



SPECTRA User Manual

Turn Node

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Table of contents

Chapter 0 - About this document	0-1
Revision history	0-1
Document cross-reference	0-1
Conventions used in this document	0-1
Chapter 1 - Introduction	1-1
What is the Turn Node?	1-1
Turn Node operational flow	1-2
Getting started	1-3
Common features	1-3
Starting the Turn Node.....	1-3
The main window	1-4
Chapter 2 - Establishing the turning path.....	2-1
Setting the aimpoint (from the LMN)	2-1
Configuring the turn path (from the TN)	2-2
Setting the turn radius	2-3
Modifying the turn path	2-3
Adding a turning wheel	2-4
Toggle sense	2-5
Flip.....	2-5
Adjusting the turning radius of added wheels.....	2-6
Deleting a turning wheel	2-6
Enabling the turn	2-6
Viewing the turning path (via the DN).....	2-7
Saving and Restoring Turn Details	2-7
Chapter 3 - Configuring the Turn Editor display	3-1
Choosing a colour for the turn.....	3-1
Displaying geographical coordinates.....	3-1
Configuring the display features	3-2

Chapter 0 - About this document

This document is the user manual for the Turn Node of Concept Systems Limited's integrated navigation system designed for marine geophysical survey usage (SPECTRA). SPECTRA is a modular system comprising various Nodes.

This manual describes how to use the Turn Node. [Chapter 1](#) introduces the Node and explains how to get started with it. [Chapter 2](#) describes how to establish a turning path, and [Chapter 3](#) describes how to configure the display.

For a general overview of the operation of SPECTRA and for a description of features and conventions common to SPECTRA Nodes, see the *SPECTRA User Manual - Beginners Guide*. For a glossary of terms, see the *SPECTRA User Manual - Glossary*. For brief descriptions of each Node, detailed descriptions of the options provided by other SPECTRA Nodes and details of how to start each Node, see the *Spectra Software Installation and Set Up* manual.

Revision history

Document Reference	Date	Notes
SPCTRA_2.0/USER/TN/1.0	12 th November 1996	First issue
SPCTRA_2.0/USER/TN/2.0		Operational flow diagram amended.
SPCTRA_2.5/USER/TN/2.5	13 th February 1998	Operational flow diagram amended again. Section added on Saving and Restoring Turn Details from file.
SPCTRA_6.5/USER/TN/2.5	October 1998	Small correction
SPECTRA_7.6.7/USER/TN/3	December 1999	Iconic buttons added to Turn Editor Helmsman display

Document cross-reference

Document Reference	Title
SPECTRA/INSTALL_2	<i>Spectra Software Installation and Set Up</i>
SPECTRA/USER/BEGIN	<i>SPECTRA User Manual - Beginner's Guide</i>
SPECTRA/USER/GLOSS	<i>SPECTRA User Manual - Glossary</i>
SPECTRA/USER/DSN	<i>SPECTRA User Manual - Data Server Node</i>
SPECTRA/USER/DTN	<i>SPECTRA User Manual - Data Transfer Node</i>
SPECTRA/USER/DN	<i>SPECTRA User Manual - Display Node</i>
SPECTRA/USER/LMN	<i>SPECTRA User Manual - Line Management Node</i>

Conventions used in this document

The conventions used in this, and all other SPECTRA user manuals, are those defined in the *SPECTRA User Manual - Beginner's Guide*.

Chapter 1 - Introduction

This chapter describes some fundamental aspects of the Turn Node and explains how to get started with it.

What is the Turn Node?

When steering the vessel to the next survey line, the navigator usually has to negotiate a turn. The Turn Node assists the navigator in this aspect of steering. An aimpoint (that point at which the vessel will be in the correct position and orientation to approach the next survey line) is defined via the LMN, and the navigator selects whether to base the turn path on the current line or the vessel position. Based on this exit point, the TN then calculates and displays the optimum turning route to the aimpoint. The calculation takes into consideration the position and orientation of the vessel at the start and end of the turn, and the distance between these two points.

