

C-Series Display

Reference Manual

Document number: 81221_2
Date: January 2004

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Important Information

Purpose

This handbook contains important information on the operation and maintenance of your C-Series Display. To get the best results in operation and performance, please take the time to read this handbook thoroughly.

For full details of installation and system integration, please refer to the C-Series System Integration and Installation Guide supplied with the display.

Safety notices

**WARNING:Navigation Aid**

This device is intended to be used as an aid to navigation. Its accuracy can be affected by many factors, including equipment failure or defects, environmental conditions and incorrect handling or use. It is the users responsibility to exercise common prudence and navigational judgement. This device should not be relied upon as a substitute for such prudence and judgement.

**WARNING:Product installation**

This equipment must be installed in accordance with the instructions in The C-Series System Integration and Installation Guide. Failure to do so could result in poor product performance, personal injury and/or damage to the vessel.

**WARNING:Electrical safety**

Make sure the power supply is switched off before making any electrical connections.

**WARNING:Electromagnetic energy**

The radar scanner transmits electromagnetic energy. Ensure that the scanner has been installed according to the recommendations given in the relevant scanner handbook.

**WARNING:Fishfinder sounder module**

Removing the transducer cable from the rear of the fishfinder sounder module whilst it is switched on can cause sparks. Only remove the transducer cable after power has been switched off. Ensure that the sounder module is mounted where it is well ventilated and in an area free from flammable vapors.

CAUTION: Water Ingress

To prevent the ingress of water and consequent damage to the display, ensure that the chart card door is firmly closed. This can be confirmed by an audible click.

CAUTION: CompactFlash Cards

Removing the CompactFlash card whilst information is being written to or read from it may cause damage to the card and loss of all data. A warning on the display indicates when the card is being accessed.

CAUTION: Card Damage

DO NOT use a metallic instrument such as a screwdriver or pliers to help you remove a card, as doing this can cause irreparable damage.

CAUTION: Global Positioning System Antenna

Do not connect or disconnect the GPS antenna from the display unit whilst power is switched on. Doing this may result in irreparable damage.

EMC conformance

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

Electronic Chart Cards

To use your C-Series Display as a navigation aid, charts with the appropriate level of detail for the geographic area you wish to navigate are required. The charts are available in an electronic format on Navionics® Gold Chart cards.

To obtain Navionics Chart cards, contact your local dealer or visit **www.navionics.com** or **www.navionics.it**.

Alternatively, anywhere in North America call Navionics toll-free on **1-800-848-5896**. Outside of North America, contact your local dealer or Navionics SpA

Telephone: (+39) 0584 961696

Fax: (+39) 0584 961309

Chapter 1: Using the Display

This chapter gives an overview of the system and its features.

1.1 The C-Series wallet

Your C-Series unit is supplied with a wallet containing the following documentation:

- **Installation Manual Reference Manual** - for installation and system integration details.
- **Reference Manual** - for full operating instructions of the C-Series Display unit.
- **Operating Guide** - gives a brief, easy-to-use overview of the system and how to use it.
- **Template** - Flush mount template.

1.2 System Overview

The C-Series display is a unit which combines chartplotter, radar, fishfinder and course monitoring applications. These applications give the following functions:

- **Chartplotter** - for navigation information, waypoint entry and route-planning.
- **Radar** - to detect the position and speed of objects around your vessel and collision avoidance.
- **Fishfinder** - to build a picture of what is below your vessel, to help find and identify targets e.g fish, wrecks etc.
- **Course Deviation Indicator (CDI)** - to help maintain your course using a 'rolling road' display.

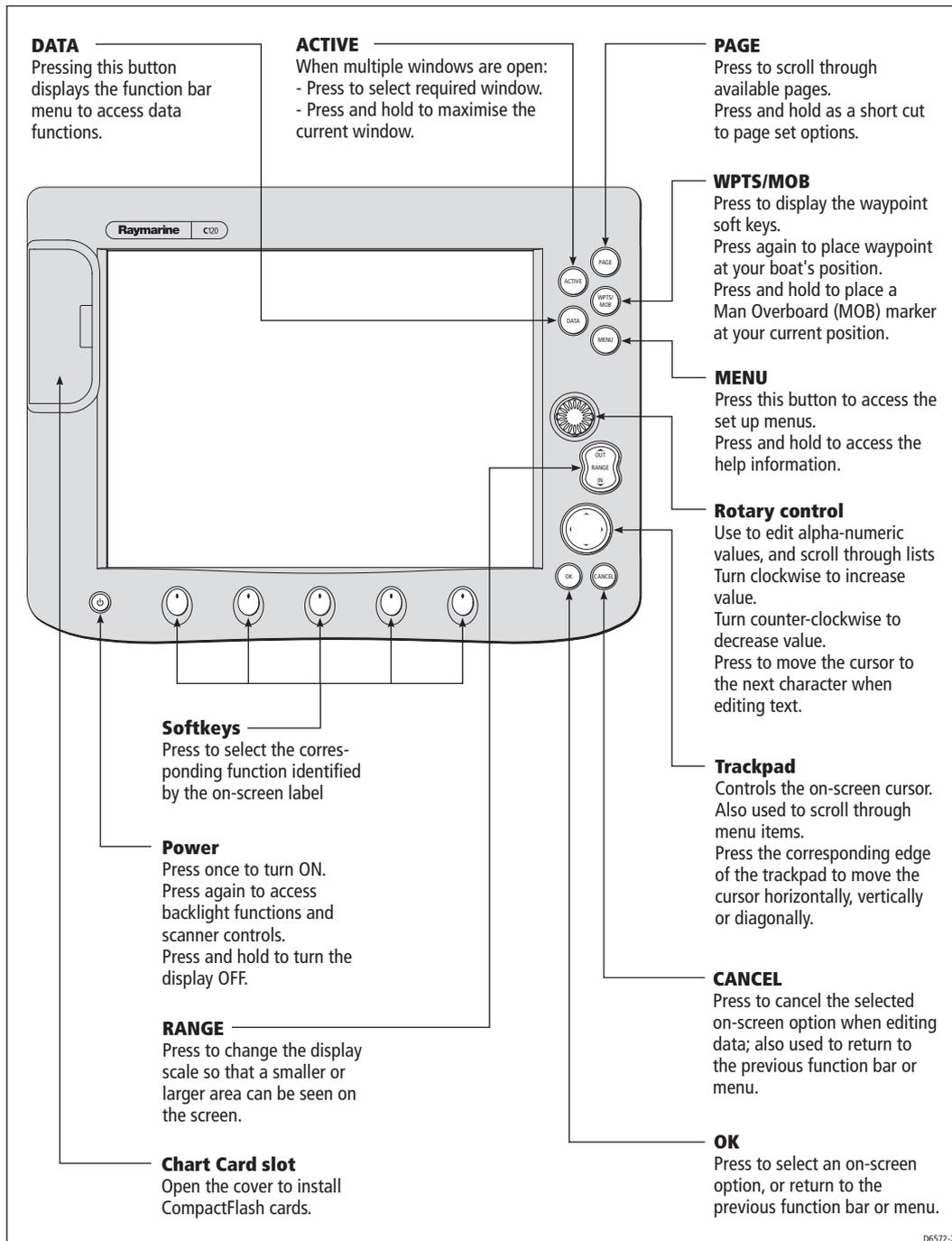
For full functionality the display requires connection to a Global Positioning System (GPS) and a compass for the acquisition of position and heading data. The individual applications also require:

- **Chartplotter** - relevant chart card to obtain detailed information for the area in which you are navigating.
- **Radar** - a C-Series compatible scanner.
- **Fishfinder** - a suitable transducer and Raymarine digital sounder module (DSM).

When used as part of a SeaTalk system it will display information from other SeaTalk instruments. It can also be integrated to an autopilot and display Digital Selective Calling (DSC) messages from a DSC VHF radio if fitted. Information from the C-Series display can also be transferred between applications and to other SeaTalk instruments within the system.

A built-in simulator lets you practise using the display and its functions without it being connected to other devices (GPS, compass, scanner and transducer).

1.3 The Controls



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Displaying information

Information is displayed in the following ways:

- System data - this is displayed using the Data Bar. This can be displayed horizontally or vertically on the screen and can be configured to your preferences.
- Control data - this is displayed using dialog boxes which enable data to be entered or edited, or by Message boxes which display information in a view only form, such as an incoming DSC call, and cannot be edited.
- Data base lists - these are lists of items that have been created and stored, such as waypoints. Items in the list can be edited.
- Menu lists - these display a range of options and let you change them.
- Application Status - data is displayed in the status bar that is permanently displayed at the top of each application window.
- Soft keys - these primarily allow you to navigate to particular functions, but some are used to show a value or status.

1.4 The Simulator

The C-Series Display includes a simulator mode, which allows you to practice operating your display without data from a GPS antenna, radar scanner or transducer. The simulator mode is switched on/off in the System Setup Menu (see *How do I set up my display?* on page 2-5). Once enabled, you can use the simulator:

- **Before installation** - Simply connect the display to a 12V dC power supply, fused at 1 amp by attaching the red core from the power lead to positive (+) and the black core to negative (-).
- **After installation** - Whilst in a marina or at anchor.

1.5 The Applications

This section introduces the way in which the various applications are presented on the display, and their main functions. Detailed operating instructions are given in the relevant chapters of this handbook.

The following applications are available:

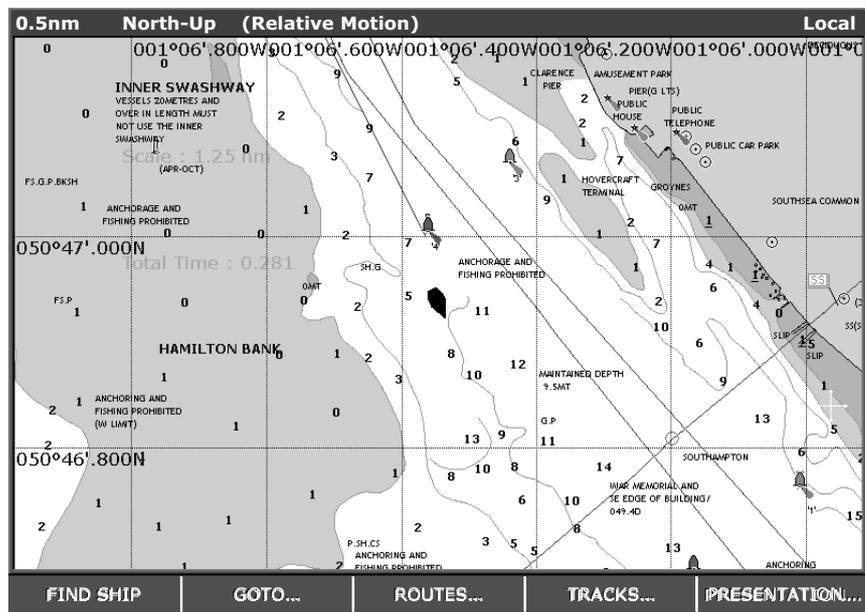
- Chartplotter
- Radar
- Fishfinder
- Course Deviation Indicator

Note: *Whilst not an application in its own right, waypoints are handled at system level in the Chartplotter, Radar and Fishfinder applications and are covered in this manual in a separate chapter entitled Working with Waypoints.*

Chartplotter

The chartplotter includes a small-scale world map enabling route plotting and tracking even when an electronic chart card is not installed. Detailed navigation information is displayed when a Navionics® electronic chart card is installed. For more information and to obtain chart cards see the *Important Information* chapter at the front of this manual.

