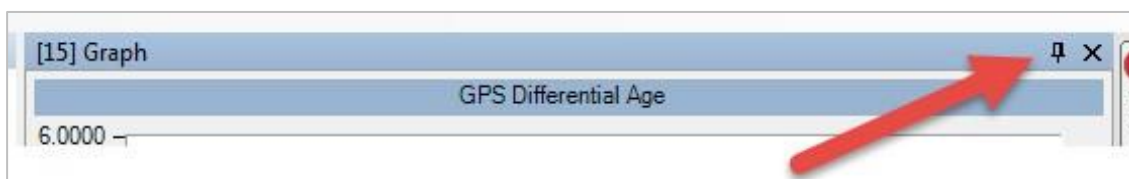2. Enable either a live or virtual stream in the Connections window by selecting Enabled.
3. Add widgets to the template using the Widget menu. Single measurement widgets are assigned to a specific product at creation time, while Graph and Measurement list widgets are created first, then have measurements from enabled products added to them.
4. Arrange widgets by dragging and dropping them using the top of their window.
5. Apply specific configurations to individual widgets by right-clicking and selecting Configure.
6. Save the template.

Saving a template

Saving a template allows it to be easily reloaded at any time. To save an unsaved template:

1. Select File > Save as....
2. Select a location for the template, give it a suitable name then click Save.

To save an existing template after changes have been made, simply click File > Save. To indicate when unsaved changes have been made to a template, a * symbol is displayed in front of the template name in the application title bar. Once saved, the symbol will disappear.

The File > Save as template option provides a number of advanced options allowing templates to be locked to specific IP address, product tags and other properties.

Note: Although templates are created using specific live or virtual streams, they are not permanently tied to those streams. Upon opening a template, the Device association window can be used to reassign widgets to a new data stream.

Loading a template

Templates are loaded in one of two ways.

+ Selecting File > Open, opens a window that can be used to select a template to open.
+ Templates can also be opened using the Template Launch Bar, which can found under View > Template Launch Bar. The Template Launch Bar features a list of templates as well as a number of configurable icons to provide one-click loading of templates. Each icon can also be assigned to a keyboard short-cut.

Hovering the mouse over each icon opens a preview panel showing the template and any short-cut key. The default Template Launch Bar can be edited by selecting Options > Template launch bar(s), and a number of additional user defined launch bars can also be created.

Whenever a new template is opened, the Device association window, shown in Figure 12, will appear. This window allows the widgets present in the template to be assigned to a new data stream, which is useful when working with different products.

In applications where only one product will be used, this behaviour can be prevented by selecting Only display this screen if device not found. To undo this, select Options > Connections > Always display serial number mapping screen.
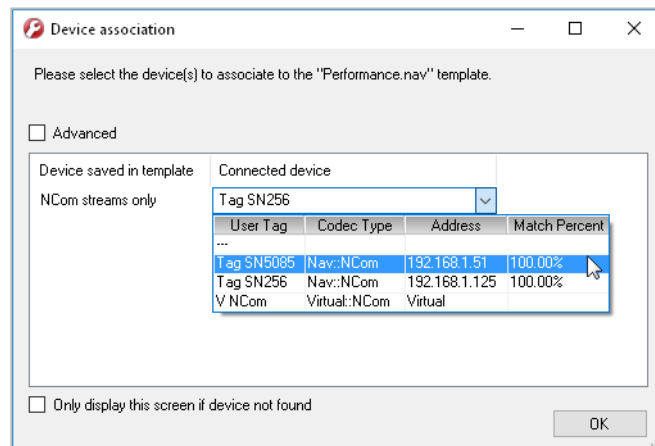
Figure 12:
Device association window

Stream assignment bar

While the Device association window is used to define which stream(s) should be used prior to opening a template, the Stream assignment bar highlighted in Figure 13 can be used to change which streams are used *after* opening atemplate.

To show/hide the Stream assignment bar click View in the Main menu bar, then select Stream assignment bar.

To assign a different stream to a group of controls, simply click on the stream you want to change, and select a new stream from the list.

Figure 13:
Stream assignment bar

Widget types

The visual devices that NAVdisplay uses to relay data are called widgets—and there are seven different styles to choose from as shown below. Single measurement widgets (analogue, digital and traffic light) display the Tag id of the stream they are tied to at the top of their window.

When working on laptops with smaller screens, space can be saved by removing the frame surrounding each widget. To do this select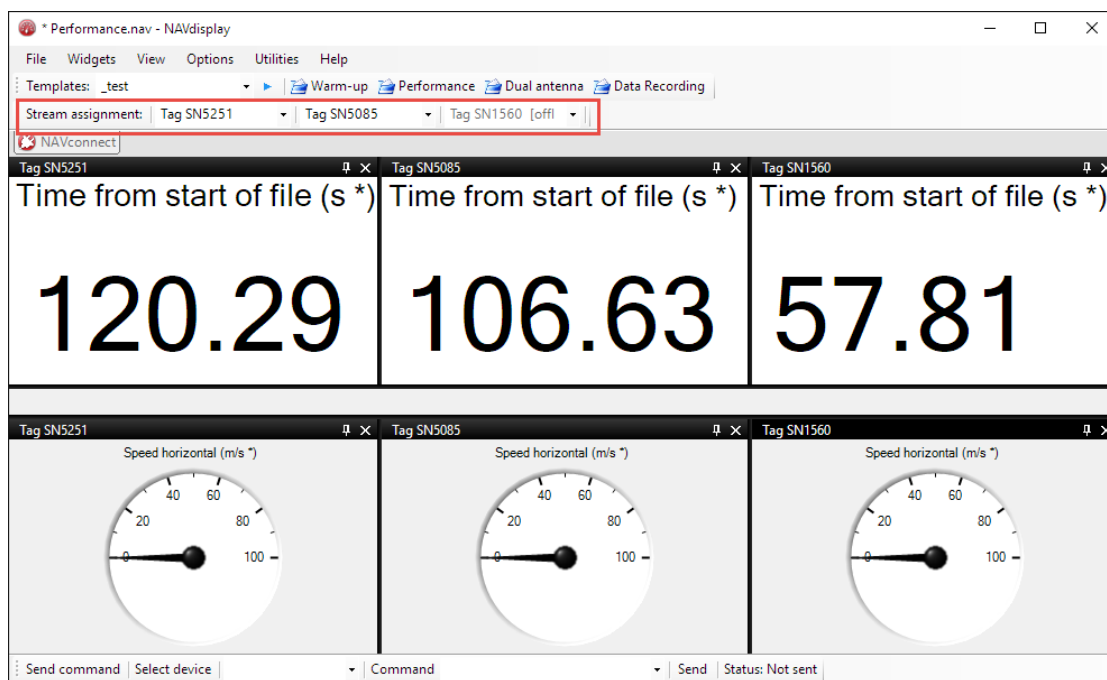 View > Widget Captions. When the widgets caption option is disabled, it isn't possible to undock or move widgets, but they can still be resized by clicking and dragging their boundary lines.

Analogue (single measurement)

The analogue measurement widget displays a single measurement in the form of an analogue dial. To configure the settings for each gauge, right-click on the widget and select Configure.
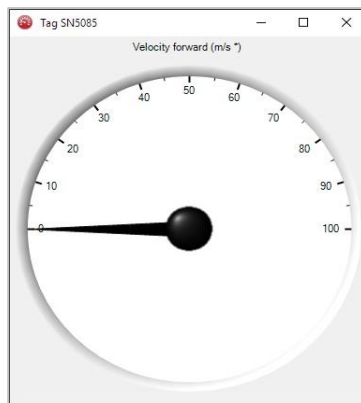

Figure 14:
An analogue measurement widget

Digital (single measurement)

The digital measurement widget displays a single measurement as digits. The colour of the text can change to indicate the measurement is within a defined range. To configure the settings, right-click on the widget and select Configure.
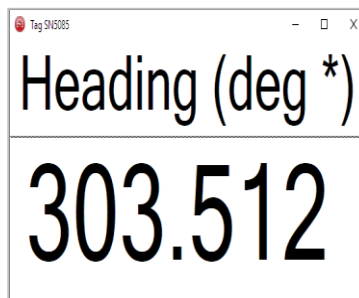
Figure 15:
A digital measurement widget

Traffic light (single measurement)

The traffic light widget watches a single measurement and changes colour depending on the value of that measurement. Colour ranges can be set using multiple conditions. If the measurement value is not within any of the defined ranges the light will turn black. To configure the settings, right-click on the widget and select Configure.

Figure 16:
A traffic light measurement widget

Analogue + Digital

The analogue + digital widget is a time-saving widget. Selecting it simply docks a digital widget inside an analogue widget, and assigns the same measurement to both. Once created, the analogue and digital elements can be independently configured, and even undocked.
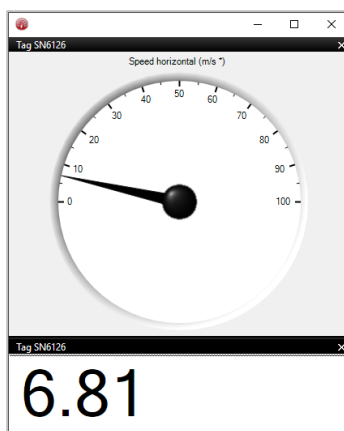
Figure 17:
An analogue + digital measurement widget

Traffic light + Digital

The traffic light + digital widget is a time-saving widget. Selecting it simply docks a digital widget inside a traffic light widget, and assigns the same measurement to both. Once created, the traffic light and digital elements can be independently configured, and even undocked.
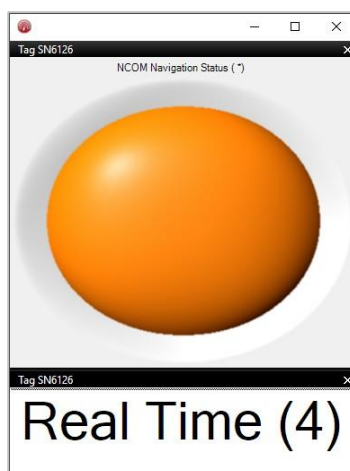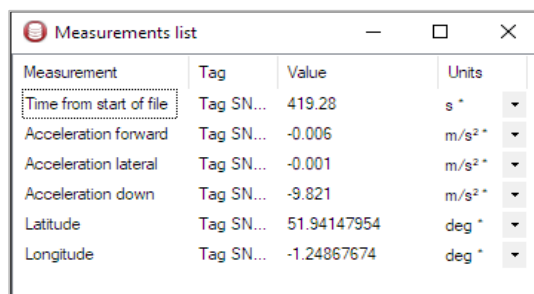
Figure 18:
A traffic light + digital measurement widget

Measurement list

The measurement list widget displays the value of multiple measurements in digital form. As with a digital widget, the text colour indicates whether the value is within a user-defined range. This is a good way to view multiple measurements in a small space. To configure the settings, right-click on the widget and select Configure.

Figure 19:
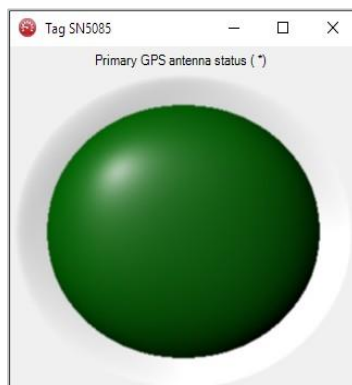Measurement list widget

Graph

The graph widget provides a scrolling time-based plot of one or more measurements. To add measurements, configure the graph and toggle the visibility of the legend, right-click on the graph area.

To remove or configure individual measurements you must find that measurement within the legend and right-click on it.

Figure 20:
A graph measurement widget

Adding widgets

The process of adding widgets to NAVsolve is explained below.

1. Choose a style of widget to add by clicking on the Main menu > Widgets.
2. Select measurement(s) to add to the control, and click OK.

Note: When creating single measurement widgets (Analogue, Digital, Traffic light, Analogue + Digital or Traffic light + Digital), it is possible to create more than one instance at a time. For example, if four measurements are selected when creating an Analogue widget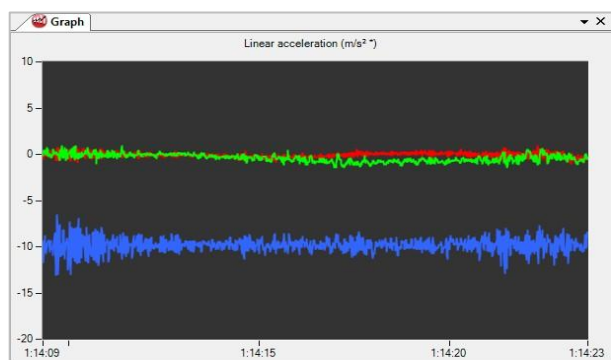, when you click OK, four analogue widgets will be created in a single group, reflecting the measurements that were chosen.

The Add measurements window

When creating or modifying widgets, the Add measurements window shown in Figure 21 is a quick and easy way to manage measurements. The window is displayed whenever a new widget is created using the process above, or when an existing widget is modified by right- clicking on it and selecting Configure.
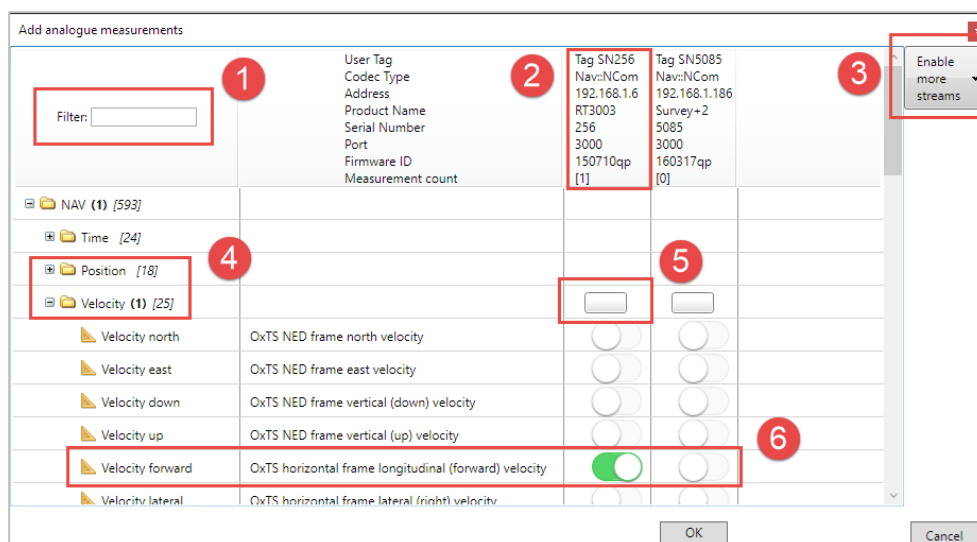
Figure 21:
Add measurements window
1) Filter box 2) Available streams 3) Enable more streams button 4) Measurement groups 5) Group toggle button 6) Measurement toggle

Filter box

The filter provides a quick method of live searching the available measurements. As you type, the available measurements will be limited to those containing a matching string.

Available streams

Any systems streaming data in a readable format on the network are shown by default. A summary of information is shown at the top of each column. A legend for the information is shown to the left of the columns.

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Enable more streams button

Clicking the Enable more streams button opens a menu that allows you to choose which streams are visible in the Add measurements window. This is sometimes useful when operating on a network where many products are connected. A check-mark in the leftmost box means a stream is visible.