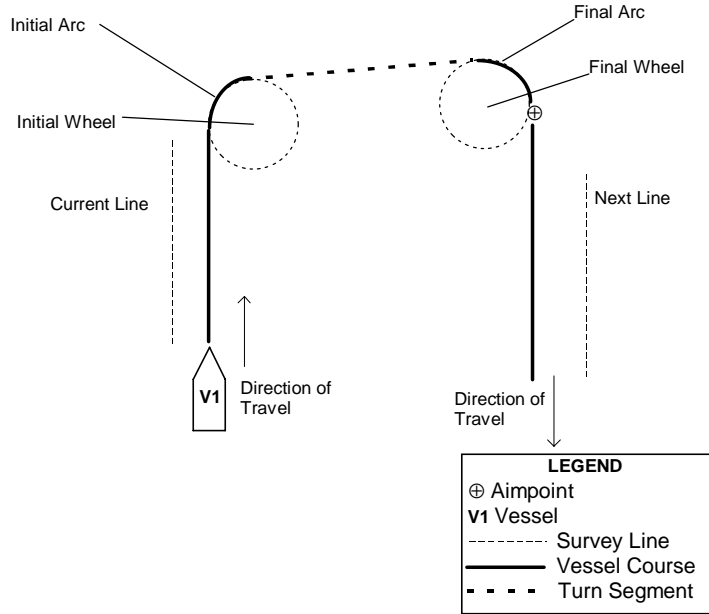
The turn will consist of two types of element:

Turning arcs the curved parts of the turn. The turning path which the vessel follows as it leaves the current line is known as the *Initial Arc*; that which it follows as it sweeps onto the aimpoint is the *Final Arc*. The size and shape of these arcs are based on circles or *wheels*, known as the *Initial Wheel* and the *Final Wheel* respectively. The navigator may configure the radii of these wheels. In some situations the computed turn may be based on more than two wheels, in others the turn may consist of only one wheel. The wheels appear in the Turning Node's main display window.

Turn segment the straight-line path connecting two turning arcs.

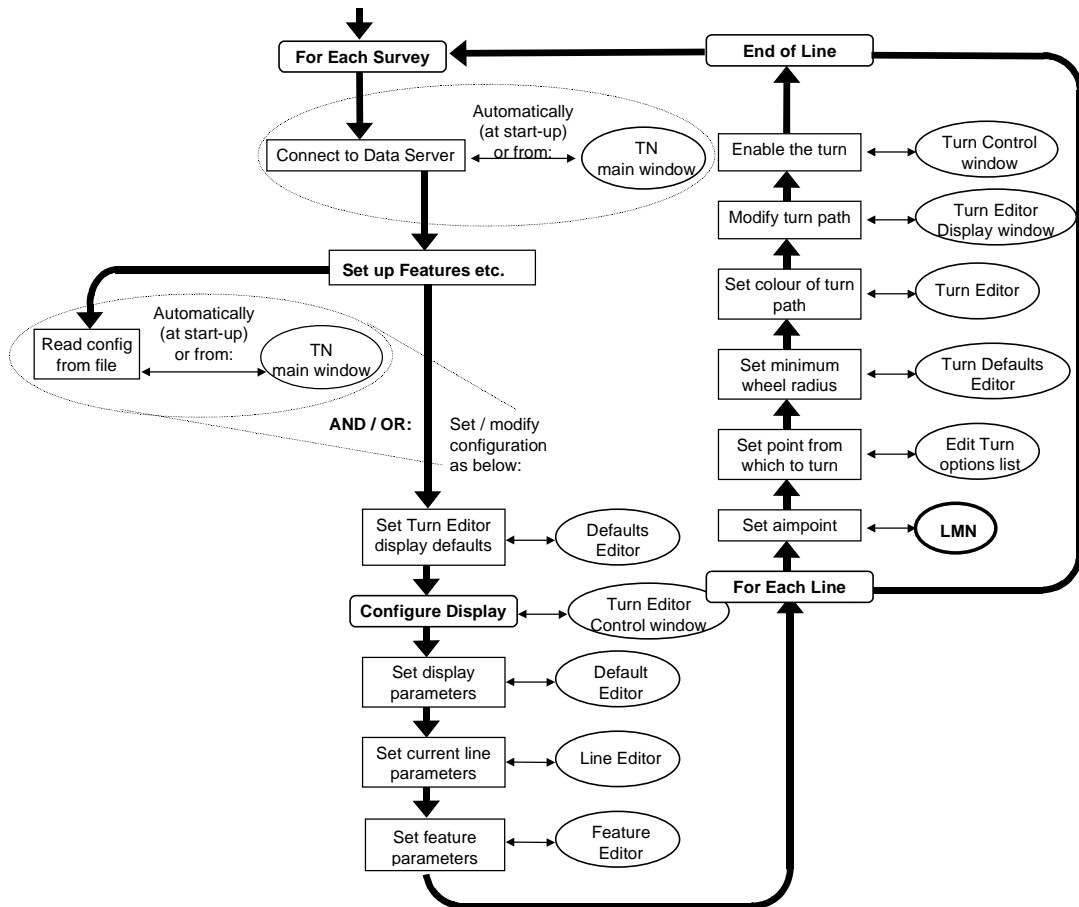
The calculated turning path does not take account of any obstacles which may lie along it. However, the TN allows the navigator to manipulate the route by adding turning wheels (and hence turn segments), adjusting the wheel position and toggling the wheel *sense* - the direction, to port or starboard, of the turn.

