Raychart 425 Chartplotter

Owner's Handbook

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SAFETY NOTICES

CAUTION: HIGH VOLTAGE

The display unit contains high voltages. Adjustments require specialized service procedures and tools available only to qualified service technicians – there are no user serviceable parts or adjustments. The operator should never remove the display unit cover or attempt to service the equipment.

CAUTION: NAVIGATIONAL AID

This device is only an aid to navigation. Its accuracy can be affected by many factors, including equipment failure or defects, environmental conditions and improper handling or use.

Note: *It is the user's responsibility to exercise common prudence and navigational judgement. This device, therefore, should not be relied upon as a substitute for such prudence and judgement.*

NAVIONICS
THE LEADER IN ELECTRONIC CHARTS

The Raychart 425 Chartplotter is designed to use Navionics Nav-Chart™ chart cards which provide cartography in seamless vector format.

Preface

This handbook covers the Raychart 425 manufactured by Raytheon Marine Company.

It contains important information on the installation and operation of your new equipment. In order to obtain the best results in operation and performance, please read this handbook thoroughly.

Raytheon's Product Support representatives, or your authorized dealer, will be available to answer any questions you may have.

Warranty

To register your Raychart 425 ownership, please take a few minutes to fill out the Warranty registration card. It is very important that you complete the owner information and return the card to the factory in order to receive full warranty benefits.

EMC Conformance

All Raytheon equipment and accessories are designed to the best industry standards for use in the recreational marine environment.

The design and manufacture of Raytheon equipment and accessories conform to the appropriate Electromagnetic Compatibility (EMC) standards, but correct installation is required to ensure that performance is not compromised.

Technical Accuracy

The technical and graphical information contained in this handbook, to the best of our knowledge, was correct as it went to press. However, the Raytheon policy of continuous product improvement may change product specifications without prior notice. As a result, unavoidable differences between the product and handbook may occur from time to time, for which liability cannot be accepted by Raytheon.

Contents - Raychart 425 Chartplotter

Chapter 1: Overview

1.1 Introduction

This handbook describes the Raychart 425 Chartplotter and its associated Raystar 120 GPS Receiver. The Raystar 120 utilizes Satellite Differential (SD) signals for enhanced navigational accuracy over conventional shore based differential GPS systems (dGPS).

The Raychart 425 Chartplotter is waterproof and can be installed either above or below deck. The equipment comprises:

- 6 in LCD display with Chart holder compartment for a Navionics® Nav-Chart electronic chart card
- Raystar 120 GPS Receiver

The Raychart 425 Chartplotter can output GPS and Waypoint data to operate with other equipment, eg. an autopilot or repeater instrument connected via the NMEA 0183 interface[1].

How this Handbook is Organized

The handbook is organized as follows:

Chapter 1: Overview (this chapter) provides an overview of the features and functions of the Raychart 425 and associated Raystar 120. Please read this chapter to familiarize yourself with the Chartplotter and Satellite Differential system.

Chapter 2: Getting Started provides an overview of the controls and how to start using the chartplotter.

Chapter 3: Operation provides detailed operating procedures for the main chartplotter functions - plotting waypoints and routes, navigation functions, Track handling, Port and Tide information, Man Overboard and Alarm functions.

Chapter 4: Setting Up provides instructions for setting up the chartplotter system and charting preferences.

Chapter 5: Installation provides planning considerations and detailed instructions for installing the Chartplotter and GPS Receiver on your vessel.

Chapter 6: Maintenance & Fault Finding provides information on user maintenance and what to do if you experience problems.

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1. National Marine Electronics Association (NMEA) 0183 interconnection standard, Version 2.3 April 1998.

Appendix A details the Technical Specification for the Chartplotter.

Appendix B details the Technical Specification for the GPS Receiver.

Appendix C defines the NMEA data received/transmitted by the Chartplotter.

Appendix D provides a list of abbreviations used in this handbook.

Installation Templates for the Raychart 425 and its associated Raystar 120 GPS Receiver are included at the end of this handbook.

1.2 Satellite Differential System

The Raystar 120 GPS Receiver utilizes a new satellite differential correction system to improve the accuracy and integrity of the basic GPS signals. Three separate compatible systems currently exist or are being developed:

1. Wide Area Augmentation System (WAAS). Developed by the Federal Aviation Administration (FAA) in the USA.
2. European Geostationary Navigation Overlay System (EGNOS). This system is being developed by a European consortium.
3. The MTSAT Satellite-Based Augmentation System (MSAS). Being developed by the Japan Civil Aviation Bureau (JCAB) for civil aviation use.

The area coverage of the WAAS system is the furthest advanced so far and includes the entire United States of America but also covers large areas outside of this as shown in *Figure 1-1*.

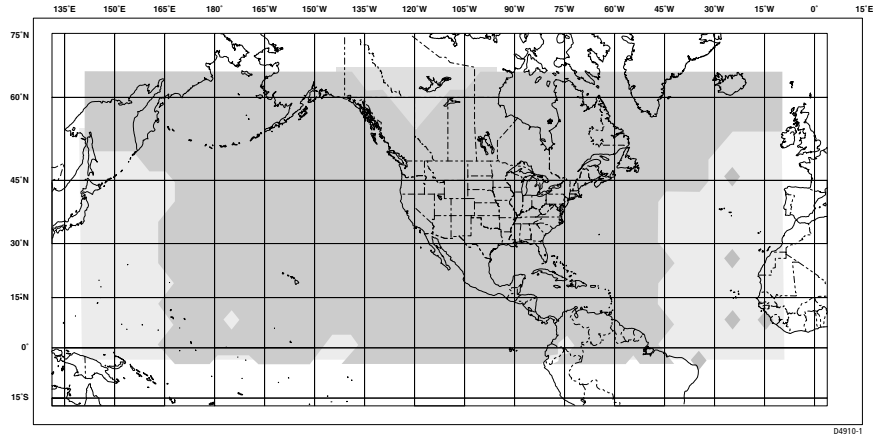

Figure 1-1: WAAS Coverage Map

The combination of the WAAS, EGNOS and MSAS systems will provide global satellite based differential GPS augmentation into the future.

How it Works

The following description is based on WAAS, but the principles apply equally to the EGNOS and MSAS systems.

WAAS comprises the following components:

- Ground Reference Stations across the USA
- Master Stations located at East Coast and West Coast
- Geostationary Satellites located above the equator

The Ground Reference Stations are located at known positions and receive data continuously from GPS. The Ground Reference Stations send their data to the Master Stations which calculate the error of the GPS-received positions and generate correctional data.

The corrected 'differential' signals are then sent to the two Geostationary Satellites which broadcast the corrected data on the standard GPS frequency, making it available to the user's Raystar 120 GPS Receiver.

The Raystar 120 GPS Receiver uses the correctional data transmitted by the Geostationary Satellites to refine the GPS positional data for greater accuracy.

WAAS is shown pictorially in *Figure 1-2*.

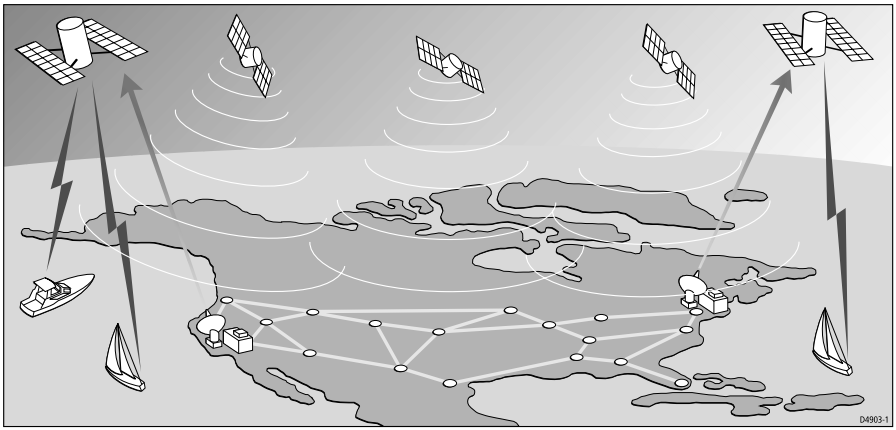

Figure 1-2: The WAAS System

Availability of the WAAS System in North America

The WAAS system is presently broadcasting and being tested for aviation use. It is expected to be certified by the FAA in 2002. During this testing and certification period, continuous service is expected, however, brief signal outages may occur as refinements and upgrades are made to the system. The status of WAAS and planned outages are available on-line at Raytheon's website http://wwws.raytheontands.com/waas

or http://www.raymarine.com

Coverage Outside of North America

EGNOS is currently in the early testing and qualification phases and signal outages may occur at any time. The status of EGNOS and any planned outages are available on-line at Raytheon's website http://www.raymarine.com

Use of Satellite Differential is currently disabled outside of the WAAS reception area. When EGNOS is qualified for navigational use, a procedure will be published on our website which will enable EGNOS operation. See http://www.raymarine.com for latest information.

Accuracy and Continuation of Broadcast Coverage

The navigational accuracy of equipment using these satellite broadcast SD signals during the testing and qualification phases is not guaranteed by Raytheon Marine Company or Raytheon Corporation, nor is the continuation of the broadcast SD signals the responsibility of Raytheon Marine Company or Raytheon Corporation.

1.3 The Chartplotter

Display Functions

The Raychart 425 Chartplotter includes the following functions:

- Create, Place, Move, Edit or Erase a Waypoint.
- GoTo Waypoint, Port, Facility or Cursor.
- Display Tide Heights, Tide Currents, Sun and Moon data.
- Create, Save, Name, Edit or Follow a Route.
- Review Route and Waypoint Lists.
- Display vessel's track on-screen.
- Convert a track to a route (*SmartRoute*).
- Set Up Alarms and Timers.
- Man OverBoard (MOB) to navigate back to a missing person or object.

- Satellite acquisition data.
- Uses positional information from Satellite Differential GPS to display vessel's position.
- The display and keys can be illuminated for night-time use.
- Detailed navigation information is displayed when a Navionics® Nav-Chart card is installed.
- The vessel's position is shown as a boat symbol pointing in its current direction.

At the top of the chartplotter screen a status bar displays chart scale, cursor position plus range and bearing or the vessel's position, Speed Over Ground (SOG) and Course Over Ground (COG). When in Simulator mode, a flashing SIM indication is displayed in inverse video in the top left hand corner with corresponding North Up (NU), Head Up (HU)or Course Up (CU) information. If in Overzoom mode, this is indicated by OV.

Waypoints previously placed are displayed and the current route is shown. Data can be viewed for current route or chart object.

The chartplotter screen can also show additional information, depending on your currently selected options, set up selections and data available from other equipment.

An example chart display in its default configuration, with a chart card installed, is shown in *Figure 1-3*.

Several functions are available to control the display as follows:

- Zoom in/out.
- Pan the Display.
- Centre the Chart around the Vessel.

Operation of these functions is described in *Chapter 2*.

Display Options

Display options are selected in System Set Up and Chart Set Up as described in *Chapter 4*.

Operating Controls

The chartplotter is operated by means of the following controls:

- A trackpad.
- Six dedicated push-button (labelled) keys.
- On-screen pop-up menus from which options are selected.
- On-screen database lists which enable the editing of items.

The controls are shown in *Figure 1-3*; they are back-lit for night-time use.

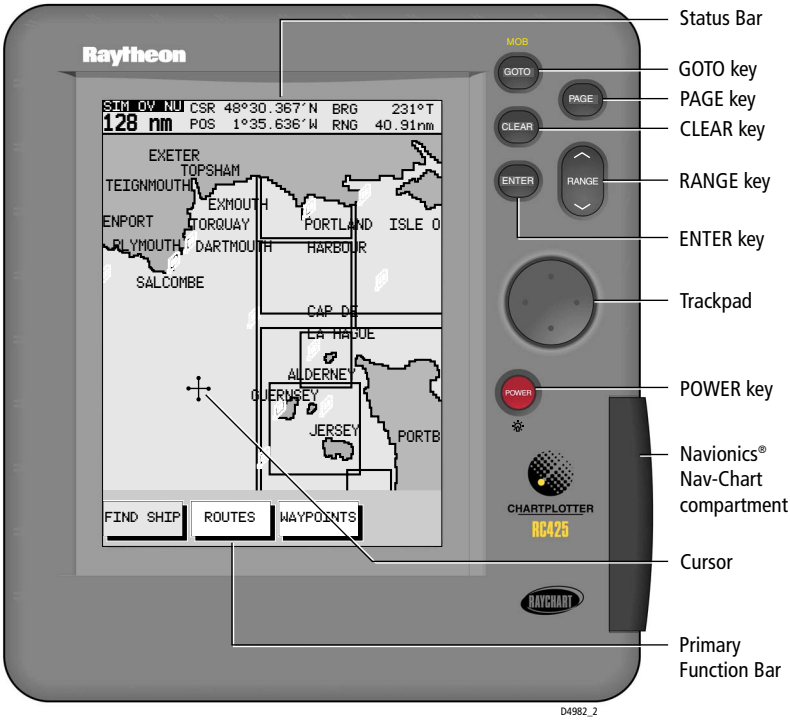

Figure 1-3: Raychart 425 Chartplotter Operating Controls

Trackpad and Cursor

The trackpad is used to move the cursor horizontally, vertically or diagonally. The cursor is the cross-hair symbol (+) which is used to select a position or item on the chart.

The longer that the edge of the trackpad is pressed, the faster the cursor moves. The current cursor position is shown in the status bar at the top of the screen.

The cursor is context-sensitive. Some items on the screen, such as waypoints and chart objects have information associated with them. When the cursor is placed over such objects, their information is displayed in the status bar. In addition, a function bar is displayed for certain items. For example, when the cursor is placed over a waypoint, the waypoint data is displayed in the status bar and the waypoint options function is displayed.

Note: *During many operations the cursor cannot be moved around the screen, eg. whilst a function bar is displayed, the cursor is used exclusively for selection. In such cases, three rapid beeps indicate invalid action.*

Dedicated Keys

These keys have fixed functions. Some keys can be used in either of two ways:

- **Press:** Press the key momentarily and then release it. This method is used for most key operations.
- **Press and hold:** Press the key, keep it pressed for the period of time stated (eg. 3 seconds), then release it.

When a dedicated key is pressed, one of the following occurs:

1. The associated operation is actioned, eg. change chart scale (**RANGE** key).
2. A pop-up menu is displayed, providing further options.
3. A set of functions is displayed.

As a key is pressed, a single audio beep confirms the key action. If the key-press is not valid for the current screen or mode, three rapid beeps sound to indicate that no response is available. If required, the key beeps can be turned off as part of your set up procedure (see *Chapter 4*).

Function Bar

The Function Bar at the bottom of the screen contains a number of functions which change according to the current operation. The functions are grouped into related sets and subsets providing access to the various functions. The primary function bar is displayed when the **ENTER** key is pressed.

The currently selected function is highlighted by means of a gray background.

When a function is invoked, one of the following occurs:

1. The associated operation is actioned, eg. GOTO WAYPOINT.
2. A sub-set of functions is displayed.
3. A pop-up menu is displayed, providing further options.
4. The appropriate database list (Route or Waypoint) is displayed.

As with dedicated keys, when the action is invoked, a single audio beep confirms the action. If the selection is not valid, three rapid beeps indicate invalid action. Key beeps can be deactivated as part of the set up parameters (see *Chapter 4*).

Pop-Up Menus

Pop-up menus usually provide various options. When a pop-up menu is on-screen, a set of associated functions is also displayed.

Use the trackpad to select an option from the menu, then use the appropriate function to set the option, eg. the radius of the waypoint arrival alarm can be specified and the selected navigation data can be set on/off.

Database Lists

The waypoints and routes created on the chartplotter are stored in database lists. These lists can be viewed and items selected for editing.

As with pop-up menus, when a database list is on-screen, a set of associated soft keys is also displayed; use the trackpad to select an item from the list, then use the appropriate function to edit the item, eg. a Waypoint or a Route can be erased.

Chapter 2: Getting Started

2.1 Introduction

This chapter provides information and instructions to allow you to practice using the Raychart 425 Chartplotter. It is intended to help you become familiar with the controls before you start using the chartplotter for routine navigation.

Note: *There is often more than one method of performing a particular task. Normal operating procedures are detailed in Chapter 3. When you become familiar with the system you can adapt these procedures to suit your method of operation.*

Conventions Used

Throughout this handbook, the dedicated (labelled) keys are shown in bold capitals; for example, **ENTER**. The functions and options are shown in normal capitals, eg. LIGHT.

Operating procedures, which may consist of a single key-press, or a sequence of numbered steps, are indicated by a ➤ symbol in the margin.

When textual data is displayed on screen, any unavailable data is shown as dashes, one per character.

Where procedures refer to *Select*, this implies using the trackpad to highlight a function, then pressing the **ENTER** key to action that function.

Simulator

The Chartplotter display unit includes a *Simulator* mode, which allows you to practice operating your chartplotter without data from a GPS system. You will need to use the set up options to switch the display to *Simulator* mode, as described in *Section 2.2, Switching On/Off*. You can use it in either of two ways:

- Before the chartplotter has been installed on your vessel. In this case, you only need to connect the Chartplotter display unit to a 12VDC power supply, fused at 1A, connecting the red core from the power lead to positive (+) and the black core to negative (-); see *Chapter 5* for full details.
- After the chartplotter has been installed on your vessel and while in a marina or otherwise at anchor.

2.2 Switching On/Off

➤ To turn the chartplotter display unit on, press the **POWER** key. The keys illuminate, the display unit beeps and the Raychart logo is displayed, followed by the following warning:

WARNING
THE ELECTRONIC CHART IS AN AID TO NAVIGATION DESIGNED TO FACILITATE THE USE OF AUTHORISED GOVERNMENT CHARTS, NOT TO REPLACE THEM. ONLY OFFICIAL GOVERNMENT CHARTS AND NOTICES TO MARINERS CONTAIN ALL INFORMATION NEEDED FOR THE SAFETY OF NAVIGATION AND, AS ALWAYS, THE CAPTAIN IS RESPONSIBLE FOR THEIR PROPER USE.

Press "ENTER" to continue.

When you have read and understood the warning, press the **ENTER** key. The chart is displayed.

If this is the first time that the chartplotter has been switched on, and no chart card is installed, the display shows the background world map at Lat 0°/Lon 0°. Otherwise, the display shows the selected chart area and any data that were displayed when the unit was last used.

➤ To turn the display unit off, press and hold the **POWER** key for at least 3 seconds. A countdown timer is displayed; when it reaches zero the display and key back-lights extinguish.

Changing the Lighting and Contrast

You can change the level of backlighting and contrast for the screen. The key backlighting remains on to enable the keys to be seen at all times.

➤ To change the lighting and contrast:

1. Press the **POWER** key to display the lighting controls (*Figure 2-1*).

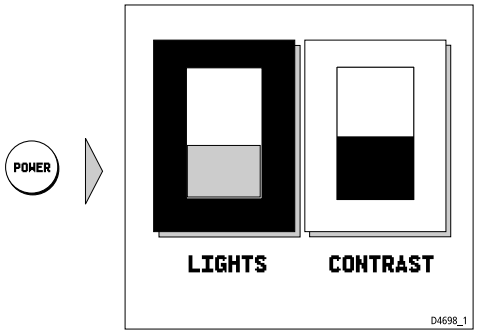

Figure 2-1: Lighting Controls

The last-used control is highlighted in inverse video.

2. Press the trackpad left/right to select the LIGHTS function.
3. Press the trackpad top/bottom to increase or decrease the lighting to one of four levels. You can press and hold the trackpad to change the setting more rapidly. The lighting level is adjusted as you change the setting.
4. Press the trackpad right to select the contrast control. There are 16 contrast levels. Adjust the setting as for lighting to select the best viewing level.
5. Press **CLEAR** to return to the chart screen, with the new lighting and contrast levels retained.

When the display unit is switched on, screen lighting is restored to ON if it was ON previously. Whilst the unit is switched on, the chosen lighting level is retained until you reset it. The new contrast level is retained until you reset it, even after power-off, unless you set the control very low or very high; in this case, the contrast will be restored on power-up as follows:

- Contrast set < 30% restored to 30%
- Contrast set > 70% restored to 70%

2.3 Chart Simulator

When simulator mode is started, your initial simulated position is wherever the cursor was last positioned. To practice using the chartplotter in a particular chart area, use the trackpad to pan to that area, then switch simulator ON.

Note: *If real position data is available and the simulator is active, simulated data takes precedence. On power-up the simulator defaults to its previous setting on power-down.* ***Care should be taken to determine de-***

sired mode on power-up. Simulated data should never be used for navigational purposes.