In the example shown in Figure 22 below, five virtual streams are shown in addition to the two real NCOM streams. Virtual streams are useful for creating new templates when no live streams are available. Virtual streams are enabled/disabled from the Main menu by clicking Options > Connections > Show virtual streams.
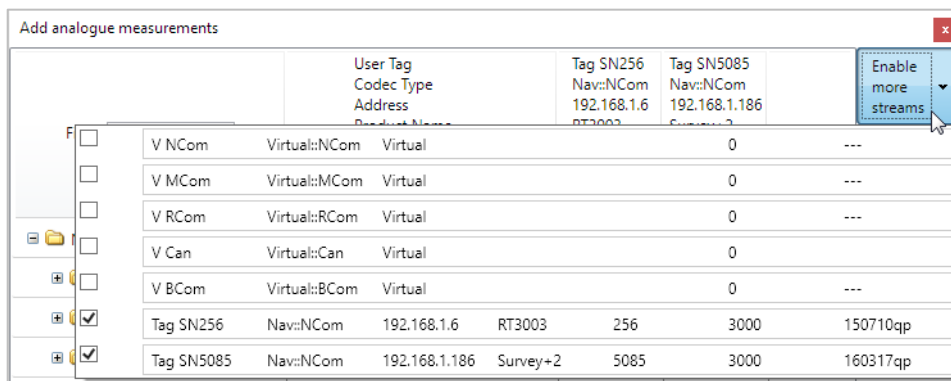
Figure 22:
Enable more streams menu

Measurement groups

To make it easier to find measurements, NAVdisplay groups navigation measurements into named groups. To view the measurements inside a group click the + button. To collapse a group click the -button.
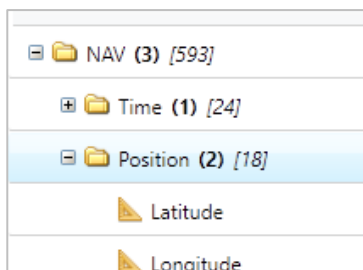
Figure 23:
Expanding and collapsing groups

Folder names are followed by a number in square brackets. This indicates the number of measurements in that particular group. A bold number in regular brackets shows how many measurements are selected within that group. In the example picture above, one measurement is selected in the Time folder, while two are selected in the Position folder. The NAV folder (which contains all 593 measurements, shows that three measurements in total have been selected.

This highlighting method makes it easy to find measurements later on, when returning to the Measurements window to make changes to widget configurations.

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Group toggle button

The rectangular group toggle buttons are located at the top of each group of measurements, adjacent to each folder names (when the group is expanded). Clicking this button toggles the state of all measurements in the group. This provides a quick way of adding all related measurements in a folder.

Measurement toggle

To select a specific measurement from a specific datastream, click the measurement toggle in the relevant column so that it shows green. Multiple selections can be made, even if you're configuring a widget that can only display a single measurement. In this case, multiple instances of the control will be created and docked in one window.

When you have finished making selections in the Add measurements window, click OK.

Analogue widgets

Analogue widgets display a single measurement using an analogue gauge. The appearance of each analogue widget and the measurement it displays, can be changed via the configuration window.

Figure 24 shows the analogue widget configuration window, which is accessed by right- clicking on an analogue widget and selecting Configure. The gauge configurations are clearly labelled, and the effect of each one is previewed on the right-hand side.

Figure 24:
Analogue widget configuration menu

To access the analogue configuration window, right-click on an analogue widget and select configure.

As well as configuring each gauge, the measurement assigned to the widget can also be changed using the measurement configuration controls at the bottom of the window.

The * symbol indicates this is the default unit. It means this widget will be affected by changes to the global default unit set in the Default units window from main toolbar. To force a widget to always use a specific unit, choose one without the *.

Except for Measurement list widgets, Colour conditions can be copied from one widget to another—even across different styles, by right-clicking on the widget on the widget you want to copy conditions from and selecting Copy colour configuration. Conditions can then be copied to any number of widgets by right-clicking on each one and selecting Paste colour configuration.

Digital widgets

Digital widgets display a single measurement using alpha-numeric characters. The measurement being displayed, and its appearance, can be changed at any time via the configuration window. The digital widget configuration window is accessed by right-clicking on the widget and selecting Configure. This will open the window shown in Figure 25.

The controls within the Measurement configuration frame control the measurement the widget displays and the units that are used. The Units setting can be thought of as a local override. When set to *, the measurement will be displayed using the default units specified in the Option Menu. When any other unit is selected, it will override the default unit.

The Valid range control changes the colour of the widget's font based on the value of the current measurement. Further conditions can be defined in the Colour conditions section. These conditions are applied in a top-down order-meaning that the first valid condition to be met will be applied. Colour conditions only apply to the measurement digits, and not to the display name.
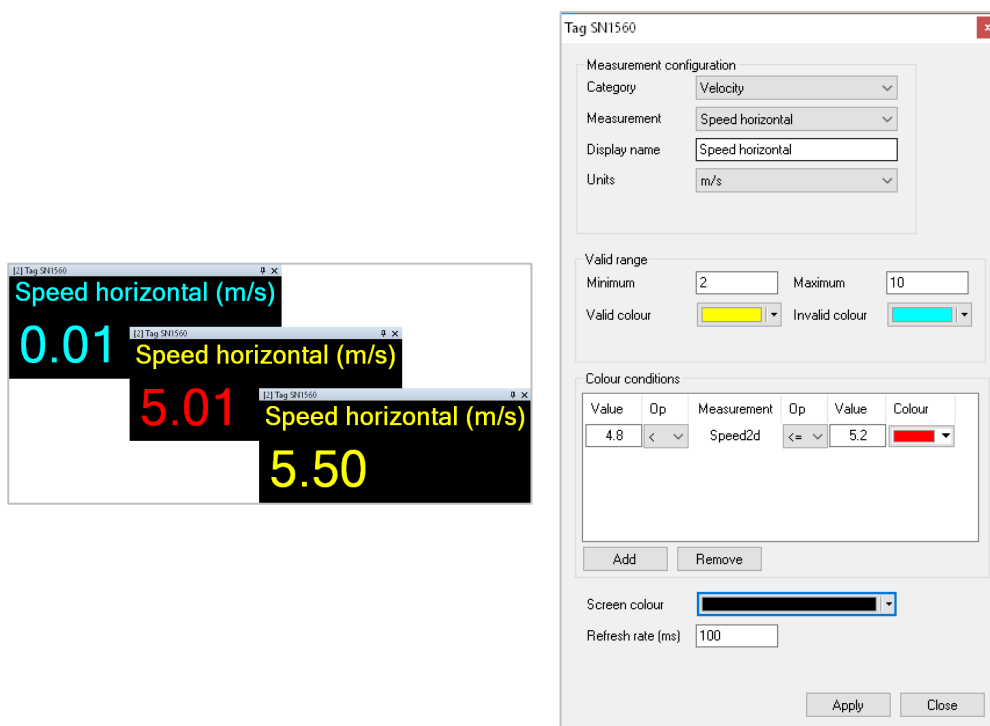

Figure 25:
Digital widget configuration window

To access the digital configuration window, right-click on a digital widget and select configure.

Except for Measurement list widgets, Colour conditions can be copied from one widget to another—even across different styles, by right-clicking on the widget on the widget you want to copy conditions from and selecting Copy colour configuration. Conditions can then be copied to any number of widgets by right-clicking on each one and selecting Paste colour configuration.

Traffic light widgets

Traffic light widgets represent individual measurements as a light. The appearance of each traffic light widget, and the measurement it references, can be changed via the configuration window. The configuration panel for traffic light widgets is accessed by right-clicking on the widget and selecting Configure. This will open the window shown in Figure 26.

The rules that determine the colour of the light can be entered into the Colour conditions section. There is no limit to the number of conditions that can be entered, but they are evaluated in a top-down manner and the first condition to be met will be applied. Both the measurement to be displayed and the style of the light of the light can be configured in the lower half of the window.

Figure 26:
Light widget configuration menu

To access the light configuration window, right-click on a digital widget and select configure.

Except for Measurement list widgets, Colour conditions can be copied from one widget to another—even across different styles, by right-clicking on the widget on the widget you want to copy conditions from and selecting Copy colour configuration. Conditions can then be copied to any number of widgets by right-clicking on each one and selecting Paste colour configuration.

Analogue + Digital widgets

Analogue + Digital widgets are simply an analogue widget with a digital widget docked inside it. At creation time, both the analogue and digital elements are set to display the same measurement—however this can be changed by right-clicking on either element and reconfiguring the widget.

For details on how to configure each element, see *Analogue widgets* on page 29, or *Digital widgets* on page 31.
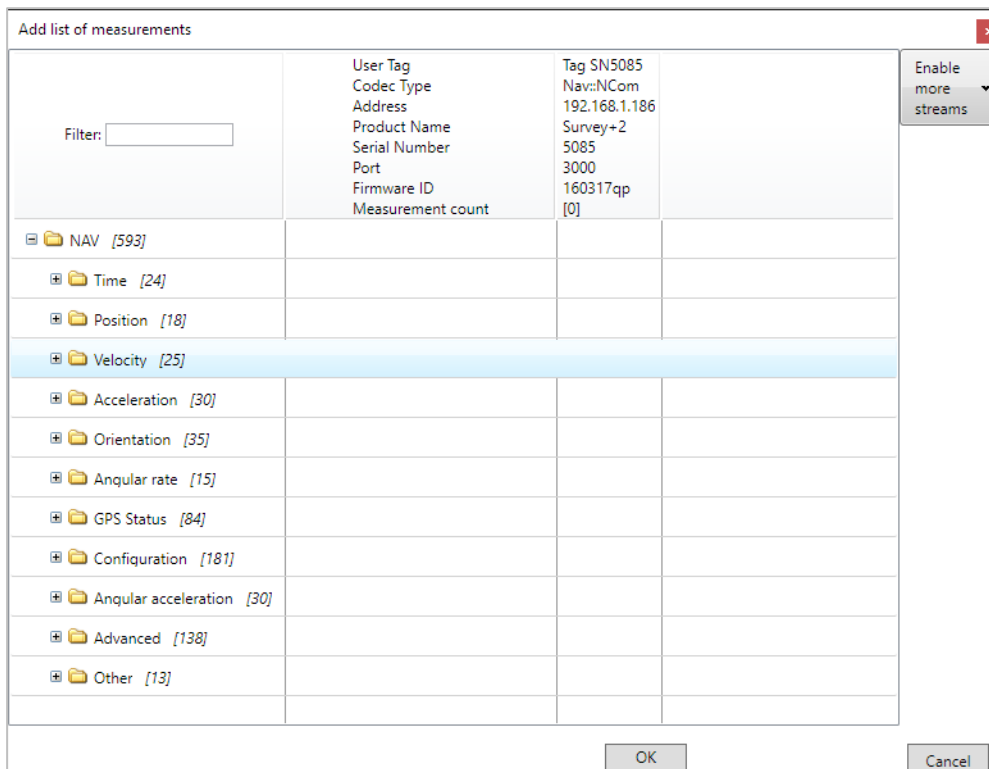
Traffic light + Digital widgets

Traffic light + Digital widgets are simply a traffic light widget with a digital widget docked inside it. At creation time, both widgets are set to display the same measurement—however this can be changed by right-clicking on either element and reconfiguring the widget.

For details on how to configure each element, see Traffic light widgets on page 33 or Digital widgets on page 31.

Measurement list widgets

Measurement list widgets are intended to display a number of measurements in a space- efficient way. When a measurement list widget is first created, the Add measurements window (Figure 27) will appear.

Figure 27:
Add measurements window

To add measurements to the list, locate them from the list on the left-hand side and then click the toggle switch next to the name of each measurement you want to add. The Add measurements window can also be accessed by right-clicking on the widget itself, and selecting Add measurement. Several measurements can be added or removed at once.

The appearance of individual measurements is controlled by right-clicking a measurement and selecting Configure. This will open the window in Figure 28. Using the controls in the Measurement configuration section of this window, the channel being displayed in the list can be changed along with its units. To override the default units, select a unit without the *.

The Valid range controls allow the colour used to display the measurement to change depending on the measurement value. Additional Colour conditions can also be added. These are evaluated in a top-down order, and the first valid rule will be applied.

The up/down buttons in the top right of the window allow different measurements present in the list to be configured without the need to close the window.

Measurements are removed from the measurement list by selecting the measurement and pressing DELETE, or by right-clicking on the measurement and selecting Remove.

Figure 28:
List widget configuration window

Graph widgets

Graph widgets display one or more measurements in a time-based plot. The appearance of each graph widget, and the measurements it displays, can be changed at any time by right- clicking in different areas of the graph.

Measurements are added to graph widgets by right-clicking on the plot area of the graph and selecting Add measurement from the context menu. This will open the window show on the left of Figure 29. To add a measurement to the list, locate them from the list on the left-hand side of the window and then click the toggle switch next to the name of each measurement. Several measurements can be added at once.

Measurements can be removed, and their appearance changed, by right-clicking on a measurement in the graph legend. If the graph legend is not visible, it can be displayed by right-clicking on the plot area

and selecting View legend. To remove a measurement, select Remove. To remove all measurements, select Removeall.

To edit the appearance of the measurement that was right-clicked, select Configure. This will open the window show on the right of Figure 21. The up/down buttons in the top right of the window allow multiple measurements present in the list to be configured without the need to close the window.
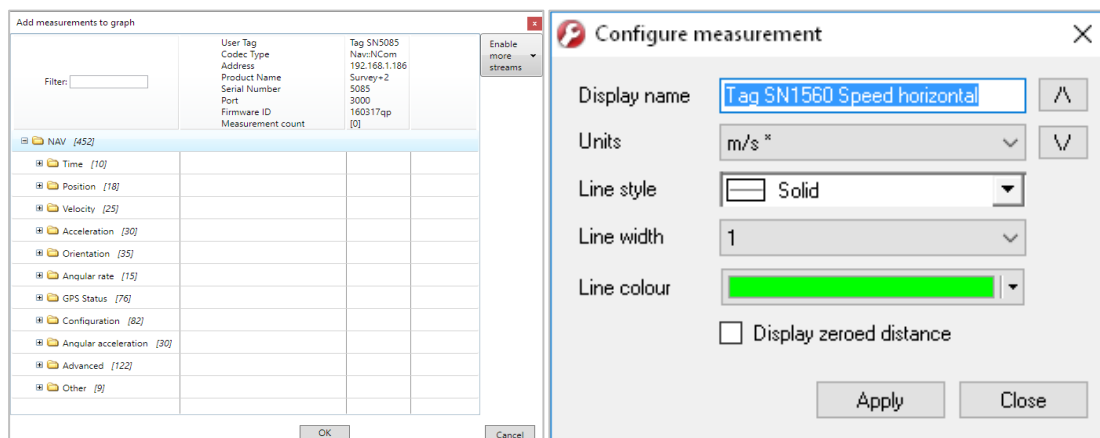
Figure 29:
Graph widget configuration menu

The Add measurement window is accessed by right-clicking on the graph plot area and selecting Configure. The Configure measurement window is accessed by right-clicking on a measurement in the graph legend. If the legend is not visible, right-click on the graph plot area and select View legend.

The appearance of the graph itself is controlled through the Graph configuration window as shown in Figure 30. This window is opened by right-clicking on plot area and selecting Configure.

While they are not displayed by default, a graph title, x-axis caption and y-axis caption can be added from the Graph configuration window. The scale of the y-axis, which is set to automatic by default, can also be manually defined.

The Miscellaneous controls in the lower part of the window allow you to change the background colour of the graph plot area, the refresh rate of the widget and the History of the graph-the time period that is displayed.
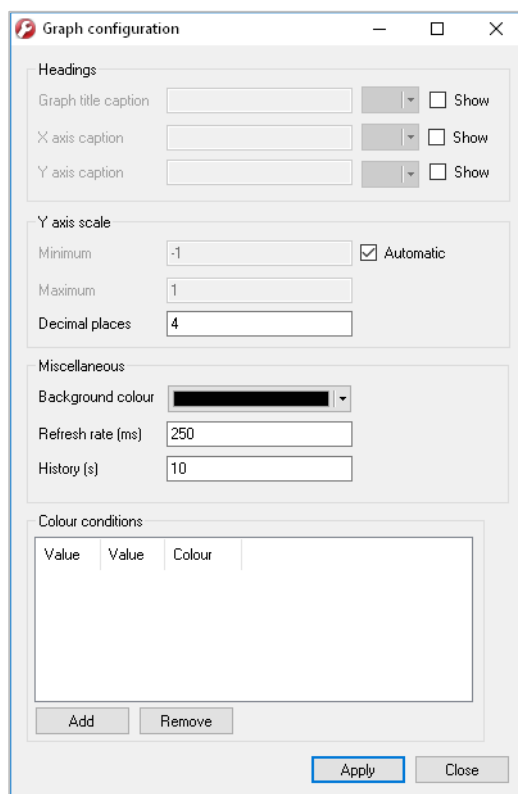
Figure 30:
Graph configuration window

The Graph configuration window is opened by right-clicking on the plot area and selecting Configure.