A feature of the chartplotter is 'autorange'. If you select a chart scale that does not have cartographic detail in some areas, the chartplotter will use the most detailed level available for the surrounding area and stretch it to fit the selected scale. This means that you will never have blank or hatched areas on your screen. However there may be some mis-alignment of objects which cross the chart boundary in this area.

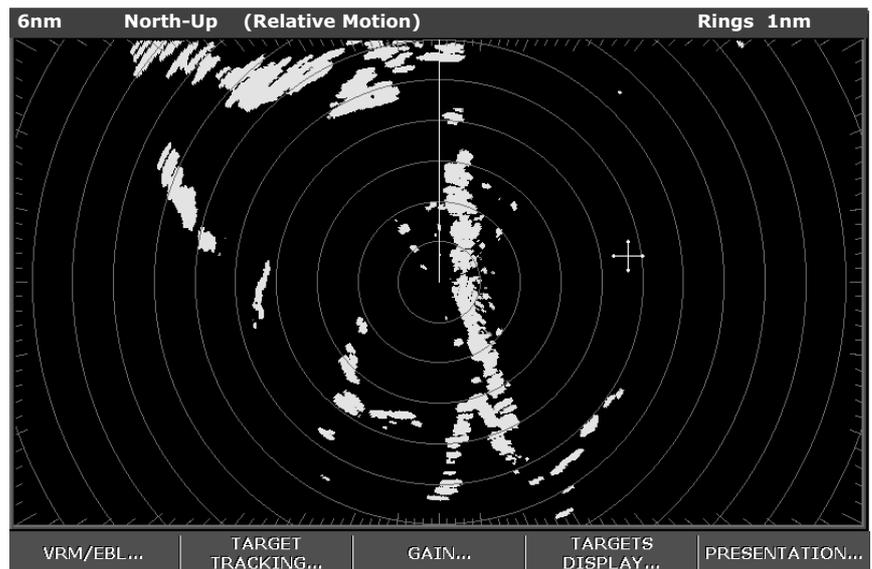


Using the chartplotter you can carry out such functions as:

- Track the course of your vessel on the chart as you travel to a destination.
- View detailed information including ports and tides (if available).
- Place, display and edit waypoints.
- Navigate to a position using cursor position, waypoints and routes, manually or using an autopilot (if fitted).
- Set up a route that can be followed.
- Overlay radar data (if available) on the chart.

Radar

The radar application gives you information on what is around your vessel at any particular moment in time. This includes positions of landmasses, other vessels and navigation markers such as buoys. A typical radar plot is shown below:

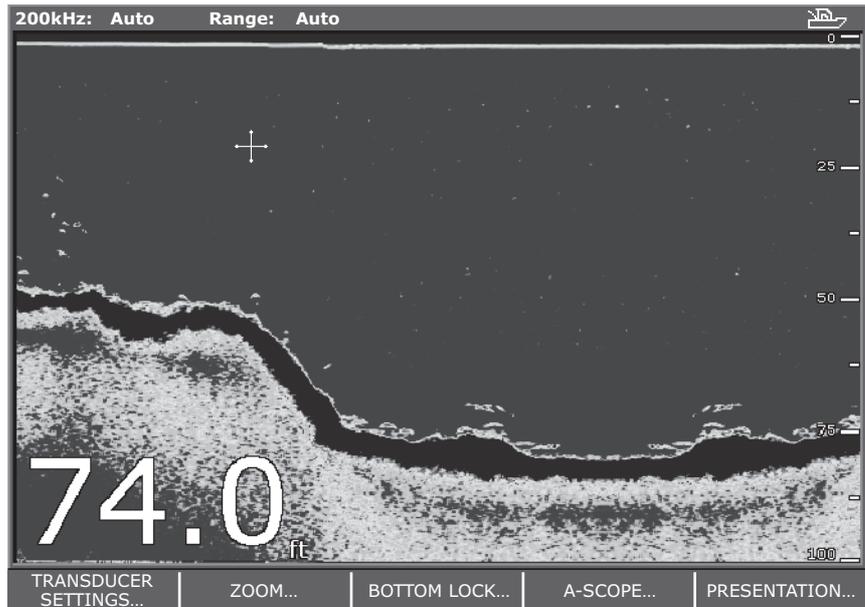


Using the radar you can carry out such functions as:

- Adjust the picture for maximum clarity, range and minimum interference.
- Detect the position, speed and direction of travel of other vessels.
- Display, place and edit waypoints.
- Use the Mini Automatic Radar Plotting Aid (MARPA) function to acquire targets and track them for collision avoidance.
- Measure the range and distance of other vessels using Variable Range Markers (VRMs) and Electronic Bearing Lines (EBLs).

Fishfinder

The Fishfinder application gives you a detailed view of what is below your vessel. This includes, the seabed and its texture, fish and other underwater objects. A typical Fishfinder image is shown below:



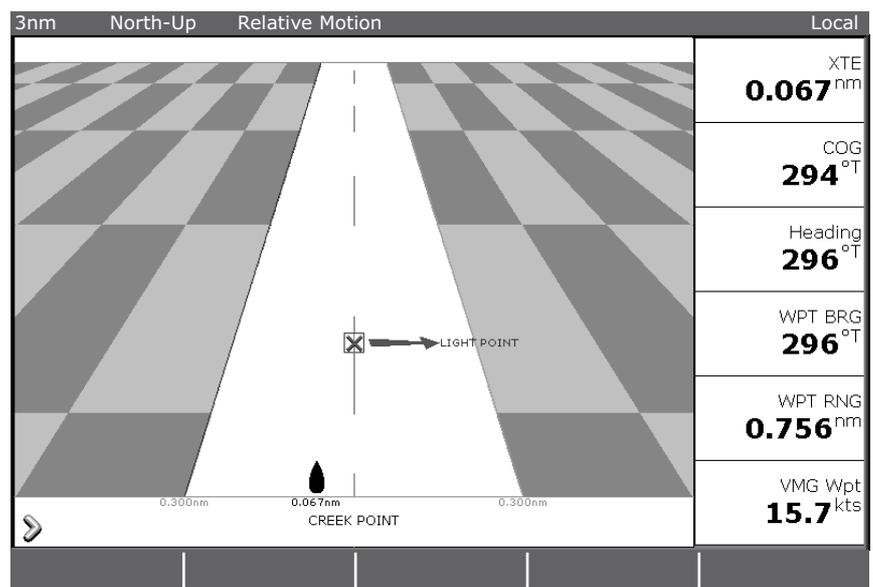
Using the Fishfinder application you can:

- Locate and distinguish different types of underwater objects.
- Obtain information about water depth and temperature and sea bed texture.
- Place waypoints to indicate places, such as a favorite fishing spot or an underwater object of interest.

Course Deviation indicator

The course deviation indicator (CDI) assists you to accurately maintain your course to your destination. A 'rolling road' in three dimensional perspective provides a real-time display of your vessel's course and any deviation as Cross Track Error (XTE)

It will give such information as any corrections required to your course and data about the target waypoint, its bearing, distance and the time to go (TTG).



Using the CDI you can:

- View information to help you steer your vessel accurately along a course.
- Monitor your course.

1.6 Getting started

This section describes how to set-up your C-Series display the first time you use it. After this initial set-up, the display will memorize your chosen settings, and these will be shown each time you power on the display. You can, of course change these settings as many times as you wish.

How do I power the display ON/OFF?



Power ON

1. Press the **POWER** button until the introductory logo is displayed. The keys light up and after a few seconds an application page and a navigation warning is displayed.
2. Read the warning and then press **OK** to remove it.

Note: *At this time the radar scanner (if fitted and powered) is checked for compatibility with the display. An error message is displayed if the scanner is incompatible.*

Controlling the radar power

To control the power to the radar:

1. Press the **POWER** button again. The radar power soft keys are displayed:

RADAR TX STDBY	SCANNER ON OFF	PALETTE DAY NIGHT
-------------------	-------------------	----------------------

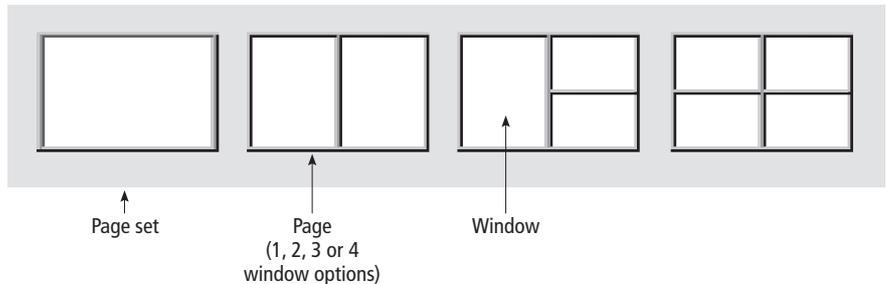
2. You can now select the required setting:
 - **Transmit (TX)** - Toggle the SCANNER setting to ON and then select TX, to enable the usual mode of operation for the radar.
 - **Standby (STDBY)**- Toggle the SCANNER setting to ON and then select STDBY, when you are not operating the radar for short time periods. The scanner does not transmit and the antenna does not rotate, so the radar uses less power. However, the scanner remains powered so when you return to transmit mode, the magnetron does not need to warm up.
 - **Scanner Off** - Toggle the SCANNER setting to OFF, when you do not require the radar, but you are using the display unit for other tasks, say, using the chart. Scanner off mode removes power from the scanner.

Power OFF

Press and hold the **POWER** button. The Power Down screen is displayed and the system counts down. When it reaches zero the display and key backlights are extinguished. If the **POWER** button is released within the countdown period, power off is cancelled.

How do I select how the applications are displayed?