➤ To view a chart image using simulated data:

1. Press the **PAGE** key to display the SET UP function bar (*Figure 2-2*):

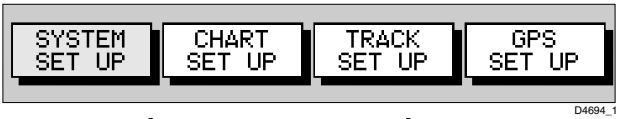

Figure 2-2: Set Up Function Bar

2. Press trackpad left/right to highlight SYSTEM SET UP and press **ENTER** to display the System Set Up menu.
3. Use trackpad up/down to highlight the SIMULATOR option.
4. Use trackpad left/right to select ON.
5. If necessary, use trackpad up/down to highlight, in turn, the SIMULATED SOG and COG options and trackpad left/right to set as required. These set Speed in 1Kt intervals and Course in 1° intervals, respectively.
6. Press **CLEAR** twice to return to the chart screen.
7. A flashing SIM indicator appears in inverse video in the status bar at the top of the chart screen.

2.4 Controlling the Display

This section describes how to:

- Change the display mode.
- Move around the chart by panning the display, changing the chart centre and changing the chart scale.

Selecting the Display Mode

Use the **PAGE** key to select the display mode. Select the following modes by repeat presses of the **PAGE** key as listed below and shown in *Figure 2-3*:

- Set Up functions (see *Chapter 4*)
- Course Deviation Indicator (CDI)
- Bearing & Distance Indication (BDI)
- Waypoint data
- Navigation data
- Time/Date data
- Return to Set Up functions

Note: *Press* **GOTO** *to return to normal Chart display at any time.*

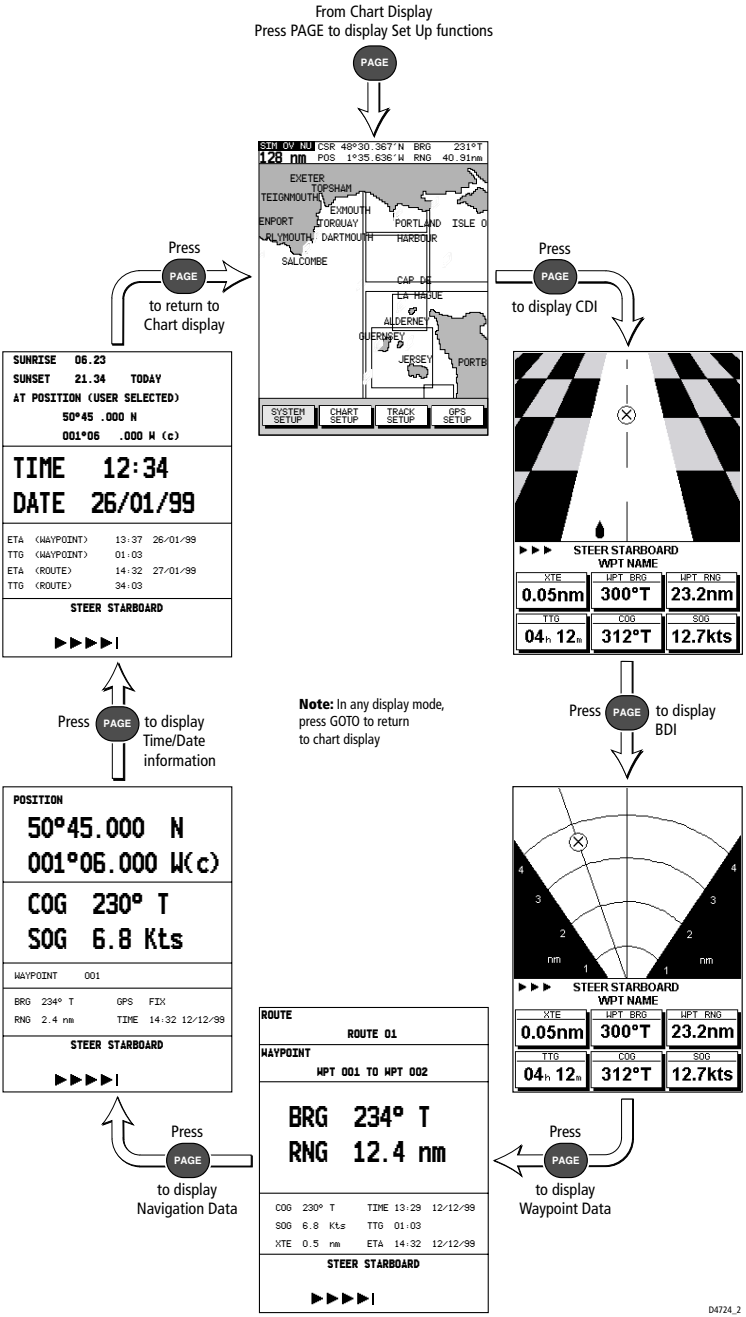

Figure 2-3: Display Modes

Moving Around the Chart

You will normally operate the chartplotter with the chart showing your vessel's current location.

In the default North-Up orientation (shown in the status box at the top of the display), the vessel moves in relation to the screen. You will need to reposition the chart if your vessel moves out of the area currently displayed, or if you wish to examine or place waypoints in another area.

Alternatively, you can *home* the cursor onto the vessel using the FIND SHIP function. '*homing*' locks the vessel to the cursor and updates the display such that the chart is re-drawn so as to ensure that the vessel is always on screen, see *Using* FIND SHIP below.

There are three ways in which you can reposition the chart:

- Use the trackpad to move the cursor to the edge of the chart; the chart pans across. This method is useful if the area you wish to see is just off screen.
- Automatically re-centre the vessel using the FIND SHIP function.
- Change the chart scale using the **RANGE** key to zoom out and in to a new area. This method is useful if the area you wish to see is some distance away.

Using FIND SHIP

FIND SHIP is used to re-draw the chart with the vessel normally at its centre and the cursor homed on the vessel.

➤ To centre the vessel:

1. From chart mode, press **ENTER**; the primary function bar is displayed (*Figure 2-4*):

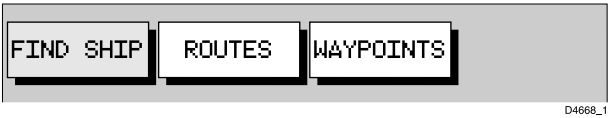

Figure 2-4: Primary Function Bar

2. Select FIND SHIP; the following actions are performed:
   - The chart is re-drawn with the vessel's position in the centre.
   - The cursor is homed onto the vessel position and moves with it.
   - When the vessel moves near the edge of the chart window, the chart is redrawn with the vessel at the centre and the cursor homed on the vessel.
   - Whilst homed, the status bar indicates vessel position, SOG and COG.

- If Screen Amplifier is enabled, the vessel is positioned so as to increase screen forward visibility, see *Chapter 4: Setting Up*.

3. To release the cursor from homed mode press the trackpad to move the cursor away from the vessel's current position. The status bar shows the cursor position, range and bearing.

Changing the Chart Scale

The **RANGE** key changes the chart scale so that a smaller or larger area is shown on the available cartography.

Plotter mode is available to allow you to zoom into a smaller area, even when no chart data is available for that scale. To enable plotter mode, see *Chapter 4: Setting Up*.

You can change the chart scale for two purposes:

- To see either more detail (of a smaller area) or a larger area (in less detail).
- To move the display to another area of the chart, by zooming out to a small scale chart, then zooming in on another position.

Each time you press the **RANGE** key, the chart scale changes to the next available setting. The Status Bar at the top of the screen indicates the distance, from top to bottom of the display, in nautical miles (*Figure 2-5*).

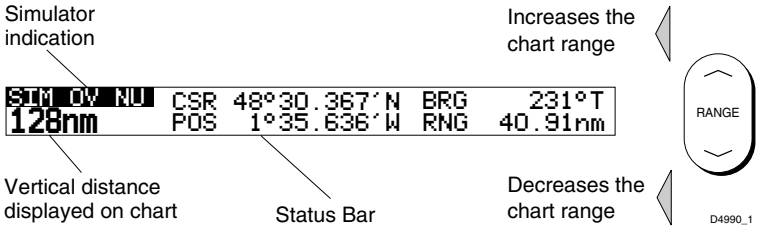

Figure 2-5: Status Bar Indication

➤ For rapid scale change, press and hold the required arrow on the **RANGE** key.

The distance indicator at the left-hand end of the status bar is updated whenever you change the chart scale.

➤ To zoom in to a more detailed chart:

1. Use the trackpad to position the cursor in the area you wish to see in more detail and press the bottom of the **RANGE** key to zoom in.
   The section of the chart around the cursor is enlarged to fill the screen with the chart showing more detail. The cursor is now positioned in the centre of the screen.

   The distance indicated at the top left of the screen is updated.

2. If further chart enlargement is available using the current chart card you can press the bottom of the **RANGE** key to zoom in again, repositioning the cursor first if required.
   An area of further chart detail is indicated by a box around the area as shown in *Figure 2-6*.

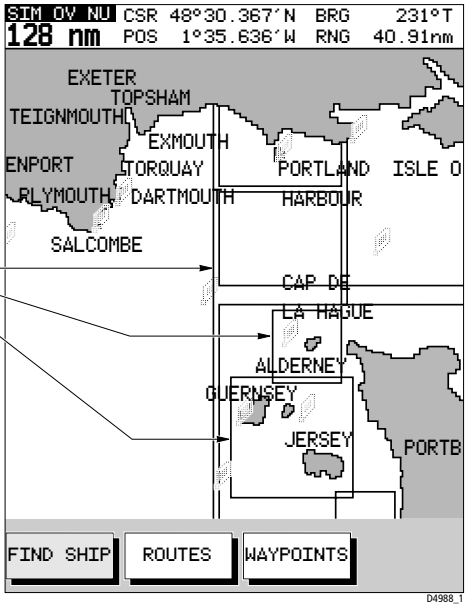

Chart Boundary - Indicates further detail is available inside. Shown when using Navionics® Nav-Chart card.

Figure 2-6: Chart Detail Boundaries

3. If no further chart detail is available then, when the bottom of the **RANGE** key is pressed, the result depends upon whether Plotter Mode is on or off:
   - If Plotter Mode is Off, the chart scale remains unchanged, indicating that the greatest detail is displayed.
   - If Plotter Mode is On, the scale is decreased but, as there is no further detail, the vessel, waypoints, routes and tracklines are displayed without cartography.

   The chart information is restored when you return to a chart scale for which the information is available.

➤ To zoom out to a less detailed chart, press the top of the **RANGE** key as many times as required.

2.5 Using Navionics Nav-Chart Cards

The chartplotter has a built-in world map that can be used for route planning. Most areas (these are shown with chart box boundaries) are covered at a range of approximately 512nm as shown on the Status Bar at the top of the screen.

To use the chartplotter as a navigation aid, charts with detailed information for the area you wish to navigate are required. The charts are available on Navionics Nav-Chart cards, each of which can store up to 20 charts in an electronic format, depending upon its memory storage capacity.

A Nav-Chart card provides an appropriate level of detail for a given geographic area and scale; this data can be displayed down to a range of 1/8 nm on the screen (height) if the data is available.

To obtain Navionics Nav-Chart cards, contact your local dealer or visit ***www.navionics.com*** *or* ***www.navionics.it*** to find the dealer nearest you.

Call Navionics toll-free from anywhere in North America on: **1-800-848-5896**.

Outside of North America, contact your local dealer or:
Navionics S.p.A.
Tel: (+39) 0584 961696
Fax: (+39) 0584 961309

Inserting a Nav-Chart Card

CAUTION:

To prevent the ingress of water and consequent damage to the unit, always ensure that the cartridge cover is fully and properly inserted, whether or not a Nav-Chart card is inserted.

➤ To insert a Nav-Chart card, refer to *Figure 2-7*:

1. Check that you are using the correct Nav-Chart card for the required area.
2. Pull out the cartridge cover at the right hand side of the unit.
3. Hold the card with the title label and keyway slot towards you and the two circular holes outermost, as shown below. Gently push the card into its slot until it clicks into position. It will only fit in the correct orientation.
4. To prevent the ingress of water, replace the cartridge cover.

Figure 2-7: Nav-Chart Card Insertion/Removal

Removing a Nav-Chart card

CAUTION:

DO NOT use a metallic instrument, eg. a screwdriver or pliers, to aid removal, as doing so can cause irreparable damage.

➤ To remove a Nav-Chart card, refer to *Figure 2-7*:

1. Pull out the cartridge cover at the right hand side of the unit.
2. Grip the card firmly and pull to remove it from its slot.
3. To prevent the ingress of water, replace the cartridge cover.

Note: *If difficulty is experienced in removing the card, a short length of cord can be secured between the two circular holes in the card to ease its removal, making sure that fitting of the cartridge cover is not impeded.*

Displaying the Chart Data

The new chart data will be displayed when you move the cursor into an area covered by the new chart When a chart cartridge is inserted, the chart is automatically redrawn.

The boundary of each chart digitized in the current card is defined by a box or rectangle. (You can switch off the chart boundaries display as part of the chartplotter set up described in *Chapter 4*).

Chapter 3: Operation

3.1 Introduction

This chapter explains how to use the chart functions to navigate with the Raychart 425.

Safety

The Raychart 425 makes it very easy to mark a waypoint and travel towards it. However, always check first that the route is safe. If using the chartplotter in combination with an autopilot connected via NMEA, the autopilot will normally prompt for confirmation before it steers the vessel towards the waypoint.

If a route has been entered using a less detailed chart, zoom in for more detail to check for hazards, such as small shoals, that may not be shown on the less detailed charts.

Note: *Until you are familiar with interpreting the chart display, you should take every opportunity to compare the displayed objects with visual targets, such as buoys and coastal structures. You should practice harbour and coastal navigation during daylight and in clear weather conditions. The equipment should not be used as a substitute for good navigational practice.*

3.2 Working with Waypoints

Introduction

The Raychart 425 enables up to 500 waypoints to be placed. A waypoint is a position entered on a chart as a reference or destination point. All waypoints placed on the chartplotter are stored in a waypoint database list which includes symbol, position, bearing, range, date and time.

All waypoints in the database are displayed on screen, unless the SHOW WAYPOINTS is set to OFF in the Chart Set Up menu, as described in *Chapter 4*. A waypoint can be selected, either on-screen or from the list, for editing.

The waypoint is usually placed at the cursor position and can be part of a route; A waypoint can also be placed at the vessel's current position. Waypoints can be placed before the chartplotter is installed on your vessel.

When a new waypoint is placed, it is displayed using either the default symbol of a cross or an alternative symbol available from the Chart Set

Up menu, as described in *Chapter 4*. The waypoint is added to the waypoint list and named with the next available number. The edit functions can be used to change the symbol and name. When the cursor is positioned over a waypoint, the waypoint bearing and range are displayed.

Waypoints can also be transferred between the chartplotter, other NMEA connected instruments or a PC, using the Waypoint Transfer functions.

This section explains how to perform the following tasks using the on-screen cursor and the waypoint list:

- Placing a Waypoint
- Selecting a Waypoint
- Displaying Waypoint data
- Editing a Waypoint (symbol, name & position)
- Erasing a Waypoint
- Moving a Waypoint

Placing a Waypoint

Note: *It is not possible to place multiple waypoints at the same position.*

➤ To place a new waypoint:

1. From chart mode, press **ENTER**; the primary function bar is displayed (*Figure 3-1*):

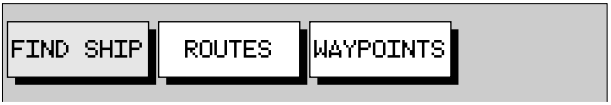

Figure 3-1: Primary Function Bar

2. Using trackpad left/right, select WAYPOINTS (*Figure 3-2*).

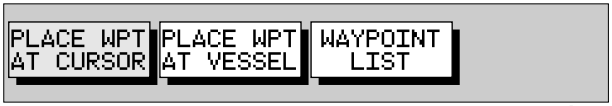

Figure 3-2: Waypoints Soft Keys

3. To place a waypoint at the cursor position:
   i. Select PLACE WPT AT CURSOR. The selected function now has help text appended to it (*Figure 3-3*):

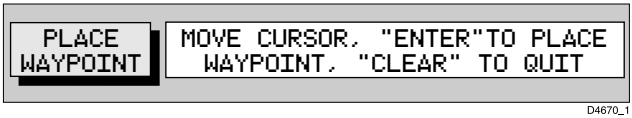

Figure 3-3: Place Waypoint Function

ii. Place the cursor in the required position on the chart and press **ENTER** to place the waypoint. The waypoint is added to the waypoint list and named using the next available number.
The waypoint functions remain displayed so that further waypoints can be placed.
If required, use EDIT WAYPOINT to name the waypoint as described in *Editing Waypoint Details* on *page 3-5*.

iii. When finished placing waypoints, press **CLEAR**.

4. To place a waypoint at the vessel's position:
Select PLACE WPT AT VESSEL. A new waypoint is placed at the vessel's current position.

5. To place a waypoint using the Waypoint List:
Select WAYPOINT LIST. The Waypoint List and associated function Soft Keys are displayed (*Figure 3-4*):

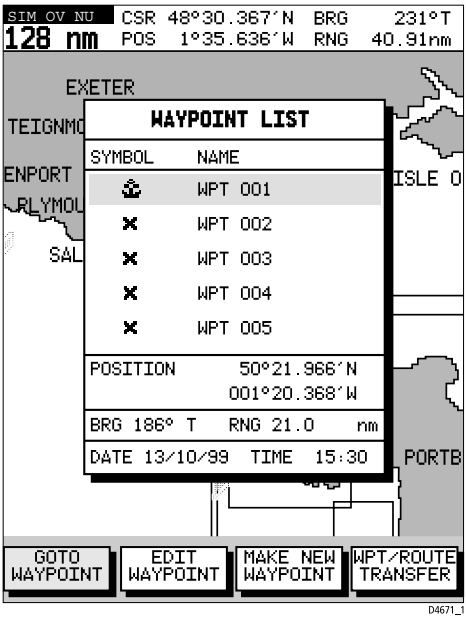

Figure 3-4: Waypoint List Display

6. Select MAKE NEW WAYPOINT.
The waypoint is placed at the current vessel position or, if a GPS fix is not available, the cursor position. The new waypoint is added to the Waypoint List and named with the next available number.

To return to chart mode, press **CLEAR** twice.

Selecting a Waypoint

Positioning the cursor over a waypoint selects that waypoint and accesses the WAYPOINT OPTIONS function bar. This enables you to GOTO (described in *Section 3.4*), edit (symbol, name, position), erase or move the waypoint.

Selecting a waypoint from the Waypoint List allows you to GOTO and edit (symbol, name, position, erase) the waypoint. The Waypoint List also provides options to make a new waypoint and transfer waypoints.

➤ To select a waypoint using the cursor:

1. Move the cursor over the waypoint; the WAYPOINT OPTIONS function bar, together with help text, is displayed (*Figure 3-5*):

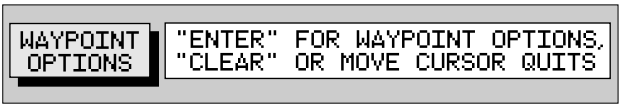

Figure 3-5: Waypoint Options

2. Press **ENTER** to select the waypoint function bar (*Figure 3-6*):

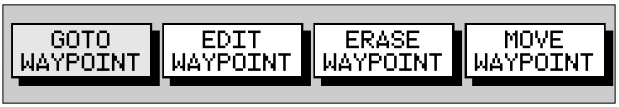

Figure 3-6: Waypoint Function Bar

The selected waypoint can be edited via these functions.

➤ To select a waypoint using the Waypoint List:

1. Press **ENTER** to display the primary function bar (*Figure 3-7*):

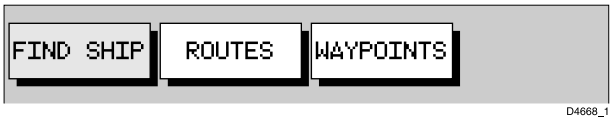

Figure 3-7: Primary Function Bar

2. Select WAYPOINTS and press **ENTER** to display the waypoint function bar (*Figure 3-8*):

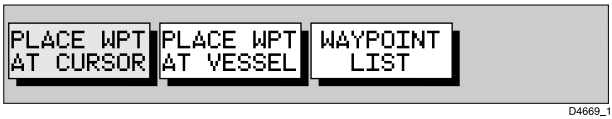

Figure 3-8: Waypoint Function Bar

3. Select WAYPOINT LIST and press **ENTER** to display the Waypoint List. The Waypoint List and associated function bar are displayed (see *Figure 3-4*).

The list details all waypoints. The selected waypoint is indicated by the highlight bar with its position; bearing and range are provided (if GPS fix available).

4. Use trackpad up/down to move through the list to highlight the required waypoint.

The selected waypoint can be edited using the EDIT WAYPOINT function.

Waypoint Data Display

Waypoint data can be viewed in two ways: the cursor can be used to select the waypoint to display the waypoint data in the status bar at the top of the screen, or the waypoint details can be viewed on the waypoint list.