Except for Measurement list widgets, Colour conditions can be copied from one widget to another—even across different styles, by right-clicking on the widget on the widget you want to copy conditions from and selecting Copy colour configuration. Conditions can then be copied to any number of widgets by right-clicking on each one and selecting Paste colour configuration.

Send command bar

The Send command bar shown in Figure 31 is used to send advanced commands to selected devices that are visible to NAVdisplay. It is mainly used by OXTS employees for diagnostic purposes but is safe to use if you are familiar with advanced commands. To display the Send command bar select View > Send command bar.
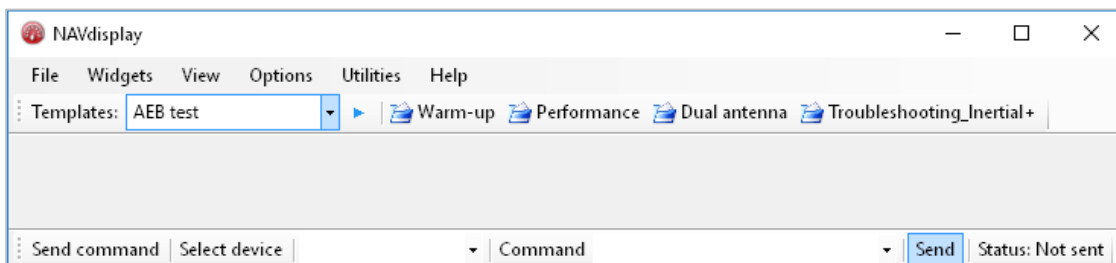
Figure 31:
Send command toolbar

The Send command bar is used to send advanced commands to the selected device.

Shortcut manager

The Shortcut manager shown in Figure 32 can be accessed by selecting View > Shortcut manager. It provides a list of all keyboard shortcuts used within NAVdisplay.
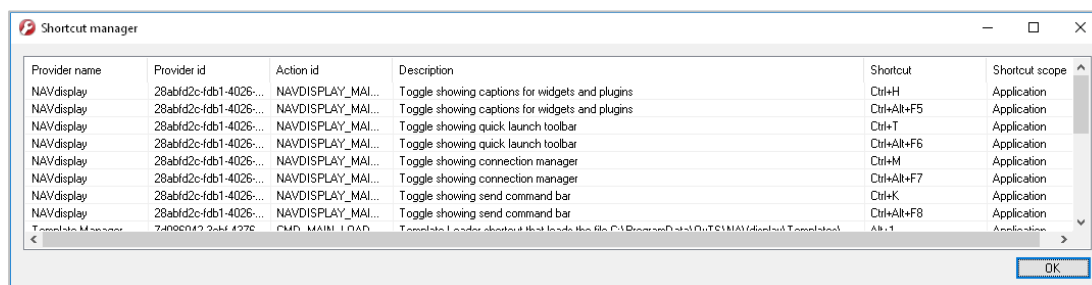
Figure 32:
Shortcut manager

Options menu

The Options menu shown in Figure 33 provides access to a number of settings that allow you to tailor the way NAVdisplay works. Most options are contained within the tabs and are described below, however, one 'global option' is shown at the bottom of the Options window regardless of which tab is selected.
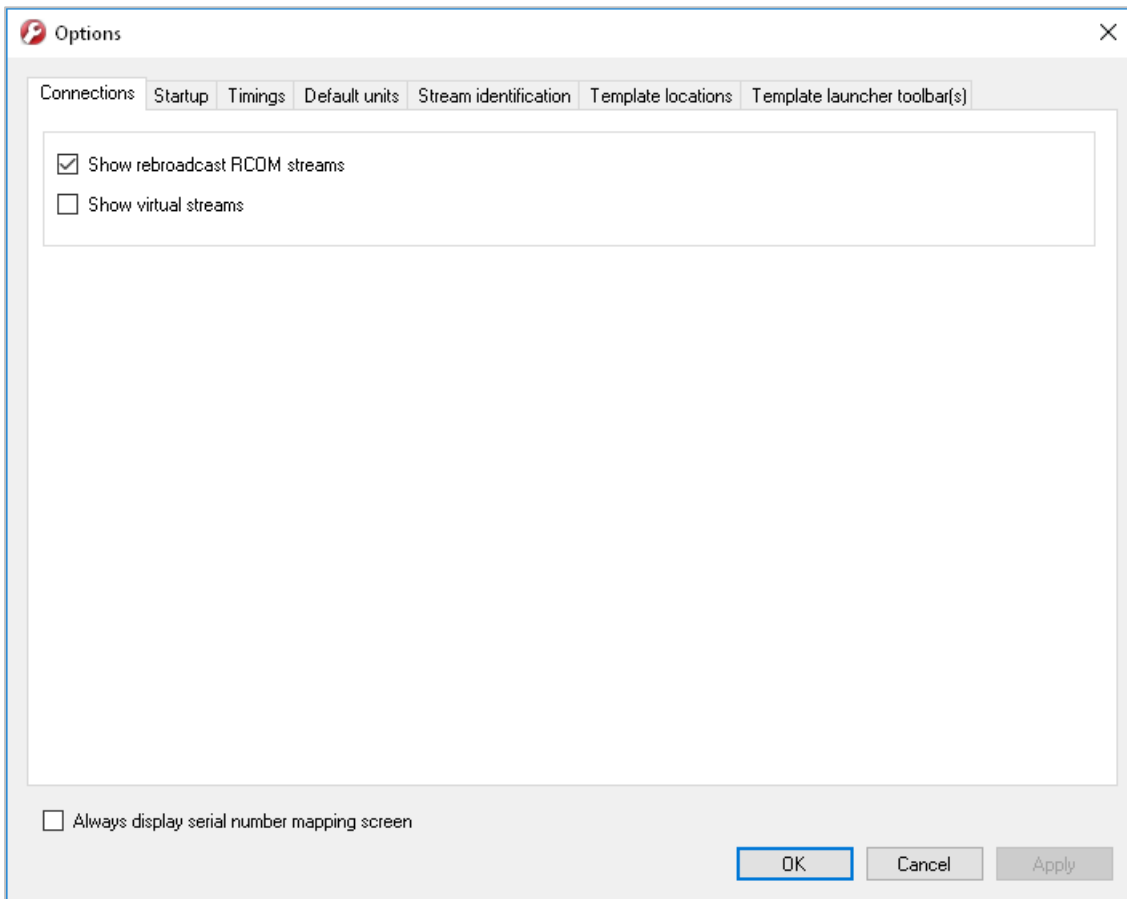
Figure 33:
Options window
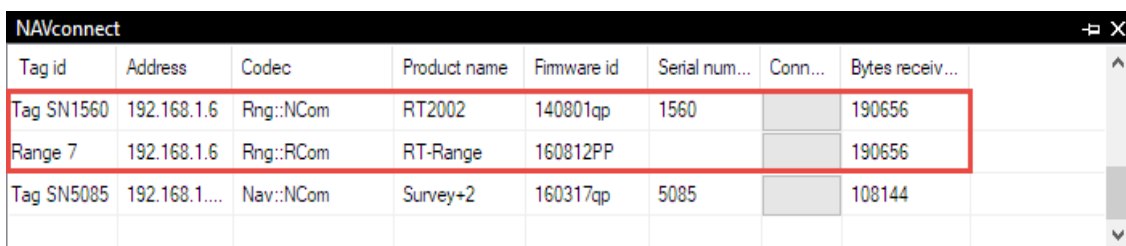
Global option

Always display serial number mapping screen: When selected, this option forces the Device association window to be displayed each time a new template is opened. Selecting the Only display this screen if device not found option on the Device association window is the same as clearing the Always display serial number mapping screen option.

Connections

Show rebroadcast RCOM streams: The RCOM format is used with RT-Range products. As well as transmitting specific RT-Range measurements, the format also acts as a wrapper for NCOM data being

transmitted from the INS. The Show rebroadcast RCOM streams causes both the RT-Range stream *and* the NCOM stream to show up in the Connections window as shown in Figure 34.

Tag id	Address	Codec	Product name	Firmware id	Serial num...	Conn...	Bytes receiv...
Tag SN1560	192.168.1.6	Rng::NCom	RT2002	140801qp	1560		190656
Range 7	192.168.1.6	Rng::RCom	RT-Range	160812PP			190656
Tag SN5085	192.168.1....	Nav::NCom	Survey+2	160317qp	5085		108144

Figure 34:
Show rebroadcast RCOM streams

The Show rebroadcast RCOM streams option reveals the NCOM stream encapsulated in the RCOM stream.

Show virtual streams: Virtual NCOM, RCOM, MCOM and BCOM streams are useful for setting up new templates when no live streams are available. They are hidden by default to provide a clearer user interface. Selecting this option causes them to be shown in the Connections window and the Device association window when opening templates.

Start up

Allow running multiple NAVdisplay instances: When selected this option allows multiple instances of NAVdisplay to run simultaneously, which can place a large demand on system resources. Any options set when running multiple instances of NAVdisplay will be set according to the last instance of NAVdisplay to close.

Re-enable device on start-up: The Re-enable device on start-up option saves time by remembering which devices were enabled in the Connections window the last time it closed, and automatically enabling them when it next opens. The option does not apply to virtual streams.

Show tip of the day: Controls whether the tip of the day is displayed when NAVdisplay starts.

Load template file on start up: When selected, this option allows a template to chosen from a list that will be loaded when NAVdisplay starts.

Timings

Data store update rate: Data streams are internally buffered by NAVdisplay. This option determines how long NAVdisplay waits before processing the data in those buffers. A lower value provides widgets with data more often, but increases the load on the processor.

Widget items refresh rate: This setting globally overrides each widget's current refresh rate. It defines how often each widget looks for new data. After this value has changed, the refresh rate of each widget can be individually modified.

Device lost time out: Defines the length of time that communication can be lost for, before NAVdisplay considers the stream to have timed out. After this time, it will grey out the device in the Connections window.

Default units

The Default units tab allows the default units used for each measurement category to be set. Each widget displays data using the relevant default unit, unless the unit has been overridden using the widget's own Unit setting. When the default units are set using this Options menu, all widgets whose unit is suffixed with * will update. When working with CAN data, it is not possible to change the default units as they are fixed by the CAN DBC file used to create the data.

Stream identification

The Stream identification tab provides a method to customise the way in which data streams are sorted and displayed throughout NAVdisplay. To display features, place a tick in the box adjacent to the feature name. The order in which features are listed is controlled by selecting a feature name, then using the up and down arrows. The topmost item will be displayed on the right. The default column by which streams are sorted and the order (ascending or descending) can be selected in the Sort by area.

Template locations

The locations used to search for templates can be set on this tab using the Add and Remove buttons. All templates found in the specified locations will be added to the Template launch bar and other template menus. The Reset default folders button can be used to add the default paths when accidentally deleted, but does not remove other paths. These must be removed manually.

Template launcher toolbar(s)

The Template launcher toolbar(s) option provides a method of customising the standard Template Launch Bar. Using the Add new template and Remove selection buttons, up to five templates can be added to a template and the Shortcuts used to activate them can also be configured. To edit an existing item in the list, simply double click it.

A large number of additional User Template Launch Bars can be created by clicking the Add new template launch bar button. User Template Launch Bars are shown in grey. Unless at least one template is added to a User Template Launch Bar using the Add new template button, it will be automatically removed when the Options window is closed. User Template Launch Bars can be removed by clicking the red X icon in the upper right corner.

Command button

The Command button window (Figure 35) provides a quick and easy way of sending advanced commands without having to enter them in the Send command bar. Each Command button window contains two buttons that can be assigned an advanced command. Multiple instances of the Command button window can be opened if more than two commands need to be sent.

The device to which the commands will be sent is set using the Devices list. To configure each button, right-click on the button to open the Setup button window. Here you can enter the Text to be displayed on the button, assign a Hotkey by pressing the desired key combination and enter the advanced command in the Command window that will be sent when the button/Hotkey is pressed. Enter the command exactly as it would be entered in the Send advanced command window. A colour can also be assigned to each button.
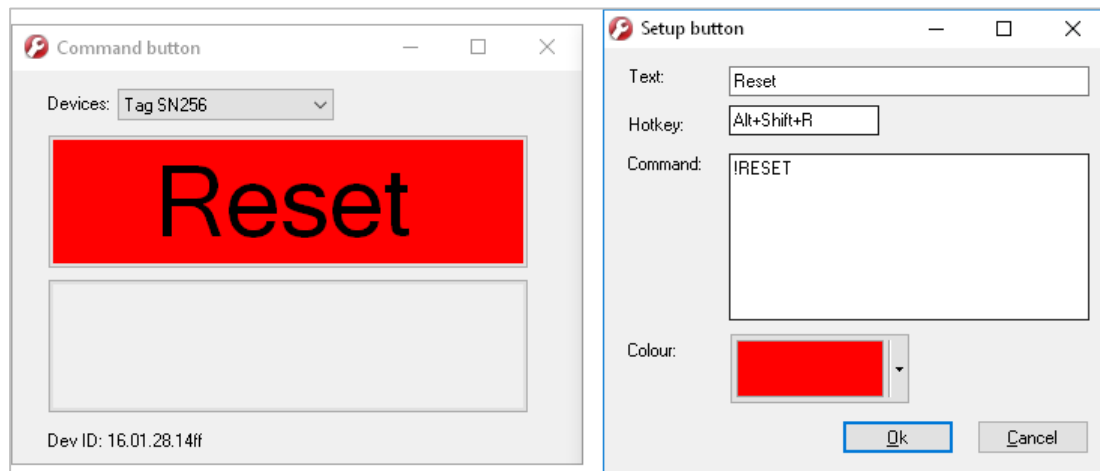
Figure 35:
Command button

OXTS

Cone placement

Unless the ground is permanently marked in some way, repeatedly and accurately placing cones or markers is not easy. The Cone placement utility solves this problem by showing where a precise point on the vehicle is in relation to a file containing the relative position of the cones. The vehicle can then be driven to the precise point and a cone can be placed.