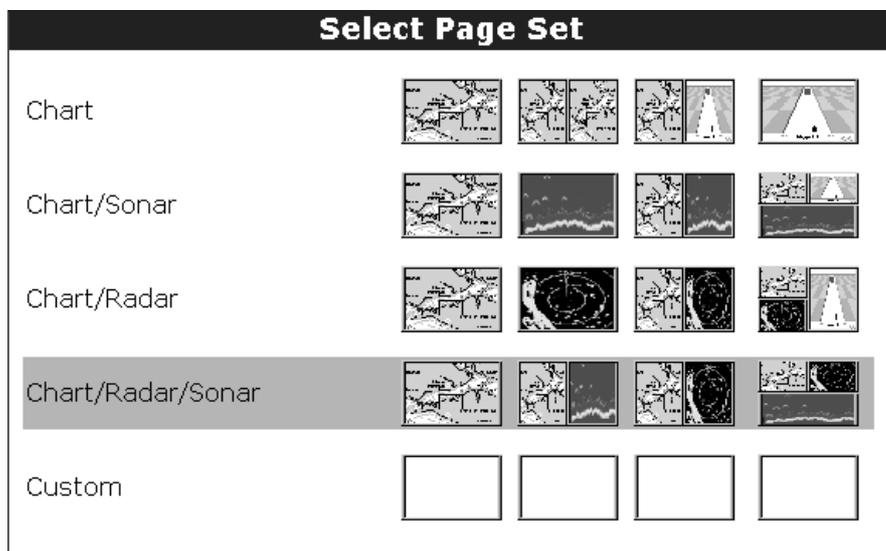
The applications are shown on the display screen using a combination of *page sets*, *pages* and *windows*.



There are four pre-configured page sets each containing four pages with a combination of windows and applications in each. If these sets are not appropriate, you can use the custom option to define the combination that suits your particular needs. These settings are saved so that each time you open an application it is presented in the same way.

How do I select a page set?

1. Press and hold the **PAGE** button. The Select Page Set window is displayed:



2. Either:

- Use the trackpad (up/down) to select the appropriate pre-configured group. Press **OK** to confirm your selection.

Or:

- Press EDIT CUSTOM GROUP, to configure the page set to your individual requirements. See *page 10* for more details.

How do I select a page?

Once you have selected the appropriate page set (see previous section), you can choose a page in one of two ways:

- Press **PAGE**. This will display the four available pages in the soft key bar. Press the corresponding soft key to the page you require.
- Press **PAGE** repeatedly, to toggle through the four available pages.



How do I select a window?

When the selected page has more than one window, the window that is currently active will be bordered in red. Pressing the **ACTIVE** button changes this active highlight to the other windows on that page.

To make the active window full-screen when multiple windows are being displayed, press and hold down the **ACTIVE** button. To return to multiple windows, press and hold down the **ACTIVE** button again.

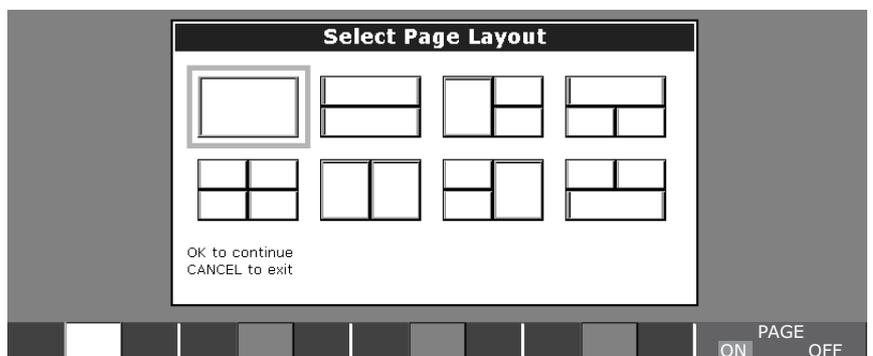
How can I select my own page layout?

If the pre-configured page sets are not to your requirements, you can customise the combination of layout and applications to suit your own particular needs:

1. Press and hold the **PAGE** button. The Select Page Set window is displayed.
2. Press EDIT CUSTOM SET. The customizable pages are shown.



3. Select the page you wish to configure by pressing the appropriate soft key. The Select Page Layout window is displayed:



4. Select the layout you require for the chosen page using the trackpad or rotary control. To exclude this page from the available selection, set the PAGE setting to OFF
5. Press **OK**. The Select Application window is displayed. If a page with multiple windows has been selected, the first window is bordered in red.
6. Select the application of your choice for that window using the trackpad or rotary control. The application is displayed on screen and on the appropriate soft key.
7. If more windows need to be configured, press **ACTIVE** to move to the next window.
8. Repeat steps 6 and 7 until all the windows in that page contain the appropriate application.
9. Press FINISH PAGE EDIT to save the new layout. The Edit Custom Page Set window is redisplayed.
10. Repeat steps 3 to 9 until you have configured each page of the custom set.
11. Press **OK** or **CANCEL**.

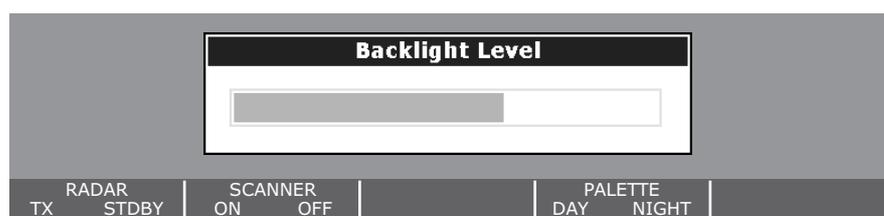
The page, window and application layout that you have defined will now be opened each time you select the custom page set. You can change your preferences at any time.

How do I adjust the display lighting?

The display has two distinct lighting modes, for day and night operation. You can also manually adjust the backlight level.

To adjust lighting, press the **POWER** button.

The following soft keys and pop-up window are displayed:



1. Press the PALETTE soft key to switch between DAY and NIGHT modes.
2. Use the rotary control to adjust the backlight level.
3. Press **OK** to return to normal operation.

Chapter 2: General Operation and System Setup

2.1 Introduction

This chapter gives details of the general operation of the C-Series display, and covers the following subjects:

- Using the controls.
- Setting up the display.
- Presenting information.
- Alarms.
- Timers.
- Installing and removing CompactFlash cards.
- Saving and retrieving information.
- Sharing information using the NMEA protocol.

2.2 What are the controls?

The controls for the display can be separated into two types:

- Buttons
- Soft keys

Buttons

Buttons allow you to access various system functions or change what you see on the screen:



POWER

Press once to power ON the display.

To access the backlight function and radar scanner controls at any time, press again.

Press and hold to turn the display OFF.



OK

Press to select an on-screen option and return to the previous function bar or menu.



CANCEL

Press this button to cancel the selected on-screen option when editing data and return to the previous function bar or menu.

**PAGE**

Press to scroll through available pages.
Press and hold as a short-cut to page-set options.

**DATA**

Press to display the soft key menus for accessing databar and data functions.

**ACTIVE**

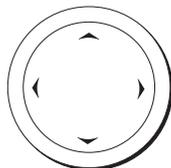
Press to select the window that you wish to work on from those that are open on a page.
When multiple windows are displayed, press and hold to change the active window to full screen. Pressing and holding once more returns you to the multiple window display.

**MENU**

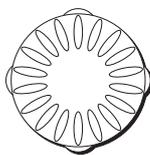
Press to access the set-up menus.
Press and hold to display help information.

**WPTS/MOB**

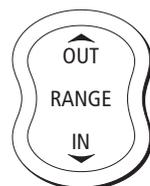
Press to display the Waypoints soft keys.
Press again to place a waypoint at the vessel position
Press and hold to place a Man Overboard (MOB) marker at your current position.

**Trackpad**

The trackpad controls the on-screen cursor and is used to scroll through menu items.
Press the corresponding edge to move the cursor horizontally, vertically or diagonally.

**Rotary control**

Use this to edit alpha-numeric values or scroll up/down lists.
Turn clockwise to increase the value.
Turn counter-clockwise to decrease the value.
Press to move the cursor to the next character when editing text.

**RANGE**

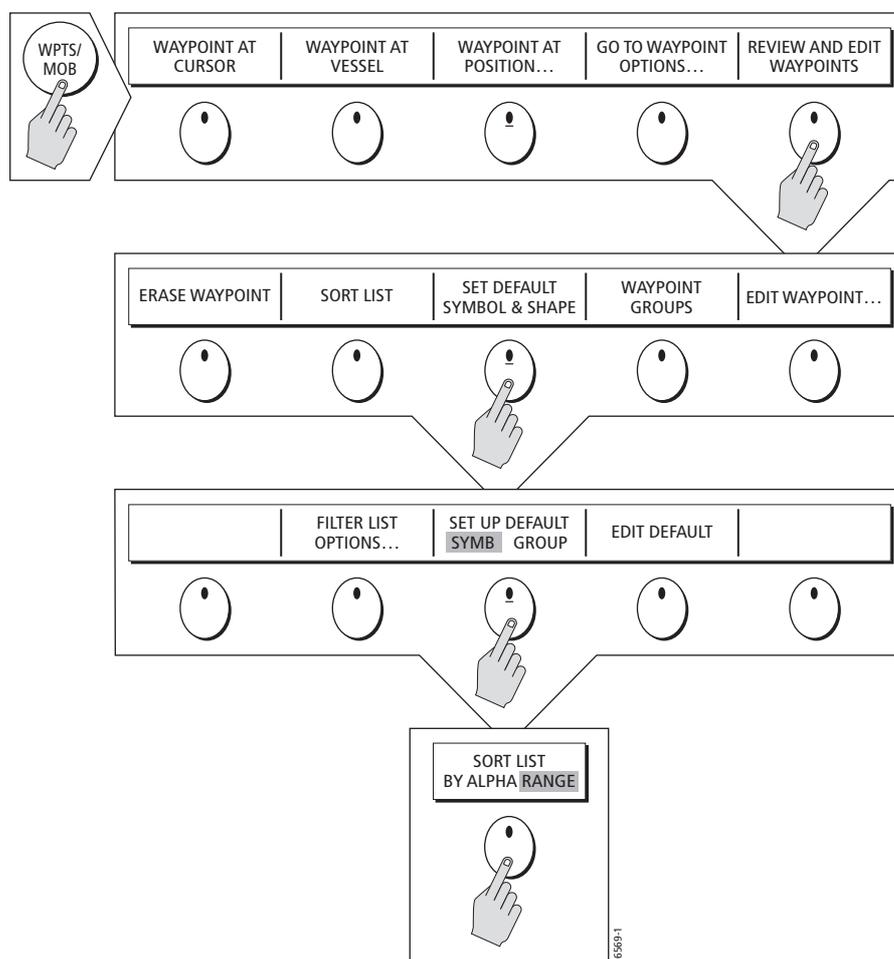
Press to change the area that is displayed on the screen.

Soft keys

There are five soft keys in the bar below the display screen. When a system function button is pressed, the primary soft keys for that function are shown.

Pressing a soft key will carry out one of the following functions:

- Take an action.
- Select one of several options. shown on the soft key label.
- Display on-screen information, dialog boxes or menus with new soft keys.
- Display further soft key options.



Soft keys sometimes interact with other on-screen controls such as:

- Dialog boxes - to edit names etc.
- Object lists - to select options.

Cursor

The cursor appears on the screen as a white cross. If it has not been moved for a short period of time, it will change to a circle with a cross in it, to make it easier to identify on the screen.