➤ To display waypoint data:

Move the cursor over the waypoint. The waypoint data is displayed in the status bar, indicating waypoint number/name, bearing and range from vessel (dashes are shown if no fix is available).
Whilst the cursor is over the waypoint, the WAYPOINT OPTIONS function bar is displayed.

➤ To remove the waypoint data:

Move the cursor away from the waypoint or press **CLEAR**.

➤ To display the waypoint details from the waypoint list:

Select the waypoint in the list as described above.
The details for the selected waypoint are displayed in the lower half of the window. Date and time are included for all waypoints.

To remove the Waypoint List and return to chart mode, press **CLEAR** three times.

Editing Waypoint Details

The name, symbol and position of a waypoint can be changed, either by means of the cursor or via the Waypoint List.

Note: *The target waypoint cannot be edited.*

➤ To edit a waypoint using the cursor:

1. Place the cursor over the waypoint, see *Selecting a Waypoint* on *page 3-4*.
2. Select WAYPOINT OPTIONS and press **ENTER** to display the Edit Waypoint function bar.
3. Select EDIT WAYPOINT. The Edit Waypoint function bar is displayed (*Figure 3-9*):

Figure 3-9: Edit Waypoint Function

4. To edit the waypoint name, select EDIT NAME.
   The NAME WAYPOINT window is displayed.
5. Use the trackpad to enter or edit the name as follows:
   - Use trackpad left/right to move the cursor to the character to be changed. Up to eight characters can be used.
   - Use trackpad up/down to scroll through the characters.
   - When editing is complete, press **ENTER**; the waypoint name is updated and the window is removed
6. To edit the symbol, select EDIT SYMBOL.
   The SELECT SYMBOL options are displayed (*Figure 3-10*).

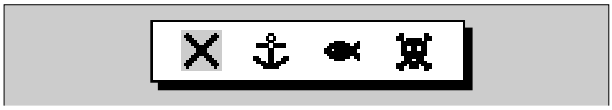

Figure 3-10: Edit Symbol Options

7. Use trackpad left/right to highlight the required symbol, then press **ENTER**.

➤ To edit a waypoint using the Waypoint List:

1. From chart mode, press **ENTER**; the primary function bar is displayed (*Figure 3-11*).

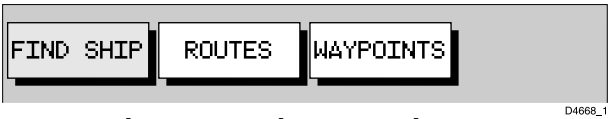

Figure 3-11: Primary Function Bar

2. Using trackpad left/right, select WAYPOINTS (*Figure 3-12*).

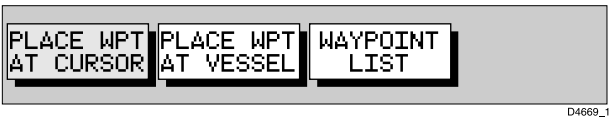

Figure 3-12: Waypoint Function Bar

3. Select WAYPOINT LIST; the Waypoint List is displayed, with its associated function bar (*Figure 3-13*):

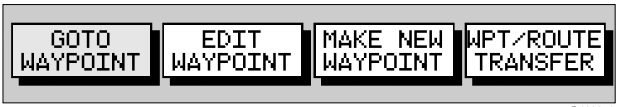

Figure 3-13: Waypoint List Function Bar

4. Select EDIT WAYPOINT; the waypoint edit functions are displayed (*Figure 3-14*):

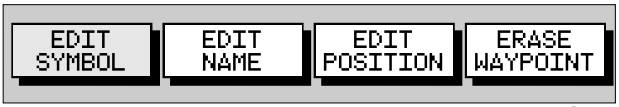

Figure 3-14: Waypoint Edit Functions

5. To edit the waypoint name, select EDIT NAME; the cursor is placed in the name field of the selected waypoint.
   i. Edit the name as previously described (up to eight characters).
6. To edit the waypoint symbol, select EDIT SYMBOL.
   i. Use trackpad left/right to highlight the required symbol.
   ii. Press **ENTER** to accept the choice or **CLEAR** to abort the operation.
7. To change the waypoint's position, select EDIT POSITION. The cursor is placed in the Position field in the Waypoint List.
   i. Use trackpad left/right to select the latitude/longitude fields.
   ii. Use trackpad up/down to scroll through and edit the values.
   iii. When editing is complete, press **ENTER** to save the new position.

Erasing Waypoints

Note: *A waypoint that is the target waypoint or waypoints that are also used in any saved route(s) cannot be erased. If an attempt is made to erase a waypoint that is used in a saved route, the warning "*WAYPOINT IS USED IN ROUTE(S) AND CANNOT BE ERASED*" is displayed.*

➤ To delete a waypoint using the cursor:

1. Place the cursor over the waypoint; see *Selecting a Waypoint* on *page 3-4*.
2. Select WAYPOINT OPTIONS and press **ENTER** to display the Edit Waypoint function bar.
3. Select ERASE WAYPOINT. A warning box appears. Press **ENTER** to erase or **CLEAR** to retain. If erased, the waypoint list is updated and the screen is cleared.

➤ To delete a waypoint using the waypoint list:

1. Select the waypoint from the waypoint list as previously described. The waypoint list function bar is displayed.
2. Use trackpad up/down to move through the list to highlight the required waypoint.
3. Select ERASE WAYPOINT. Press **ENTER** to erase the waypoint.

To return to chart mode, press **CLEAR** three times.

Moving Waypoints

Any waypoint, except the target waypoint, can be moved. The Waypoint function bar and cursor are used to move the selected waypoint, or the waypoint position can be edited.

Note: *Take care when editing waypoints as it is possible to move waypoints that are used in routes stored in the Route Database List.*

➤ To move a waypoint using the cursor:

1. Place the cursor over the waypoint; see *Selecting a Waypoint* on *page 3-4*.
2. Select WAYPOINT OPTIONS and press **ENTER** to display the Edit Waypoint function bar.
3. Select MOVE WAYPOINT. The selected (highlighted) function now has help text appended to it (*Figure 3-15*):

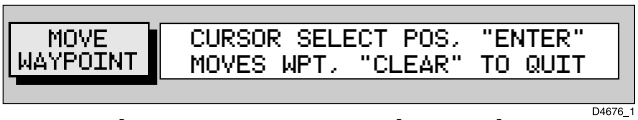

Figure 3-15: Move Waypoint Function

4. Move the cursor to the required waypoint position.
5. When the cursor is in the correct position, press **ENTER** to set the new position and return to normal cursor control.

To return to chart mode, press **CLEAR**.

➤ To move a waypoint using the Waypoint List:

1. Select the waypoint using the Waypoint List as described above. The waypoint functions are displayed.
2. To edit the waypoint position proceed as previously described in *Editing Waypoint Details* on *page 3-5*.

3.3 Working with Routes

A route is made up of a series of waypoints (maximum 50). A route is made by placing a series of waypoints on the chart.

When a route is created it becomes the current route and is displayed on-screen. The current route is maintained after power-off. Only one route can be current and is displayed (if it is in the field-of-view) as solid lines connecting waypoints. If following the route, the current leg is shown as a dotted line.

After a route has been created, the **GOTO** key can be used to follow the route. The **GOTO** key provides various other options as described in *Section 3.4*.

Up to 20 routes can be saved in the route database. Any one of these can be selected from the database to be used as the current route.

The current route can be edited by adding and/or moving waypoints. When a route has been saved, options are also provided to name or erase a route.

This section explains how to perform the following tasks:

- Create a new route.
- Save the current route in the database.
- Clear the current route.
- Retrieve a route from the database list as the current route.
- Display route information, including route leg data and waypoint details.
- Use the database list to erase and name existing routes.
- Edit a route by adding, removing and moving waypoints.

➤ To access the route function bar:

1. Press **ENTER** to display the primary function bar (*Figure 3-16*):

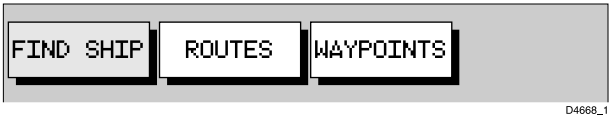

Figure 3-16: Primary Function Bar

2. Select ROUTES to display the first level functions (*Figure 3-17*):

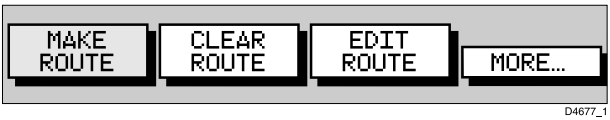

Figure 3-17: First Level Functions

3. Select MORE to see more functions (*Figure 3-18*):

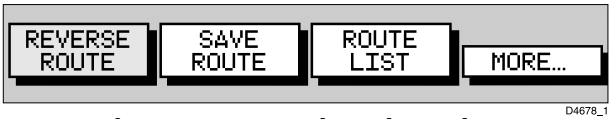

Figure 3-18: Second Level Functions

4. Select MORE again to return to the first level functions.
5. Press **CLEAR** to return to chart mode.

Creating a New Route

Note: *If there is a current route on screen, it is cleared when* MAKE ROUTE *is selected. If following the current route you are prompted to* STOP FOLLOW. *Press* **ENTER** *to continue or* **CLEAR** *to abandon route creation. If the route has not been saved you are prompted to save it.*

Waypoints in a route can be added/removed after it has been created, either via the ROUTES function or via the cursor (see *Editing a Route* in the following sections).

➤ To make a new route by placing waypoints:

Note: *You can pan the chart and change the scale whilst placing waypoints.*

1. If necessary, move the cursor to the required area in which to make the route and select a suitable chart scale.
2. Select ROUTES then MAKE ROUTE. The MAKE ROUTE function is replaced with PLACE WAYPOINT, together with help text (*Figure 3-19*):

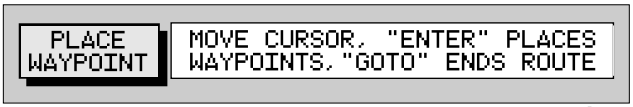

Figure 3-19: Place Waypoint Function

3. Move the cursor to the position on the chart where the first waypoint is to be placed and press **ENTER**.

Note: *The cursor can be placed on an existing waypoint, if required; the* PLACE WAYPOINT *function changes to* USE THIS WAYPOINT. *Press* **ENTER** *to use the waypoint.*

The waypoint appears on the screen at the cursor position. The number displayed alongside the waypoint identifies its position in the route.

Note: *If the route is Cleared before it is saved, the waypoint is removed.*

4. Move the cursor to the next waypoint position; a dotted line connects the cursor to the last placed waypoint.

5. Press **ENTER** again. The next waypoint is placed and the dotted line changes to a solid line.

Note: *If the waypoint was placed incorrectly, it can be deleted by pressing* **CLEAR**. *Successive waypoints can be deleted in this way.*

6. Repeat *Step 4.* and *Step 5.* until all waypoints have been placed. Up to 50 waypoints can be included in a route. Any existing waypoint(s) can be included by placing the cursor on the waypoint(s).
7. When all your waypoints have been entered, press **GOTO** to complete the route. The route is displayed on screen and is the current route, but is not active, ie. not being followed.
8. Select MORE to access the SAVE ROUTE function, or **ENTER** to return to chart mode.

Note: *The completed route is stored in the unit's memory and will be re-displayed if the unit is switched off and on again. However, it is recommended that the route is saved as described below. The current route waypoints do not appear in the waypoint list until the route is saved.*

Saving the Current Route

Up to 20 named routes can be saved in the route database. These routes can then be re-displayed and followed subsequently.

Note: *If an operation is attempted that affects this route (eg.* CLEAR ROUTE*) before the current route is saved, you are prompted to save it.*

➤ To save and name the current route:

1. Select ROUTES, followed by MORE.
2. Select SAVE ROUTE. The Save Route list is displayed.
3. The next available entry on the list is highlighted. If required, use trackpad up/down to select another position in the list; this can be a blank slot, or an existing route no longer required. (*Figure 3-20*).

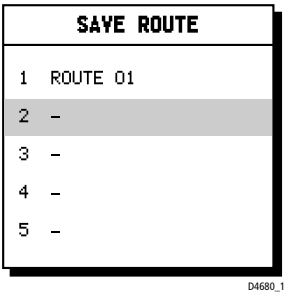

Figure 3-20: Save Route List

4. Press **ENTER** to save the route. Press **ENTER** again (in response to the prompt) to name the route or **CLEAR** to save as the default ROUTE XX, where XX is the next available number.

When naming a route, use the trackpad to move the cursor right or left to the character to be edited. Use trackpad up/down to scroll through the characters or numerals. The name can contain up to eight alphanumeric characters, including spaces.

5. Press **ENTER** to finish and clear the Route List, then press **CLEAR** to return to the chart mode.

Clearing the Current Route from the Screen

To clear the current route from the screen, select CLEAR ROUTE. If the current route has not been saved, you are prompted to save it.

➤ To clear the current route from the screen:

1. Select ROUTES or place the cursor over a route leg until the leg data is displayed in the Status Bar.
2. Select CLEAR ROUTE and press **ENTER** to clear the route or press **CLEAR** to cancel the operation.
3. If the route has not been saved, a prompt gives the options **ENTER** to save or **CLEAR** to remove the route from the screen.
4. To save the route in the database, press **ENTER**. The Name Route functions are displayed, see *Saving the Current Route* on *page 3-11*.

Retrieving a Route from the Database

A route from the database list can be selected as the current route. The list is accessed from the second set of ROUTES functions.

➤ To select a route as the current route:

1. Select ROUTES, followed by MORE, then ROUTE LIST. The route list is displayed with the currently selected route highlighted (*Figure 3-21*):

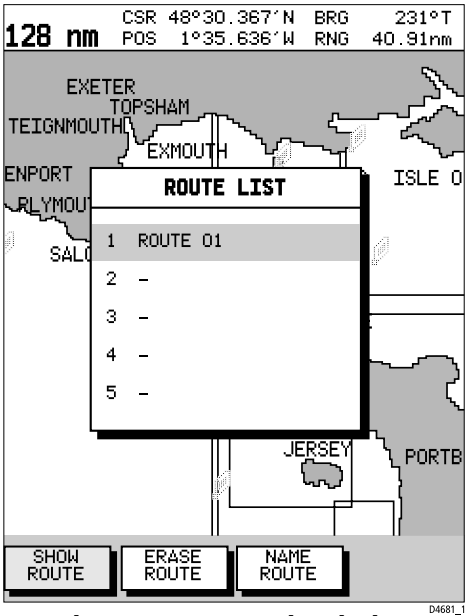

Figure 3-21: Route List Display

2. Select SHOW ROUTE. The route list is removed and the selected route is shown on screen as the current route.

Displaying Route Leg and Waypoint Information

➤ To display information about a route leg, move the cursor over the leg until its data is displayed in the status bar at the top of the screen (*Figure 3-22*).

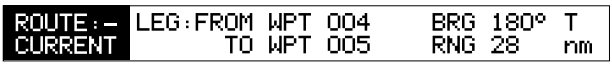

Figure 3-22: Status Bar showing Current Route

To remove the data, move the cursor away from the route leg or press **CLEAR**.

➤ To display information about a route waypoint, move the cursor over the waypoint until its pop-up data box is displayed (*Figure 3-23*).

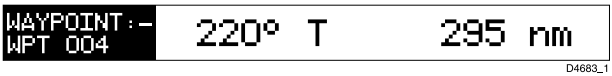

Figure 3-23: Waypoint Pop-Up Box

To remove the data, move the cursor away from the waypoint or press **CLEAR**.

Erasing or (re)Naming a Route

A route or can be deleted or re-named via the Route List. When deleting a route, you are prompted to confirm.

➤ To select a route to delete:

1. Select ROUTES, followed by MORE, then ROUTE LIST. The route list is displayed with the selected route highlighted.
2. Select ERASE ROUTE.
3. Press **ENTER** to erase the route from the list. A warning box appears, prompting you to press **ENTER** to confirm or **CLEAR** to cancel the operation.
4. Press **CLEAR** three times to remove the route list and return to chart mode.

➤ To select a route to (re)name:

1. Select ROUTES, followed by MORE, then ROUTE LIST. The route list is displayed with the selected route highlighted.
2. Select NAME ROUTE. and press **ENTER**.
3. To name or rename a route, use trackpad left/right to select each character to be edited. Use trackpad up/down to scroll through the characters or numerals.
4. Press **ENTER** to accept the new name or **CLEAR** to cancel the operation.
5. Press **CLEAR** three times to clear the Route List and return to chart mode.

Editing a Route

A route may be edited in order to:

- Add a Waypoint into a route
- Remove a Waypoint from a route
- Move a Waypoint (as described in *Section 3.2*)
- Reverse a Route

Any changes made to the route affect only the current route, so the route must be saved in order to keep the changes.

Inserting/Deleting Waypoints in a Route

➤ To add waypoint(s) to the end of a route:

Note: *If no current route is displayed, select a route from the Route List and use the* SHOW ROUTE *function to make it active, see Retrieving a route from the database.*

1. Select EDIT ROUTE and press **ENTER**; the PLACE WAYPOINT function is shown as above (see *Figure 3-19*).
2. Add waypoint(s) to the route by moving the cursor and pressing **ENTER** in the same way as the route was first created.
3. Remove waypoints from a route by pressing **CLEAR** in the same way as the route was first created.

Note: *When deleting waypoints, if the route has not been saved, the waypoint is erased. If the route has been saved, the waypoint remains on the screen.*

➤ To insert a waypoint into a route:

1. Move the cursor over the route leg where a waypoint is to be inserted. The route leg data is shown in the status bar (*Figure 3-24*)and the ROUTE OPTIONS function, with help text, is displayed (*Figure 3-25*):

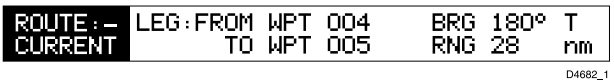

Figure 3-24: Route Leg Data

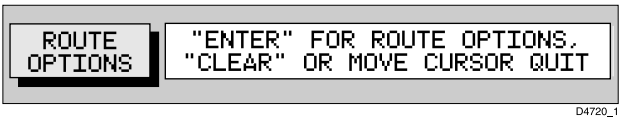

Figure 3-25: Route Options Function

2. Press **ENTER**; the Route Leg functions are displayed (*Figure 3-26*):

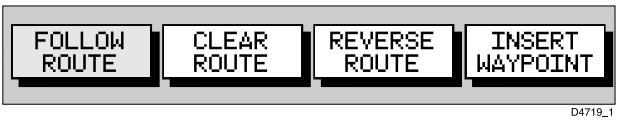

Figure 3-26: Route Leg Functions

3. Select INSERT WAYPOINT.
   The cursor now controls the route leg which is connected to the existing waypoints on either side of the cursor by a dotted line.
4. Using the trackpad, move the cursor to the required position and press **ENTER** to place the new waypoint and return to normal cursor operation or **CLEAR** to cancel the operation.

Note: *If you move the cursor over an existing waypoint, the option to use this waypoint appears.*

5. Press **CLEAR** again to remove the function bar and route leg data.
   The waypoints in the current route are re-numbered to identify the new positions.

➤ To remove a waypoint from the route using the cursor:

1. Place the cursor over the waypoint; see *Selecting a Waypoint* on *page 3-4*.
2. Select WAYPOINT OPTIONS; the Waypoint functions are displayed.
3. Select REMOVE WAYPOINT; the waypoint is removed from the route and the remaining waypoints in the current route are renumbered accordingly.

3.4 Following Routes and Going to Target Points

The **GOTO** key accesses the functions to follow a route or go to a waypoint, port, nearest facility or current cursor position. When the target destination is selected, the chartplotter calculates bearing, distance and cross track error; this information can be repeated on other instrumentation and passed to an autopilot via NMEA. Cross Track Error (XTE) can be reset to zero from the actual vessel position.

When the chartplotter is following a route, the target destination is indicated by a square around the waypoint (or cursor marker) and a dotted line shows the intended track, from the start point or previous waypoint, to the target waypoint.

This section explains how to perform the following tasks:

- Follow a route.
- Reverse a route.
- Target Point Arrival.
- Altering the route, including joining at a selected waypoint, advancing waypoints and restarting XTE.
- Go to an individual point, either an existing waypoint or the cursor.
- Go to the nearest facility or a selected port.
- Stop and Restart Follow/Goto.

An alarm is triggered when approaching a waypoint. *Chapter 4* describes how to set the alarm.