Note: This function is only available with INS firmware after version 100901 (September 2010).
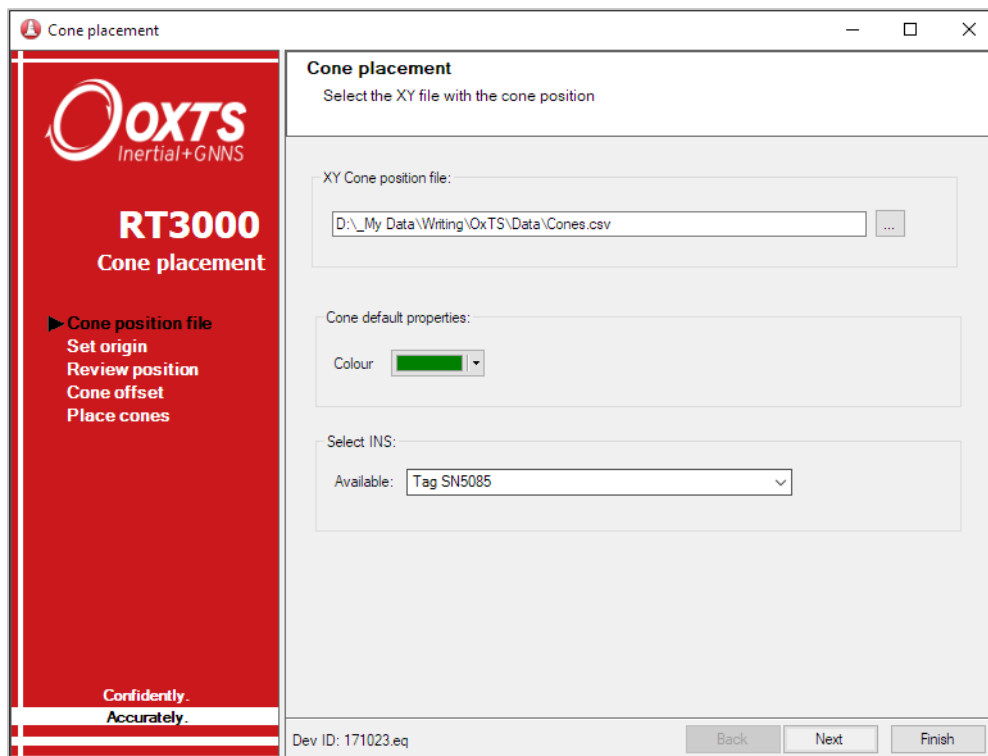
Figure 36:
Cone placement utility

There are five steps for placing cones on the ground:

1. A file containing the XY positions of the cones is needed (discussed later).
2. The origin (latitude and longitude) for the {0,0} XY location of the cones needs to be set, and the angle of the X-axis (compared to true north) needs to be set.
3. The position of the cones can be reviewed in Google Earth. This is useful for checking the position of the cones before going out to the proving ground.
4. The cones cannot (easily) be placed at the location of the INS as this is generally inside the vehicle. Instead, an offset from the INS to a location on the vehicle perimeter where the cones are to be placed can be entered into the software.
5. Finally, a window representing the current position of the cone, compared to the vehicle, helps guide the vehicle to the right location so a cone can be placed on the ground.

On the Cone position file page, shown in Figure 36, the name of the file containing the XY positions can be entered into the edit box or selected using the ... button. The file must be in CSV format.

The CSV file can contain a colour for each cone to help with the layout. If no colour is defined then the default colour is used in the software, this can be set using the Colour drop- down list in the Cone Default Properties group box.

Each row of the cone position file must contain:

```
<x-position>, <y-position>[,<colour>]
```

where the x-position and y-position are in metres; the colour field is optional and should be

#rrggbb where rr, gg, bb are the hexadecimal values (00 to FF) for red, green and blue. This is similar to colours in HTML.

For example:

```
0.0,0.0

3.0,0.0

6.0,0.0,#00FF00

9.0,0.0
```

International lists (using the comma as the decimal separator and semicolon for the list separator) can be configured in the operating system and will work correctly.

The Set origin page is shown in Figure 37.

Figure 37:
Cone placement, Set origin page

On the Set origin page, the global position (latitude, longitude and altitude) of the origin for the cones can be set. The angle of the x-axis (compared to true north) can be set so that the cones can be rotated to fit the proving ground. The latitude and longitude should be entered in decimal degrees.

The local co-ordinates of the INS can be used for the origin and axis of the cones. To use the local co-ordinates, press the Copy button to the right of the Use local co-ordinates of the RT text. If the Copy button is unavailable, then no local co-ordinates are available to copy.

The current position and heading of the unit can also be used for the cone placement. Drive the vehicle to the origin and angle the vehicle along the x-axis of the cones. Press the Copy button to the right of the Use current position and heading of the INS text.

If the local co-ordinates configured in the INS are stored in a folder, then they can be read into the Cone placement window. To read in the local co-ordinates from a folder use the ... button to the right of the text Use local co-ordinate in a folder.

The Review position page is shown in Figure 38.
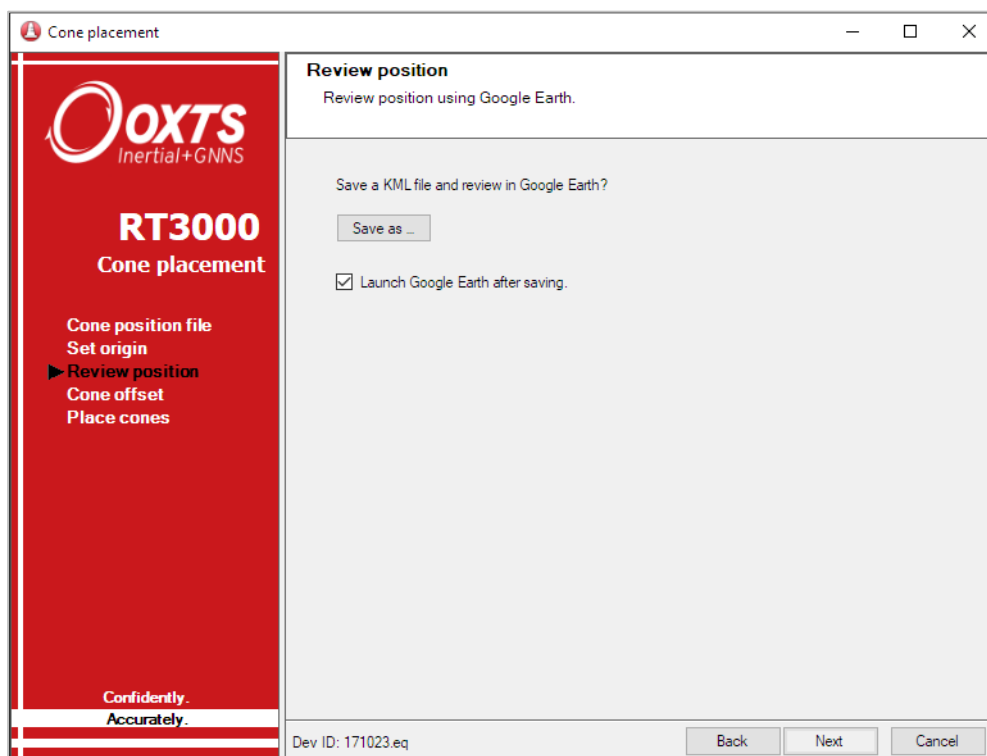
Figure 38:
Cone placement, Review position page

Using the cone position file and the origin information, a KML file suitable for Google Earth can be saved. This file will load into Google Earth and show the position of all the cones.
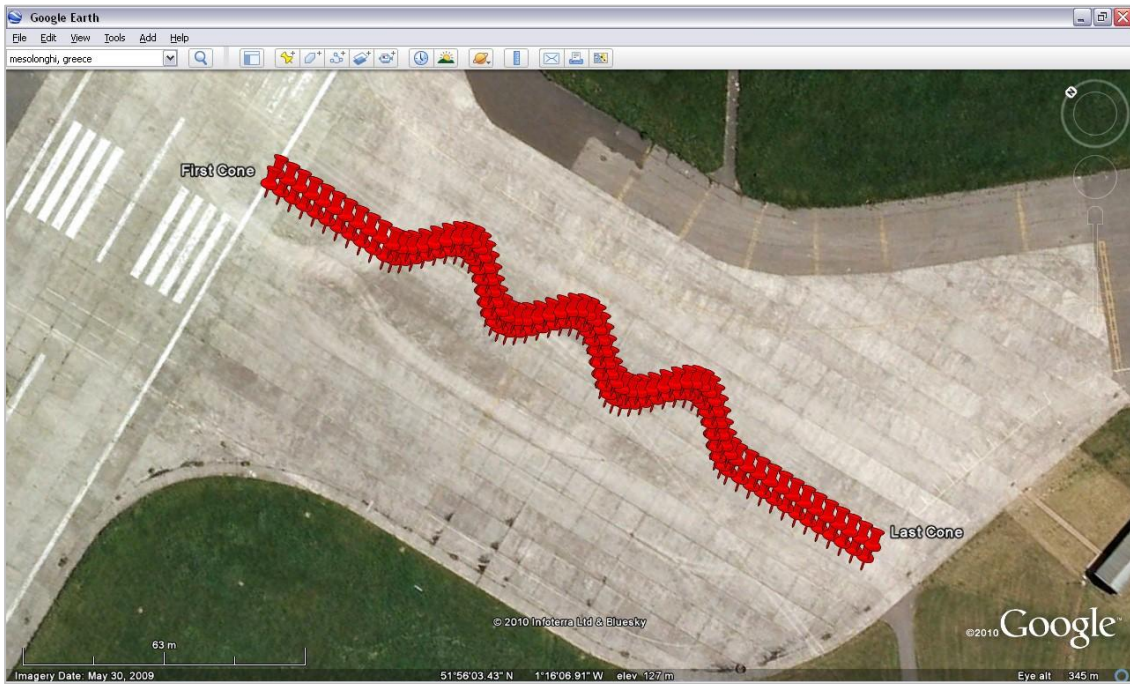
Figure 39:
KML file in Google Earth showing cone locations
Image created with a licensed version of Google Earth.

By returning to the Set origin page, the position of the cones can be changed until they are in a suitable location. Note that Google Earth can have errors larger than 5 m in it, so it is not suitable for accurate placement of the cones. Also, unless the base-station is surveyed in accurately (not with a 3-minute average) then the INS can also have a fixed offset, typically up to 3 m.

The Cone offset page is shown in Figure 32.
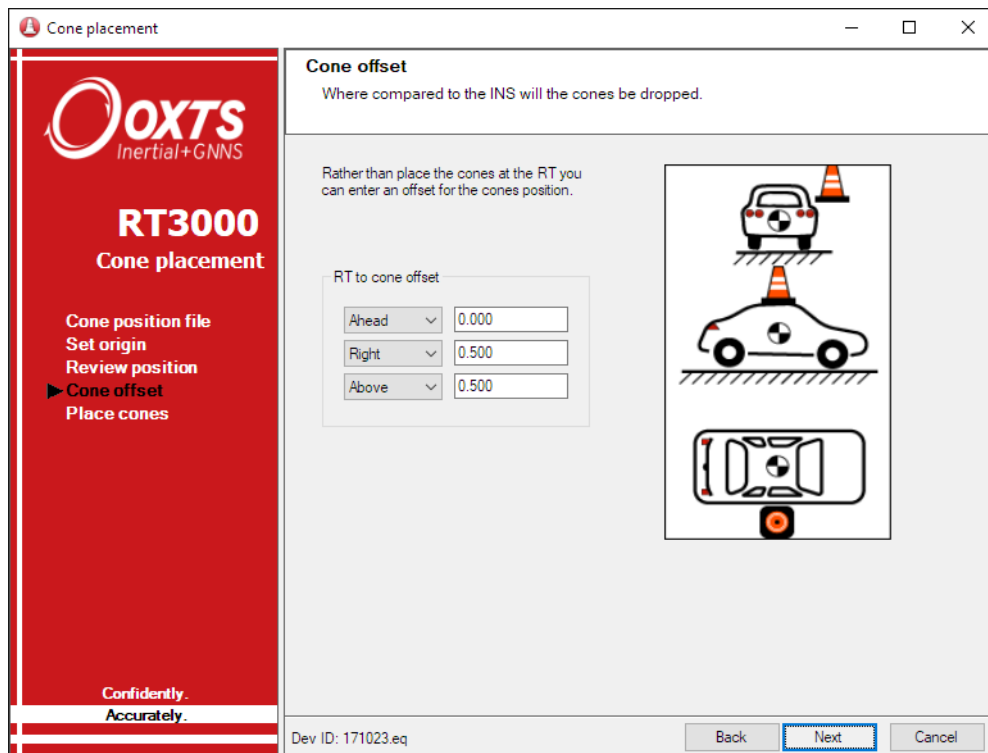
Figure 40:
Cone offset page

On the Cone Offset page the location where the cones will be dropped can be configured. This is measured from the INS to the drop position. Diagrams are included to help and to make sure that the measurements are in the correct directions.

The Place cones page is shown in Figure 41.
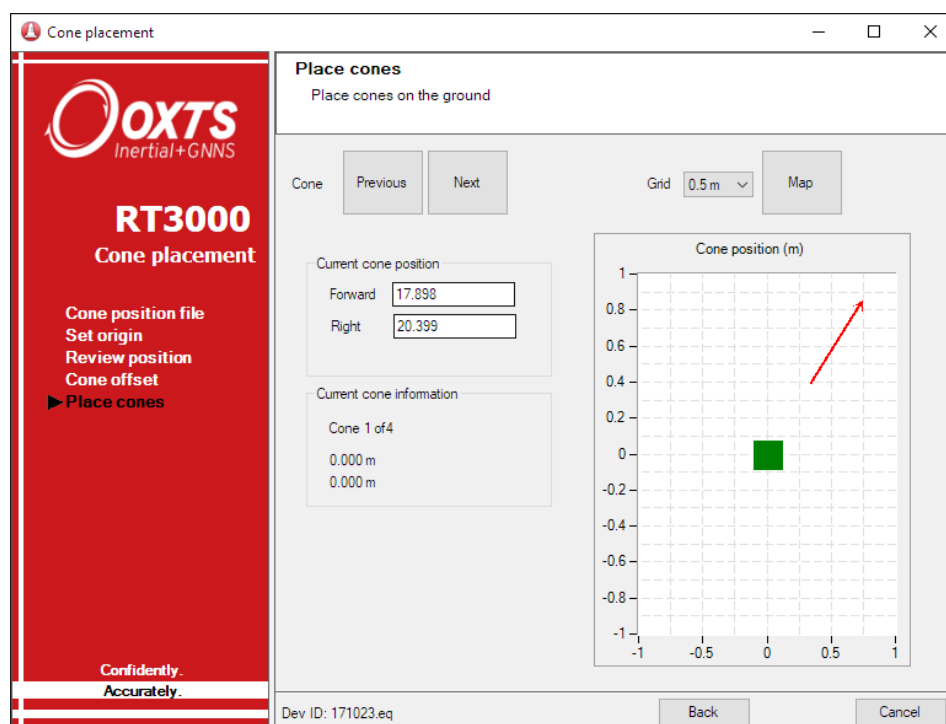
Figure 41:
Cone placement, Place cones page

This is the page that shows where the cones should be placed compared to the location of the car.

At the top of the page a tool bar is used to interact with the software. Table 4 explains the functions of the items on the toolbar.

| Tool	Description
Previous	This changes the cone that is currently being placed to the previous cone
Next	This changes the cone that is currently being placed to the next cone
Grid	This changes the scales on the graph that shows the current position and the current cone
Map	This opens the map window, which gives an overview of all the cones, the car's position and shows which cone is being placed. The Map window is shown in Figure 42

Table 4:
Cone placement, place Cones Page, Toolbar

The Current cone position group box shows the offset of the car compared to the ideal cone position. It is hard to drive the car to the exact spot where the cone needs to be positioned.

Using a tape measure, exact adjustments can be made using these values so that the cone is placed at the right location.

The Cone position graph shows the forward (vertical axis) and the right (horizontal axis) values graphically. The numbers and the graph both change when the Cone offset values are changed.

The Current cone information shows the cone number and the cone position in the XY co- ordinates, as read from the file.
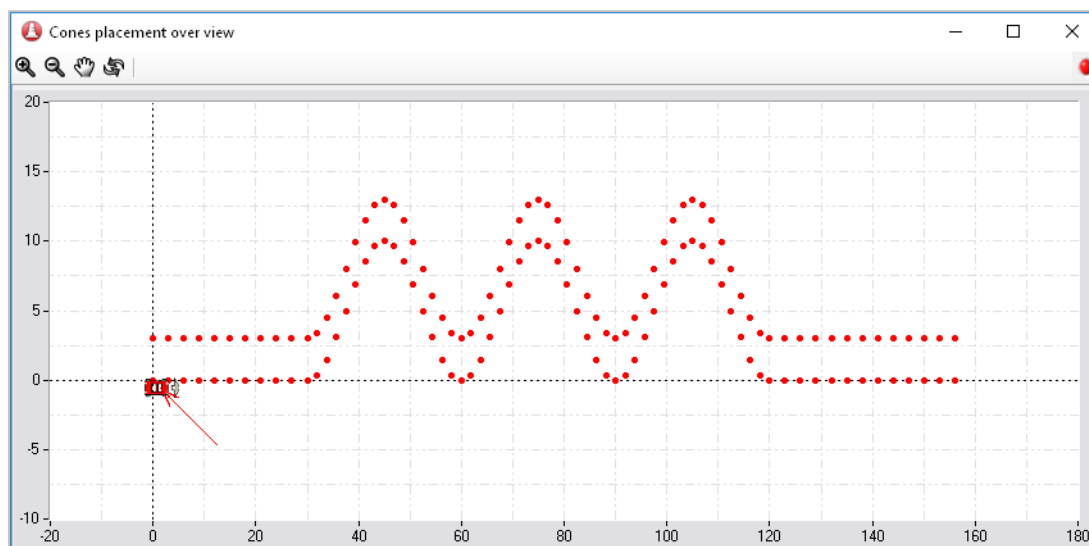
Figure 42:
Cone placement, map window

The Map window shows all of the cones, the location of the car and has an arrow to the current cone. The scale can be changed using the zoom buttons.