The following sketch illustrates some of the features of the TN's main display:



Turn Node operational flow

The following diagram shows the process of using the Turn Node, and the relationship between this process and the Node's main windows.



Getting started

Common features

Note that some features are common to all SPECTRA Nodes. These include:

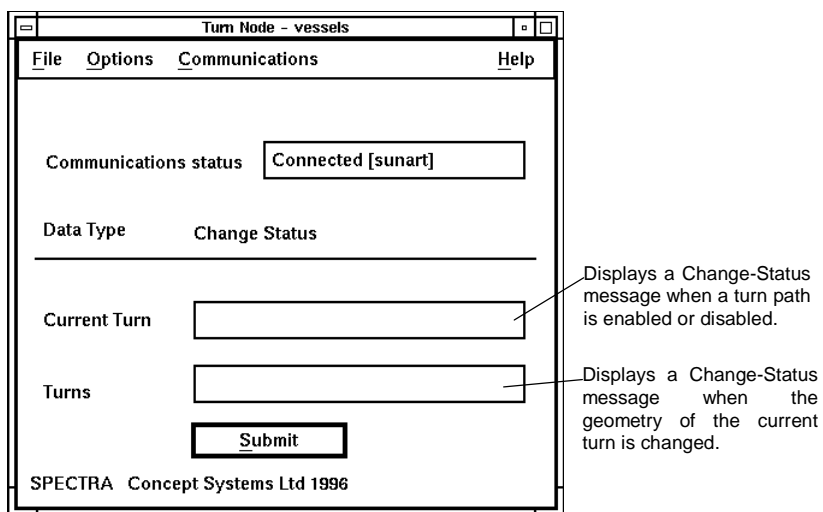
- general use of the mouse buttons;
- status areas on a node's main window;
- opening and saving configuration files, and exiting from the node (via the *File* menu on a node's main window);
- submitting configuration changes to the Data Server (via the *Submit* button or the *File* menu on a node's main window);
- selecting or specifying a file (for opening or saving the configuration);
- connecting to and disconnecting from the Data Server, and viewing communications errors (via the *Communications* menu);
- applying any configuration changes to the Node and exiting from the sub-window (via the *OK*, *Apply* and *Cancel* buttons or the *File* menu on sub-windows of the node); and
- obtaining help.

Starting the Turn Node

Normally, you will start the Turn Node from the Monitor Node. Details of the commands needed to start this and other SPECTRA Nodes can be found in the *Spectra Software Installation and Set Up* manual.

The main window

The starting point for setting a turning path is the Turn Node window.



From here you can gain access to the Turn Editor, from which to establish the turn path. You can also utilise options to configure the Turn Node's display.