➤ To access the follow and goto functions:

1. Press **GOTO** to display the first level GOTO functions (*Figure 3-27*):

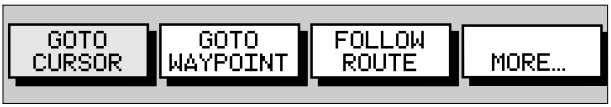

Figure 3-27: First Level GOTO Functions

2. Select MORE to display the second level GOTO functions (*Figure 3-28*):

Figure 3-28: Second Level GOTO Functions

3. Select MORE to return to the first level functions.
4. Press **CLEAR** to return to the chart screen.

Note: *The functions differ if a* FOLLOW *or* GOTO *is already in progress (see Stop Follow or Stop Goto on page 3-23).*

Follow a Route

Note: *If a route has been reversed or if a route on screen was being followed, but stopped before completion, the target waypoint (outlined by a square box) may be different to when the route was created. The target waypoint should always be checked before initiating a* FOLLOW ROUTE.

➤ To follow the current route:

1. Press the **GOTO** key. The Goto/Follow functions are displayed. Alternatively, place the cursor over a route leg until the Route functions are displayed.
2. Select FOLLOW ROUTE.

The vessel's current position becomes the origin and the first waypoint in the current route becomes the target waypoint. A dotted line connects the vessel's current position to the target waypoint. This line remains fixed on screen as the vessel moves. The function bar is removed.

Reverse a Route

This option enables a return route to be generated from an existing route which is then followed in reverse order, with waypoints renumbered accordingly.

➤ To reverse the current route:

From the normal chart display **either**:

1. Press **ENTER** to display the primary function bar, then select ROUTES, followed by MORE, then REVERSE ROUTE.

or

2. Move the cursor over a route leg or waypoint until the ROUTE OPTIONS function is displayed. Press **ENTER** to display the options and select REVERSE ROUTE.

The current route is reversed on the screen and the waypoints are renumbered.

➤ To follow the reversed route:

3. Press the **GOTO** key. The Goto/Follow functions are displayed.
4. Press FOLLOW ROUTE.

The vessel's current position becomes the origin and the first waypoint in the reversed route becomes the target waypoint. The function bar is removed.

Target Point Arrival

Target alarms (see *Chapter 4*) can be set up to sound when the vessel is approaching the target point. The arrival alarm is defined as a circle (not visible on the screen), with a specified radius around the target.

The alarm is triggered when either of the following conditions is met:

- The distance to the target point is less than that specified for the Arrival alarm.
- The vessel reaches the closest point of approach to the target (ie. it crosses a line passing through the waypoint and perpendicular to the track).

➤ To cancel the Arrival alarm and go towards the next waypoint in the route, press any key.

The target becomes the origin, the next waypoint becomes the target point and the two are connected by a dotted line indicating the current leg.

If the target waypoint was the subject of a GOTO, or was the last waypoint in a route, the pop-up alarm is cleared and any temporary waypoint is removed.

Alter a Route

A route can be followed from a selected waypoint (Join a route) or, if already following, advanced to the next waypoint. Also the XTE can be restarted, setting the current vessel position as the new origin.

In addition, a selected waypoint can be moved as described in *Section 3.2*, or removed from the route as described in *Section 3.3*.

Join a Route

➤ To start following the current route from a selected waypoint:

1. Move the cursor over a route waypoint until the WAYPOINT OPTIONS function is displayed (*Figure 3-29*):

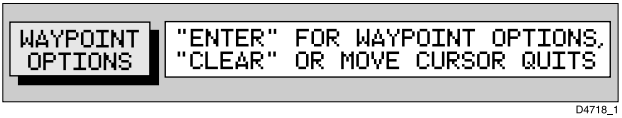

Figure 3-29: Route Options Function

2. Press **ENTER** and select FOLLOW FROM HERE(*Figure 3-30*).

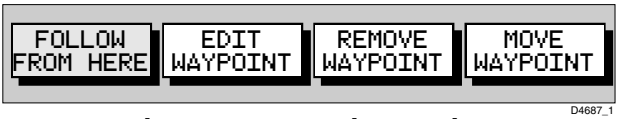

Figure 3-30: Waypoint Function

The vessel follows the route, using the selected waypoint as the target.

3. To return to chart mode, move the cursor away from the waypoint or press **CLEAR**.

Advance to a Waypoint

When following a route it is possible to advance to the next waypoint, even if the current target waypoint has not been reached.

➤ To advance to a waypoint:

1. Press the **GOTO** key to display the Goto/Follow functions (*Figure 3-31*):

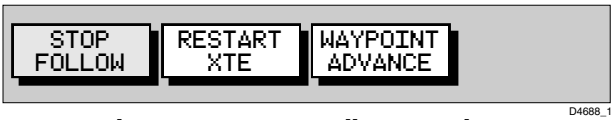

Figure 3-31: GOTO/Follow Functions

2. Select WAYPOINT ADVANCE. The current leg of the route is abandoned and the next waypoint becomes the target. The display is updated to show the new route leg.

Restart Cross Track Error (XTE)

Reset XTE is useful if you find yourself off track and prefer to go directly to your target, rather than get back onto the original track.

Whilst following a route, or going to a target point, you can restart the XTE. This sets the XTE to zero and moves the origin to the vessel's actual position.

➤ To restart XTE:

1. Press the **GOTO** key.
   If following a route, the following functions are displayed (*Figure 3-32*):

Figure 3-32: GOTO Options (1)

If a GOTO is in progress, the following functions are displayed (*Figure 3-33*):

Figure 3-33: GOTO Options (2)

2. Select RESTART XTE. The dotted line between the original origin and the target waypoint is redrawn from the vessel's current position to the target waypoint and the XTE is reset to zero

Going to an Individual Target

Rather than following a route, you can go directly to a selected target. This can be an existing waypoint, a port or nearest facility or the current cursor position.

Go to a Waypoint

➤ To navigate directly to an existing waypoint:

1. From the normal chart display **either**:
   i. Use the trackpad to position the cursor over the required waypoint until the waypoint options function is displayed (*Figure 3-34*):

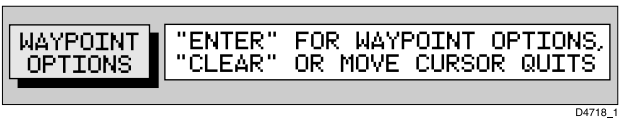

Figure 3-34: Waypoint Options

...then press **ENTER** to display the waypoint functions (*Figure 3-35*):

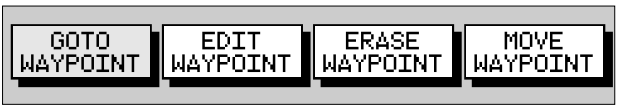

Figure 3-35: Waypoint Functions

or

ii. Press the **GOTO** key to display the waypoint options and select GOTO WAYPOINT; the waypoint list appears. Use the cursor to select the required waypoint (*Figure 3-36*):

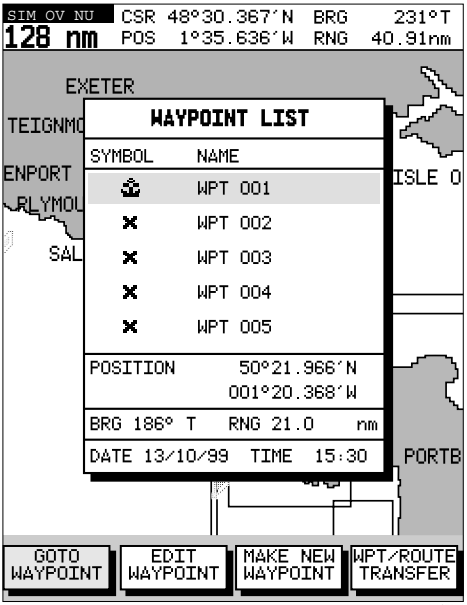

Figure 3-36: Waypoint List

Alternatively, a waypoint can be selected from the Waypoint List as described in *Section 3.2*.

2. Select GOTO WAYPOINT.
   A dotted line is drawn from the vessel's current position to the selected waypoint and navigation to the selected waypoint begins.

Go to Cursor

Note: *If navigation is currently in progress or if the cursor is homed (Find Ship) it is not possible to go to cursor.*

➤ To navigate directly to the current cursor position:

1. Press the **GOTO** key and select GOTO CURSOR. The GOTO CURSOR function now has help text appended to it (*Figure 3-37*):

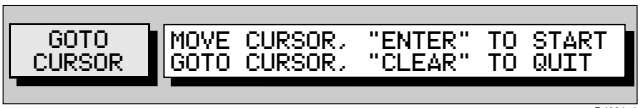

Figure 3-37: GOTO Cursor Function

2. Use the trackpad to position the cursor as required.
3. Press **ENTER** to start the GoTo, or **CLEAR** to cancel the operation.

A temporary waypoint is placed at the cursor position and navigation proceeds towards it. The temporary waypoint is shown as a square with a dot in it's centre and is connected to the vessel's starting position by a dotted line.

On arrival, the arrival alarm is sounded and the arrival pop-up box is displayed.

Note: *The temporary waypoint is not added to the waypoint list; when the GoTo is complete, or is stopped, the temporary waypoint is erased.*

Go to a Port

You can navigate directly to the nearest port or to a selected port or facility.

➤ To navigate directly to selected port:

1. Press the **GOTO** key and select GOTO PORT to display the Port List.
2. Use trackpad up/down to select the required port and press **ENTER** to start the GoTo, or **CLEAR** to cancel the operation.

A dotted line is drawn between the current vessel position and the target waypoint which is placed at the port. The line remains fixed on the screen as the vessel moves.

Bearing, Range and Cross Track Error are calculated for the target waypoint in the same manner as for any other Goto or Follow function.

On arrival, the arrival alarm is sounded and the arrival pop-up box is displayed.

➤ To navigate directly to the nearest port or facility:

1. Press the **GOTO** key and select GOTO NEAREST to display the list.
   The list shows the eight nearest places where the selected facility exists, in order of distance. The bearing and range (in selected units) for each one is shown.

2. Use trackpad up/down to select the required destination and press **ENTER** to start the GoTo, or **CLEAR** to cancel the operation.

The operation is conducted in the same manner as for GOTO PORT above.

Stop Follow or Stop Goto

➤ To stop following the route or target point:

1. Either press the **GOTO** key or move the cursor over the target waypoint.
2. Select the STOP GOTO or STOP FOLLOW function (*Figure 3-38*):

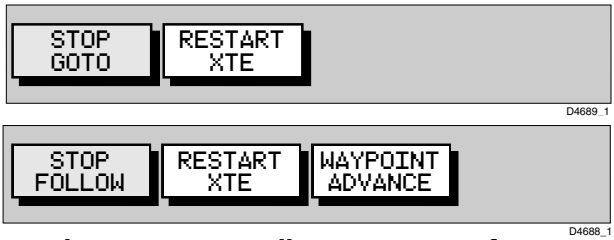

Figure 3-38: Stop Follow/Stop Goto Soft Keys

The dotted line from the vessel to the target waypoint disappears.

3.5 Changing the Display Mode

Use the **PAGE** key to select the required display mode. Repeat presses of the **PAGE** key provide the following display modes:

- Set Up functions (see *Chapter 4*)
- Course Deviation Indicator (CDI)
- Bearing & Distance Indication (BDI)
- Waypoint data
- Navigation data
- Time/Date data
- Return to Chart display

Note: *Press* **GOTO** *in any display mode to return to normal Chart display.*

➤ To change the display mode:

1. Press the **PAGE** key to show the SET UP functions with SYSTEM SET UP highlighted (*Figure 3-39*):

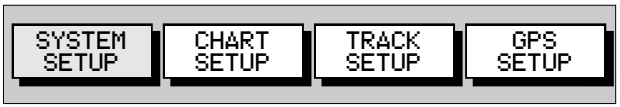

Figure 3-39: Setup Function Bar

2. Repeat Step 1 to cycle through each of the available display modes.

Note: *The Set Up Function Bar remains displayed in each display mode. To remove the Set Up Function Bar, press* **CLEAR**.

CDI Display

The CDI display shows Cross Track Error (XTE) and distance to waypoint presented in a 'runway' format (*Figure 3-40*):

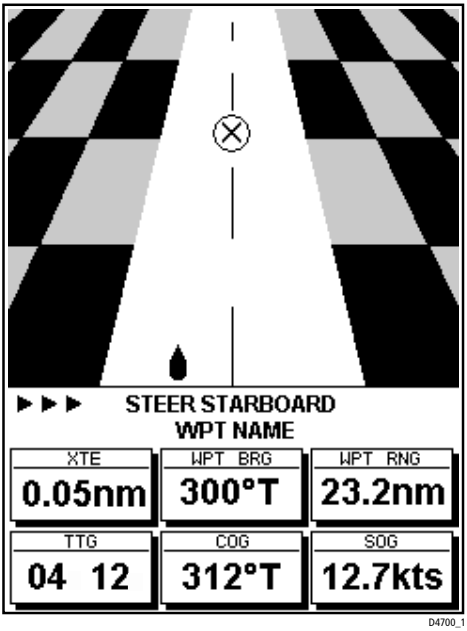

Figure 3-40: CDI Display

The 'runway' represents a 0.3nm width with the vessel symbol shown at the bottom. Bearing to Waypoint, Distance to Waypoint, Time to Go (TTG), Course Over Ground (COG) and Speed Over Ground (SOG) are also shown. Time to Go is calculated on the basis of distance to destination and Speed Over Ground (SOG) towards the destination.

At waypoint ranges greater than 4nm, the symbol remains at the top of the screen. As the waypoint range falls below 4nm, the symbol moves down the centre line.

The checkered pattern moves down the screen to simulate movement when SOG is greater than 2 knots.

The steering instruction is STEER STARBOARD if the XTE is 0.01nm or more to port, STEER PORT if the XTE is 0.01nm or more to starboard or ON COURSE if the XTE is less than 0.01 on either side. If no GOTO or follow is in progress, the steering instruction is NO TARGET.

The graphical XTE indication places arrows either side of the steering instruction and pointing towards it, dependent on the value of XTE.

The first arrow is shown when the XTE reaches 0.01nm, the second at.05nm and subsequently at 0.1nm intervals.

BDI Display

The BDI display shows deviation from the bearing to waypoint and distance to waypoint. Cross track Error, Bearing to Waypoint, Distance to Waypoint, Time to Go, COG and SOG are also shown. Time To Go is calculated on the basis of distance to destination and velocity made good towards destination (*Figure 3-41*).

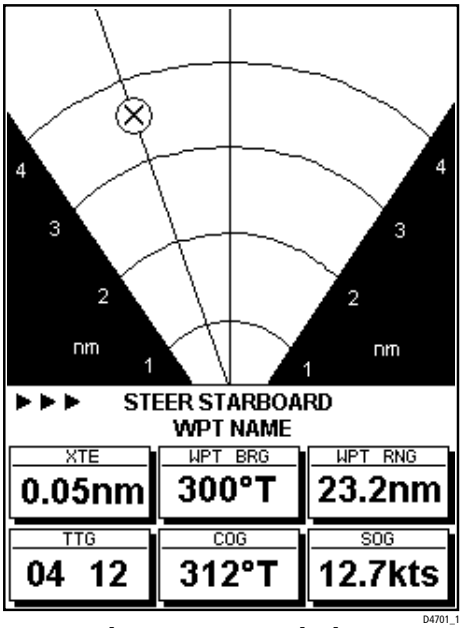

Figure 3-41: BDI Display

The line to the waypoint symbol is shown at an angle equal to the difference between the COG and the Bearing to Waypoint.

The range scale automatically scales for distance. The ranges shown are 1nm, 4nm, 20nm, 40nm, 100nm, 200nm, 400nm, 1000nm, 2000nm, 4000nm. In each case the range scale has graduations at ¼, ½ and ¾ of the current scale.

The steering instruction is STEER STARBOARD if the waypoint line is 1° or more to port, STEER PORT if the waypoint line is 1° or more to starboard or ON COURSE if the waypoint line is dead ahead. If no GOTO or follow is in progress, the steering instruction is NO TARGET, no steering arrows are shown, but the rhumb line indicator is shown.

The graphical XTE indication will place arrows either side of the steering instruction and pointing towards it dependent on the difference between COG and bearing to Waypoint. The first arrow is shown when the difference reaches 5° and thereafter at 5° intervals.

Waypoint Data

The Waypoint Data display comprises text data occupying the whole screen (*Figure 3-42*).

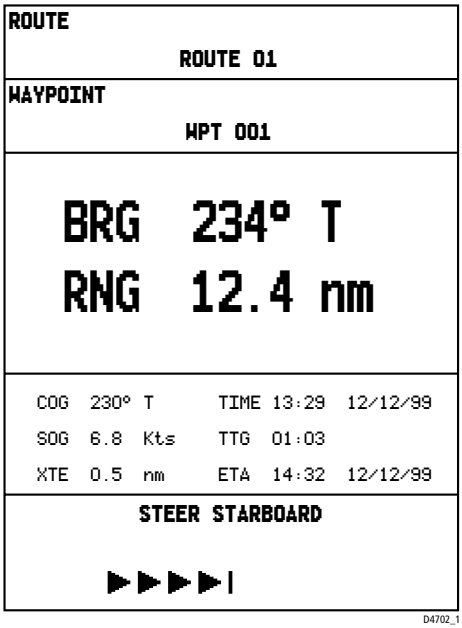

Figure 3-42: Waypoint Data Display

If a route is not selected, the ROUTE field displays NO ROUTE.

The WAYPOINT field shows the name of the waypoint. If the waypoint is part of a route then the title field includes the waypoint index in the route. If there is no target waypoint the text indicates NO WAYPOINT and all waypoint data is shown as dashes, one per character. If a route is being followed and the waypoint is not named, the text shows the waypoint number within the route (as displayed on screen). If a GOTO Cursor or Port is in progress, the text indicates GOTO CURSOR or GOTO 'Port Name'.

BRG, RNG and XTE data relate to the target waypoint.

Time refers to time data which is acquired from GPS information. Any local time offset is set in the System Set Up menu, see *Chapter 4*.

The Time To Go (TTG) and Estimated Time of Arrival (ETA) data relate to the target waypoint (not the whole route) and are based on the Speed Over Ground (SOG) towards the target. If the VMG is negative, or data is not available, these fields are replaced by dashes, one per character.

The steering instruction is STEER STARBOARD if the XTE is 0.01nm or more to port, STEER PORT if the XTE is 0.01nm or more to starboard or ON COURSE if XTE is less than 0.01 on either side.

If no GOTO or follow is in progress, the steering instruction is NO TARGET, no steering arrows are shown, but the rhumb line indicator is shown.

The graphical XTE indication places arrows either side of the rhumb line indicator and pointing towards it, dependent on the value of XTE. The first arrow is shown when the XTE reaches 0.01nm, the second at.05nm and subsequently at 0.1nm intervals.

Note: *The steering instruction and graphical XTE indication are repeated on all text-only displays.*

Navigation Data

The Navigation Data display comprises text data occupying the whole screen (*Figure 3-43*):

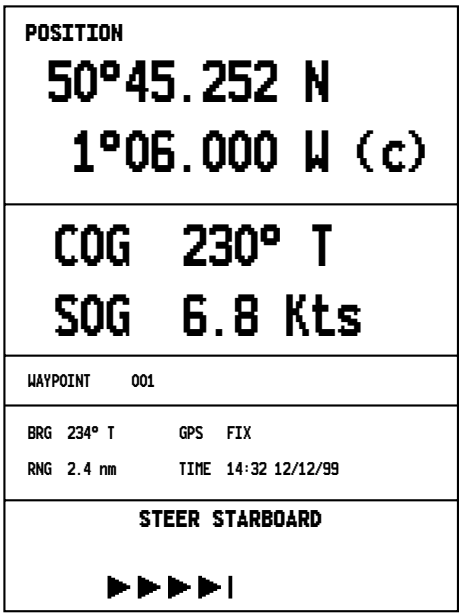

Figure 3-43: Navigation Data Display

Textual data provides Position, SOG, COG, Bearing and Range to waypoint, Time, Fix status and the XTE indicator. Any unavailable data is replaced by dashes, one per character. When there is no GPS fix but there is a value for the last fix, this is shown instead; POSITION is replaced with LAST POSITION.

The (c) indicator only appears when the position has been user calibrated.

The Fix indicator shows the GPS Fix status and indicates either D FIX, SD FIX or NO FIX.

Note: *Graphical XTE indicator is as per Waypoint Data on page 3-26.*

Time/Date Data

The Time/Date display comprises text data occupying the whole screen (*Figure 3-44*):

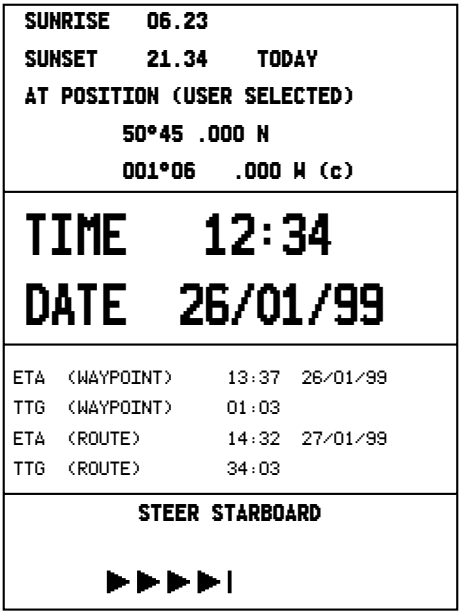

Figure 3-44: Time/Date Data Display

Textual data provides Sunrise and Sunset time, Current Time/ Date, Waypoint and Route arrival times plus the XTE indicator.