Note that the location of the car on the map window is not affected by the quantities entered in the Cone offset page. The car is drawn assuming that the INS is in the centre of the car. This window is only to be used as an overview: for accurate positioning using the graph on the Place Cones page.

Drift test

The Drift test utility shown in Figure 43 is designed to provide a quick and easy way monitor the lateral drift of vehicles. The tabbed controls on the left of the screen determine the test conditions, while the window on the right displays a visual representation of the vehicle's drift.

Figure 43:
Drift test utility window

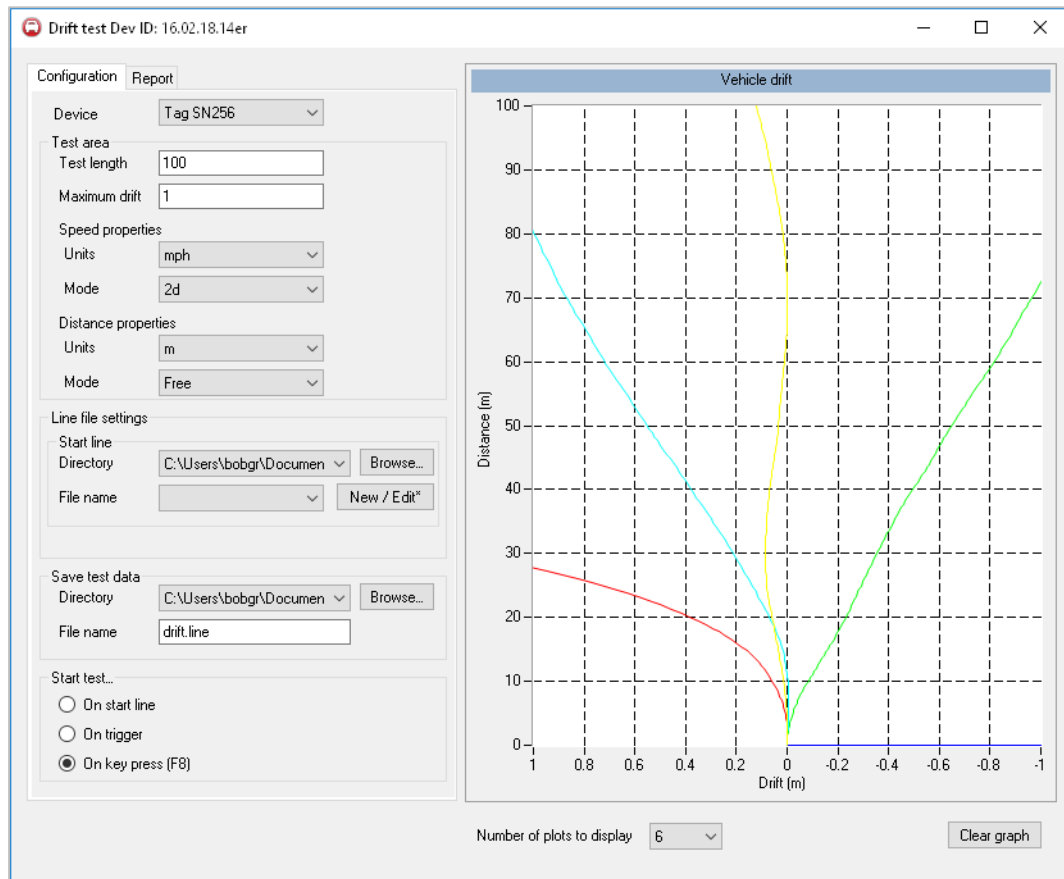| Field	Definition
Device	The device to be evaluated
Test length	Defines the height of the Vehicle drift graph. The test automatically ends when the line leaves the graph area
Maximum drift	Defines the width of the window to either side of zero. The test automatically ends when the line leaves the graph area
Speed units	Defines the units used to create the report for each line
Speed mode	Defines the speed mode to use; 2D or 3D
Distance units	Defines the units used to create the report for each line
Distance mode	When set to hold, the IMU sets a higher threshold to what it considers movement-avoiding distance accumulation due to errors. This is only needed in areas of poor GNSS reception
Line file directory	Location of folder that contains one or more start line files
Line file name	The file name of the start line used to trigger the test
Save test data directory	Folder where test reports should be saved
Save test data file name	Each report is saved separately in the test data directory using the form [file name][line number].CSV
Start test on start line	The test will activate when the vehicle passes the selected start line
Start test on trigger	The test will start each time the INS reports a trigger event
Start on key press (F8)	The test can be manually triggered each time F8 is pressed
Number of plots to display	Defines the number of plots that will be added before the graph automatically clears. When the graph clears, the files created for the report page remain.

Table 5:
Drift test utility window field definitions

The Report tab provides a more detailed summary of the saved drift tests. Each CSV file found in the Save test Data Directory can be selected and reviewed. A Delete files button at the bottom of the report page can be used to remove all CSV files in the working directory. Please note that you should change the default working directory to avoid accidentally deleting important files.

OXTS

File replay

The File replay utility reads data from an NCOM, RCOM, XCOM or MCOM file and uses it to simulate a device broadcasting live data on the network. This allows templates to be tested when no physical device is connected.

The utility can also control the playback speed too. This feature, and the option to loop the playback of files, becomes available once playback commences.

Multiple instances of the File replay utility can be run at once, enabling one or more devices to be simulated. However, if the File replay window is closed at any time, the simulated device will become unavailable.

To open the File replay utility, click Utilities on the Main menu, then click File replay. Alternatively, dragging and dropping one or more NCOM, RCOM, XCOM or MCOM files into NAVdisplay will open a File replay window for each file.
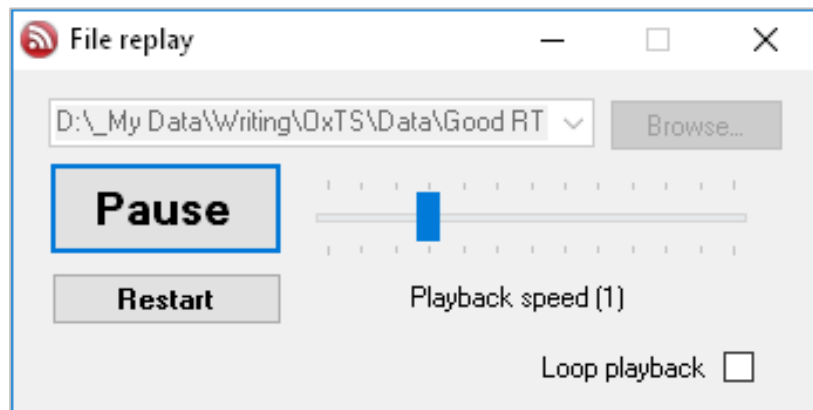

Figure 44:
File replay window

The File replay utility simulates a device broadcasting on the network.

Serial port

OXTS devices are normally connected to PCs via Ethernet. However, the Serial port utility found in the Utilities menu enables navigation data to be received via serial RS232 connections. The settings used on the Serial port window will need to match the serial connection settings that your OXTS product has been configured with.

This window must be left open at all times while viewing the data. If it is closed NAVdisplay will immediately stop reading from the device. Multiple instances of the Serial port window can be opened at once.
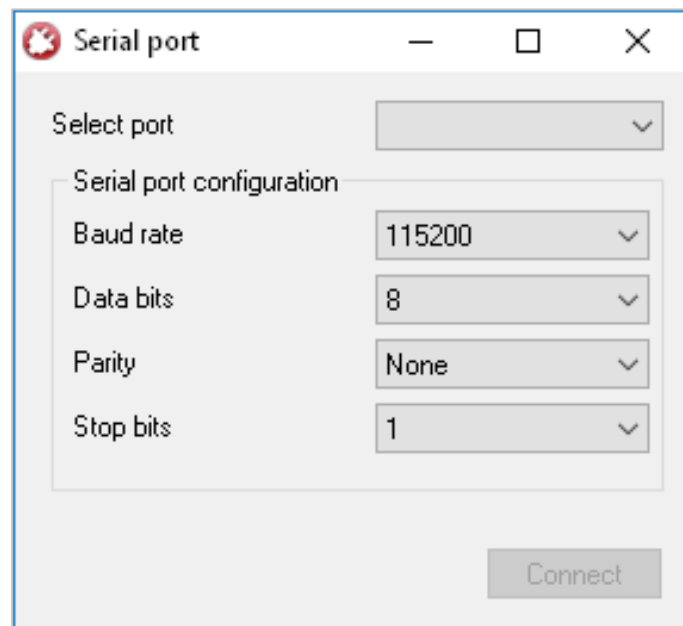
The Serial port window is accessed via the Utilities menu on the main menu.

Device status

The device status utility is a software tool that allows the feature code status of selected devices to be checked. The utility is launched by selecting Device status from the Utilities menu on the main toolbar. This will open the window shown in Figure 46.

The Device status window provides a list of all features that can be enabled using feature codes. The Setting column has fourstates:

+ Enabled
+ Disabled
+ Not supported
+ Expired

The issue date and expiry data for any enabled features is shown in the relevant column. For more information on feature codes, or to enable available features, please email sales@oxts.com.
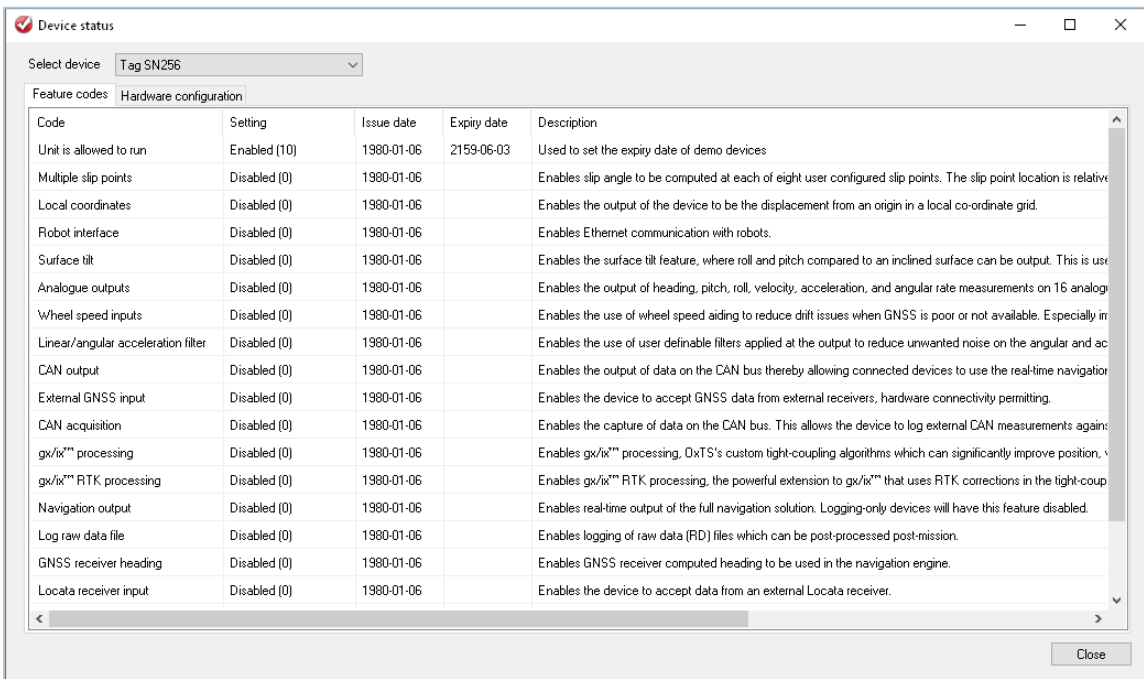

Figure 46:
Device status window

The Device status window is accessed via the Utilities menu on the main toolbar. It shows what feature codes have been enabled on the selected device.

Test and save module

The Test and save module is launched by selecting Utilities > Test and save. This utility is designed to automatically process, then save data that fits the test criteria defined on the start/ stop tabs. It is useful because it allows real-time evaluation of data without the need to stop and analyse data manually.

Several instances of the Test and save utility can be launched simultaneously, allowing multiple tests to be conducted in parallel. Each tab of the Test and save module is described in more detail below, however the Test status and Start now buttons shown in Figure 47 are available regardless of which tab is selected.
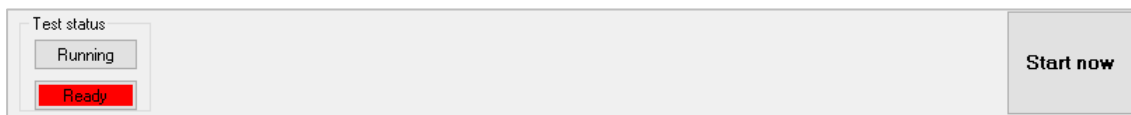

Figure 47:
Test and save buttons

When the module is ready to begin testing, the Ready button turns red. When the module is running a test the Running button turns red. The Start now button can be used to manually start and stop tests at any time.

General tab

The General tab show in Figure 48 contains a special version of the Connections window that is used to select the data streams used by the Test and save module. This version of the Connections window is independent of the Connections window accessed via the View menu in NAVdisplay, and only streams that are enabled via the Select Streams button are visible to the Test and save module.
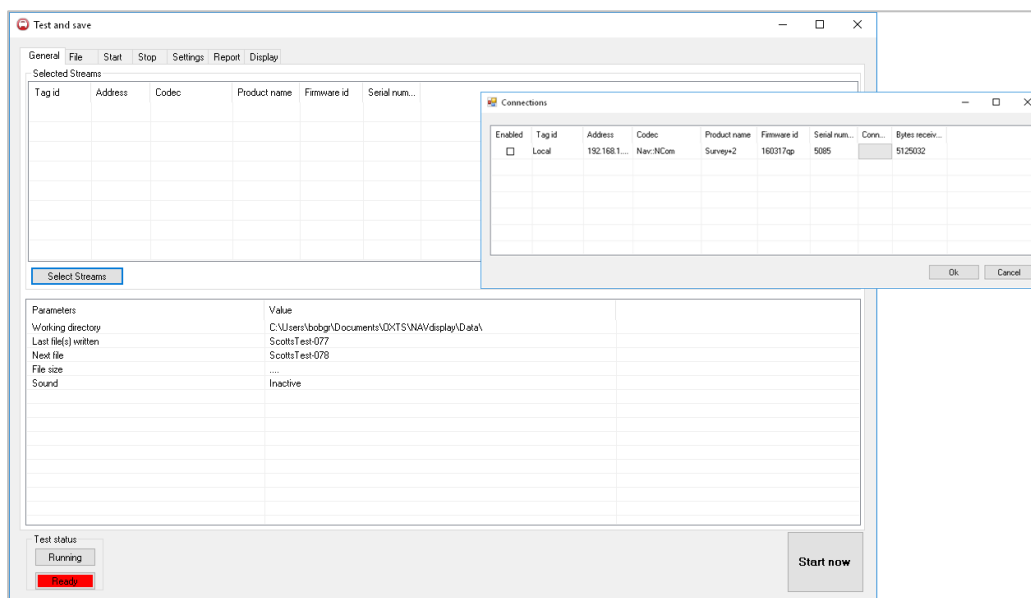

Figure 48:
Test and save General tab
Note: the screenshot shows the Connections window accessed by clicking Select Streams.