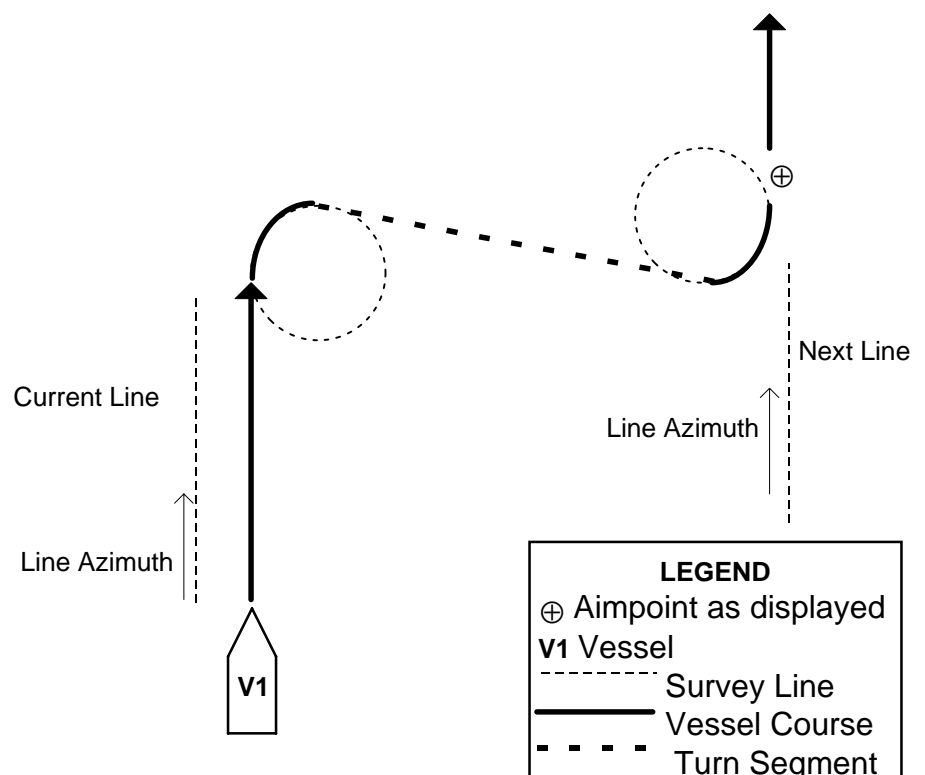
Chapter 2 - Establishing the turning path

There are two aspects to establishing the turning path: setting the aimpoint (via the Line Management Node), and configuring and enabling the turning path (via the Turn Node).

Setting the aimpoint (from the LMN)

From the Line Control window of the LMN, select an aimpoint; a feature to which the vessel will steer. Note however, the aimpoint you select here is the desired destination of the vessel; the aimpoint which appears on the display is the point from which the vessel will be able to approach its destination in the correct orientation.

When you select a survey line as the aimpoint, the line azimuth determines the direction from which the vessel will approach the line. In fact, the course made good of the vessel will attempt to follow the line azimuth. Occasionally, this will result in a turn of the wrong orientation: the vessel will travel away from the survey line rather than along it as the following diagram illustrates:

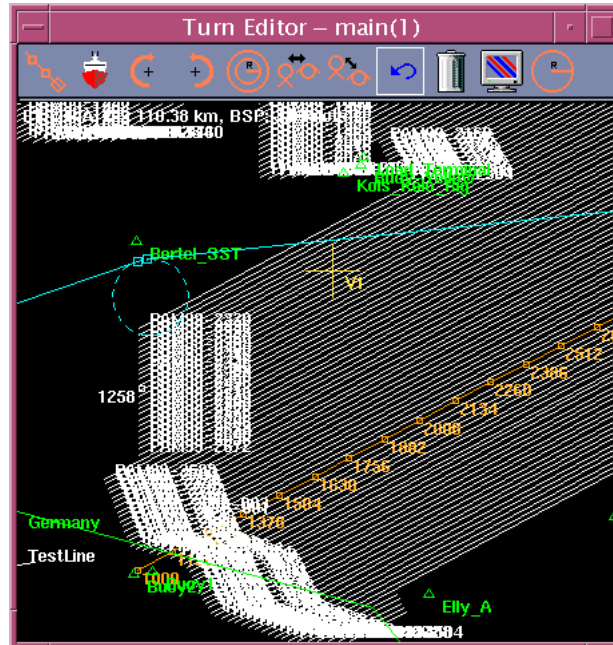


If the Turn Editor display is configured to show the feature defined as the aimpoint, you will readily detect such an occurrence.