Sunrise and Sunset times are for the selected day and at the selected position. The TODAY indicator emphasizes that the sunrise and sunset times relate to the current day. If another day is selected, the TODAY text is replaced with ON XX/XX/XX where XX/XX/XX is the selected date in the current format.

When the Time/Date screen is first opened, the data relates to the current day, unless there is no date information available. In this case the last date is used. The vessel's current position is used unless there is no GPS fix in which case the cursor position is used and shown as a USER SELECTED position.

The position data can be either as selected by you, in which case the text relating to the position is USER SELECTED, or the current position in which case the text is VESSEL.

The (c) indicator only appears when the position has been user calibrated.

The Time and Date fields show the local current time and date.

The TTG and ETA (WAYPOINT) data relates to the target waypoint. The TTG and ETA (ROUTE) data relates to the end of the route.

All data is based on the SOG towards the current target. If the SOG is negative, or data is not available, these fields are replaced with dashes, one per character.

➤ To display Sunrise/Sunset information for a different date:

1. If the Set Up functions are displayed, press **CLEAR** to remove them; press **ENTER** to display the position functions (*Figure 3-45*).

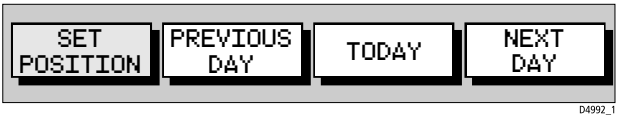

Figure 3-45: Position Functions

2. Select PREVIOUS DAY or NEXT DAY as required to display Sunrise/Sunset information for a particular date.
3. Select TODAY to return the display to current date.

➤ To set the position data manually:

1. Display the Position functions as described for Sunrise/Sunset display above (*Figure 3-45*).
2. Select SET POSITION then either:
   i. VESSEL POSITION which sets the position to the current position of the vessel, **or**
   ii. SELECT POSITION which enables specific Latitude/Longitude data to be entered.
   Use cursor left/right to select individual characters to edit.
   Use cursor up/down to select the required character.
   iii. Press **ENTER** to complete, or **CLEAR** to abort, the change(s).

3.6 Transferring Waypoints and Routes

Displayed Waypoints

Waypoints and routes can be received and transmitted via NMEA, see also *Chapter 5, Section 5.3, Installing the Chartplotter*. The NMEA link could be to a PC, typically via a spare RS232 COM port.

Managing Database Lists

The SEND WAYPOINTS function sends all waypoints in the Waypoint List and all routes in the Route List. Sending the Waypoint List does not affect current routes.

Note: *Sending the Waypoint List includes waypoints in an unsaved route*.

The RECEIVE WAYPOINTS function adds waypoints and routes received via NMEA to the Waypoint List and Route List.

Note: *Where multiple waypoints have the same position, the last waypoint sent is the only one included in the Waypoint List.*

➤ To send waypoints (and route lists):

1. From chart mode, press **ENTER**; the primary function bar is displayed (*Figure 3-46*):

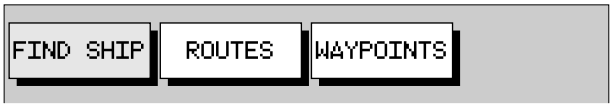

Figure 3-46: Primary Function Bar

2. Using trackpad left/right, select WAYPOINTS (*Figure 3-47*).

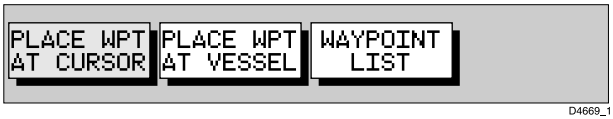

Figure 3-47: Waypoint Function Bar

3. Select WAYPOINT LIST.

The Waypoint List is displayed, with its associated function bar (*Figure 3-48*):

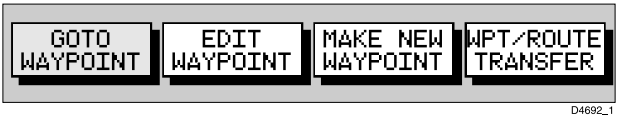

Figure 3-48: Waypoint List Function Bar

4. Initiate receiving of waypoints on the NMEA compatible equipment.
5. Select WPT/ROUTE TRANSFER.

The waypoint transfer functions are displayed (*Figure 3-49*):

Figure 3-49: Waypoint Functions

6. Select SEND WAYPOINTS and press **ENTER**; the text changes to STOP SENDING.
7. To stop waypoint transfer, press **ENTER**.

➤ To receive waypoints and route lists:

1. Display the Waypoint List as previously described, then select WPT/ROUTE TRANSFER.
2. Select RECEIVE WAYPOINTS and press **ENTER**; the text changes to STOP RECEIVING and remains selected.
3. Initiate sending waypoints on the NMEA compatible equipment.
4. To stop waypoint transfer, press **ENTER**.

Note: *If either the Waypoint List or Route List becomes full, a warning is displayed and the operation is terminated.*

3.7 Using Tracks

The Track function is used to mark an on-screen trail that the vessel has followed, as if it had left a visible fixed wake.

While the track is turned on, it is recorded in the display unit's memory. You specify the interval at which track points are made and a line is drawn on-screen between each point. Up to 2000 track points can be saved in total.

The track remains on-screen, even following a Power off/on, until the track is cleared.

Using the *SmartRoute* function, a track can also be converted to and saved as a route which is automatically reversed, ready for use as a return voyage.

This section describes how to:

- Set up a track and specify the interval between track points.
- Clear the current track.
- Convert the track to a route (*SmartRoute*).

➤ To access the track controls:

1. From chart mode, press the **PAGE** key to display the chart set up function bar (*Figure 3-50*):

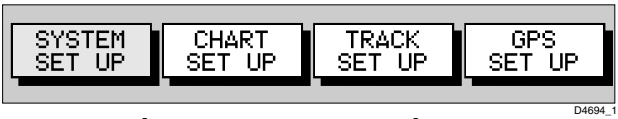

Figure 3-50: Set Up Function Bar

2. Select TRACK SET UP to display the Track function bar (*Figure 3-51*):

Figure 3-51: Track Set Up Options

The following instructions assume that the track functions are displayed.

Setting up a Track

Use the track functions to switch the track on and to specify the interval at which track points are placed. The time interval between track points can be set to 1s, 10s, 30s, 1min, 10min or 30 minutes. The distance spacing between track points can be set to 0.05nm, 0.1nm, 0.5nm or 1nm. The maximum track length is 2000 points. When this limit has been reached, track points continue to be placed, but the oldest points start to be deleted. Track points continue to be placed until the track is switched off. The current track is retained even when the unit is powered off.

Setting a short time interval between track points is best suited to navigation within a close or complex environment, eg. an estuary or marina whereas, in contrast, a greater distance interval is best suited to a long haul voyage.

When complete, a track can be converted to and saved as a route (*SmartRoute*).

Refer to the track interval setting guide (*Figure 3-52*) to determine the best setting for your planned voyage; this is particularly important if you wish to use *SmartRoute* to convert the track to a route.

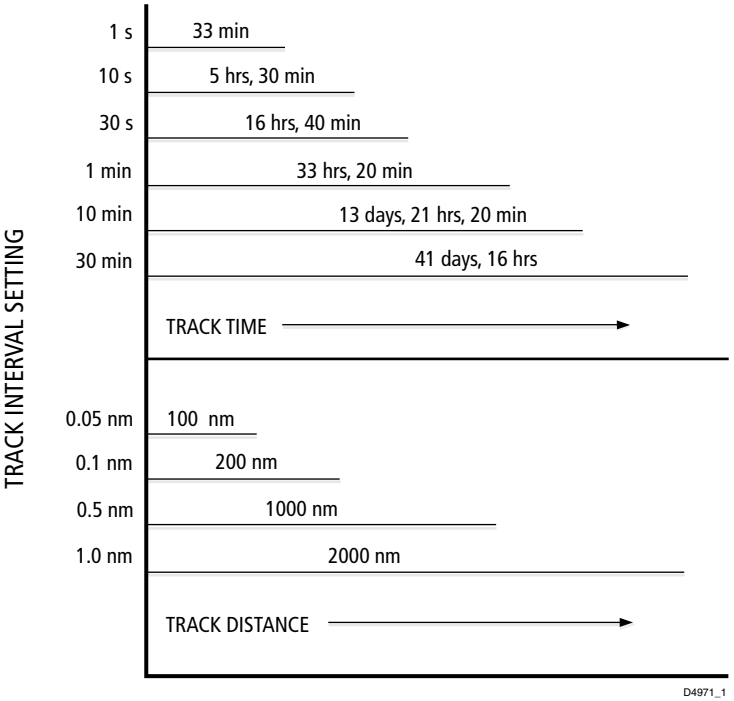

Figure 3-52: Track Interval Setting Guide

➤ To set up a track:

1. Select the INTERVAL function.
   Use trackpad up/down to select the appropriate options to set either a time interval or a distance interval; press up to increase the interval or down to decrease the interval.
2. Use trackpad left/right to select TRACK ON and press **ENTER**.
   The TRACK ON text changes to indicate TRACK OFF.

The vessel's track is displayed on-screen with a line joining the points at the selected interval.

Clearing the Current Track

The current track can be cleared from the screen.

➤ To clear the current track:

1. Select CLEAR TRACK.
   The current track is cleared from the screen and memory.
2. If no further track points are to be placed, select TRACK OFF and press **ENTER**; the TRACK OFF text changes to indicate TRACK ON.

SmartRoute

SmartRoute enables the latest track to be converted to a route.

➤ To convert a track to a route:

1. Select MAKE INTO ROUTE and press **ENTER**.
   The current track is converted to a new route, with the most recently placed track point as the start of the route, ie. the track is reversed.

If there is an unsaved current route on screen, the option to save the route is given, see *Section 3.3, Working with Routes*.

2. Check the calculated route and, in particular, that the route deviation from the original, given in the warning box, is within navigable limits.

3.8 Displaying Chart Information

Nav-Chart cards include a number of displayed objects for which data is available, eg. lights, buoys, ports or tidal data. Placing the cursor over an object displays its associated data in a pop-up box. Typical examples for Port Services and Tide Information are given below.

Port Services

At detailed chart scales, placing the cursor over a port symbol enables detailed information to be displayed. Port information is indicated by the  symbol. The port facilities are listed in the object information pop-up and, where available, details for each facility can be displayed.

In some areas the chart shows symbols for individual facilities. These facilities and symbols are dependent upon the particular area Nav-Chart card used.

➤ To obtain port services information:

1. Place the cursor over the port symbol for which information is required. The PORT SERVICES function, together with help text, is displayed (*Figure 3-53*):

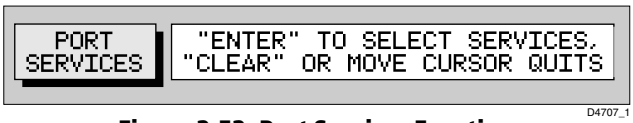

Figure 3-53: Port Services Function

2. To view the port services available, press **ENTER**. The available services are listed on-screen in an object information pop-up (*Figure 3-54*):

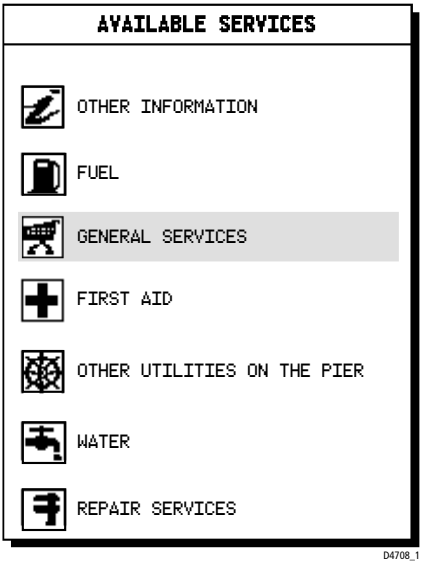

Figure 3-54: Available Port Services

3. Use the trackpad to select the required service and press **ENTER** to display further details (*Figure 3-55*):

Figure 3-55: Port Service Details

4. To see more options (if available), select the**.....More.....** option and press **ENTER**.
5. Press **CLEAR** to remove the pop-up from the screen.

Tide Information

At detailed chart scales, placing the cursor over a Tide Height or Current symbol for more than 0.5 seconds enables detailed tide information to be

displayed in an object information pop-up box. Soft keys enable Sun/Moon Data and Previous/Next Day information to be displayed.

Tidal Height

➤ To obtain Tide Height Data:

1. Place the cursor over a Tide Height symbol ⟨T⟩
   The Tidal Heights soft key and help text appear (*Figure 3-56*).

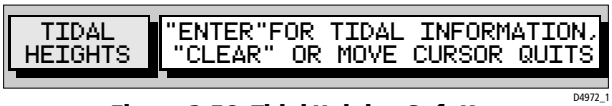

Figure 3-56: Tidal Heights Soft Key

2. Press **ENTER** to show the Tidal Heights information (*Figure 3-57*) or **CLEAR** to cancel the operation. If no Fix is available (to provide date information), a warning box appears.

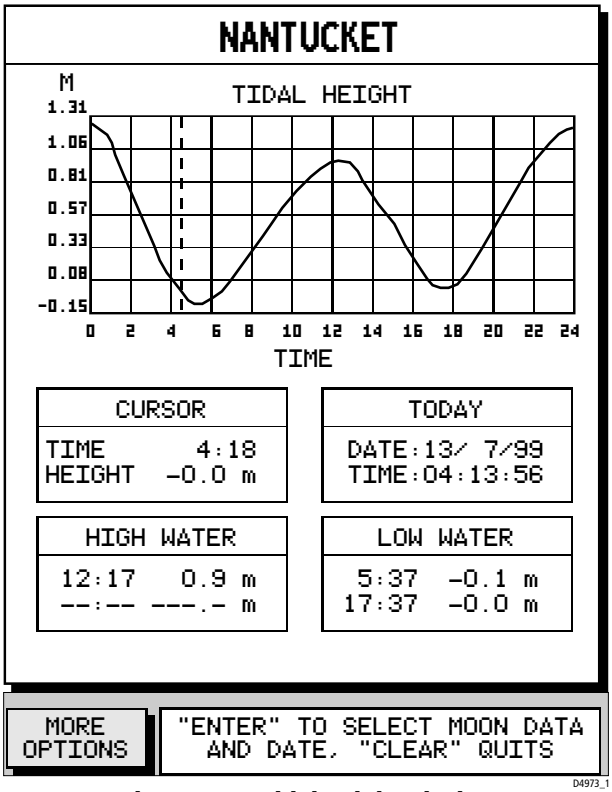

Figure 3-57: Tidal Height Display

The 'Port Name' is that supplied by the Nav-Chart cartridge. The Tidal Height graph is automatically scaled. The cursor, represented by a dashed line, can be moved along the horizontal axis by means of the Trackpad. A CURSOR data box below the graph shows corresponding TIME and HEIGHT.

Times and heights of HIGH WATER and LOW WATER are shown in their individual boxes.

DATE and TIME for TODAY (default) are shown with PREVIOUS/NEXT DAY information available via the MORE OPTIONS soft key; repeated presses of these two soft keys moves the date back/forward one day at a time.

3. To return to chart display, press **CLEAR**.

➤ To display the Tide Height at a particular Date/Time:

1. Press **ENTER** to select MORE OPTIONS; the SUN/MOON DATA soft keys are shown (*Figure 3-58*).

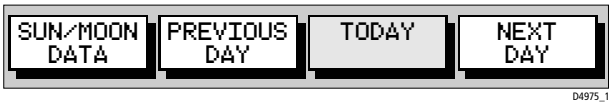

Figure 3-58: Sun/Moon Data Soft Keys

2. Using trackpad left/right, select PREVIOUS DAY or NEXT DAY soft key; press **ENTER** the appropriate number of times to select the required Date.
3. Using trackpad left/right, move the cursor to the required time of day. The Cursor box shows the Tide Height for that particular Date/Time.
4. Select TODAY to return to current Date/Time.

➤ To display Sun/Moon data:

1. Select SUN/MOON DATA.
   The SUN rise/set and MOON rise/set times are shown in individual boxes.
   The MOON PHASE box indicates the number of days referred to full moon, together with a pictorial representation (*Figure 3-59*).

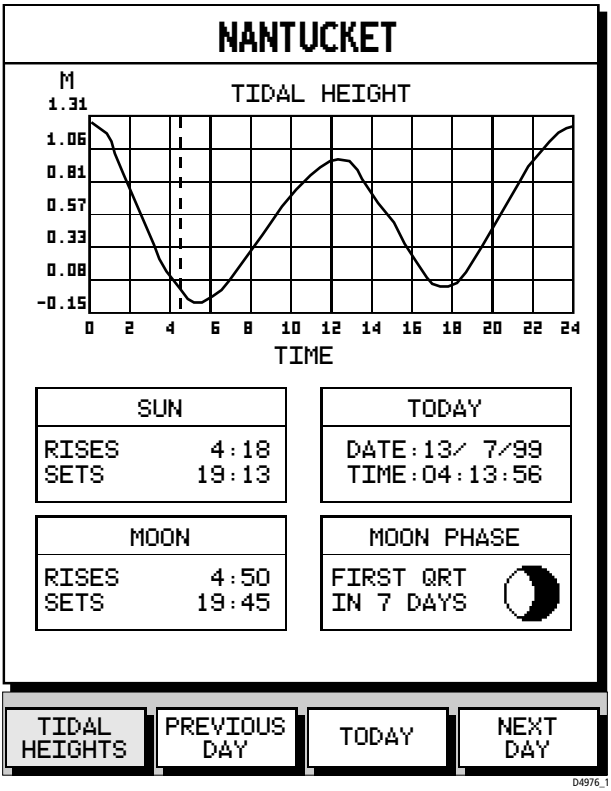

Figure 3-59: Tidal Heights & Sun/Moon Data Display

2. Select TIDAL HEIGHTS or press **CLEAR** to return to the Tidal Heights data.

Tidal Current

➤ To obtain Tidal Current Data:

1. Place the cursor over a Tide Current symbol ⟐
   The Tidal Current soft key and help text appear (*Figure 3-60*).

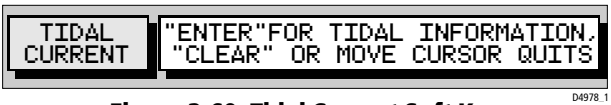

Figure 3-60: Tidal Current Soft Key

2. Press **ENTER** to show the Tidal Current information and soft keys (*Figure 3-61*) or **CLEAR** to cancel the operation.

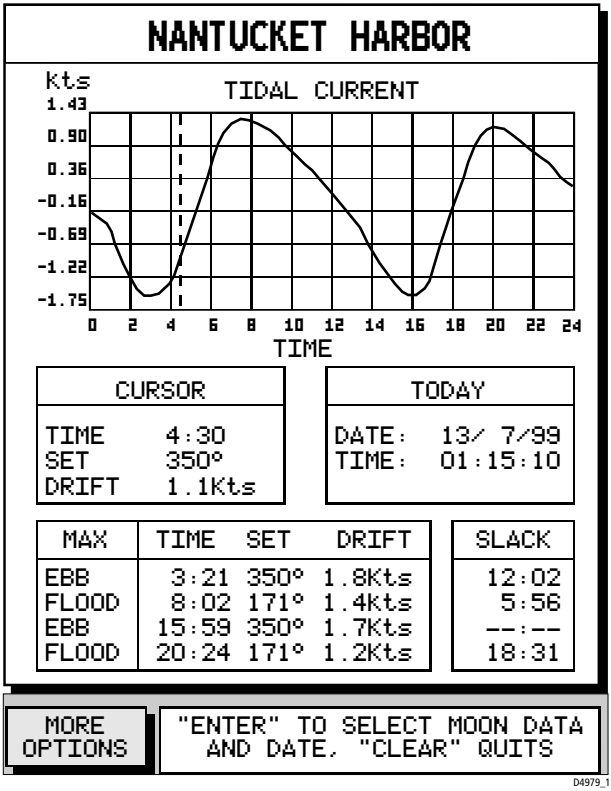

Figure 3-61: Tidal Current Display

The 'Port Name' is that supplied by the Nav-Chart cartridge. The Tidal Current graph is automatically scaled. The cursor, represented by a dashed line, can be moved along the horizontal axis by means of the Trackpad. A CURSOR data box below the graph shows corresponding TIME, SET and DRIFT.