To select streams, click the Select Streams button, then select the Enabled box next to your chosen streams in the Connections window. More than one stream can be Enabled.

The table in the lower half of the General tab summarises the settings and tests defined on the Test and save module's other tabs. Table 6 below lists all parameters and describes their purpose.

Parameter	Description
Working directory	Displays the directory where all test files will be saved
List file(s) written	Displays the name of the last test file recorded
Next file	Displays the name of the next test file to be recorded
File size	Displays the size of the file currently being recorded
Sound	Displays whether any of the start or stop sounds are active

Table 6:
Description of General tab parameters

File tab

The File tab shown in Figure 49 is where the path used to store any test data is defined and where the automatic file naming function is configured.
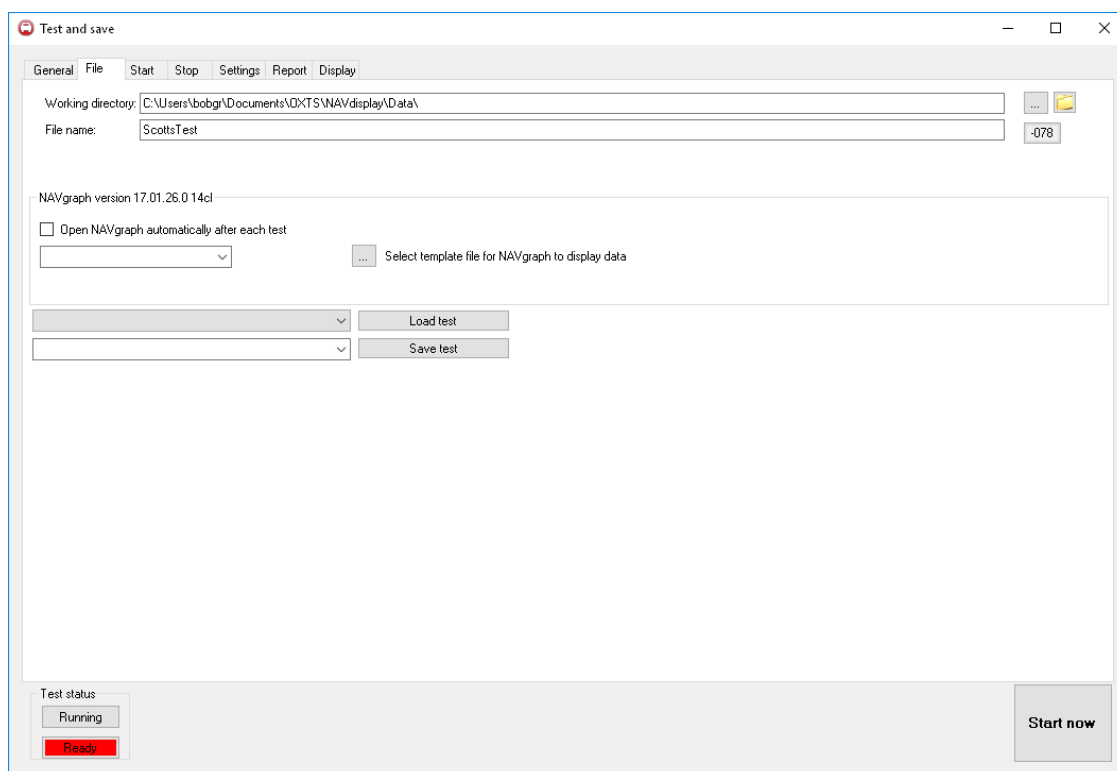

Figure 49:
Test and save File tab

Working directories can be defined by copying and pasting a path directly into the text box, or by clicking the … button and navigating to a target folder. Pressing the folder icon at the end opens the specified target folder in Windows Explorer.

When test files are created, they will be named with the text entered into the File name text box and suffixed with the auto-incrementing number displayed on the -000 button to the right-hand side. Clicking the -000 button opens the Data file numbering window shown in Figure 50, where the suffix can be formatted.
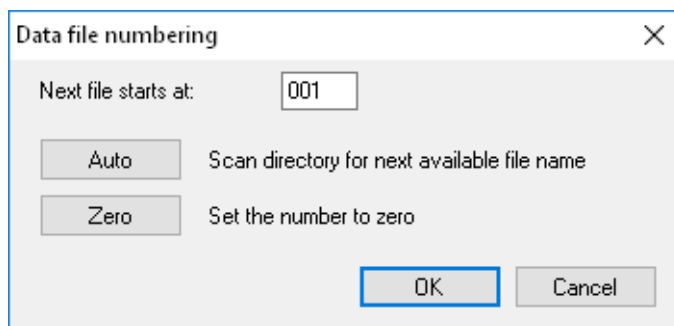
Once a test file has been created, it can be automatically opened in NAVgraph. To enable this option, select Open NAVgraph automatically after each test. The menu below this option allows a NAVgraph template to be selected. To access NAVgraph templates not located in the default location, use the … button to navigate to this folder. The templates will then appear in the drop-down menu.

At the bottom of the window are the controls for loading and saving your tests. Once conditions have been defined in the Start and Stop tabs, they can be saved for future use by simply entering a name in the drop-down box and clicking Save test. Once one or more tests have been saved, they can be quickly loaded by selecting them from the drop-down list and clicking Load test.

Start Tab

The start tab shown in Figure 51 is used to define the conditions under which a test file will be started. When an INS is configured using NAVconfig, trigger events can be defined. These are captured by NAVdisplay and can be used to start and stop tests.
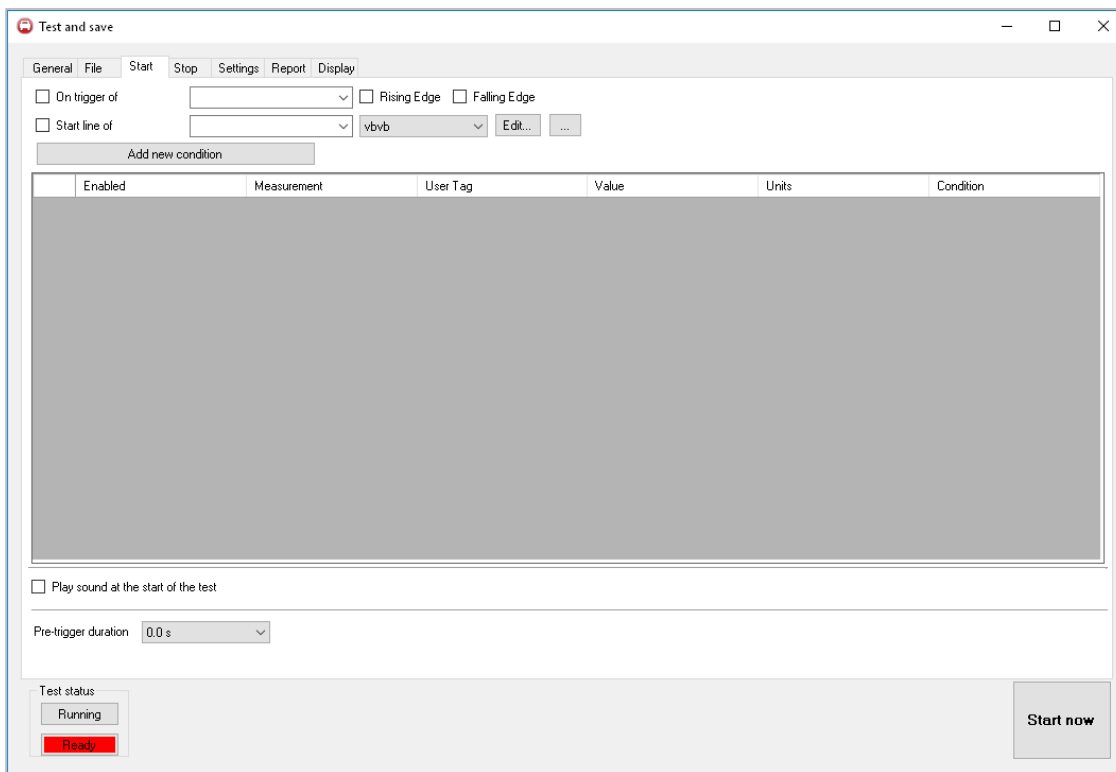

Figure 51:
Test and save Start tab

The tag ID of any live products that are visible to NAVdisplay will show up in the drop down menus. To start a test on the falling edge trigger of a product, select the On falling trigger of option, and choose the correct device from the adjacent menu.

Selecting the Start Line of option will start the test when the chosen INS crosses a predefined line in the correct direction. This option cannot be selected until a valid start line is either defined or selected. Pressing Edit... opens the Define Start Line window as shown in Figure 52.

To create a new start line, enter the desired name in the File Name box at the top of the window and choose a location by pressing the ... button.
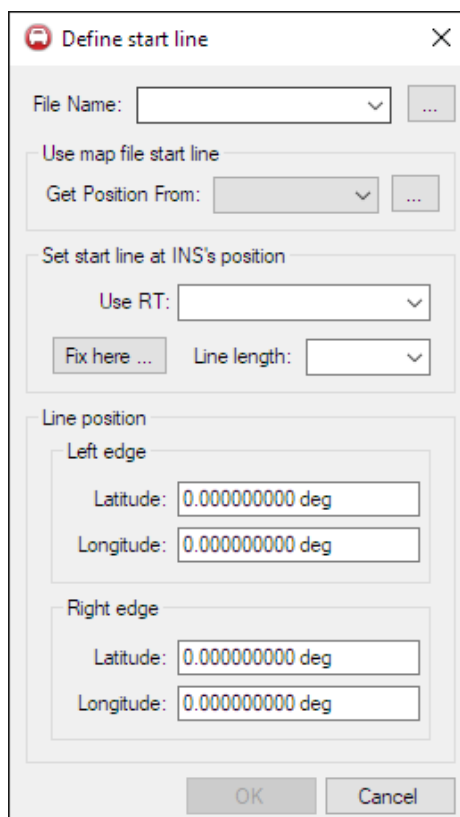
Figure 52:
Define Start Line window

To set a start line using live data from a device, move the vehicle to the desired start line position and ensure it is pointing in the right direction, then press Fix here.... This will set the start line at the current position perpendicular to the current heading.

The desired length of the start line can be selected using the Line length drop-down list box. The latitude and longitude of each end of the start line are displayed lower down. These edit boxes can also be used to manually type in the co-ordinates of a desired start line.

Tests can also be triggered by testing any value being output by the INS. To build new conditions, click the Add new condition button. This will open the Add measurements window, where the measurement to be tested can be selected.

By entering a value, the units and a condition it is possible to define triggers suitable for most tests. There is no practical limit to the number of conditions that can be entered, however, the Test and save module evaluates conditions in a top-down order and starts the test on the first true condition it encounters.

The option to play a sound at the start of the test is useful when there is only one person in the vehicle, as it provides an audible alert for the driver.

The Pre-trigger duration provides a method of including measurement data that occurred before the test was triggered in the output data files. This is possible as NAVdisplay keeps data in a buffer. Up to two seconds of data, prior to the start of the test, can be included.

Stop Tab

The Stop tab shown in Figure 53 is used to define the conditions under which a test file will be stopped. Tests can be stopped on the rising or falling edge of a INS trigger, when crossing a stop line or on one or more user defined conditions.
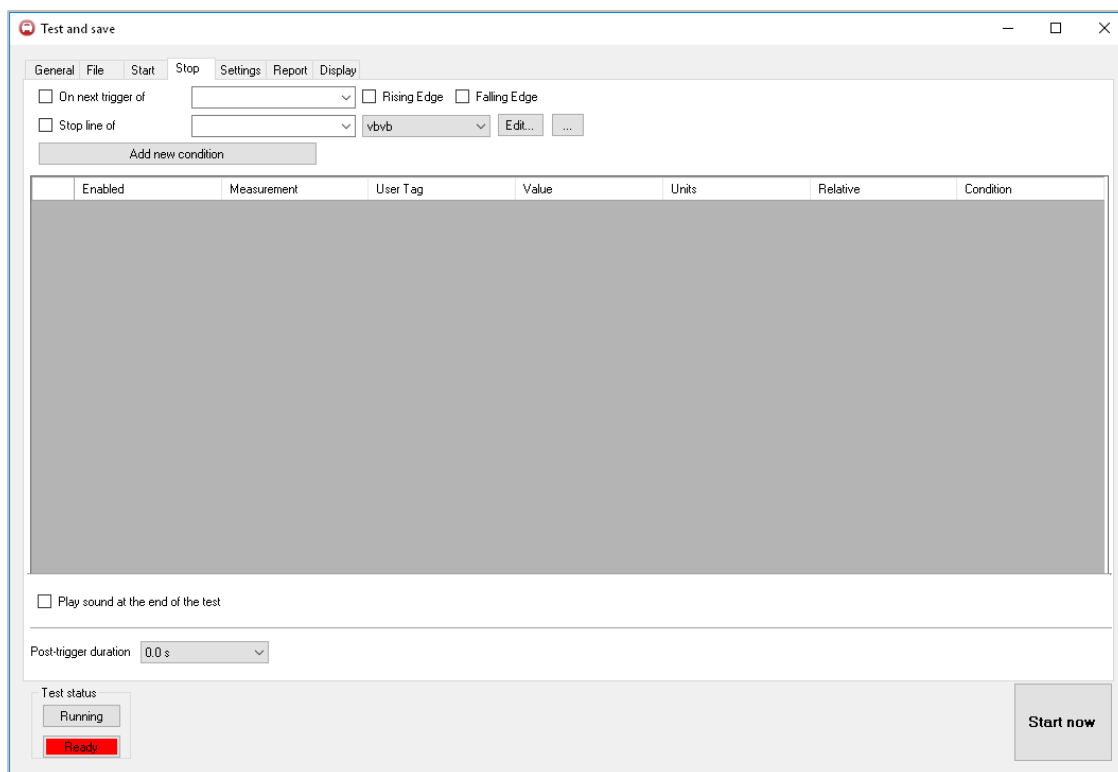

Figure 53
Test and save Stop tab

The On next trigger of and Stop line of options work in the same way as those on the Start tab. User-defined conditions are also added in the same way as user-defined start conditions, except there is an additional column called Relative, which allows the end condition to be entered relative to the start condition.

The Play sound at the end of test option is a useful audio indication for the vehicle driver that the test has terminated. The Post-trigger duration continues to add data for the specified duration after the test has concluded.