To rectify such a problem, choose *Reverse Aimpoint* from the Line Control window. This has the effect of reversing the orientation of the turn.

Configuring the turn path (from the TN)

From the Turn Node main window select *Options/Turn Editor*. This reveals the Turn Editor, a display similar in appearance to the Helmsman display. Right click anywhere on this display to reveal the Turn Editor Control window.



From here you can establish and enable a turning path; see below for details. You can also configure the Turn Editor to display the survey as you require, see Chapter 3 “[Configuring the Turn Editor display](#)”, for details.

Select the point from which you wish the turn path to be calculated. This can be either the current vessel position or the end of the current line. Use the iconic toolbar button to select *Compute Turn based on Vessel Position* or *Compute Turn based on Current Line*, as appropriate.



Clicking this button bases the turn path calculation on the current line.



Clicking this button bases the turn path calculation on the vessel position.



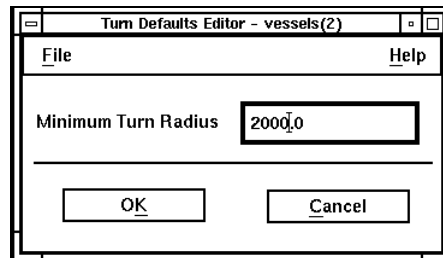
Click this button to Undo your last editing action.

Setting the turn radius

Set the minimum wheel radius for the turning wheels which comprise the turn.



Click this button (*Turn Defaults*) to reveal:



Enter the minimum required wheel radius (metres) for turning wheels and click *OK*. This fixes the radii for the initial and final wheels and the default radii for all turn wheels that are subsequently created. The radii of added wheels may be altered later. See [“Adjusting the turning radius”](#), below.

With the turn path on display, manipulate it to produce the optimum route. See [“Modifying the turn path”](#) for details.

Modifying the turn path

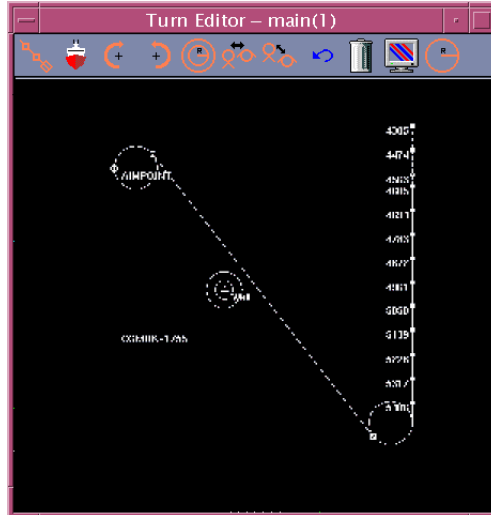
The calculated turning route does not take account of any obstacles which may lie along its path. The navigator can modify the route to avoid any such obstacles by adding one or more turning wheels, adjusting the position of such, and specifying the turning sense - to port or starboard.



Note:

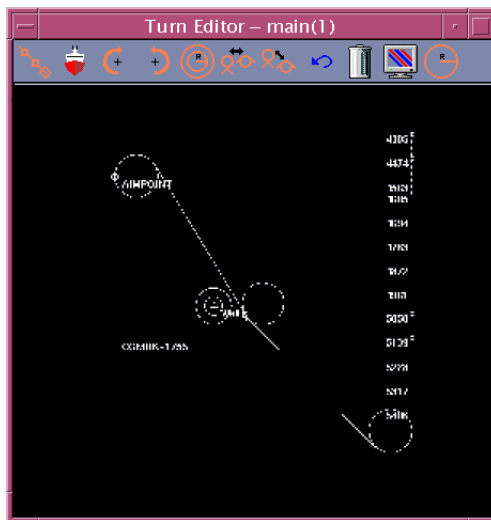
For operations such as *Add*, *Delete*, *Flip* and *Toggle Sense*, there are certain circumstances in which the operation may not succeed, leaving the turn unaltered. For example, if the application computes the optimal turn to consist of three wheels, you may select the intermediate wheel and request *Delete*. This request will be ignored, however, leaving the turn in the original state.