DATE and TIME for TODAY (default) are shown with PREVIOUS/NEXT DAY information available via the MORE OPTIONS soft key; repeated presses of these two soft keys moves the date back/forward one day at a time.

Times of MAXimum EBB and FLOOD Tides, together with SET and DRIFT figures are shown. A separate box shows corresponding SLACK figures. These data correspond to the selected Date/Time.

3. To return to chart display, press **CLEAR**.

➤ To display the Tidal Current data for a particular Date:

1. Press **ENTER** to select MORE OPTIONS; the SUN/MOON DATA soft keys are shown (*Figure 3-62*).

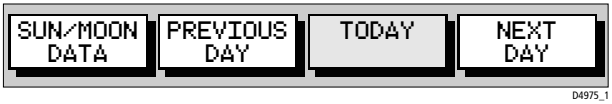

Figure 3-62: Sun/Moon Data Soft Keys

2. Using trackpad left/right, select PREVIOUS DAY or NEXT DAY soft key; press **ENTER** the appropriate number of times to select the required Date.
3. Select TODAY to return to current Date/Time.

➤ To display Sun/Moon data:

1. Select SUN/MOON DATA; the SUN rise/set and MOON rise/set times are shown in individual boxes.
   The MOON PHASE box indicates the number of days referred to full moon, together with a pictorial representation (*Figure 3-63*).

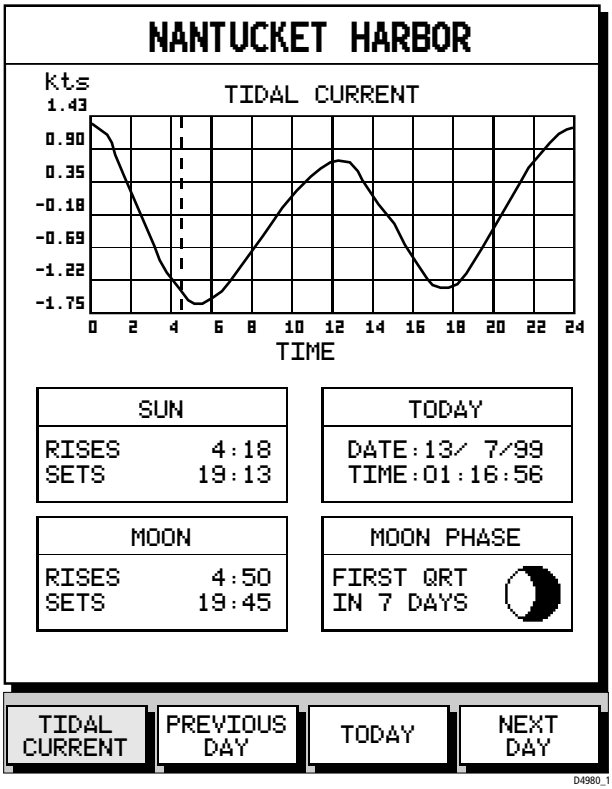

Figure 3-63: Tidal Current & Sun/Moon Data Display

2. Select TIDAL CURRENT or press **CLEAR** to return to the Tidal Current data.

3.9 Man Overboard (MOB)

If a person or object is lost overboard, and you need to return to the location, use the Man Overboard (MOB) function.

Note: *To obtain MOB position, a valid GPS fix must be available.*

➤ To initiate the MOB procedure from the Chart display, press and hold the **GOTO** key for two seconds. The system performs the following tasks automatically:

- Stops any GoTo or Follow operation.
- Selects a $^1/_2$ nm scale (even if cartography is not available).
- Marks the current position as a temporary waypoint with an MOB symbol which replaces any current active waypoint and route.
- Displays the MOB data box, showing the bearing and range to the MOB position, the elapsed time since the MOB was initiated and COG data (*Figure 3-64*).

Figure 3-64: MOB Data Box

- Sends an MOB message, including bearing and range, to other units in the system, via NMEA.

Notes: ***(1)*** *A suffix (c) to the POSition data indicates that the vessel's position has been User Calibrated, see Chapter 4,Chart Set Up Parameters.*
(2) *The* **RANGE** *key operates normally to change chart scale.*

➤ To cancel MOB, press and hold the **GOTO** key for 2 seconds.
The MOB symbol and data box are removed and the unit returns to normal Chart mode.

3.10Alarms

The chartplotter reports the following alarms (*Table 3-1*):

Table 3-1: Alarm Settings

Alarm	Indicates
Arrival	The vessel has arrived at the active waypoint: it has either reached the arrival circle (the radius of which is specified) or, has reached its closest point of approach (defined by a line passing through the waypoint and perpendicular to the track).
XTE	The vessel has exceeded the specified distance (maximum cross track error) from the active route leg.
Anchor	The vessel has drifted from its anchor position (set when the alarm was turned on) by more than the specified distance.
No Fix	GPS fix or Differential data has been lost for more than 30 s.

The alarms are switched on or off, and the limits set, using the Chart Set Up function via the **PAGE** key menu, see *Chapter 4, Section 4.3, Chart Set Up Parameters*.

When an alarm is triggered, the alarm buzzer sounds and a pop-up box, describing the alarm, is displayed.

➤ To silence the alarm and clear the message, press any key.

Chapter 4: Setting Up

4.1 Introduction

When you have installed your system and are familiar with its basic operation, you may wish to set it up to operate according to your requirements and display information according to your preferences.

This is achieved using the function controls which are displayed when the **PAGE** key is pressed. These settings can be changed at any time.

When your preferences are set, they maintain until they are reset and are retained even when the unit is powered off.

This chapter covers the following topics:

- System parameters and default settings.
- Chartplotter-specific parameters and default settings.

The set up parameters are selected via three soft keys:

- **System Set Up:** controlling overall functionality.
- **Chart Set Up:** controlling the chartplotter functions, including waypoint information and vectors.
- **GPS Set Up:** displaying the Raystar 120 GPS receiver status.

Note: *The additional* TRACK SET UP *function is covered in Chapter 3:Operation.*

This section provides instructions for displaying and changing the factory default values to your preferences. The following sections list the parameters with their possible settings and describe the function of each parameter in turn.

4.2 System Set Up Parameters

➤ To set the System default parameters:

1. From chart mode, with no function bar displayed, press the **PAGE** key to display the SET UP function bar (*Figure 4-1*):

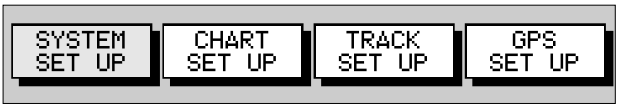

Figure 4-1: Set Up Function Bar

2. Use trackpad left/right to highlight SYSTEM SET UP and press **ENTER** to display the System Set Up menu (*Figure 4-2*):

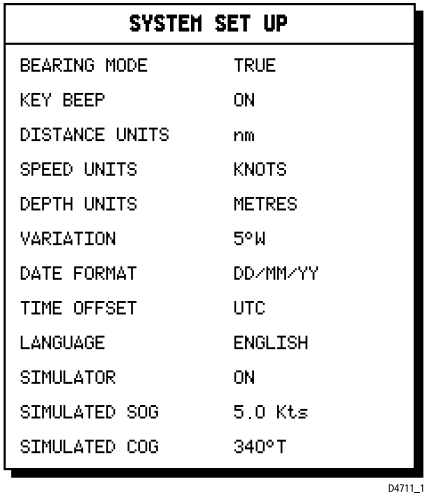

Figure 4-2: System Set Up Menu

3. Use trackpad up/down to move the highlight up or down the list.
4. When the required parameter is highlighted, use trackpad left/right to step through the settings.
5. When the required values have been chosen, press **ENTER** to implement the change and return to the set up function bar.
6. Press **CLEAR** to clear the function bar and return to the chart display.

Note: *To return all settings to their original factory settings, perform a factory reset as described in Chapter 6.*

Table 4-2 lists the System menus and their options, shows the factory default settings and provides space to make a note of personal settings. Each parameter is described in the following subsections.

Table 4-2: System Menu Options

Menu Item	Options	Factory Default	New Setting
BEARING MODE	MAGnetic/TRUE	TRUE	
KEY BEEP	OFF/ON	ON	
DISTANCE UNITS	NAUTICAL MILES (nm) KILOMETERS (km) STATUTE MILES (sm)	NAUTICAL MILES	
SPEED UNITS	KNOTS KILOMETERS PER HOUR (KPH) MILES PER HOUR (MPH)	KNOTS	

Table 4-2: System Menu Options (Continued)

Menu Item	Options	Factory Default	New Setting
DEPTH UNITS	METRES FEET FATHOMS	METRES	
VARIATION	30°W to 30°E (1° steps)	0.0°E	
DATE FORMAT	DD/MM/YY or MM/DD/YY	DD/MM/YY	
TIME OFFSET	UTC or local offset value up to 13 hours in 1 hour steps	UTC	
LANGUAGE	Multi Language	ENGLISH	
SIMULATOR	OFF/ON	OFF	
SIMULATED SOG	00Kt to 99Kt in 1Kt steps	00Kt	
SIMULATED COG	000° to 359° in 1° steps	000°	

Bearing Mode

The mode (MAGnetic or TRUE) of all bearing and heading data displayed. This is indicated by M or T in the BRG or COG field of the Chart status bar.

Key Beep

This setting controls audible feedback resulting from operation of the keys.

Note: *Alarms remain active.*

Units

This sets the units for distance, speed and depth. This setting will be used to display all data. However, the distance units do not affect the chart scale, which is always in nautical miles.

Variation

The variation value is the difference between True and Magnetic direction data for heading or bearing values. The Magnetic value is derived from True by applying the user selected value of variation.

The variation is varied in 1° steps to 30° East or West. Press trackpad right to move the value eastward, or left to move it westward. The selected value is retained when the unit is switched off. The Default value is zero.

Date Format

Set the preferred date format (DD/MM/YY or MM/DD/YY). The selected setting is retained when the unit switched off. The Default is DD/MM/YY.

Time Offset

To display local time, use the trackpad to change from UTC to the required time offset. This can be up to ±13 hours, in 1 hour steps. The default is UTC.

Language

Select the language in which information is to be displayed. The selected language is used for screen text, labels, menus and options. Chart text, provided by the chart card, is not affected.

Simulator

The simulator allows operation of the Raychart 425 without data from external sources. The options are ON or OFF.

When ON is selected the simulator generates position, SOG and COG data and uses the simulated data instead of any real data. A flashing SIM status indicator is displayed in the left hand corner of the Status Bar at the top of the screen.

Note: *The simulated data overrides any real data that the display unit is receiving from externally connected equipment.*

The position is initially the position of the cursor when the simulator is switched on and the SOG and COG are as selected by the user. The position is updated to reflect the SOG and COG. See *Simulated SOG* and *Simulated COG* below.

If a GOTO or Follow is started, the simulator does not use the selected value of COG but, instead, generates a value of COG that simulates the navigation function in progress. When GOTO or Follow is stopped, the user selected value of COG is used.

Simulated SOG

Use horizontal movements of the trackpad to adjust the value of SOG which is adjustable in 1 knot intervals from 00 to 99.

The Default value is zero and the selected value is retained on power down.

If the simulator is switched OFF, the value is shown as dashes and no adjustment is possible.

Simulated COG

Use horizontal movements of the trackpad to adjust the value of COG which is adjustable in 1° intervals from 000° to 359°. It wraps around from 000 to 359 and from 359 to 000.

The Default value is zero and the selected value is retained on power down.

If the simulator is switched OFF, the value is shown as dashes and no adjustment is possible.

4.3 Chart Set Up Parameters

The CHART SET UP function allows the chartplotter to be set up according to your system configuration and your personal preferences.

➤ To set the Chart default parameters:

1. Press the **PAGE** key to display the SET UP function bar (*Figure 4-3*):

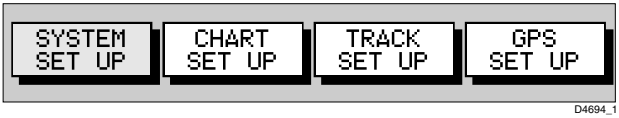

Figure 4-3: Set Up Function Bar

2. Use the trackpad left/right to highlight the CHART SET UP function and press **ENTER** to display the Chart Set Up menu (*Figure 4-4*):

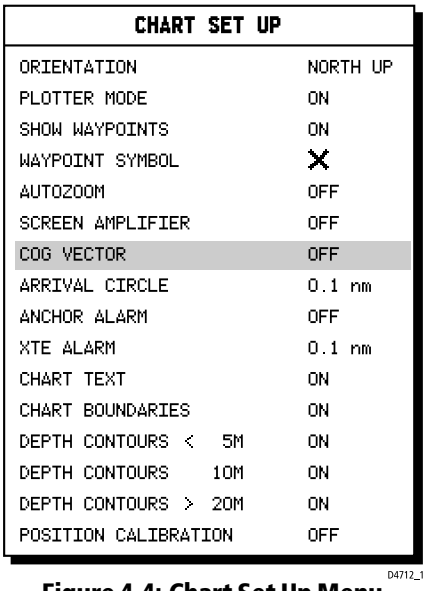

Figure 4-4: Chart Set Up Menu

3. Use trackpad up/down to highlight the required parameter, then use trackpad left/right to select the required setting.
4. When the required values have been set, press **ENTER** to clear the menu and return to the set up function bar.
5. Press **CLEAR** to clear the function bar and return to the normal display.

Note: *To return all settings to their original factory settings, perform a factory reset as described in Chapter 6.*

Table 4-3 lists the Chart Set up parameters and their options, shows the factory default setting and provides a space to make a note of the new default setting. Each parameter is described in the following subsections.

Table 4-3: Chart Setup Parameters

Parameter	Options	Factory Default	New Setting
ORIENTATION	NORTH UP COURSE UP HEAD UP	NORTH UP	
PLOTTER MODE	OFF/ON	ON	
SHOW WAYPOINTS	OFF/ON	ON	
WAYPOINT SYMBOL	FISH, SCULL, ANCHOR or X	X	
AUTOZOOM	OFF/ON	ON	
SCREEN AMPLIFIER	OFF/ON	ON	
COG VECTOR	OFF/ON	OFF	
ARRIVAL CIRCLE	0.01nm, 0.05nm, 0.1nm, 0.5nm	0.1nm	
ANCHOR ALARM	OFF, 0.01nm, 0.05nm, 0.1nm, 0.5nm	OFF	
XTE ALARM	OFF, 0.01nm, 0.05nm, 0.1nm, 0.3nm, 0.5nm	OFF	
CHART TEXT	OFF/ON	ON	
CHART BOUNDARIES	OFF/ON	ON	
DEPTH CONTOURS <5M	OFF/ON	ON	

Table 4-3: Chart Setup Parameters (Continued)

Parameter	Options	Factory Default	New Setting
DEPTH CONTOURS 10M	OFF/ON	ON	
DEPTH CONTOURS >20M	OFF/ON	ON	
POSITION CALIBRATION	OFF/ON/SET CAL	OFF	

Orientation

The chart orientation is normally North Up, but can be changed to Course Up or Head Up. The selected mode is always shown in the inverse video Mode Indicator in the top left hand corner of the Status Bar at the top of the display in the form NU (North Up), HU (Heading Up) or CU (Course Up). The orientation modes function as follows:

- **North Up:** The chart is displayed with north upwards. This is the default mode and is the only mode available if there is no COG data.
- **Course Up:** The chart is rotated such that the currently selected course (bearing to the target waypoint) or, if no navigation function is taking place, the current COG value is shown upwards.
  To update the Course Up reference whilst Course Up is the current mode, re-select COURSE UP from the set up menu.
  If a new course is selected, eg. a new target waypoint, the chart displays the new course upwards.
- **Head Up:** The chart is displayed with the vessel's current COG upwards. As the heading changes the chart rotates periodically to maintain orientation.

Note: *Head Up and Course Up modes are dependent upon a valid GPS fix.*

Plotter Mode

Plotter mode allows the user to zoom in beyond the level of cartography and continue to use plotter functions. The selected setting is retained when unit switched off.

Show Waypoints

This option controls whether or not the waypoints are shown on the Chart display, with their appropriate symbols. The active waypoint, and waypoints in the current route, are always shown.

Waypoint Symbol

This option allows selection of the symbol for waypoint display. The selected symbol is used for subsequent waypoints. Existing waypoints are not affected. The selected symbol is retained when the unit switched off.

Autozoom

When autozoom is enabled, commencing any navigation function or selecting FIND SHIP activates Autozoom. When active, this selects the chart range and position such that the vessel and the target waypoint are both on screen but at the largest scale possible. Moving the cursor off the vessel, or changing scale, deactivates Autozoom.

Autozoom will not zoom in beyond the largest cartographic scale (unless Plotter Mode is activated). When in MOB mode, Autozoom is selected automatically and will zoom in as far as possible, irrespective of the selection of Plotter Mode.

Screen Amplifier

Screen amplifier mode makes best use of the screen by positioning the vessel on the screen so as to increase forward visibility. The screen amplifier is only active when the cursor is 'homed' on the vessel.

COG Vector

When ON, a vector line from the vessel is drawn in the direction of COG. This line extends to the edge of the screen. If COG is not valid, no line is drawn. The selected setting is retained when the unit switched off.

Arrival Circle

The selected value is used as the arrival circle radius. When approaching the target waypoint, this is the distance at which the arrival alarm sounds. The selected setting is retained when unit switched off. Arrival criteria are met when the arrival circle is entered or a line perpendicular to the desired track and passing through the waypoint is crossed.

Anchor Alarm

The selected value is used as the anchor alarm distance. If the vessel moves outside of the selected distance from its position (at the time that the alarm was enabled) the alarm sounds and an alarm message is displayed.

To silence the alarm, press any key. This removes the warning and resets the distance, ie. the alarm will not sound again unless the vessel moves the selected distance from its position (at the time that the alarm was silenced). The alarm is set to OFF on power up.

XTE Alarm

The selected value is used as the cross track error limit. The alarm sounds when the cross track error exceeds the selected limit when a GOTO or a Route Follow is in progress and an alarm message is displayed.

Chart Text

When ON, Chart text, eg. place names are shown on the screen. The selected setting is retained when the unit switched off.

Chart Boundaries

When ON, Chart boundary lines are shown on the screen. The selected setting is retained when the unit switched off.

Depth Contours <5M

When ON, depth contours less than 5 metres are shown. The selected setting is retained when the unit switched off.

Depth Contours 10M

When ON, depth contours of 10 metres are shown. The selected setting is retained when the unit switched off.

Depth Contours >20M

When ON, depth contours greater than 20 metres are shown. The selected setting is retained when the unit switched off.

Position Calibration

When ON, all position data is offset from WGS 84 by the amount of the selected calibration and is suffixed by (c). The selected setting is retained when the unit switched off. The default calibration offset is zero.

➤ To perform position calibration:

1. Using horizontal trackpad movements, select SET CAL.
   The menu is removed and a single function and help text are shown (*Figure 4-5*):

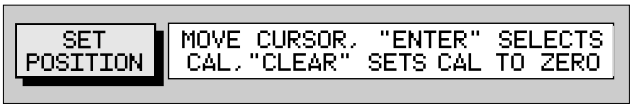

Figure 4-5: Set Position Function

2. Using the trackpad, set the value of offset required. The distance and bearing of cursor from vessel is displayed in the Status Bar as BRG and RNG.
3. Press **ENTER** to confirm the selected offset value or **CLEAR** to reset the value to zero and return to the Chart Set Up menu.

An offset of 2nm or less is applied to all position data equal to the range and bearing between the WGS 84 position and the position entered. The menu returns with ON highlighted.

Note: *Pressing* **ENTER** *with a selected offset of more than 2nm gives a warning message which is cleared on any key press. The Calibration Set Up mode maintains and the user can either reselect an acceptable offset or press* **CLEAR** *to reset the value to zero and return to the Set Up menu.*

4.4 GPS Setup

The GPS set up page provides information for the status of the tracked navigation satellites plus HDOP and satellite Fix Status. It also provides the ability to set up a Differential GPS (RC420D), by manually retuning it to a different differential beacon.

➤ To select GPS Set Up:

1. Press the **PAGE** key to display the SET UP functions:

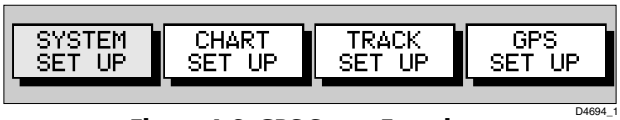

Figure 4-6: GPS Setup Functions

2. Use the trackpad to highlight the GPS SET UP function and press **ENTER** to display the GPS STATUS screen and soft key.

GPS STATUS is displayed (*Figure 4-7*).