Settings tab

The Settings tab shown in Figure 54 contains a number of options that can be used to control the creation of report files and to then check those files using pass/fail criteria.
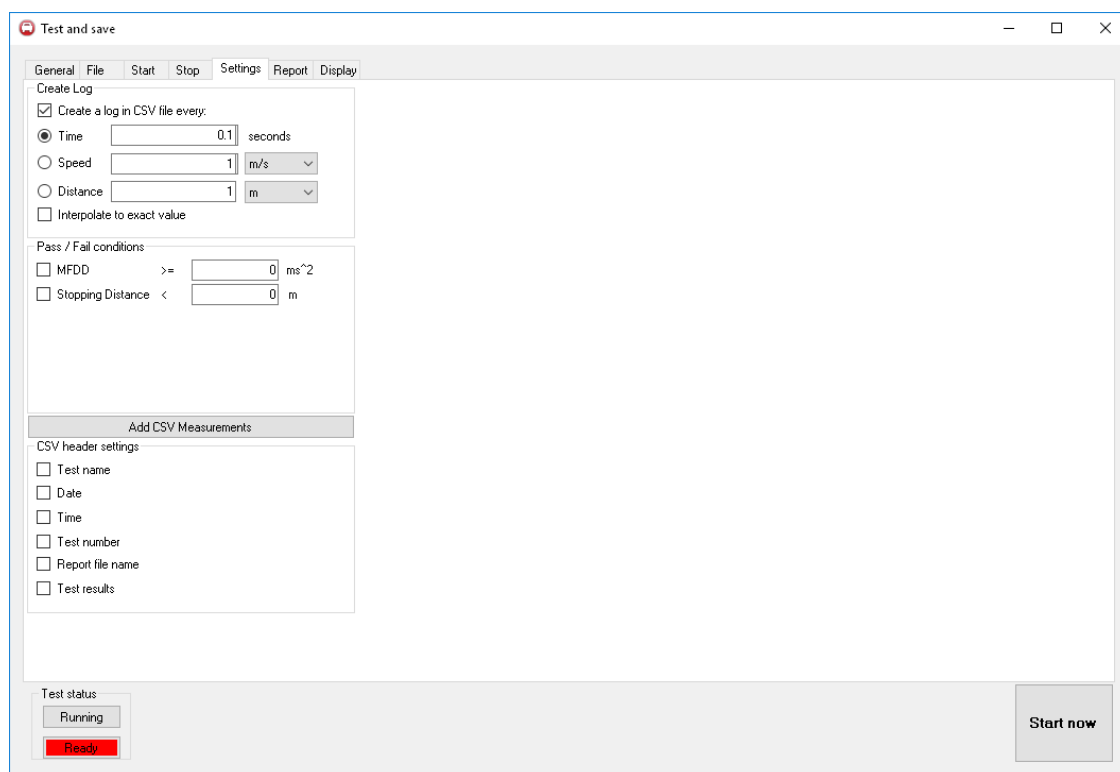

Figure 54:
Test and save Settings tab

The Create Log section houses the controls that determine if a CSV report file is created. An NCOM and XCOM file is created by default each time a test is conducted. To create a CSV report, select Create a log in CSV file every…, then choose Time, Speed or Distance.

The report uses the actual values collected by the INS, which may not exactly match the values specified for the report. To interpolate the INS data to exactly match the values you have specified, select the Interpolate to exactvalue option.

The Add CSV Measurements button allows you to choose the measurements that will be included in the report. Once selected, those measurements are show to the right-hand side of the window.

The CSV header settings control the information that will be included in the header of the CSV file as shown in Figure 55.

Figure 55:
Header section

The Pass/Fail section is where the parameters used to evaluate a pass or fail condition are entered. When enabled, the MFDD and Stopping Distance are evaluated according to the values entered in this section, and a Pass Fail tag will be generated.

Report tab

The report tab shown in Figure 56 provides a list of all the reports that have been created in the current working directory. By clicking on a report, a preview of the results is displayed in the window, and the colour of the header information window changes to red or green depending on the Pass/Fail status of that report. Data displayed in the preview window can also be selected and copied using CTRL+A and CTRL+C.
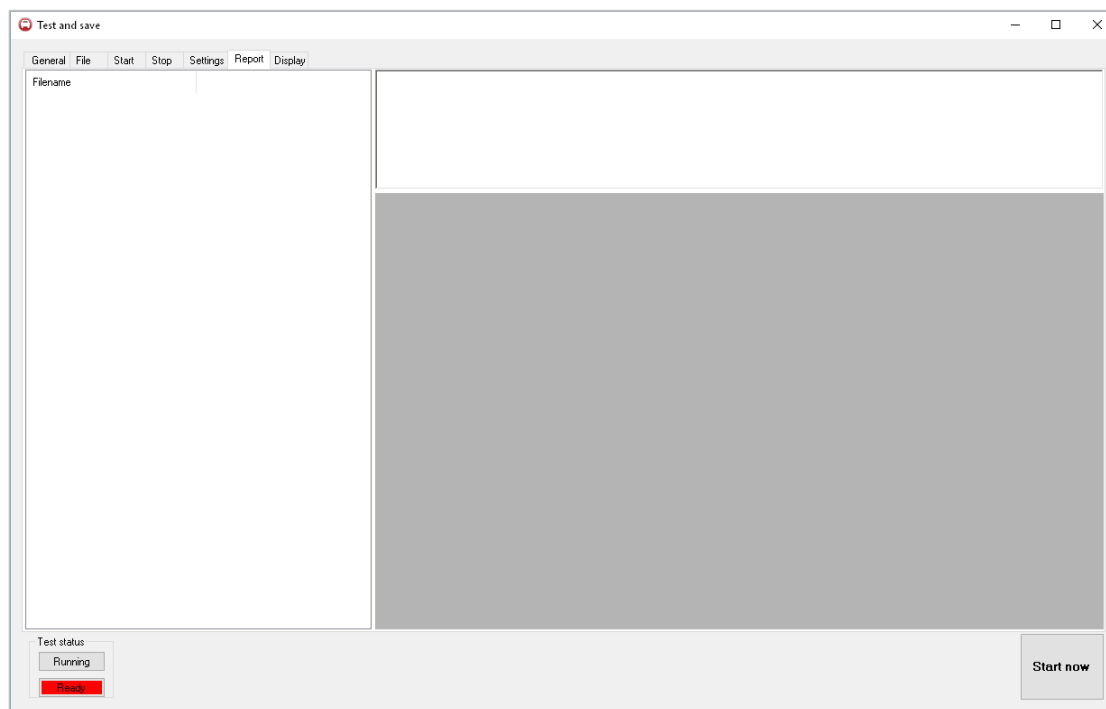

Figure 56:
Test and save Report tab

Display tab

The display tab provides a real-time plot of the data when a test is active. It also displays a line representing the Start and Stop parameters as a green and red line respectively. A new graph is added for each Start and Stop condition and is named with the condition measurement, allowing all conditions to be evaluated.

Figure 57 shows the Display tab, where two conditions have been added. The first condition is based on the measurement Speed 3D, while the second is based on Acceleration lateral.

Figure 57:
Test and save Display tab

Quick Config

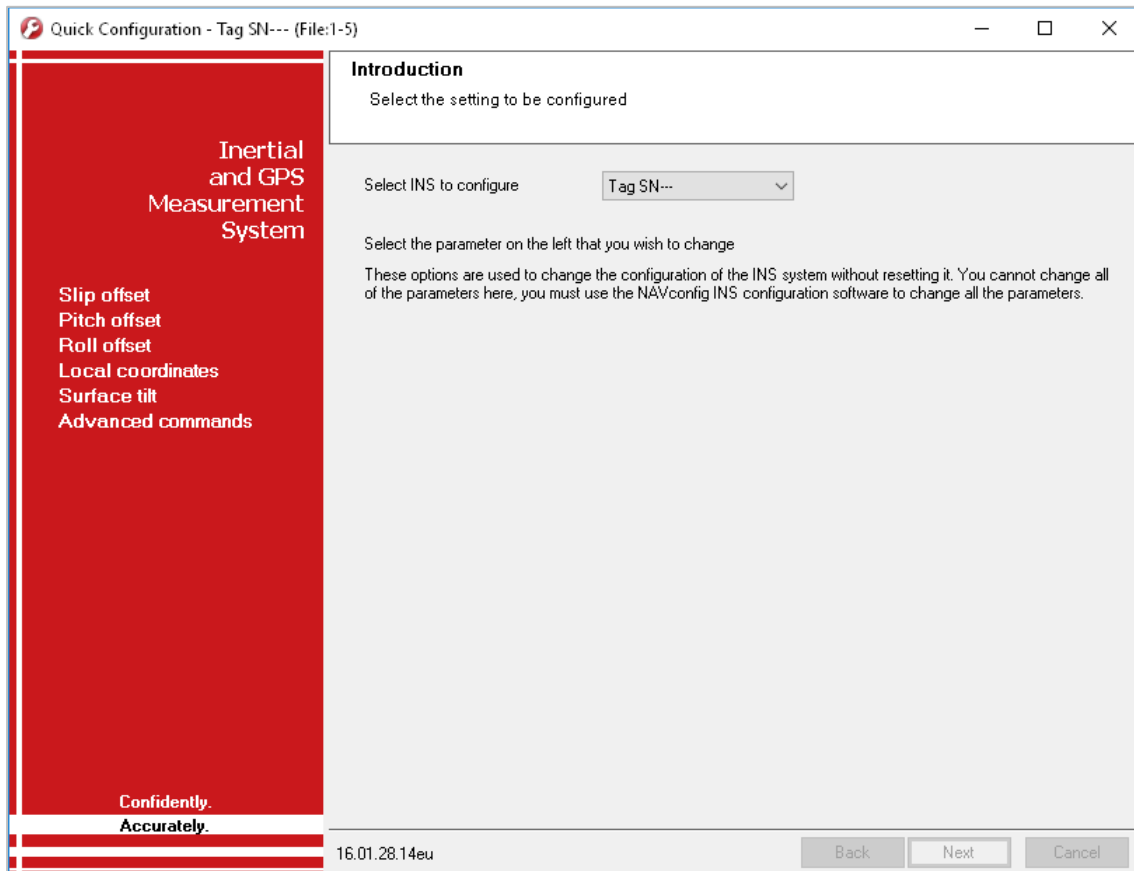Selecting Quick Config from the Utilities menu opens the window shown in Figure 58.

Figure 58:
Quick Configuration window

Contained within the Quick Configuration window are a number of options that can be used to change the configuration of the selected unit without resetting it. Only a limited number of parameters can be changed using this window, the full range of parameters can be changed using the configuration software, NAVconfig.

Slip offset

Pressing Slip offset on the menu to the left of the Quick Configuration window opens the Slip offset page shown in Figure 59 below.
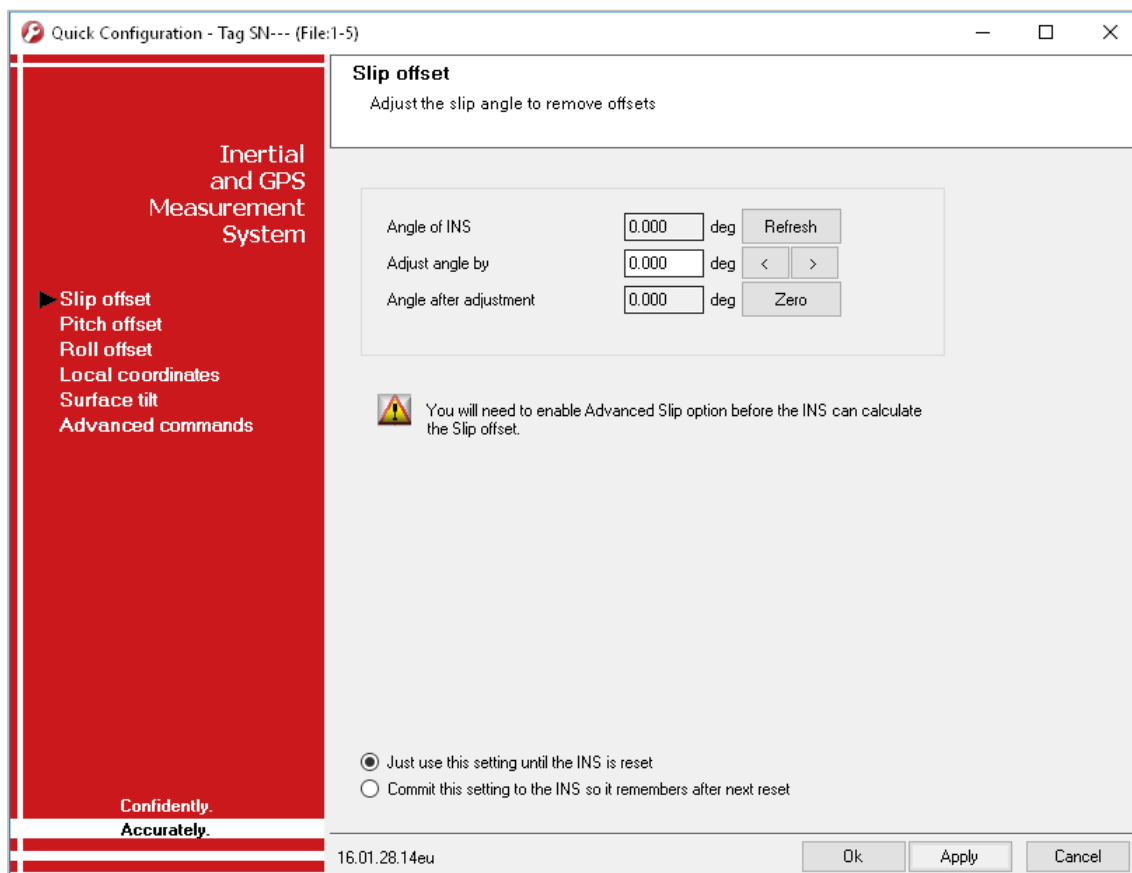

Figure 59:
Slip offset window

This option can be used to correct any longitudinal misalignment in the way the unit has been mounted in the vehicle. It does this by changing the angle of heading with respect to the IMU. There are two ways of doing this which are explained below.

If the angle of the misalignment is known, the value in degrees can be entered into the Adjust angle by box or using the arrows next to the box.

If the angle of misalignment is not known, it can be calculated and corrected if Advanced Slip or Wheel Configuration has been enabled with the configuration software and the INS has had a suitable warm up run. Pressing the Refresh button displays the current angle of misalignment calculated by the unit. Pressing the Zero button adds or subtracts the appropriate value to zero the angle of misalignment.

Before pressing the Apply button, one of two options must first be selected at the bottom of the page. The first option—Just use this setting until the INS is reset, selected by default, will cause the unit to use the selected offset until it is reset. The second option—Commit this setting to the INS so it remembers after next reset will store the offset in the configuration of the unit to be used until the configuration is changed.

Pitch offset

Pressing pitch offset on the menu to the left of the Quick Configuration window opens the Pitch offset page shown in Figure 60.

Figure 60:
Pitch offset page

This option can be used to correct any pitch misalignment in the way the unit has been mounted in the vehicle. There are two ways of doing this which are explained below.

If the angle of the misalignment is known, the value in degrees can be entered into the Adjust angle by box, or using the arrows next to the edit box.

If the angle of misalignment is not known, it can be calculated and corrected for if the vehicle is stationary on a suitably level surface. Pressing Refresh displays the current angle of misalignment calculated by the INS. Pressing the Zero button adds or subtracts the appropriate value to zero the angle of misalignment.

Before pressing the Apply button, one of two options must first be selected at the bottom of the page. The first option—Just use this setting until the INS is reset, selected by default, will cause the unit to use the selected offset until it is reset. The second option—Commit this setting to the INS so it remembers after next reset will store the offset in the configuration of the unit to be used until the configuration is changed.

Roll offset

Pressing Roll offset on the menu to the left of the Quick Configuration window will open the Roll offset page as shown in Figure 61.

Figure 61:
Roll offset page

This option can be used to correct any roll misalignment in the way the unit has been mounted in the vehicle. There are two ways of doing this which are explained below.

If the angle of the misalignment is known, the value in degrees can be entered into the Adjust angle by box, or using the arrows next to the edit box.

If the angle of misalignment is not known, it can be calculated and corrected if the vehicle is stationary on a suitably level surface. Pressing the Refresh button will display the current angle of misalignment calculated by the INS. Pressing the Zero button will add or subtract the appropriate value to zero the angle of misalignment.

Before pressing the Apply button, one of two options must first be selected at the bottom of the page. The first option—Just use this setting until the INS is reset, selected by default, will cause the INS to use the selected offset until it is reset. The second option—Commit this setting to the INS so it remembers after next reset, will store the offset in the configuration of the unit to be used until the configuration is changed.

Local coordinates

Pressing Local coordinates on the menu to the left of the Quick Configuration window will open the Local coordinates page as shown in Figure 62.

Figure 62:
Local coordinates page

This option can be used to set up X and Y local co-ordinates of the test area. Firstly, one of two options must be selected at the bottom of the page. The first option—Just use this setting until the INS is reset, selected by default, will cause the unit to use the selected local co-ordinates until it is reset. The second option—Commit this setting to the INS so it remembers after next reset, will store the local co-ordinates in the configuration of the unit to be used until the configuration is changed.