The cursor is context-sensitive. When you place it over an object such as a waypoint or chart feature, it changes color and a label or information associated with the object is displayed. The following table details the labels displayed alongside the cursor:

Label	Feature	Application
BOX	Data box (any type)	Chart and radar
MOB	Man Over Board marker	Chart and radar
WPT	Waypoint	Chart and radar
A/B	Ruler line	Chart
COG	Course Over Ground vector	Chart
HDG	Heading vector	Chart
POS	Vessel's position	Chart
RTE	Route leg	Chart
TIDE	Tide indicator	Chart
WIND	Wind indicator	Chart
CTR	Center of radar	Radar
FLT	Floating EBL/VRM	Radar
GRD	Guard zone	Radar
MARPA	MARPA target	Radar
SHM	Ship's Heading Marker	Radar
VRM/EBL	VRM and EBL, 1 or 2	Radar
ZMB	Zoom box	Radar

In addition soft keys are displayed to control certain items. For example, when you place the cursor over a waypoint, the waypoint soft keys are displayed.

2.3 How do I set up my display?

You can set up the display so that the applications being used are presented in the way that suits how you work. This section shows you how to access and change these settings.

To access and edit the Setup menu:

1. Press **MENU**. The Setup menu is displayed.
2. Use the trackpad or the rotary control to highlight the menu items you wish to access.
3. Press the trackpad (right) to select this item. The menu changes to show you the available options or shows a sub-menu.
4. Press the trackpad (right) to enter the options menu.
5. Press trackpad (down) to highlight the required option.
6. Either:
 - Use the trackpad or the rotary control to change the value of a numerical field and press **OK** to save.Or:
 - Press **OK** to select the highlighted option.
7. Repeat steps 2 to 6 until you have completed setting up the display with your preferences.

Setup Menu

The Setup Menu contains the following sub-menus:

- Application specific Setup Menus i.e. Chart and Cartographic Setup, Radar Setup, Fishfinder Setup. For further details please refer to the appropriate chapter.
- System Setup.
- Alarm Setup.
- GPS Status.
- Compass Setup.
- Display Setup.
- Databar Setup.
- Select Page Set.
- System Diagnostics.
- Remove CF Card

When you first power on your display the default values are used. The tables that follow show the sub-menus, default settings and options available:

System Setup

MENU ITEM	OPTIONS (Default in bold)
Position Mode Controls whether the position is expressed in latitude and longitude co-ordinates or Loran TDs.	Lat/Long TD's
TD Setup If the <i>Position Mode</i> is set to TD's, this function controls the selected chain identifier, slave and ASF.	Various
Simulator ON - allows operation of display without data from antenna and/or external data sources. Demo - a series of slides with descriptions to demonstrate the various system functions.	OFF ON Demo
Bearing Mode Mode of all bearing and heading data displayed. This does not affect how the chart or radar are drawn.	True Magnetic
MOB Data Type Selects whether position data or dead reckoning displayed on screen. Assuming your boat and the MOB are subject to same tide and wind effects, dead reckoning normally gives a more accurate course.	Dead Reckoning Position
Variation Source This allows you to compensate for the naturally occurring offset of the earth's magnetic field. When set to AUTO, the system will calculate this difference automatically. To enter your own variation value, set to MANUAL.	Auto Manual
Manual variation If Variation Source is set to MANUAL then use this setting to enter the variation value. This value transmitted to any other SeaTalk instruments.	0°E Range 0 - 30° east/west
Language Selected language used for screen text, labels, menus, options and display format for lat/long position information.	English (UK), English (US), Français, Deutsch, Español, Português, Italiano, Neder- lands, Dansk, Svenska, Norsk, Suomi, Íslenska
Extended Character Set Controls whether foreign characters are made available when you are entering text.	OFF ON
Settings Reset Sets all system setup options to their default values	

MENU ITEM	OPTIONS (Default in bold)
Settings and Data Reset Resets system setup options including fishfinder. The DSM is not reset..	
Date /Time Setup	See sub-menu below
Units Setup	See sub-menu below
System Integration	See sub-menu below

Date/Time Setup Menu

MENU ITEM	OPTIONS (Default in bold)
Date Format Displays date as day/month/year or month/day/year	mm/dd/yy dd/mm/yy
Time Format Displays either 12 or 24 hour clock	12hr 24hr
Local Time Offset Specify local time in hours (plus or minus 13) from the Universal Time Constant.	+/- 13hrs from UTC

Units Setup Menu

MENU ITEM	OPTIONS (Default in bold)
Distance Unit Choose the units that you require distances displayed in.	NM Miles km
Speed Units Choose the units that you require speed to be measured in.	Knots MPH KPH
Depth Units Choose the units that you require depths to be measured in.	Meters Feet Fathoms
Temperature Units Choose the units that your require temperature to be measured in.	Fahrenheit Celsius

System Integration Setup Menu

MENU ITEM	OPTIONS (Default in bold)
DSC Message When set to ON, details of distress DSC messages are displayed on screen	ON OFF
SeaTalk Alarms When set to enabled, all SeaTalk system alarms are received and displayed on the chartplotter.	Enabled Disabled
Bridge NMEA Heading Used to prevent NMEA heading data being bridged onto the SeaTalk bus. Switch this function off if you are using MARPA with an external fast heading sensor.	ON OFF
NMEA Output Setup Allows you to switch off individual NMEA out sentences	APB, BWC, BWR, DBT, DPT, GGA, GLL, MTW, RMA, RMB, RMC, RSD, RTE, TTM, VHW, VLW, VTG, WPL, ZDA

Alarm Setup Menu

The Alarm Setup Menu is divided into these sub-menus:

- System Alarms Setup.
- Navigation Alarms Setup.
- Radar Alarms Setup.
- Fishfinder Alarms Setup.

*Note: To silence any alarms, press **ACKNOWLEDGE**.*

System Alarms Setup

System alarms will sound in all applications.

MENU ITEM	OPTIONS (Default in bold)
Anchor Alarm Switches the anchor alarm on or off.	OFF ON
Anchor Alarm Radius If the <i>Anchor Alarm</i> is set to ON, an alarm is triggered when you drift from your anchor position by more than the specified distance.	0.01 - 9.99 nm 1nm (or equivalent in the selected <i>Distance Unit</i>)
Timer Switches the countdown timer alarm on or off	OFF ON

MENU ITEM	OPTIONS (Default in bold)
Timer Period If the <i>Timer</i> is set to ON, the system counts down from the time you specify. An alarm is triggered when zero is reached.	1 min - 99hrs 59mins
Alarm Clock Switches the alarm clock on or off.	OFF ON
Alarm Clock Time If the <i>Alarm Clock</i> is set to ON, an alarm is triggered when the time you specify is reached.	00.01 - 24:00hrs
Temperature Alarm If this alarm is set to ON, an alarm is triggered if the temperature moves into or out of the range that you have specified in <i>Lower Temperature Limit</i> / <i>Upper Temperature Limit</i> .	OFF ON
Lower Temperature Limit Specifies the lower limit of the temperature range that is to trigger the <i>Temperature Alarm</i> .	70°F 0°-99.8°F
Upper Temperature Limit Specifies the upper limit of the temperature range that is to trigger the <i>Temperature Alarm</i> .	75°F 0.2°-99.9°F

Navigation Alarms Setup

Navigation alarms will sound in any application when you are navigating.

MENU ITEM	OPTIONS (Default in bold)
Arrival Alarm Radius The distance from the target waypoint or the closest point of approach to the target waypoint that triggers the arrival alarm to sound.	0.1nm 0.01 - 9.99nm
Offtrack Alarm Switches the off-track alarm on or off	OFF ON
Offtrack Alarm XTE If the <i>Offtrack Alarm</i> is set to ON, an alarm is triggered when the XTE for any current navigation, exceeds the value that you have specified.	0.3nm 0.01 - 9.99nm (or equivalent in the selected <i>Distance Unit</i>)

Radar Alarms Setup

These alarms will only sound when you are in the radar application.

MENU ITEM	OPTIONS (Default in bold)
Guard Zone Sensitivity Ensure that this is not set too low or targets will be missed.	50% 0 - 100%

Fishfinder Alarms Setup

These alarms will only sound when you are in the fishfinder application

MENU ITEM	OPTION (Default in bold)
Fish Alarm Switches the fish alarm on or off.	OFF ON
Fish Alarm Sensitivity If the <i>Fish Alarm</i> is set to ON, an alarm is triggered when the fish return strength reaches the sensitivity that you specify.	0 10% - 100%
Fish Alarm Depth Limits If the <i>Fish Alarm</i> and this alarm is set to ON, an alarm is triggered (2 beeps) if any target meets the sensitivity level and is within the <i>Shallow Fish Limit</i> and <i>Deep Fish Limit</i> that you specify.	OFF ON
Shallow Fish Limit Specifies the lower value for the <i>Fish Alarm Depth Limit</i> .	> 1 fathom > 1m > 2ft
Deep Fish Limit Specifies the upper value for the <i>Fish Alarm Depth Limit</i>	> 1 fathom > 1m > 2ft
Shallow Depth Alarm Switches the shallow depth alarm on or off. If a DSM is not connected, this cannot be set.	OFF ON
Shallow Depth Alarm Value If the <i>Shallow Depth Alarm</i> is set to ON, an alarm is triggered if the depth drops below the value you specify.	> 1 fathom > 1m 2ft Up to maximum range of transducer

MENU ITEM	OPTION (Default in bold)
Deep Depth Alarm Switches the deep depth alarm on or off. If a DSM is not connected, this cannot be set.	OFF ON
Deep Depth Alarm Value If the <i>Deep Depth Alarm</i> is set to ON, an alarm is triggered if the depth exceeds the value that you specify.	> 1 fathom > 1 m > 2ft 3000 ft (DSM with 600W transducer attached) 5000 ft (DSM with 1kW transducer attached)

GPS Status

This allows you to set up your GPS. For more information, see *page 23*.

Compass Setup

To linearize ('swing') your compass proceed as follows:

1. Select the Compass Setup sub-menu.
2. Press LINEARIZE COMPASS and follow the instructions displayed on screen. When instructed to align heading, press the ALIGN HEADING soft key and then turn the rotary control **one click at a time** to fine tune the heading.

Display Setup

MENU OPTION	OPTIONS (Default in bold)
Soft key Autohide Controls whether the soft key bar is automatically hidden if not used for a period of 10 seconds. Pressing any key re-displays the soft key bar.	OFF ON
Cursor Autohide Controls whether the cursor is automatically hidden if not used for 10 seconds. Pressing any key re-displays the cursor.	OFF ON
Key beep Controls whether a noise is made when you press a key.	OFF ON
Text size Controls the size of the text on the screen	Small Large

Databar Setup

This sub-menu accesses the Configure Data Bar Menu - refer to *How do I change the data bar?* on *page 2-14* for full details.