Adding a turning wheel

Consider the example below. A turning route is defined and displayed. Note the well lying close to the calculated route. To manoeuvre around this obstacle, add a turning wheel and manipulate the turning route.



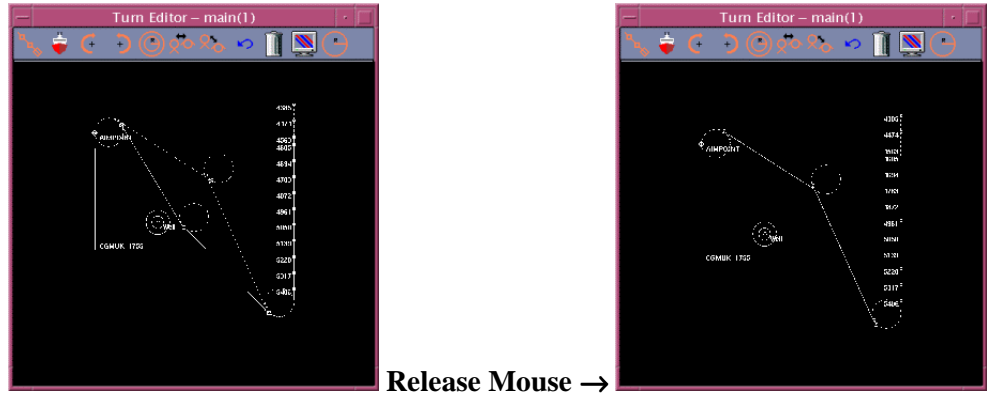
select turn then click  or 



Activate the turning path by middle clicking in the initial turning wheel. Its circumference will appear as a dotted line.

Use the *Add Turn Wheel* buttons (shown above) to add either a port (anticlockwise) or starboard (clockwise) turn.

Position the cursor inside the added wheel and hold down the middle mouse button. Drag the wheel away from the obstacle, holding the mouse button down whilst doing so. The original route remains on the display as a solid line; the new route appears as a dashed line until the mouse is released.



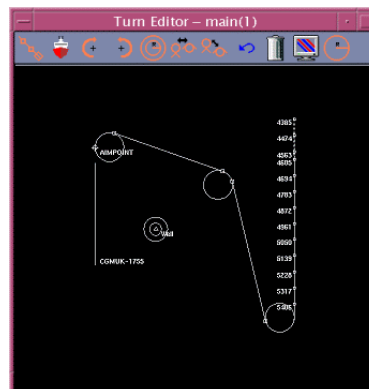
The turning path still requires modification, however. On inspection you will notice that the additional turning arc has a starboard sense and encompasses almost the entire turning wheel. Following this path would require the vessel to *loop the loop*, when the obvious course is to make a turn to port. You can change the sense of the turn in two ways; *Flip* or *Toggle Sense* of the wheel.

Toggle sense

Activate the added wheel by middle clicking in its centre.



Click the *Toggle Sense* button. The position of the wheel remains constant while the turn segments jump to touch the wheel at new positions. The turning arc now has a port sense.

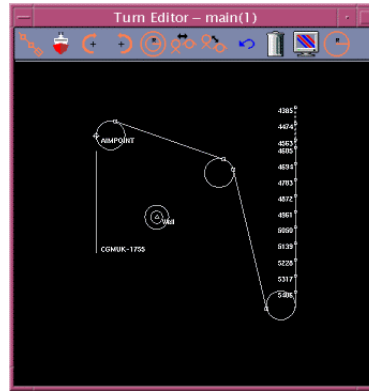


Flip

Activate the added wheel by middle clicking in its centre.



Click on the *Flip* button. (This causes the wheel to be reflected through the point where the adjacent turn segments would meet if extrapolated.) The wheel position jumps while the adjacent turn segments remain constant. The turning arc now has a port sense.



Note that you can only manipulate the position and sense of added wheels: the initial and final wheels may move and change sense, but this is controlled by the application.