Pressing the Set origin button sets the current location of the INS as the origin of the local co- ordinates. In order to set the X axis, the unit must be driven a minimum of 100 meters along the desired X axis before pressing the Set axis button.

Surface tilt

Pressing Surface tilt on the menu to the left of the Quick Configuration window will open the Surface tilt page as shown in Figure 63.
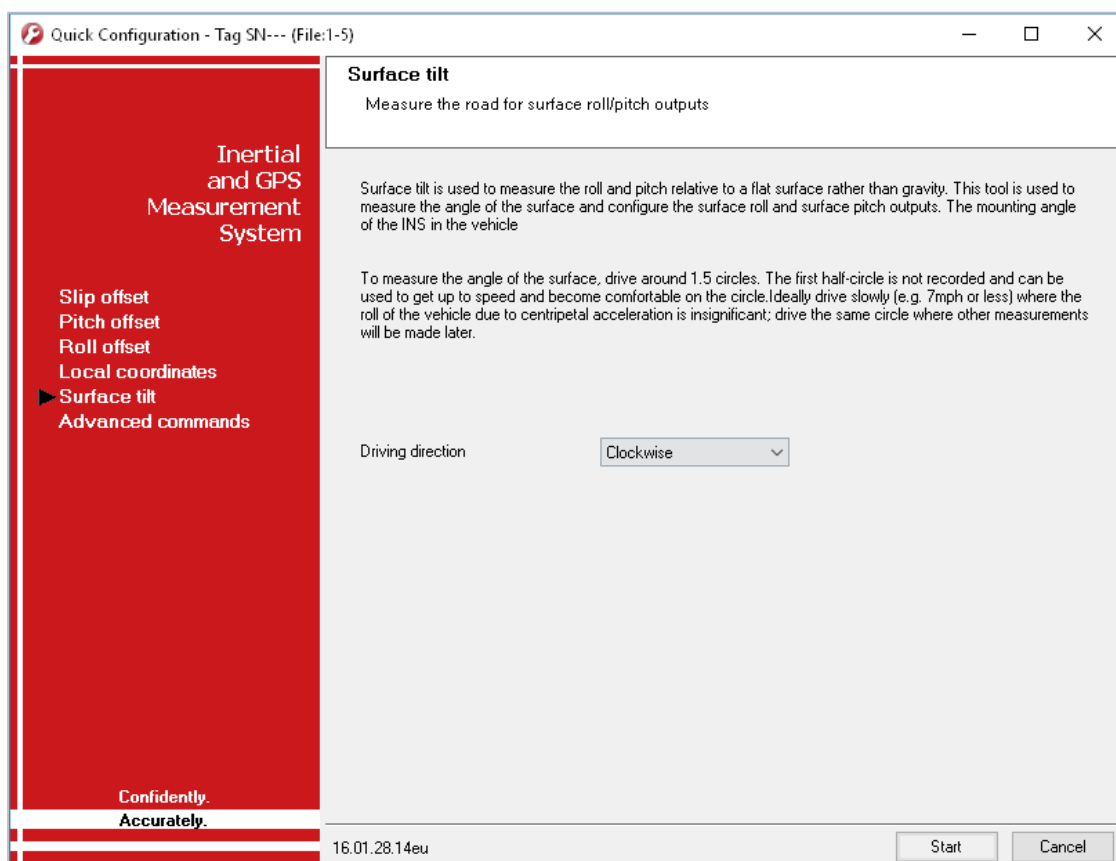

Figure 63:
Surface tilt page

This option can be used to measure the tilt of a surface, as well as the exact mounting angle of the unit in the vehicle. This enables the roll and pitch of the vehicle to be measured relative to the surface rather than gravity.

The Surface tilt page contains detailed instructions on how to take the measurements. Selecting either a clockwise or an anti-clockwise circle from the drop-down list boxthen pressing the Start button will open the map page.

To complete the surface tilt exercise the vehicle must be driven for 1.5 circles at a low constant speed. This speed should be no higher than the recommended maximum speed mentioned in the instructions on the first page.

The Progress around the circles bar at the bottom of the window displays how much of the exercise has been completed in the form of a progress bar. The Northing and Easting map in the middle of the page will display in real time the relative position of the unit and plot its path.

The first half circle is not recorded and can be used to find a constant speed and circle that can be maintained. This half circle will be displayed on the map as a thin line to represent the warm up period.

Once the first half circle is completed the remaining circle will be recorded and used to calculate the surface tilt. This circle will be displayed on the map as a series of plotted points to represent the recorded

data. When the start position of the exercise is reached, the plot of the warm up period will be overwritten by plotted points. When the start position of the recorded data is reached the exercise will be complete.

Once the exercise is completed a Next button will appear at the bottom of the page. Pressing this button will open the summary page. The Measurements computed area displays the surface pitch and roll measurements along with the mounting pitch and roll measurements computed in degrees.

The Quality measure area displays the error in the computed measurements due to variations in the surface angle and mountingangle.

The Apply surface correction area contains two tick boxes that can be used to define which measurements are corrected. Selecting the Correct the surface roll and pitch using these measurements tick box will apply the corrections to the surface tilt, selecting the Correct the roll and pitch mount angles of the unit in the vehicle tick box will apply the corrections to the mounting of the unit.

Before pressing the Apply button, one of two options must first be selected at the bottom of the page. The first option—Just use this setting until the INS is reset, selected by default, will cause the unit to use the selected corrections until it is reset. The second option— Commit this setting to the INS so it remembers after next reset will store the corrections in the configuration of the unit to be used until the configuration is changed.

Advanced

Pressing Advanced commands on the menu to the left of the Quick Configuration window will open the Advanced commands page as shown in Figure 64.
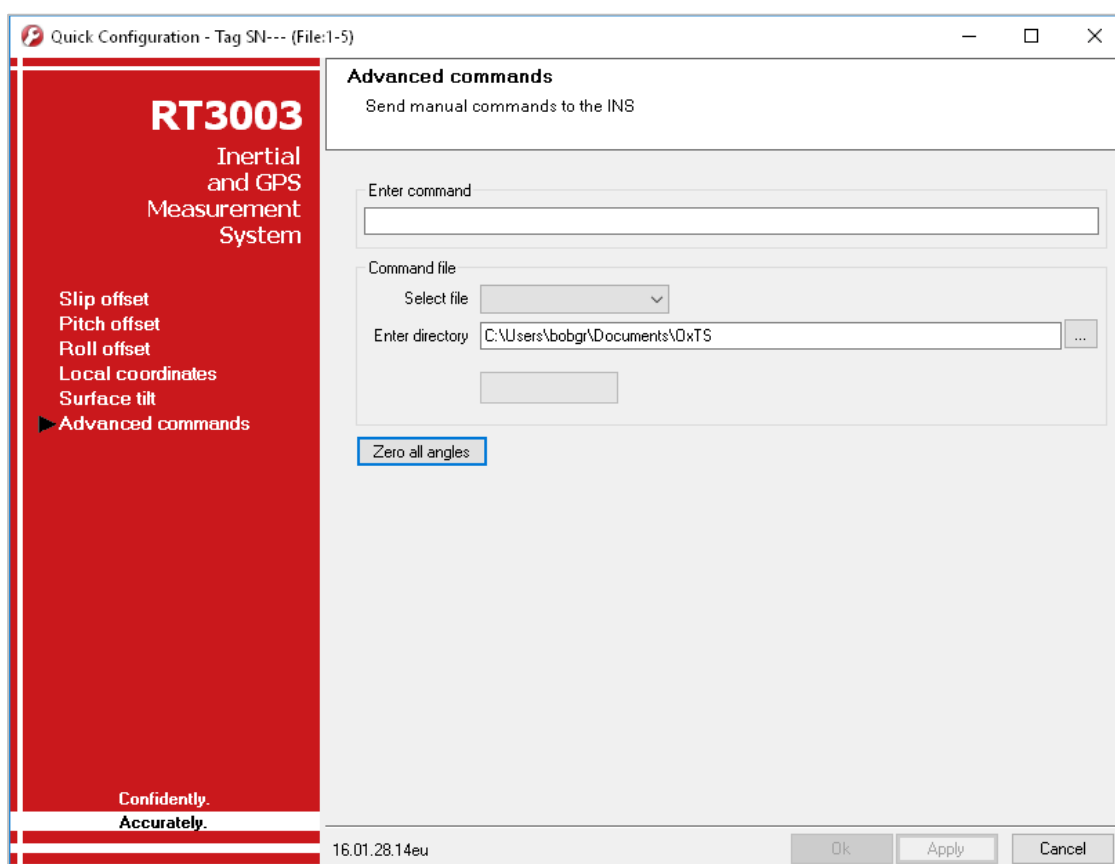

Figure 64:
Advanced commands page

This option can be used to send commands to the unit, either as a manually typed single line, or in the form of a script file. These commands are generally used internally by OXTS; however, they may be provided to use special functions.

The Zero all angles button can be used to capture the current estimates of roll, pitch and slip offset and modify the mounting angle of the INS so that all three angles are zero. For this to correctly represent the orientation of the vehicle, the vehicle has to be on horizontal ground, with no tilt, otherwise the values will be wrong. The button uses advanced slip to estimate the slip offset of the vehicle, so this needs to be configured.

It is better to use the three individual adjustments or the surface tilt if you are unsure of what the effect will be.

Using the Zero all angles button, the angles will be changed until the INS is next reset or powered up. There is no way, using this button, to commit the changes permanently to configuration in the INS.

Trigger command button

The Trigger command button provides an automated way to send Advanced commands to connected devices based on the state of that device's digital inputs and outputs. Six buttons are available as shown in Figure 65. There is one button for each input/output condition that can be used as a trigger.
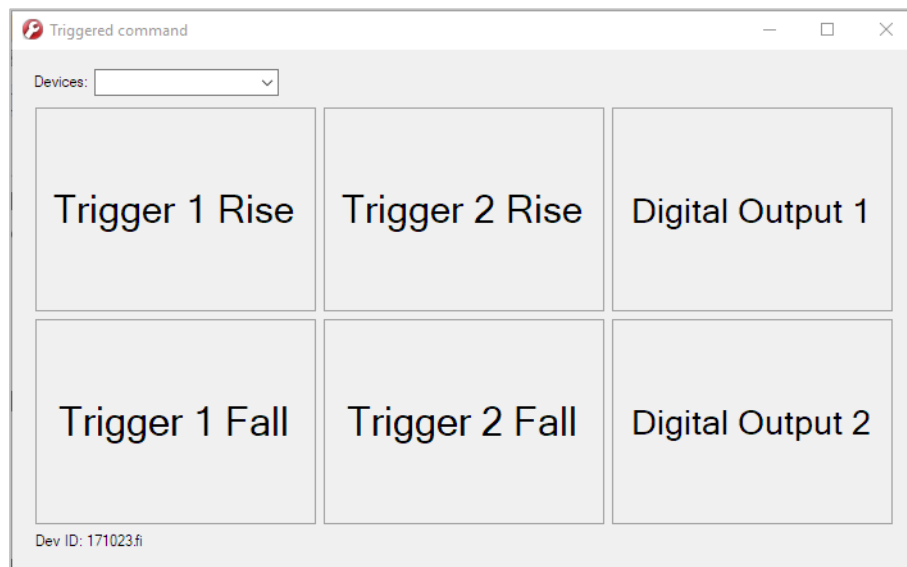

Figure 65:
Trigger command button

The Devices control is used to select the INS that will be used as a trigger source, and will also receive the advanced commands that are sent. To configure the action in response to a trigger state, right-click on the appropriate button to open the Trigger setup window shown in Figure 66

From this window a trigger ignore value can be set. Trigger signals received in less time than the Ignore trigger time, after the previous trigger, will not trigger additional commands to be sent.

The Command window is where the command or commands to be sent are entered.

When a command is triggered, the button for the relevant trigger condition can change colour to show the action has been triggered. The Trigger colour setting defines the colour that is used.
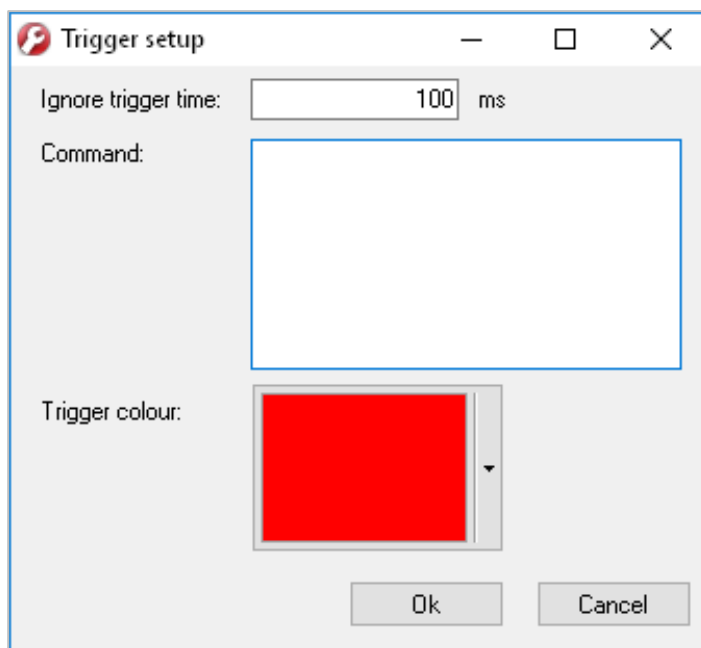

Figure 66:
Trigger command setup

Tip of the day and hotkeys

Tip of the day

When NAVdisplay first opens, the Tip of the day window shown in Figure 67 is displayed by default. This window provides some information about NAVdisplay and new features, as well as a number of useful keyboard shortcuts. This window can be permanently hidden by clearing the Show tips at startup option. The Tip of the day window can be re-enabled by selecting Help > Tip of the day and selecting the Show tips at startup option, or via Options > Startup > Show tip of the day.
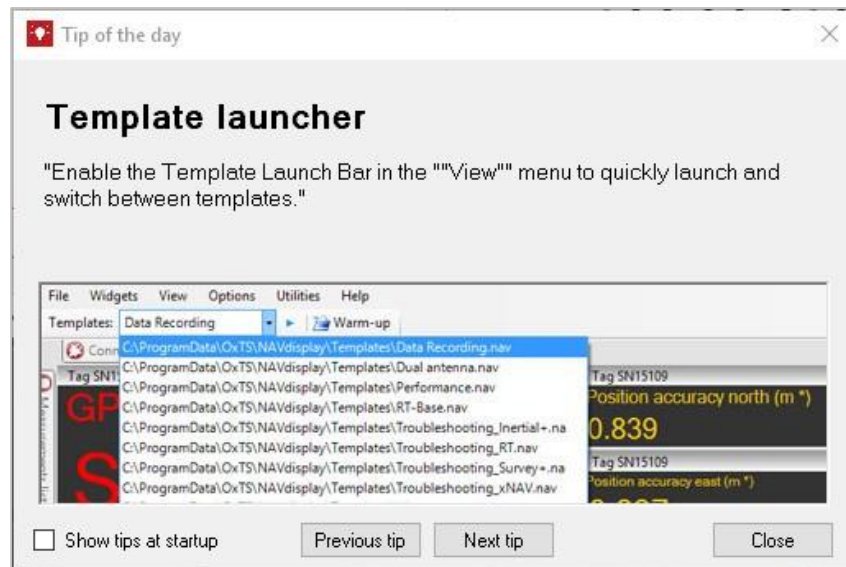

Figure 67:
Tip of the day window

Keyboard shortcuts

Keyboard shortcut keys provide access to many of NAVdisplay's features without the use of a mouse. This is useful in the field, where it is often hard to see the mouse pointer in bright sunlight. A list of shortcuts can be found by selecting View > Shortcut manager.

Revision history

Revision	Comments
250527	Manual moved to new branding.

Table 7:
Revision history

Blank for user notes

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