Alternately this setup can be accessed by pressing the **DATA** button and then pressing and holding DATABAR ON OFF.

Select Page Set

This sub-menu accesses the Select Page Sets Menu - see *Chapter 1:Using the Display*.

System Diagnostics

This sub-menu is for diagnostic use by authorized dealers. You should not make any adjustments to these settings.

Remove CF Card

This sub-menu allows you to safely remove the Compact Flash card that is currently in use.

WARNING:Improper use of this setting may cause loss of data or damage to the card. Ensure you have read the instructions on *page 19* thoroughly before attempting to remove or insert a Compact Flash card.

2.4 How is system information shown on the screen?

Information associated with an application, your vessel or the environment can be shown on the screen in the following ways:

- Status Bar.
- Data Bar.

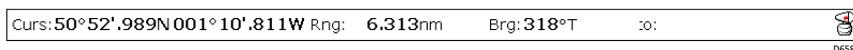
Status bar

The Status bar, shown below, is specific to the application in which it appears. It is always displayed full width across the top of a window and give information about that particular application, such as heading, range and scale. A status bar cannot be edited.



Data bar

The data bar, can be displayed where you prefer it, either horizontally along the top, or vertically at the right-hand side of a page. It can be turned on or off as required by pressing the DATA ON/OFF soft key, which is accessed by pressing the **DATA** button.



The default data bar displays the following information:

- Speed over Ground (SOG).
- Course over Ground (COG).
- Vessel position.
- Cursor bearing and range.
- Radar Transmit status.
- Transducer status.
- Status icons (see overleaf).

You can display information from other instruments if they are connected to the system using SeaTalk or NMEA 0183.

You can also change what data is displayed and the size of the data bar. The amount of data which you can display is affected by the size of the data bar that you choose.

What do the status icons tell me?

The status icons on the data bar confirm whether the appropriate connections to your C-Series has been made:

Status icon	Description
	The boat and fish icon indicates the current status of your fish-finder: Icon animated - connection to a DSM has been successful. Icon static - the DSM is connected but not transmitting. Icon greyed-out - no DSM is connected.
	The satellite icon indicates the current status of your GPS: FIX - your unit is successfully connected to a GPS receiver. NO FIX - your unit has been unable to connect to a suitable GPS receiver.
	The scanner icon indicates the current status of scanner: Icon rotates - the scanner is transmitting (TRANSMIT/TX mode). Icon static - the scanner is powered on but is not currently transmitting (STANDBY mode). Icon greyed out - this indicates that the scanner is currently powered off (OFF mode). Icon rotates and is then static -

How do I change the data bar?

You can change the position of the data bar, and the information it contains by using the **MENU** button. Data is added to the bar from the top (side data bar) or left (top data bar). As you add more data existing data moves down. If you remove data, any data below it moves up.

1. Press the **MENU** button.
2. Select the Databar Setup menu.
3. Select the required on-screen position (Top or Side) of the data bar using the Position option.
4. Select the required size (Large or Normal) using the Top Databar Size option.
5. To change the content of the data bar, select the Configure option. You may now ADD DATA, REMOVE DATA and MOVE DATA, as follows:

To add data

1. Press ADD DATA. The Data Groups menu is displayed, this provides a list of sub menus for different categories of data.
2. Select the required Data Group sub-menu, then select the data item to add to the data bar.

3. Press **OK** to select the highlighted data. The Menu will disappear from the screen and the Data soft keys will re-appear. The selected data is added to the top of the bar.

To move data

1. Use the trackpad to highlight the data you want to move.
2. Press MOVE DATA. The soft key is highlighted.
3. Use the trackpad to move the data to the required position.
4. Press **OK** (or another soft key) to accept the new position.

To remove data

1. Use the trackpad to highlight the item you want to remove.
2. Press REMOVE DATA.

*Note: You can also access the Configure Data Bar menu by pressing the **DATA** button and then holding down the DATA BAR ON soft key.*

2.5 How is control information shown on the screen?

Information connected with controls is shown on your screen in the following ways:

- Soft Keys.
- Dialog boxes.
- Pop-Up messages.
- Database lists.

Soft Keys

These are the primary means of control of the display, see *Soft keys on page 3* for a detailed explanation.

Dialog boxes

Dialog boxes allow the editing of objects stored on the display, such as a waypoint. Objects can be selected on-screen or from the appropriate list. Dialog box information can be edited using the soft keys, the rotary control or the track pad.

Edit Waypoint	
Symbol: 	Position: 50°50'.838N 001°06'.331W
Name: <input type="text" value="Waypoint 1"/>	BRG: <input type="text" value="223°"/>
Group: <input type="text" value="My Waypoints"/>	RNG: <input type="text" value="3.978nm"/>
Comment: <input type="text"/>	

How do I edit dialog box information?

You can edit dialog box information using the trackpad, rotary control and the soft keys:

1. Select the field you want to edit using the trackpad.
2. Press EDIT. The first entry of the selected field will be highlighted.
3. Use either the rotary control or trackpad (up/down) together with the various soft keys, to change the character or selection in the list.
Character text can be entered in upper or lower case. (although the system is not case sensitive e.g. WAYPOINT 1, Waypoint 1 are considered to be the same name).
If you need to use special or accented characters (e.g. ~ ` `), the Extended Character Set should be changed to ON.
4. Use the trackpad (left/right), or rotary end push to move to the next character to be edited.
5. Repeat Steps 3 and 4 until you have edited the selected field.
6. Press **OK** when the field is edited. **CANCEL** will revert back to the previous value.
7. Use the trackpad to move to the next field that you want to edit.
8. Repeat Steps 2 to 7 until you have finished editing everything you want to in the dialog box.
9. Press **OK** to accept all the new values, and clear the dialog box from the screen.

Pop-up messages

Pop-up messages, can be of two types:

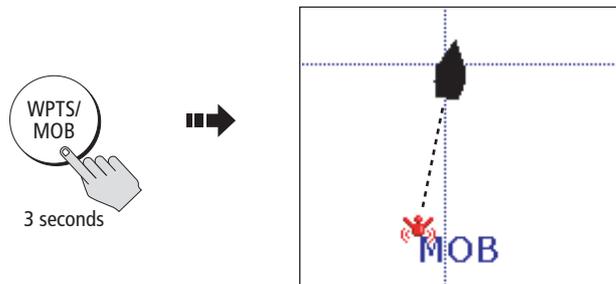
- Information - these messages appear for a set period of time and alert you to something which is happening, such as a function not being available. These messages cannot be edited, and some may be a prompt that require a response.
- Alarm messages. See *How do I get warning of a hazard?* on page 18 for more information.

Database list

Database lists contain information that have been added to the display memory, such as lists provided for waypoints, routes and tracks. You can scroll through a database list using the trackpad to highlight a particular entry. Information for that entry is shown in the right hand section of the database list. Entries within a database list can be selected for editing (e.g. erase or edit the name of a waypoint).

2.6 How do I mark a Man Overboard position?

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



The MOB function can be used whilst any application is in use and is activated by either pressing the **WPTS/MOB** key for three seconds, or by a MOB message being received from other equipment on the SeaTalk system.

When a MOB message is activated the following is initiated automatically:

- The MOB alarm is triggered (Morse --- every 30 seconds)
- A MOB waypoint is placed at your current position.
- The bearing, range and vessel position are displayed in the data bar. These are calculated according to the MOB data type set in the System Alarms SetUp (see *page 8*). Assuming that your boat and the MOB are subject to the same tide and wind effects, dead reckoning normally gives a more accurate course.
- If radar is transmitting, the system changes the radar range to $\frac{1}{4}$ nm.
- Navigation to any active waypoint is suspended and any existing navigation function is cancelled. No further GOTO or route functions will be selectable.
- Other Raymarine equipment acknowledges the MOB.
- As your vessel moves away from the MOB position, a dotted line is displayed from your current position to the MOB position.

Note: To obtain a MOB position, you need either position data from a GPS (or equivalent device) or heading and speed data.

You can clear a MOB and its data by either pressing and holding the **WPTS/MOB** key or via any instrument on SeaTalk. Once cleared, your chart and radar applications will return to the motion mode that applied prior to the MOB alarm and the GOTO and route functions will once more be available.

2.7 How do I get warning of a hazard?

You get warning of a hazard via in-built alarms which are generated for the system as a whole and for each application. If an alarm is generated, it sounds an audible warning and displays a message box on screen. This message box explains the cause of the alarm.

You can specify what alarms will operate and the levels at which they sound using the System Setup Menu, see *How do I set up my display?* on page 5.

How do I cancel an alarm?

Display alarms

By pressing the ACKNOWLEDGE soft key, the alarm is silenced and any message box is cleared. If the alarm has been generated by the chartplotter, the appropriate action is taken. For example, following an arrival alarm, the next route leg is activated.

If an anchor alarm is silenced, but the alarm condition persists, the alarm is repeated every 30 seconds

External alarms

If an instrument that is connected to the display generates alarms, these will sound on your C-Series display accompanied by a pop-up message box. You can cancel these alarms by pressing the ACKNOWLEDGE soft key. The alarm will be silenced, but no other action will be taken by the C-Series display.

2.8 How do I use the timers?

Alarm clock

The alarm clock is accessed via the Alarms Set-Up menu/System Alarms Setup sub-menu of the. It is used as you would use your alarm clock at home.

Countdown timer

The countdown timer can be use as a race start countdown, or as a countdown to an event. It displays in hours, minutes and seconds.

2.9 How do I insert or remove a CompactFlash card?



CAUTION: CompactFlash Card Installation

When installing CompactFlash cards ensure that the card is being fitted the correct way around. **DO NOT** try and force the card into position as this may result in irreparable damage to the card.

CAUTION: Water Ingress

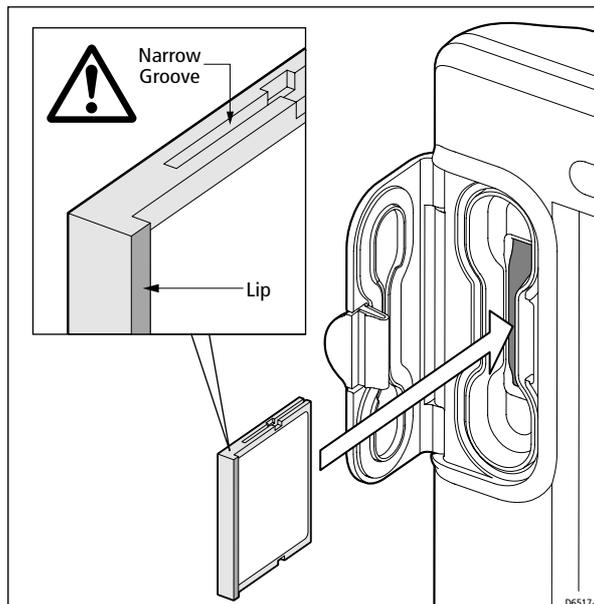
To prevent the ingress of water and consequent damage to the display, ensure that the chart card door is firmly closed at all times during operation. This can be confirmed by an audible click.