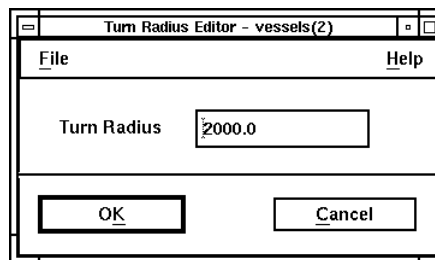
Adjusting the turning radius of added wheels

Added turning wheels will have the same radii as the initial and final wheels as defined via the Turn Defaults Editor. To adjust the radius of an added wheel:

Middle click inside the wheel to be altered.



Click the *Set Radius* button and the following window will appear:



In the *Turn Radius* field enter the minimum radius (metres) required.

Click *OK* to apply the configuration and close the window. The added wheel will shrink or expand as configured.

If you desire all added wheels to have the same radius, configure this window in advance of adding turning wheels.

Note that the size of the initial and final wheels cannot be altered.

Deleting a turning wheel

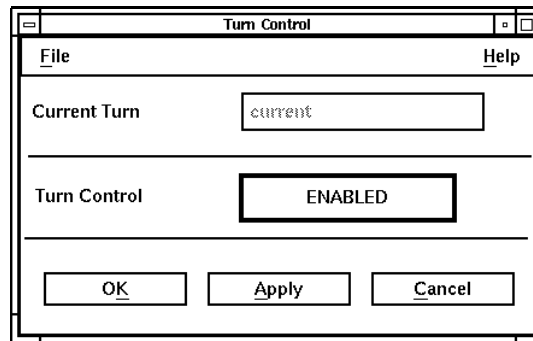
Select the wheel to delete by middle clicking in its centre.



Click the *Delete Turn Wheel* button. The wheel will vanish and the adjacent wheels will link up.

Enabling the turn

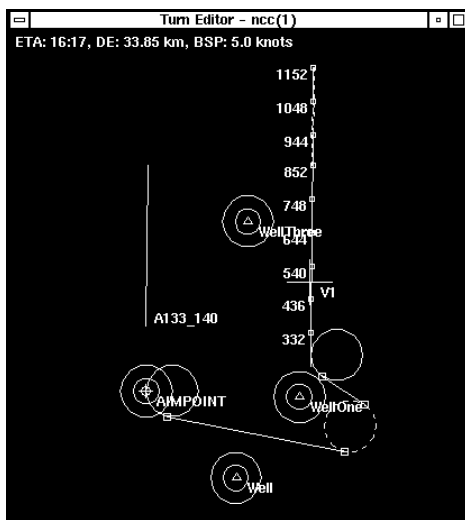
Confirm the route by making the turn path available to the rest of SPECTRA. From the Turn Node main window select *Options/Turn Control* and *Enable* the turn.



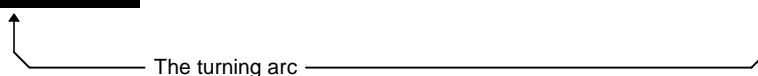
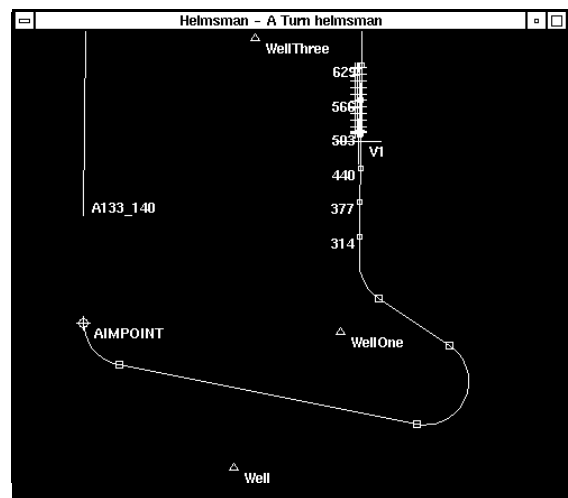
Viewing the turning path (via the DN)

You can view the turn path via the Helmsman display in the Display Node. The Turn Node's display is very similar to the Display Node's Helmsman display but as each is configured independently, the same survey features may appear differently in each. However, the Turn Node will always display the turning arc as part of the full turning wheel; the Display Node only shows the actual arc within the route.