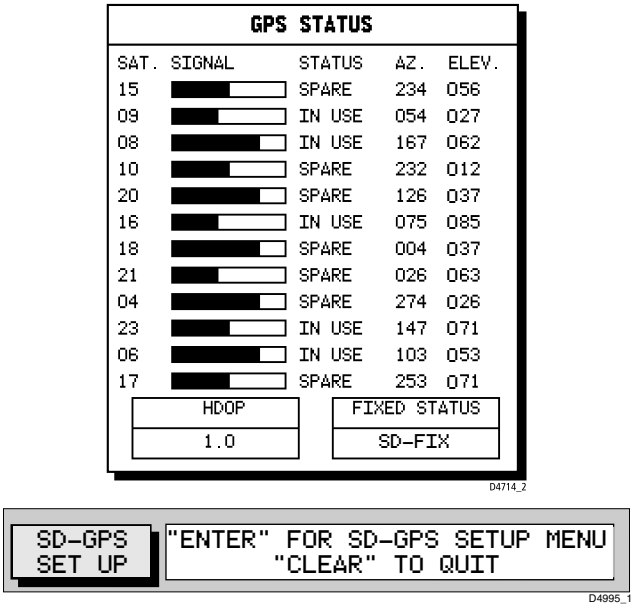

Figure 4-7: GPS Status Screen and Soft Key

The GPS STATUS screen provides, for each tracked satellite, the satellite number, a graphical signal strength bar, status, azimuth angle and its elevation angle from your vessel.

Positional accuracy is dependent upon these parameters; in particular, the azimuth and elevation angles are used in a triangulation process to calculate your position. HDOP (Horizontal Dilution Of Position) is a measure of this accuracy; a higher figure signifies greater error. In ideal circumstances, the figure should be in the region of 1.0. The Fix Status can indicate:

- SD-FIX, where a Satellite Differential fix has been acquired
- FIX, where a differential beacon fix has been acquired
- NO FIX, where no satellite fix can be acquired

➤ To access the SD GPS Setup menu:

1. Press **ENTER**; the SD GPS SET UP menu is displayed (*Figure 4-8*):

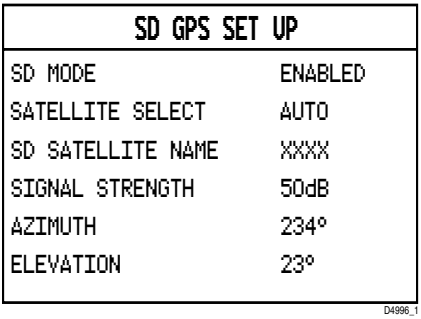

Figure 4-8: SD GPS SET UP Menu

2. Using vertical trackpad movements, select SD MODE.
3. Use horizontal trackpad movements to toggle between ENABLED and DISABLED.
   - Select ENABLED to allow the unit to use SD corrections if available.
   - Select DISABLED to force the unit to calculate a normal GPS fix with no satellite GPS corrections.
4. Use vertical trackpad movements to select SATELLITE SELECT and use horizontal trackpad movements to toggle between AUTO and MANUAL.
   - Select AUTO to instruct the unit to select the SD satellite automatically.
   - Select MANUAL to force the unit to use the SD satellite selected.

Note: *The* SIGNAL STRENGTH, AZIMUTH *and* ELEVATION *fields are determined by information from the SD satellite.*

5. Press **ENTER** to select the new SD Satellite settings and return to the GPS STATUS window, then press **CLEAR** again to return to the Setup functions.

Chapter 5: Installation

5.1 Introduction

This chapter provides instructions to assist in planning the installation of the Raychart 425 Chartplotter aboard your vessel.

Note: *If you wish to practice using the Raychart 425 before installation, you can connect it, via a 1A quick blow fuse, to a 12VDC power supply and operate it using the simulator mode, as described in Chapter 2:Getting Started.*

EMC Installation Guidelines

All Raytheon equipment and accessories are designed to the best industry standards for use in the leisure marine environment.

Their design and manufacture conforms to the appropriate Electromagnetic Compatibility (EMC) standards, but correct installation is required to ensure that performance is not compromised. Although every effort has been taken to ensure that they will perform under all conditions, it is important to understand what factors could affect the operation of the product.

The guidelines given here describe the conditions for optimum EMC performance, but it is recognized that it may not be possible to meet all of these conditions in all situations. To ensure the best possible conditions for EMC performance within the constraints imposed by any location, always ensure the maximum separation possible between different items of electrical equipment.

For **optimum** EMC performance, it is recommended that **wherever possible**:

- All Raytheon equipment and cables connected to it are:
  - At least 1 m (3 ft) from any equipment transmitting or cables carrying radio signals eg. VHF radios, cables and antennas. In the case of SSB radios, the distance should be increased to 2 m (7 ft).
  - More than 2 m (7 ft) from the path of a radar beam. A radar beam can normally be assumed to spread 20 degrees above and below the radiating element.
- The equipment is supplied from a separate battery from that used for engine start. Voltage drops below 10VDC in the power supply to our products, and starter motor transients, can cause the equipment to reset. This will not damage the equipment, but may cause the loss of some information and may change the operating mode.

- Raytheon specified cables are used at all times. Cutting and rejoining these cables can compromise EMC performance and so must be avoided unless doing so is detailed in the installation instructions.
- If a suppression ferrite is attached to a cable, this ferrite should not be removed. If the ferrite needs to be removed during installation it must be reassembled in the same position.

Suppression Ferrites

Figure 5-1 shows typical cable suppression ferrites fitted to Raytheon equipment. Always use the ferrites supplied by Raytheon.

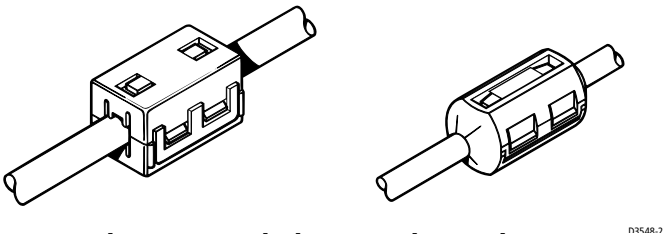

Figure 5-1: Typical Suppression Ferrites

Connections to Other Equipment

If your Raytheon equipment is to be connected to other equipment using a cable not supplied by Raytheon, a suppression ferrite MUST always be fitted to the cable close to the Raytheon unit.

5.2 Unpacking and Inspecting the Components

Unpack your Raychart 425 Chartplotter carefully. Retain the carton and packing materials in the event that you need to return the unit for service.

Referring to *Table 5-1* , check that you have all the correct system components.

Table 5-1:System Parts and Accessories

Item	Part #
RC425 System comprising:	E32032
RC425 Chartplotter	R38064
Raystar 120GPS Receiver	E32026
RC425 Accessories:	
Sun Cover	E35004

Table 5-1:System Parts and Accessories (Continued)

Item	Part #
Panel Mount Kit*	E35006
Trunnion Mount Kit	E35005
Power Cable	R38024
GPS Extension Cable*	E35003
Owner's Handbook	81172
Bridge Card	86055

* Optional Accessory.

Items Missing?

If any one (or more) of the above items is missing or damaged, please contact your Raytheon dealer or our Product Support Department to obtain replacement parts. **Please note that missing or damaged items cannot be replaced without proof of purchase.**

Registering this Product

When you have checked that you have all of the listed components, please take the time to complete the pre-paid warranty registration card. This ensures that you receive prompt and expert attention should you experience any difficulties with the product.

GPS Receiver Installation

The Raystar 120 GPS Receiver is designed to receive the signals emitted from the satellites in a direct path. Ideally, the unit should be mounted horizontally in a location that is open and clear of any masts, search lights, or other structures that could block line-of-sight reception of signals. The height of the GPS Receiver is not as important as it's having a clear view horizon to horizon for optimum signal reception. In fact, the lower the unit can be mounted and have a clear view to satellites, the better. The more stable the unit, the easier it is to track satellites lower to the horizon.

The Raystar 120 can be mounted on a pole. Alternatively, you can use the supplied surface mount kit.

When mounting the GPS Receiver flush to a deck surface, avoid areas where the unit will be trodden upon or where it may present a tripping hazard.

When planning the location for the unit, consider finding a convenient pathway for running the interconnecting cable between the GPS Receiver and the display unit or to the rest of an integrated system. Ideally the cable should be run such that it is hidden from view and, if possible, be in a direct path to the point of connection. It is important to keep the cable separated from other shipboard cables as far as possible to prevent interference pick-up.

Note: *Mounting on the mast of a sailboat is not recommended.*

Surface Mounting

Refer to *Figure 5-2*:

1. Select a suitable area which allows access to the underside of the mounting surface for fixing and, using the template supplied in this document, carefully drill the two 6mm (0.25in) fixing holes marked.
2. If the cable is to pass through the mounting surface drill the 6mm (0.25in) or 19mm (0.75in) centre hole depending on whether the plug is to pass through the surface or not.
   If the cable is to exit from the side of the GPS Receiver above the mounting surface, remove the two plastic tabs (1) obstructing the cable channel.

Note: *Failure to remove the plastic tabs from within the cable channel could result in cable damage.*

3. Screw the supplied brass studs (2) into the underside of the GPS Receiver.
4. Stick the supplied gasket (3) to the mounting surface ensuring that the holes match and pass the cable through the centre hole or the cable exit channel.
5. Carefully position the GPS Receiver, passing the studs through the holes in the mounting surface and secure to the mounting surface using the thumb nuts provided (4).

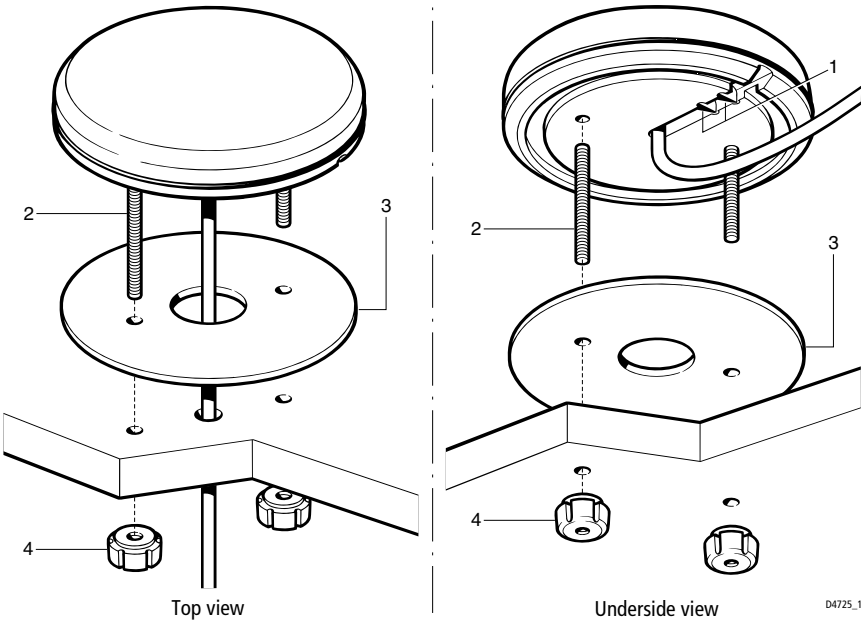

Figure 5-2: Surface Mounting Arrangement

Pole Mounting

Refer to *Figure 5-3*:

1. Screw the pole mount base to a suitable pole or rail mount bracket, having an industry standard 1in 14TPI thread, until secure.
2. Pass the cable through the centre hole of the pole mount base (A) or through the cable exit hole alongside the centre hole (B) or insert the cable into the side exit channel (C).
3. Check that the cable is positioned correctly and secure the GPS Receiver to the pole mount base using the two screws provided. If the cable is to exit from the side of the GPS Receiver through the side channel, remove the two plastic tabs (1) obstructing the cable channel.

Note: *Failure to remove the plastic tabs from within the cable channel could result in cable damage.*

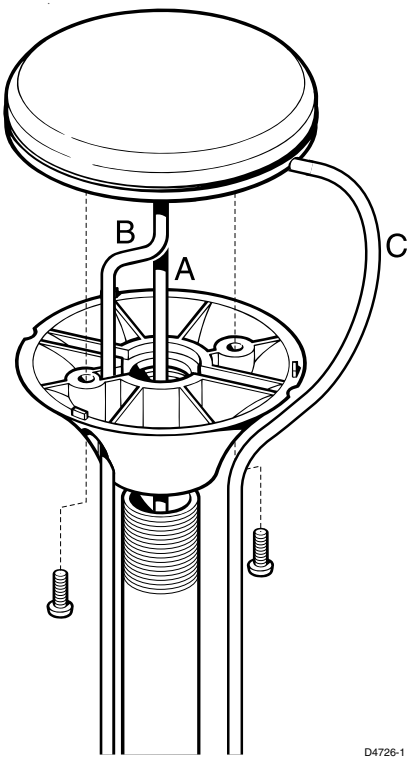

Figure 5-3: Pole Mounting Arrangement

5.3 Installing the Chartplotter

When planning the installation of your Raychart 425, the following points should be considered to ensure reliable and trouble free operation:

- **Convenience:** The unit should be installed in a convenient position where it can be viewed straight on or with a viewing angle of less than 35°. You may wish to apply power before you install the unit, to determine the best viewing angle prior to fixing. The mounting location should be easily accessible to allow operation of the front panel controls.
- **Access:** There must be sufficient space behind the display unit to allow cable connections to the rear panel connectors, avoiding tight bends in the cable. At least 4cm should be allowed at the right of the chartplotter to enable chart cards to be inserted and removed.

- **Interference:** The selected location should be far enough away from devices that may cause interference, such as motors and generators (see the EMC guidelines earlier in this section).
- **Power Source:** The unit should be located near a DC power source. The power cable supplied is 1.5m, but a longer cable can be used if required. Power must be supplied via a 1A quick blow fuse or circuit breaker. Refer to *Section 5.4, Cable Running*.
- **Interconnections:** The unit transmits navigation and waypoint data on NMEA and, therefore, can be connected to an NMEA[1] compatible autopilot or compatible instrument repeater(s). The navigation data transmitted by the chartplotter is detailed in *Appendix C* to this handbook.
- **Environment:** The unit should be protected from physical damage, heat sources and excessive vibration. Although the unit is waterproof, it is good practice to mount it in a protected area away from prolonged and direct exposure to rain and/or salt spray.

The dimensions of the unit, including the bracket, are shown in *Figure 5-4.*

1. *National Marine Electronics Association (NMEA) 0183 interconnection standard, Version 2.3 April 1998.*

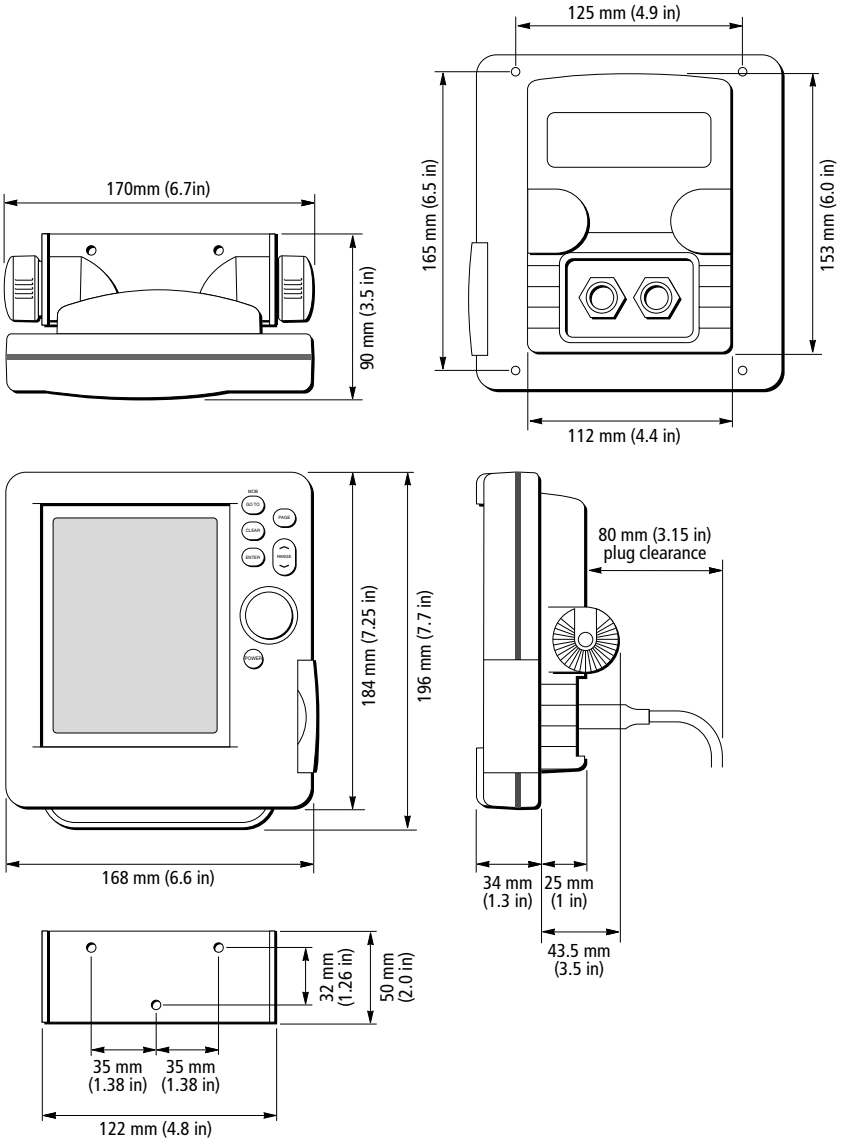

Figure 5-4: Raychart 425 Dimensions

Trunnion (yoke) Mounting

The display unit can be conveniently mounted on a dash area, chart table, bulkhead or deckhead. Trunnion mount the unit as follows:

1. Loosen the trunnion knobs and remove the trunnion from the display unit.
2. Mark the locations of the trunnion screw holes on the mounting surface.
3. Use the screws supplied to fix the trunnion at the marked locations.
4. Fit the unit to the trunnion, adjust the display angle and tighten the knobs.

Panel Mounting

CAUTION:

Make sure that there are no hidden electrical wires or other items behind the location before proceeding. Make sure that there is sufficient rear access for mounting and cabling. Allow at least 4cm at the right hand side of the display to enable chart cards to be inserted and removed.

The unit can be panel mounted, using the panel-mounting kit (accessory) available from your local Raytheon dealer.

➤ Panel mount the unit as follows:

1. Check the selected location for the unit. A clear, flat area at least 7in (175mm) wide by 7½in (190mm) high, with at least 3½in (90mm) of clearance behind the panel, is required.
2. Using the supplied template, trace out the display unit cut-out and mark the drilling centres for the four securing holes outside of the cut-out area.
3. To provide start holes for removing the cut-out, drill four $^{3}/_{8}$ in (10mm) holes in each opposing corner and four $^{1}/_{4}$ in (6mm) holes for the two trunnion lug clearance slots in the cut-out area.
4. Using a suitable saw, cut along the inside edge of the cut-out line.
5. With the trunnion (yoke) and knobs removed, make sure that the unit fits in the cut-out area.
6. Drill out the four $^{3}/_{16}$ in (5mm) securing holes as indicated on the template. It is recommended that a $^{1}/_{16}$ in (1mm) pilot hole is drilled first.
7. Screw the studs into the vacant holes at the rear of the unit, hand tight only.
8. Place the gasket on the unit and slide the unit into the panel cut-out.
9. Secure the unit with the thumb nuts, hand tight only (*Figure 5-5*).

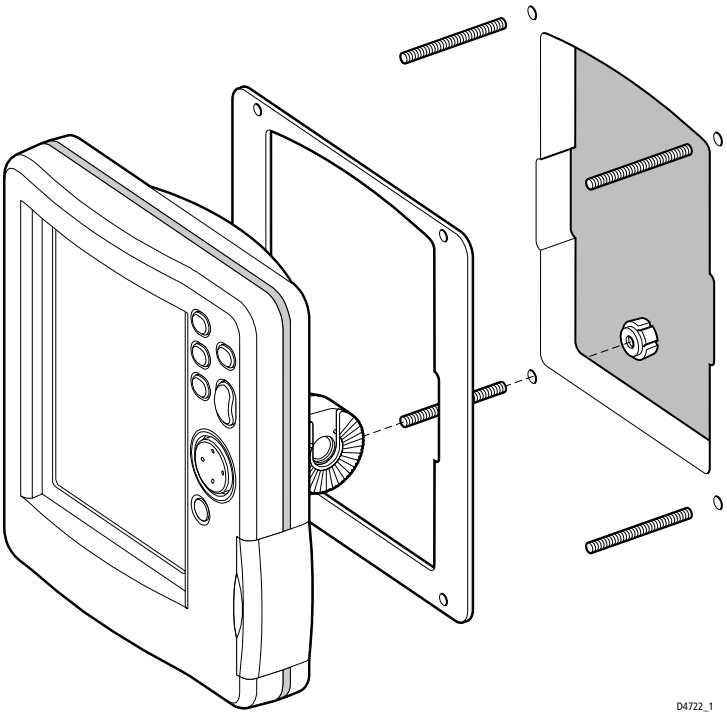

Figure 5-5: Raychart 425 Panel Mounting Arrangement

5.4 Cable Running

Introduction

The minimum requirements are a power cable and a connection from the Raystar 120 GPS Receiver. Additional cables will be required if connecting to other equipment.