CAUTION: Card Removal

DO NOT use a metallic instrument such as a screwdriver or pliers to help you remove a card, as doing this can cause irreparable damage.

CAUTION: Card writing

CompactFlash cards can be damaged if they are removed from the unit during either a read or write operation. A warning is displayed during write operations. The unit is continually reading the card. It is therefore essential that before removing the card you follow the correct procedure for stopping read generation.

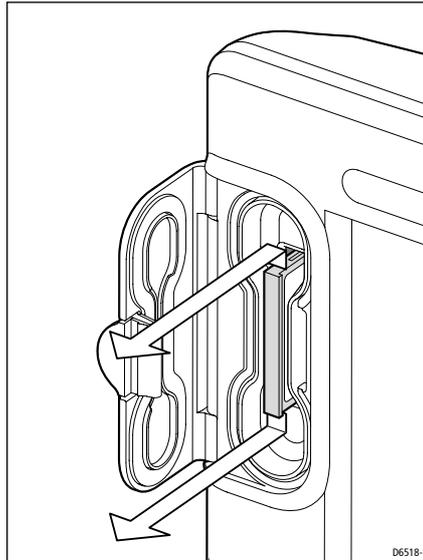


Inserting a card

To insert a card, refer to the illustration, and:

1. Check that you are using the correct type of card. Refer to *Important Information* section of this handbook.
2. Open the chart card door, located on the front left of the display.

3. Insert the card as shown, with the lip of the card facing inwards, it should position easily. If it does not, DO NOT force it, check the direction in which the lip is facing.
4. Gently press the card home.
5. To prevent the ingress of water and consequent damage, close the chart card door and press firmly until an audible click is heard.



Removing a card

...with the unit powered down

1. Open the chart card door.
2. Grip the card and pull to remove it from its slot.
3. To prevent the ingress of water and consequent damage, close the chart card door and press firmly until an audible click is heard.

...with the unit powered on

Press **MENU**. The Setup menu is displayed.

1. Use trackpad (up/down) to highlight REMOVE CF CARD.
2. Use trackpad(right) to select. The following message appears:

You may now safely remove your CompactFlash card
Press OK or CANCEL when finished

D6865-1

3. Open the chart card door.
4. Grip the card and pull to remove it from its slot.

5. To prevent the ingress of water and consequent damage, close the chart card door and press firmly until an audible click is heard.
6. Press **OK**.

Improper card removal

If you try to remove a card when the unit is powered, without accessing the setup menu, a warning message is displayed.

Follow the instructions given in the message, and refer to *Removing a card* before proceeding.

2.10 How do I save or retrieve information?

Your display can save up to 1,000 waypoints, 100 routes and 10 tracks in data base lists. You may want to save more than this number, or use waypoints, routes or tracks on another instrument. This can be carried out in one of two ways, either

- By archiving them to a CompactFlash[®] card, or:
- Transferring to another instrument or PC by using NMEA.

When navigation is active, you can also receive waypoints, routes and tracks from other SeaTalk instruments and from NMEA instruments if you want to save them on your unit.

How do I save information to a card?

1. Insert a card into the card slot. See *"How do I insert or remove a CompactFlash card?"* on page 19.
2. Press the **DATA** button.
3. Press the ARCHIVE & TRANSFER.
4. Press the SAVE TO CARD.
5. Toggle SELECT LIST to WPT (Waypoint), RTE (Route), or TRK (Track).
6. The database list for your selection appears on the screen.
7. Use the trackpad (up/down) to highlight what you want to save.
8. Press the SAVE ALL or SAVE GROUP/ROUTE/TRACK as appropriate. A message box appears to show that the information is being written to the card.
9. When the transfer is complete a message will appear on the screen.

Note: Pressing the SAVE ALL soft key, will save all of a Database list to a card.

How do I retrieve information from a card?

1. Insert a card into the card slot. See *"How do I insert or remove a CompactFlash card?"* on page 19.
2. Press the **DATA** button.

3. Press the ARCHIVE & TRANSFER.
4. Press the RETRIEVE FROM CARD.
5. From SELECT LIST, choose WPT (Waypoint), RTE (Route), or TRK (Track).
6. The card contents for your selection appears on the screen.
7. Use the trackpad (up/down) to select what you want to retrieve.
8. Press RETRIEVE ALL or RETRIEVE GROUP/ROUTE/TRACK as appropriate. A message box appears to show that the information is being written to the display.
9. When the transfer is complete a message will appear on the screen.

Note: Pressing the RETRIEVE ALL soft key, will retrieve all of a Database list to the display.

If whilst retrieving information a selection is already found to exist on the display, a warning message will appear:

The soft keys will change to give you the options of:

- RETRIEVE AS NEW
- REPLACE
- CANCEL RETRIEVE

Select which option you want by pressing the corresponding soft key.

How do I erase information from a card?

If you wish to remove information from a card, for example you no longer need it, or the card is full, it can be erased by using the DELETE or DELETE ALL soft keys that can be found on the Retrieve soft key bar. A message will be displayed on screen asking you to confirm that you want to delete the item(s), before it takes place.

2.11 How do I send and receive information using NMEA?

You can transfer and retrieve waypoints or routes to and from another instrument or PC by:

To transfer or receive information using NMEA:

1. Press the **DATA** button.
2. Press the ARCHIVE AND TRANSFER.
3. Press the TRANSFER ON NMEA. The following soft keys are displayed

SEND WPTS ON NMEA	SEND RTES ON NMEA	RECEIVE ON NMEA		
----------------------	----------------------	-----------------	--	--

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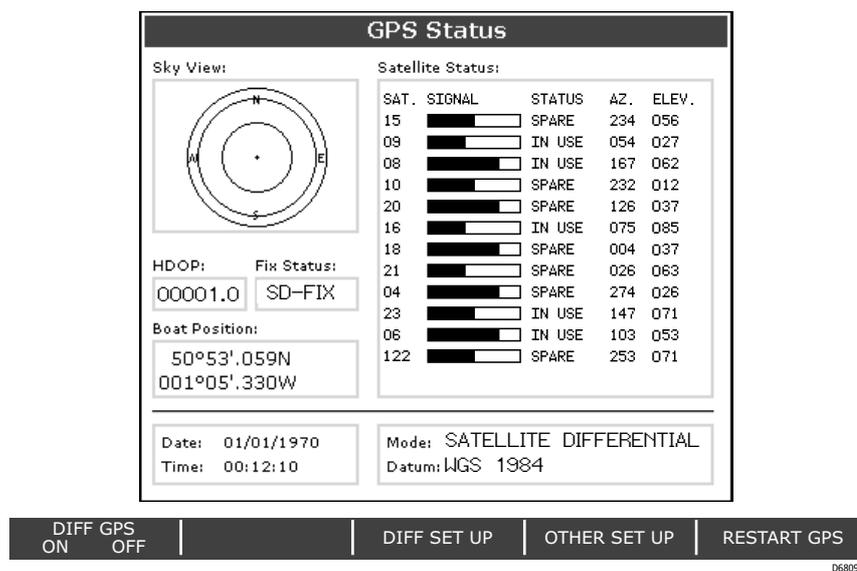
4. Press SEND WPTS ON NMEA, SEND RTES ON NMEA or RECEIVE ON NMEA. The transfer starts. If you wish to stop the transfer at any point, press STOP TRANSFER.
5. When the transfer is complete, STOP TRANSFER greys out and the soft keys reappear.

2.12 How can I set up my GPS?

You can set up your Global Positioning System (GPS) and check its status using the GPS Status page of the Setup menu.

To access the GPS Status page:

1. Press **MENU**. The Setup menu is displayed.
2. Use trackpad (up/down) to highlight GPS Status.
3. Use trackpad (right) to display the GPS Status dialog box.



This screen provides, for each tracked satellite, the satellite number, a graphical signal strength bar, status, azimuth angle and its elevation angle from your vessel. The sky view graphic shows the position of these satellites.

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

The fix status can indicate:

- NO FIX - no satellite fix can be acquired.
- FIX OK - a normal GPS fix has been acquired.
- D-FIX - a differential fix has been acquired.
- SD-FIX - a satellite differential fix has been acquired.

If your boat is equipped with a Raymarine GPS, the Differential GPS can be switched on or off using the appropriate soft key.

Chapter 3: Working with Waypoints

3.1 Introduction

Waypoints are a core feature of the C-series display. They can be created in the radar, chart or fishfinder application and used by all the applications. Waypoints can be stored in the system, archived to a CompactFlash card or transferred to another NMEA compatible instrument. To make full use of waypoint features, ensure your display is receiving heading and position data.



This chapter gives details of how to place, edit, manage and navigate to a waypoint using the dedicated **WPTS** button.

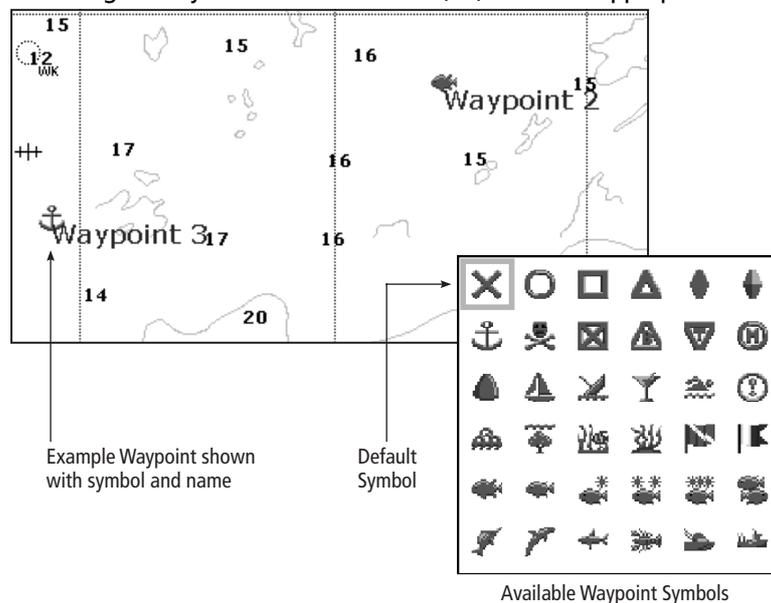
What is a waypoint?

A waypoint is a position marked on a chart, radar or fishfinder window to indicate a site (for fishing, diving etc.) or as a place to navigate to.

How are waypoints represented?