The Turn Node



The Display Node



Saving and Restoring Turn Details

Full details of the currently defined turn can be saved in a .TN file using *File|Save*. A file can be re-loaded at any time using *File|Open*. Files can be loaded and submitted to the data server automatically at system start-up time by using the -X command line option (see the Spectra Software Installation and Set Up manual). If no .TN file is found, the Turn Node will attempt to load a back-up "current turn file". This .CTF file is

managed by the node as a safety measure and does not require any user action.

WARNING!

When the TN is closed down, or in the event of a crash, it saves the current turn status to `.TN` and `.CTF` files. On re-starting the node, that turn will be automatically enabled. If this is not appropriate at the time of re-starting the node then you should immediately disable the turn via the turn control window.

If the name of the working `.TN` file is changed during a run and a crash/forced re-start occurs, the node will revert to the filename given by the `-X` option in the `mn.ini` file or command line.

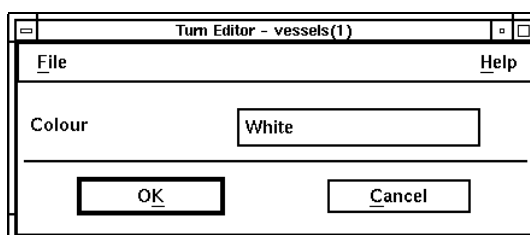
`.TN` and `.CTF` files are stored by default in the `PN_DATA` directory.

Chapter 3 - Configuring the Turn Editor display

Like the Helmsman Display, the Turn Editor display can be configured in terms of scale, position, colours used, and features displayed.

Choosing a colour for the turn

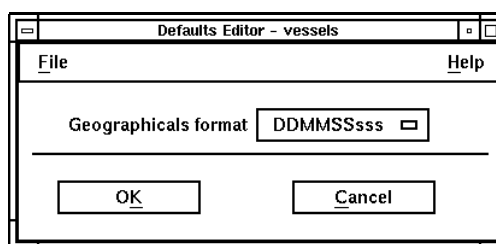
Choose a colour in which to display the turn. Select *Display Options* from the *Edit Turn* options list to reveal the Turn Editor:



Right click on the *Colour* field to reveal a list of possible colours to choose from. Select a colour and press *OK*. The chosen colour will appear in the *Colour* field. Press *OK* to apply this colour to the display and close the window. The default colour is yellow.

Displaying geographical coordinates

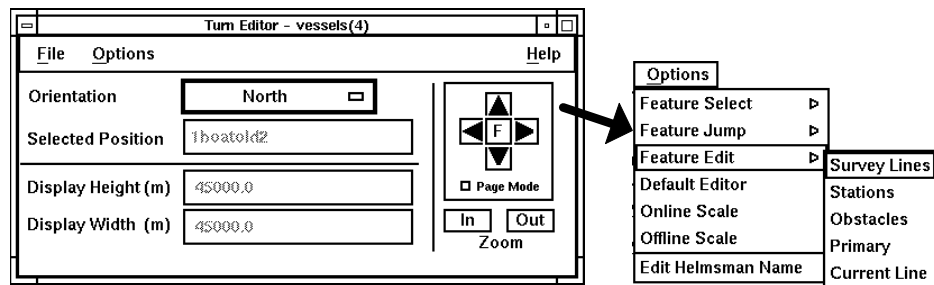
First select the format in which to display geographical coordinates. Select *Options/Defaults* from the Turn Node main window to reveal the Default Editor window:



Choose from DDMMSSsss (degrees, minutes, seconds and decimal seconds), DDMMmmmmm (degrees, minutes and decimal minutes) and DDddddddd (degrees and decimal degrees).

Configuring the display features

Select *Helmsman Control* from the *Edit Turn* options list to reveal:



The Turn Editor control window is similar to the Helmsman control window. Note however, the *Options* menu here is more limited.

Configure the display in the same manner as for the Helmsman display - see the *SPECTRA User Manual - Display Node* for details. Note that for the purposes of displaying the Aimpoint, it can be found at the bottom of the list of *Obstacles*.