Notes: *(1) All cables should be adequately cleated and protected from physical damage and exposure to heat. Avoid running cables through bilges, doorways or close to moving objects or heat sources.*

(2) Where a cable passes through an exposed bulkhead or deckhead, a watertight gland or swan neck tube should be used.

Connectors

GPS Connector

The **GPS** connector provides power and data connections to the Raystar 120 GPS Receiver using the attached 33ft (10m) cable terminated in a moulded 6-pin connector.

➤ Connect the GPS Receiver as follows:

1. Mount the GPS Receiver as detailed in *GPS Receiver Installation* on *page 3*.
2. Feed the **GPS** cable through to the rear of the chartplotter.
3. Coil up any unused cable in an appropriate safe space out of view. Do not bend the cable tighter than 4in (100mm) radius.
4. Connect the cable to the **GPS** connector on the rear of the chartplotter.

Note: *If the supplied cable is too short, use an extension cable (Part# E35003) available from your local Raytheon dealer.*

POWER/NMEA Connector

CAUTION:

If you do not have a breaker in your power circuit, you must fit an in-line 1A quick-blow fuse to the positive (red) lead of the power cable.
This unit is not intended for use on positive ground vessels.

The **POWER/NMEA** connector provides for 12VDC power connection and NMEA inputs/outputs using the supplied cable.

The chartplotter is intended for use on vessels' DC power systems operating in the range 10.0VDC to 18.0VDC (ie. 12V systems, not 24V or 32V systems).

Power connections should be made at a DC power distribution panel through an isolator switch and a 1A circuit breaker or 1A quick blow fuse. All connections must be clean and tight.

The DC power system should be either:

- Negative ground, with the negative battery terminal connected to the vessel's ground.
- Floating, with neither battery terminal connected to the vessel's ground.

A 1.5m (5ft) power cable is supplied. If a longer power cable run is required, use the supplied power cable to connect to the unit plus a

suitable connector block to connect to the extension cable. The supplied power cable cores have a cross-section of 2.0mm^2 (15 AWG).

Longer power cable runs may require larger wire gauges to minimize any voltage drop in the cable. In order to determine the correct supply cable size if the power cable must be extended, estimate the length of cable between the vessel's main power source and the connector block, then select the wire size determined by the distance as indicated in *Table 5-2* .

Table 5-2:Maximum Power Cable Extension Lengths

Power Cable Core mm^2:	1.5	2.0	2.5	4.0	6.0	10.0
Equivalent AWG:	16	15	14	12	10	8
Maximum Extension (feet):	36	49	65	98	147	230
Maximum Extension (meters):	11.0	15.0	20.0	30.0	45.0	70.0

The DC power and NMEA inputs/outputs should be connected to the **POWER/NMEA** cable at the rear of the chartplotter. The cable colors are detailed *Table 5-3* .

Table 5-3:Power/NMEA Cable Colors

Function	**Color**
Battery negative	Black
Battery positive (10.0VDC to 18.0VDC)	Red
NMEA input (+ve)	White
NMEA input (-ve) common	Green
Not connected	Gray
NMEA output (+ve)	Yellow
Data output (-ve) common	Brown
Not connected	Screen

➤ Connect to the power supply using the power cable supplied:

1. Connect the moulded connector to the **POWER/NMEA** connector on the rear of the chartplotter. Run the free end back to the vessel's distribution panel or, if insufficient cable length, to a junction box.
2. Cut the cable to length and connect the red wire, via a 1A quick blow fuse or circuit breaker, to the +ve battery terminal and the black wire to 0V (-ve battery terminal).

3. Use a suitable junction box to connect to NMEA equipment if required.
4. Cut any unused cores short or insulate and tape back.

Note: *If the power connections are accidentally reversed, the system will not function. Use a voltmeter to check that the input power leads are connected with the correct polarity.*

5.5 System Check and Initial Switch On

When installation is complete and all connections have been made, re-check the installation before using the system for navigation. If problems occur, refer to *Chapter 6:Maintenance & Fault Finding*.

EMC Conformance

Always check the installation before going to sea to make sure that it is not affected by radio transmissions, engine starting etc.

System Check

Before performing the functional test, check that:

- All connections are clean and tight.
- All cables are secured and protected.

Initial Switch On

To switch on the chartplotter, press and hold the **POWER** key until the unit beeps.

If necessary, adjust the lighting and contrast (see *Chapter 2*).

If required, change the default language settings as follows:

1. Press the **PAGE** key to display the setup function bar.
2. Using trackpad left/right, select the SYSTEM SET UP function and press **ENTER**.
   The SYSTEM SET UP menu is displayed, listing the parameters and their current settings (*Figure 5-6*):

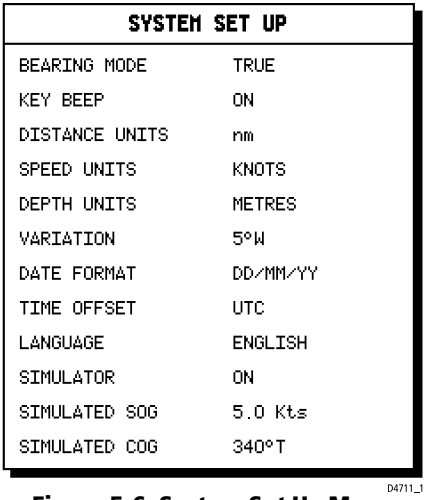

Figure 5-6: System Set Up Menu

3. Using trackpad up/down, select the LANGUAGE option.
4. Using trackpad left/right, select the required language.
5. Press **ENTER** to return to the setup functions. The chartplotter now uses the selected language.
6. Press **CLEAR** to return to the normal chart screen.

Checking Chartplotter Operation

To confirm that the chartplotter is operating correctly, perform the following checks:

1. Press the trackpad left/right, up/down and check cursor movement and normal scrolling action.
2. Insert a Navionics Nav-chart® card for the area of your vessel. Use the **RANGE** key to zoom-in and check that the new chart cartridge data is displayed.
3. Ensure that position data is available; use the FIND SHIP function to check that the cursor is fixed on the vessel symbol which is correctly positioned at the centre of the chart display, see *Chapter 3:Operation*.

Chapter 6: Maintenance & Fault Finding

This chapter provides information on routine maintenance and on possible causes of problems you may experience with your Raychart 425 Chartplotter and/or its associated Raystar 120 Receiver.

6.1 Maintenance

WARNING:

The chartplotter contains high voltage and specialized circuits only accessible to qualified service technicians - there are no user serviceable parts or adjustments and the operator should not attempt to service the equipment. The operator should not remove the rear cover.

Routine Checks

The Chartplotter is a sealed unit. Maintenance procedures are therefore limited to the following periodic checks:

- Wipe the display unit clean with a damp cloth.
- Examine the cables for signs of damage, such as chafing, cuts or nicks.
- Check that the cable connectors are firmly attached and that the connections to the vessel's dc power are clean and tight.
- Ensure that the cartridge cover is always fitted correctly.

Note: *Never use chemical or abrasive materials to clean the chartplotter. If the unit is dirty, wipe it with a clean, damp cloth.*

Servicing and Safety

Raytheon equipment should be serviced only by authorized Raytheon service technicians. They will ensure that service procedures and replacement parts used will not affect performance. There are no user serviceable parts in any Raytheon product.

Some products generate high voltages, so never handle the cables/ connectors when power is being supplied to the equipment.

When powered up, all electrical equipment produces electromagnetic fields. These can cause adjacent pieces of electrical equipment to interact with one another, with a consequent adverse effect on operation. In order to minimize these effects and enable you to get the best possible performance from your Raytheon equipment, guidelines are given in the

installation instructions, to enable you to ensure minimum interaction between different items of equipment, ie. ensure optimum Electromagnetic Compatibility (EMC).

Always report any EMC-related problem to your nearest Raytheon dealer. We use such information to improve our quality standards.

In some installations, it may not be possible to prevent the equipment from being affected by external influences. In general this will not damage the equipment but it can lead to spurious resetting action, or momentarily may result in faulty operation.

6.2 Resetting the System

Two types of reset are available for the Chartplotter:

- **Power-On Reset:** When you turn the display unit off, then on again, the screen reverts to the chart display with all windows cleared.
- **Factory Reset:** This resets all values back to their original factory settings.

Note: *Take care - factory reset clears all Waypoint and Route databases.*

➤ To perform a factory reset:

1. Power off the unit.
2. Press and hold **CLEAR** whilst powering up until <Erase backup procedure> is displayed.
3. Either press **CLEAR** to abort Factory Reset and resume normal Power-Up or press **ENTER** to continue Factory Reset.
4. Press **ENTER** again; the unit restarts as for a first time Power Up with all values reset to their original factory settings

Note: *The factory default settings are listed in Chapter 4.*

6.3 Problem Solving

Prior to packing and shipping, all Raytheon products are subjected to comprehensive test and quality assurance programmes. However, if this unit should develop a fault, please refer to the following table to identify the most likely cause and the corrective action required to restore normal operation.

If you still have a problem after referring to the table, contact your local dealer, national distributor or Raytheon Product Support for further advice.

Always quote the product serial number.

Fault Finding

As a guide to problem solving, common problems and their possible causes are detailed in *Table 6-1*.

Table 6-1:Fault Finding Guide

Problem	Correction
Unit does not function	1. Make sure that the power supply cable is sound and that all connections are tight and free from corrosion. 2. Check polarity of the dc power cables for proper connection. Reconnect leads if necessary. 3. Check in-line fuse. Replace if necessary. 4. Check vessel's power (battery) for correct voltage readings(10.0VDC to 18.0VDC).
Poor display definition	Adjust contrast setting and/or backlight level.
No position information	Check the GPS Receiver connection Check the GPS Receiver
No fix	Check that GPS Receiver not obstructed and able to get clear direct line of sight view of satellites in the sky.
No NMEA data received	Check the POWER/NMEA connector and the NMEA equipment. Note that NMEA OUT from one product connects to NMEA IN on another product and vice versa.
Loss of stored data, eg. waypoints	Return to dealer for internal battery check. Note that the Waypoint database is cleared when a Factory Reset is performed.
No detailed chart data	Check that Nav-Chart card is pushed fully home Check that the Nav-Chart card has appropriate cartography.
Other problems	Visit website www.raymarine.com

6.4 Worldwide Support

In the first instance, contact the authorized distributor in your own country. A list of worldwide distributors and contact information is supplied with your system.

Alternatively, visit the Raytheon World Wide Web site:
www.raymarine.com

Appendix A: Raychart 425 Specification

CE	Conforms to 89/336/EEC(EMC), EN60945:1997	
Y2K	Compliant	
Size	184mm (7.3in) x 168mm (6.7in) x 75mm (3in), excluding trunnion	
Weight	0.75 kg (1.65 lb)	
Environmental	Waterproofing	To CFR46; suitable for external mounting
	Temp Range - Operating:	-10°C to 70°C
	Temp Range -Storage:	-20°C to 70°C
	Humidity	20% to 95% RH
Mounting	Trunnion (yoke) or panel	
Power Input	10.0VDC to 18.0VDC 12Vdc nominal	
	Consumption - Typical	<9.6W @12VDC including GPS*
Controls	6 defined keys and trackpad	
Display type	Film Super Twist Nematic (FSTN) LCD	320 x 240 pixels (¼VGA) monochrome portrait with 4 grey scales, 4 levels of backlighting, 16 levels of contrast
Display size	145mm (6in) diagonal 117mm (4.25in) x 88mm (3.5in) viewable area	
Interfaces	Power/NMEA	NMEA 0183 receive and transmit Waypoint upload/download (WPL and RTE)
	GPS	Raystar 120 GPS Receiver
Cartography	Navionics Nav-Chart cartridge	
Software update	Via Cartography cartridge interface	

Memory	Capacity:	Waypoints: 500 max (20 routes of up to 50 way-points) Track history: 2000 points
	Protection:	Built in dealer replaceable Lithium battery giving 3 to 5 years usage

Appendix B: Raystar 120 Specification

Feature	Details
Receiver type:	12 Parallel channels
Frequency:	1575.42 MHz ±1 MHz (C/A code), L1
Sensitivity:	-130dBm
Signal acquisition:	Automatic
Time to first fix:	2.5 minutes maximum, typically <40 seconds
Position accuracy:	15m RMS. (L1, C/A code, HDOP <2 without SA) <2.5meters with WAAS/EGNOS/MSAS
Speed accuracy:	0.5m/s RMS. (L1, C/A code HDOP <2.5 without SA)
Geodetic Datum:	WGS-84 (Customer Selectable Position Correction)
Cable length:	10m (33ft)
Memory Backup:	Lithium battery (10 year life)

CAUTION:

Care should be taken when disposing of this equipment, as a lithium battery is fitted internally.
Local regulations for the disposal of hazardous materials may apply and must be adhered to.

Appendix C: NMEA Data

Connector	Received	Transmitted
POWER/NMEA	GGA, GSV, GSA, GLL, VTG, MSS, WPL, RTE, RMC	GGA, GSV, GSA, GLL,VTG, WPL, RTE, XTE, APB, BWR, RMB
GPS	GGA, GSV, GSA, GLL,VTG, PRAYA	

Appendix D: List of Abbreviations

BDI	Bearing Deviation Indicator
BTW	Bearing To Waypoint
CDI	Course Deviation Indicator
COG	Course Over Ground. The actual direction of your vessel's movement over the ground.
dGPS	Differential Global Positioning System
DTG	Distance To Go
EMC	Electro-Magnetic Compatibility
ETA	Estimated Time of Arrival
GPS	Global Positioning System
HDOP	Horizontal Dilution Of Precision. The multiplicative factor that modifies ranging error. It is caused solely by the geometry between your vessel and your set of satellites.
MOB	Man OverBoard
NMEA	National Marine Electronics Association (interconnection standard)
SOG	Speed Over Ground. The rate of movement of the vessel over the ground.
TTG	Time To Go
WPT	Waypoint
XTE	Cross Track Error

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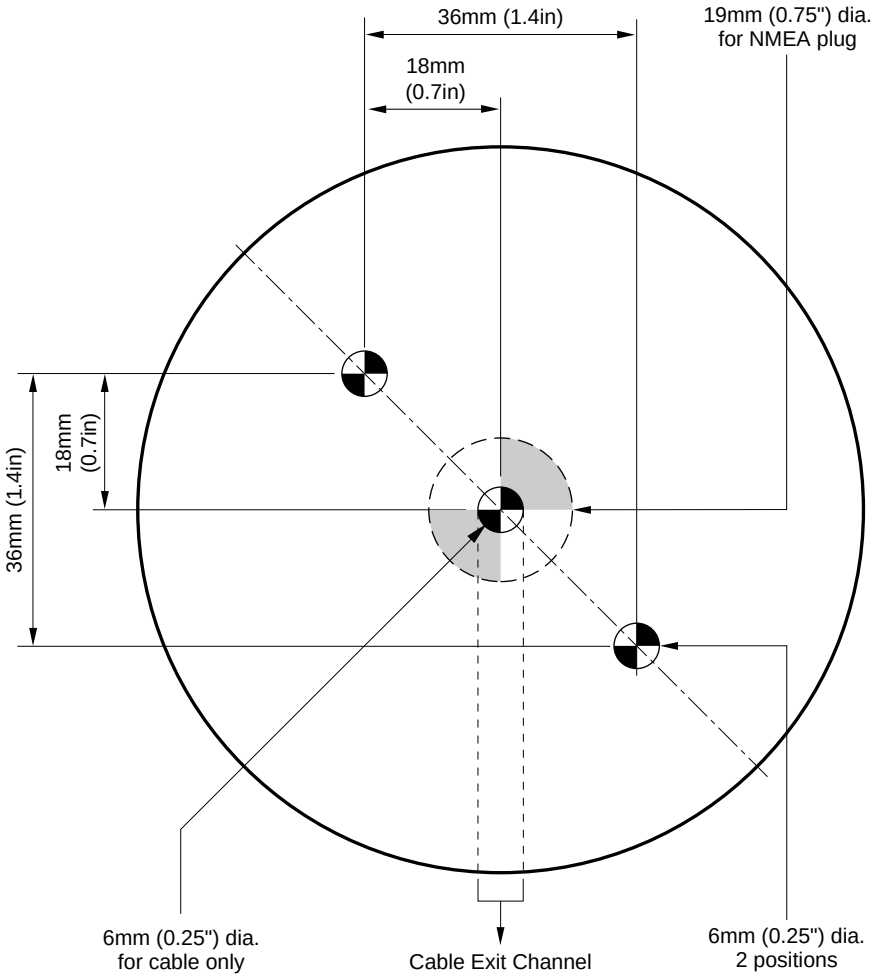
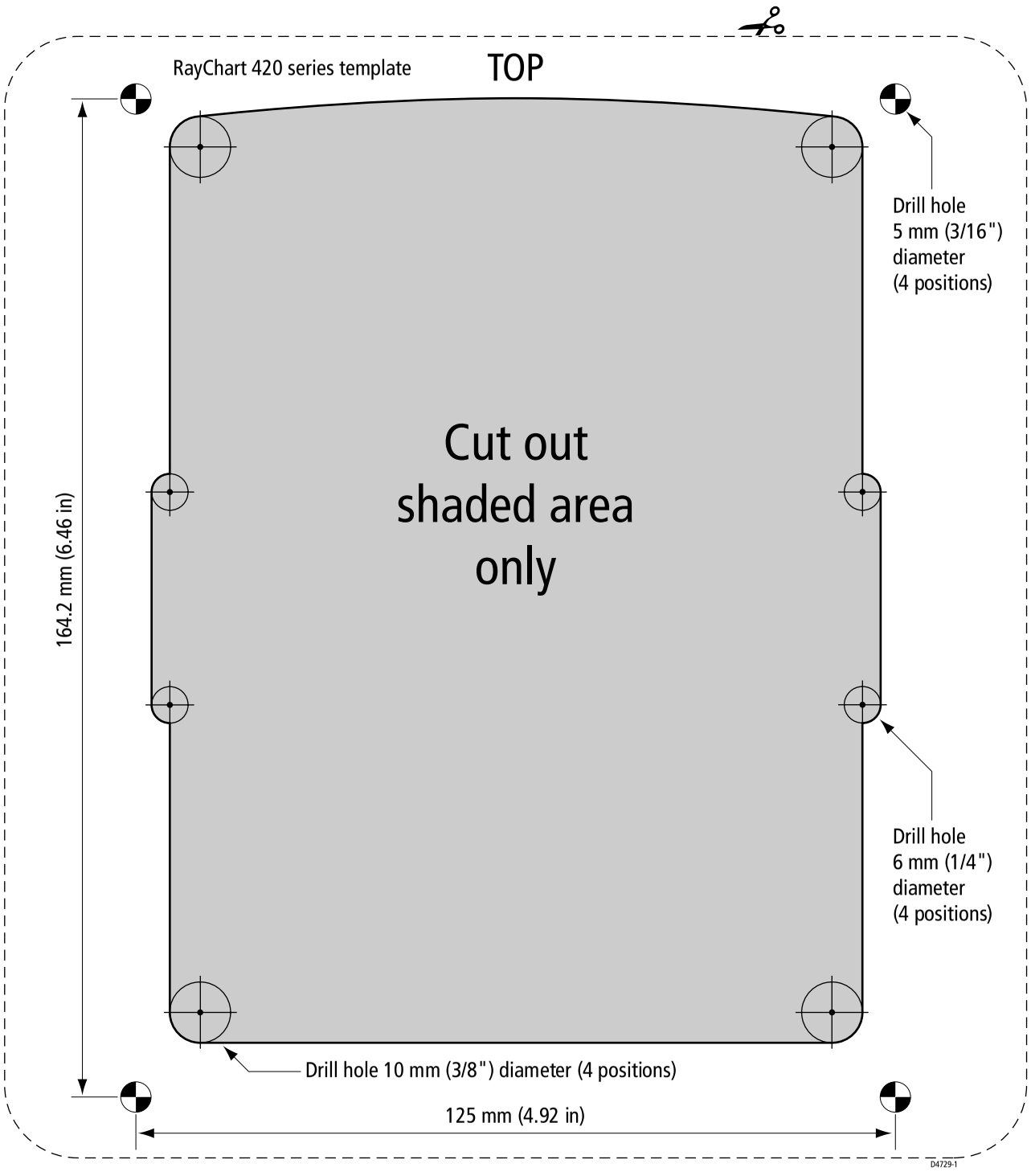


GPS Receiver Mounting Template

Note: *Access to the underside of the mounting surface must be available to allow for secure fixing.*



Raychart 425 Mounting Template