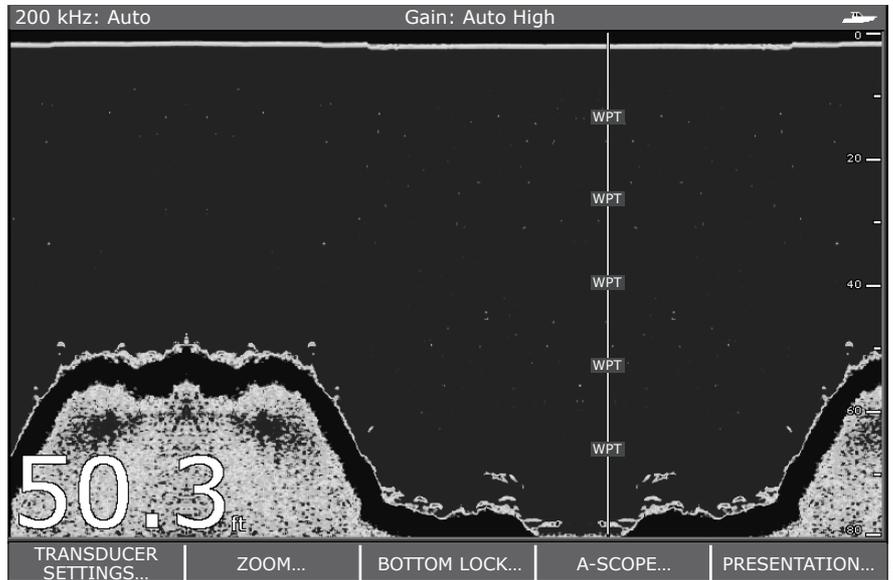
... on chart and radar screens

Waypoints are represented on chart and radar screens by a symbol. If necessary, you can change this symbol from the default ('X') to a more appropriate one:.



... on fishfinder screens

Waypoints are represented on fishfinder windows by a vertical line labeled WPT:



How are waypoints stored?

The details of all waypoints, irrespective of the application they were created in, are stored in a dedicated waypoint list.

The C-Series display is capable of storing up to 1,000 waypoints. If you reach this limit you can either delete those waypoints that you no longer use or archive those that are used infrequently to a compact flash card and then delete them from the system.

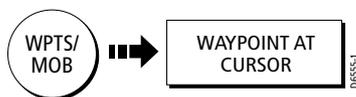
3.2 How can I place a waypoint?

WAYPOINT AT CURSOR	WAYPOINT AT VESSEL	WAYPOINT AT POSITION...	GOTO WAYPOINT OPTIONS...	REVIEW AND EDIT WAYPOINTS...
--------------------	--------------------	-------------------------	--------------------------	------------------------------

A waypoint can be placed at the cursor position, the boat's position or at a position of your choosing (using lat./long or Loran TD coordinates). All waypoints can also be used in the creation of routes.

When waypoints are placed they are given a default symbol and group. You can change this default, or the symbol/group assigned to individual waypoints, if required. (see *How can I edit a waypoint?* on page 7)

...at the cursor



To place a waypoint at the cursor position:

1. Move the cursor to the required position for the waypoint.
2. Press **WPTS**.
3. Press WAYPOINT AT CURSOR:
 - i. A waypoint is placed at the cursor position.
 - ii. The edit waypoint box and associated soft keys are displayed for a short period of time, to enable you to change the details of the waypoint. For more information refer to *How can I edit a waypoint?* on page 7
4. To accept the default details, either wait for the create waypoint box to disappear or press **OK**.

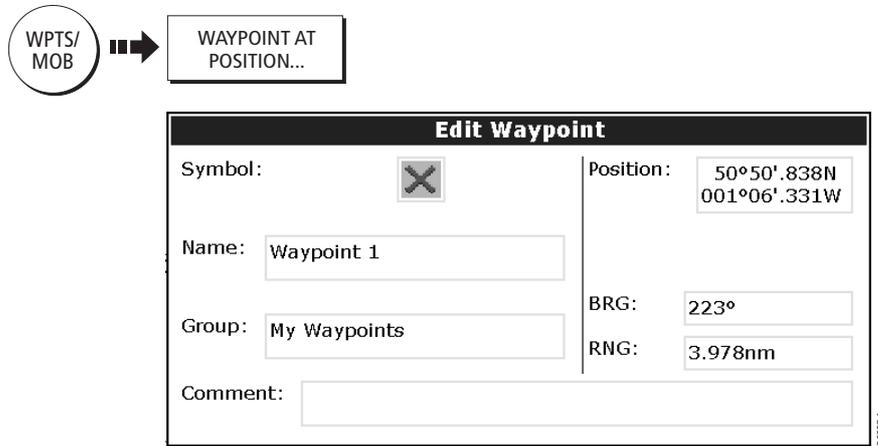
... at my current position



1. Press **WPTS** twice.
 - i. A waypoint is placed at your boat's position.
 - ii. The create waypoint box and associated soft keys are displayed for a short period of time, to enable you to change the details of the waypoint. For more information refer to *How can I edit a waypoint?* on page 7
2. To accept the default details, either wait for the create waypoint box to disappear or press **OK**.

Note: *If the system cannot determine your position, a warning is displayed and the waypoint is not placed.*

...at a known position



1. Press **WPTS**.
2. Press **WAYPOINT AT POSITION**.
The Edit Waypoint box is displayed with the highlight flashing in the position field.
3. Use the trackpad and/or the rotary control to enter the required position.
4. Press **OK** to place the waypoint at this position.
You can now use the trackpad to scroll through and edit the details of the waypoint if required. For more information, see *How can I edit a waypoint?* on page 7.
5. Press **OK** again, to return to normal operation.

3.3 How do I navigate to a waypoint?

You can navigate to an existing waypoint by using the GOTO WAYPOINT OPTIONS soft key. This can either be accessed by selecting the required waypoint on screen with the cursor (chart and radar only) or via the **WPTS/MOB** button (all applications).

...using the cursor



1. On the chart or radar screen, move the cursor over the waypoint you wish to go to. The cursor changes color and displays a waypoint label. The soft keys change to show you are working with a waypoint.
2. Press GOTO WAYPOINT.

...via the WPTS/MOB button



1. In any application, press **WPTS/MOB** and then GOTO WAYPOINT OPTIONS. The Waypoint List is displayed.
2. Using the trackpad (up/down), highlight the waypoint you wish to navigate to.
3. Press GOTO WAYPOINT.

Notes: (1) *If at any time you wish to stop navigating towards the selected waypoint, press STOP GOTO.*

(2) *For more information on navigation, see Chapter 4: Using the Chart*

(3) *The chart application also provides controls to GOTO a waypoint.*

3.4 How do I view waypoint information?

You can view the details of any waypoint that you have placed, by either selecting it with the cursor or by selecting it on the waypoint list. Once you are viewing a waypoint's details, a variety of editing and managing options are available.

...using the cursor

You can select a waypoint with the cursor and view its details provided that the waypoint is not being navigated to:

1. Move the cursor over the waypoint you wish to view.
The cursor changes color and displays a WPT label. The soft keys displayed change to show you are working with a waypoint.
2. Press EDIT WAYPOINT.
This displays the waypoint information in a dialog box. You can edit the details if required (see *How can I edit a waypoint?* on page 7).
3. Press **OK** to return to normal operation.

...using the waypoint list

The waypoint list shows all the waypoints that have been placed and displays details of the selected waypoint.

1. Press **WPTS**.
2. Press REVIEW AND EDIT WAYPOINTS.
The waypoint list is displayed:

Waypoint List	
Name:	Group: My Waypoints
Waypoint 1	Position: 50°53'.826N 001°10'.963W
Waypoint 2	Rng/Brg: 284° 4.315nm
Waypoint 3	
	Temperature: ---.-°F
	Depth: ---.-ft
	Date: 05/11/2003
	Time: 14:59:11

3. Use the trackpad (up/down) to move to the required waypoint.
The information for the selected waypoint is displayed.
4. Press **OK** to return to normal operation.

3.5 How can I edit a waypoint?

Once a waypoint has been placed it can be edited in a variety of ways. You can:

- Change the waypoint details - name, symbol, group.
- Move a waypoint.
- Erase a waypoint.
- Change the default symbol and group of newly placed waypoints.

How do I change the waypoint details?

When a waypoint is created it is assigned a default name, symbol and group. You can change these details to suit your needs. This is particularly useful when you are managing large numbers of waypoints.

To change the details of a waypoint:

1. Select the waypoint with the cursor or via the waypoint list.
2. Press EDIT WAYPOINT to display the editing dialog box.
The details of the selected waypoint are displayed:
3. Use the trackpad (up/down) to highlight the detail you wish to change.
4. Press the EDIT soft key.
5. Use the trackpad or the rotary control to edit the information as required.
6. Press **OK** to save the change or **CANCEL** to exit that field without saving.
7. Use the trackpad to select and edit other details, or
Press **OK** to return to the waypoint list.

How can I move a waypoint?

You can move any waypoint to a new position. If, however, you are navigating to a waypoint and you wish it to be moved, you will need to stop navigation (Press STOP FOLLOW). There are two methods of moving a waypoint:

...by entering new coordinates

If you know the new co-ordinates, bearing or range for the particular waypoint, you can enter this information by editing the waypoint as described above.

...by dragging the waypoint to a new position

You can drag a waypoint to a new position using the cursor and trackpad:

1. Use the cursor to select the waypoint that you want to move.
2. Press MOVE WAYPOINT.
3. Use the trackpad to drag the waypoint to the new location.
4. Press **OK** to save or **CANCEL** to abandon the move

CAUTION:

It is possible to move waypoints that are used in routes. In such instances, the stored route will include the Waypoint in its new position. Ensure that this does not present a navigation hazard.

How do I erase a waypoint?

You can erase any waypoint on the system using the cursor or the waypoint list **except:**

- The waypoint that you are currently navigating to (See *How do I navigate to a specific point?* on page 4-7), or
- Any waypoint used in a route.

If you attempt to erase such a waypoint, a warning message will be displayed

...using the cursor

1. Move the cursor over the waypoint that you want to erase.
2. Press ERASE WAYPOINT.
3. You will then be asked to confirm this. Press YES to confirm, or NO to cancel.

...using the waypoint list

1. Select the waypoint in the waypoint list.
2. Press ERASE WAYPOINT.
3. You will then be asked to confirm this. Press YES to confirm, or NO to cancel.

How do I change the default symbol and group?

When you add a waypoint to your system it is assigned to the default group and given the default symbol:

Default Symbol	
Default Group	<input type="text" value="My Waypoints"/>

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If these are not suitable, you can select an alternative symbol and group to be the default:

1. Press REVIEW AND EDIT WAYPOINTS.
2. Press SET DEFAULT SYM & GROUP.
3. Press SET UP DEFAULT, to highlight either the symbol or group option. The current default is displayed.
4. Press EDIT DEFAULT. The selection of available symbols or the list of group names is displayed.
5. Use the trackpad to select the required default symbol or group. If none of the existing waypoint groups are suitable, you will need to make a new group (see *How do I make a new waypoint group?* on page 10 for details).
6. Press **OK** to accept; **CANCEL** to abandon.

3.6 How can I sort waypoints in the waypoint list?

If your system contains a large number of waypoints, you can sort your waypoint list to make it easier to locate a particular waypoint.

The waypoint list can be sorted by:

- Waypoint name (default)
- Waypoint range, closest first
- Symbol
- Group name
- Date
- Comment
- Depth

To sort the waypoint list:

1. When the waypoint list is displayed, press SORT LIST.
The currently selected sort option is displayed.
2. Press SELECT SORT OPTION to display the list of sorting options.
3. Use the trackpad (up/down) or the rotary control, to select the new sorting method.
4. Press **OK** to accept or **CANCEL** to make no change.

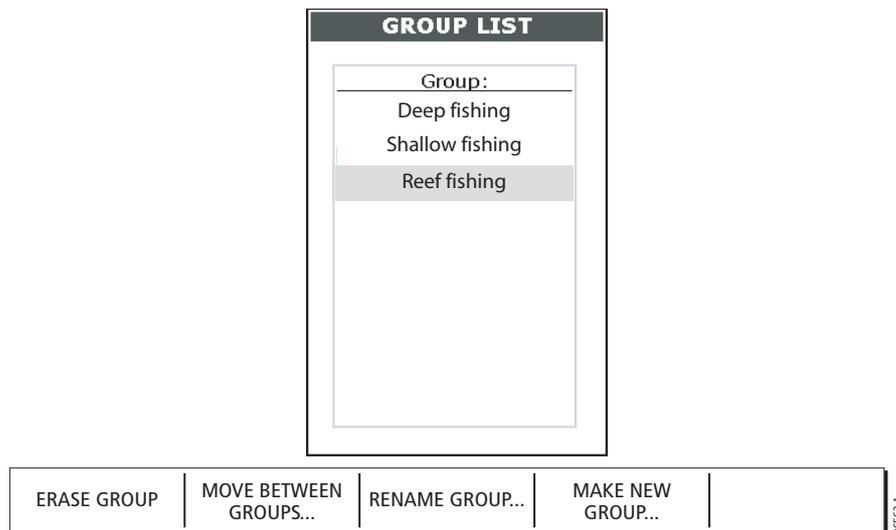
3.7 How can I organize my waypoints into groups?



Provided that you have not changed the default group, all waypoints are automatically placed in the default "My Waypoints" group when they are created. In order to make your waypoints easier to manage, you can organize them into groups of your choice. When fishing, for example, you may only wish to see the waypoints that indicate good fishing sites. Other waypoints, say, for racing, would be superfluous at this time.

To display the group options:

1. Press **WPTS/MOB**.
2. Press REVIEW AND EDITE WAYPOINTS and then WAYPOINT GROUPS. The group list and associate soft keys are displayed e.g.



Note: A waypoint cannot be placed in multiple groups

How do I make a new waypoint group?

To create a waypoint group:

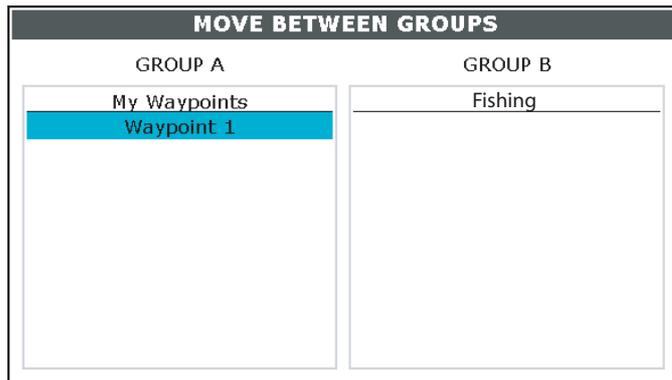
1. Press MAKE NEW GROUP.
The new waypoint group dialog box is displayed.
2. Either:
 - Press **OK** - to accept the default group name.
 - or:
 - Press EDIT GROUP NAME - to change the group name.
3. Use the trackpad and rotary control to enter the required group name and press **OK**.

How do I move waypoints between groups?

Waypoints can be easily moved between groups using the MOVE BETWEEN GROUPS option. To move a waypoint:

1. Select MOVE BETWEEN GROUPS.

The first two groups stored are displayed as GROUP A and GROUP B.



2. Determine the group that contains the waypoint that is to be moved as follows:
 - i. Press SELECT GROUP A.
The Group List containing all the groups in your system is displayed.
 - ii. Use the trackpad or the rotary control, to select the group that contains the waypoint that is to be moved.
 - iii. Press **OK**.
The waypoints in the selected group are listed.
3. Determine the group that the waypoint is to be moved to as follows:
 - i. Use the trackpad (right) to move to the GROUP B column.
 - ii. Press SELECT GROUP B.
The Group List containing all the groups in your system is displayed.
 - iii. Use the trackpad or the rotary control, to select the group that the waypoint is to be added to.
4. Use the trackpad to return to GROUP A and select the appropriate waypoint.
5. Press MOVE WAYPOINT FROM A TO B, to move the waypoint.
This can be repeated until you have made all of your changes.
6. Press **OK** to return to the GROUP LIST.

Note: Alternately, waypoints can be moved from Group B to Group A if required. The soft keys reflect this accordingly.

How do I rename an existing group?

You can change the name of an existing waypoint group:

1. Select the required group in from the GROUP LIST and press RENAME GROUP.
The group name is displayed in a dialog box
2. Press EDIT GROUP NAME
3. Use the trackpad or the rotary control to edit the information as required.
4. Press **OK** to save the new name and return to the GROUP LIST.
Press **CANCEL** to revert to the original name.

How do I erase a group?

When a waypoint group is erased from the system, all of the waypoints in that group will be erased. Ensure that any waypoints you want to keep are moved from a group before you erase it.

1. From the GROUP LIST, select the group to be removed.
2. Press ERASE GROUP.
3. You will then be asked to confirm the removal of the group,
Press YES to confirm, or NO to cancel.

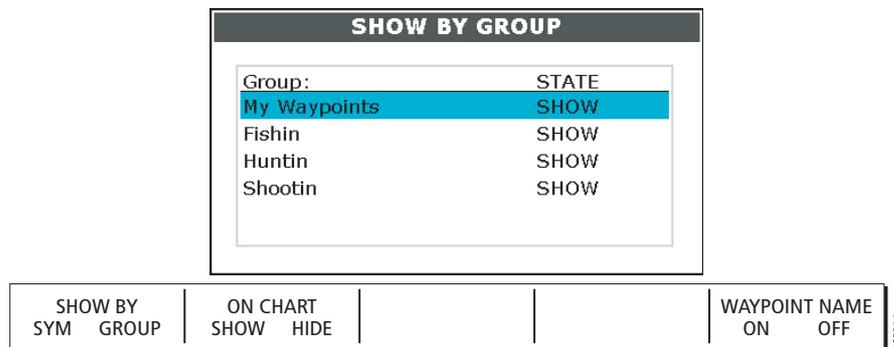
3.8 How can I control how waypoints are displayed?



When you have placed many waypoints on your system, it may become difficult to easily interpret chart information. This is particularly the case if you have many waypoints in a small area. There are a number of ways that you can control the display of waypoints and waypoint information. These are:

- Show or hide waypoints belonging to a specific group.
- Show or hide waypoints with a particular symbol.
- Show or hide all of the waypoint names.
- Show or hide the index of a waypoint within a route (see *How do I show or hide the waypoint index?* on page 4-33).

With a chart or radar application active, use the PRESENTATION and then the SHOW/HIDE WAYPOINTS soft keys to access the waypoint information display controls.

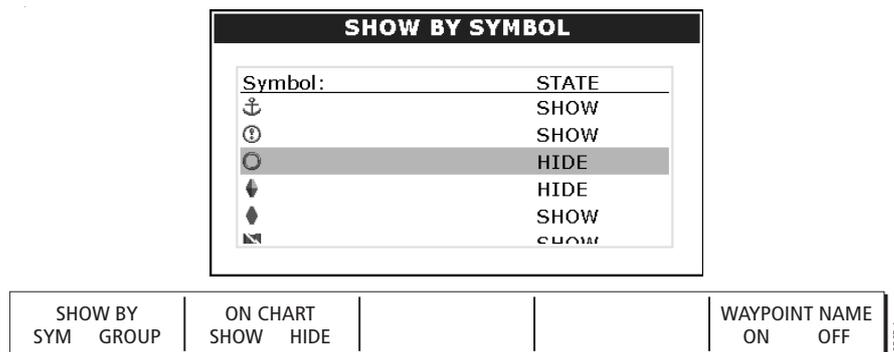


Display by symbol or group

You can determine which waypoint groups or symbol types are shown using the SHOW BY soft key. This is used in conjunction with the ON CHART soft key when the chartplotter is active or the ON RADAR soft key when radar is active.

Show by Group and Show by Symbol

A list of available groups or symbols are shown with their show/hide status.



To change the status of a group or symbol:

1. Use the trackpad to highlight to the appropriate group or symbol.
2. Press the ON CHART or ON RADAR soft key to change the show/hide status.
3. Press **OK** or **CANCEL** to remove the dialog box.

Notes: (1) *If a waypoint is placed but its group is set to Hide, then the waypoint will not be displayed.*

(2) *Waypoints in an active route are always displayed, regardless of whether the display is set to show or hide.*

Display waypoint names

Press the WAYPOINT NAME soft key to show or hide all waypoint names. The selected value is highlighted in the soft key display.

Chapter 4: Using the Chart

4.1 Introduction

This chapter describes how to use the chartplotter application of the C-Series display.

To access full functionality your chartplotter requires position and heading data from your boat's Global Positioning System (GPS).

Once the heading and position data is available you can:

- Find out where you are.
- Navigate to a specific point.
- Build and follow a route.
- Monitor where you are going.
- Record where you have been.
- Manage and edit routes and tracks.

All of these functions are available in the chartplotter application, so you can plot and track routes at large scales even when a chart is not installed.

In addition the chartplotter provides functions to:

- Control what you see in the chart window.
- Set up alarms.
- View radar data on the chart.

Using your chartplotter safely

Your chartplotter makes use of waypoints, which are easy to place and travel towards. However, you should always check that a route is safe.

If you have entered your route using a large scale chart, zoom in to a smaller area to check for hazards, such as small shoals, that may not be shown on a larger scale chart.

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 simulator mode can also be used to help you gain experience.

It is strongly recommended that before you use your chartplotter application, that you read and understand *Chapter 3: Working with Waypoints*.

CAUTION:

The equipment should not be used as a substitute for good navigational practice nor for official government paper charts. Do not use the chartplotter before you have read the *Important Information* chapter.

4.2 What can the chartplotter show me?

The chartplotter has a built in world map; most areas are displayed at a scale of 72 nm from the top to the bottom of the screen and can be overzoomed as required.

Electronic Charts

To use the chartplotter as a navigation aid, you will need chart cards containing detailed information for the area you wish to navigate. These cards are available from NAVIONICS (See *Chapter 1:Using the Display*). For full information on installing and removing chart cards refer to *Chapter 2:General Operation and System Setup*.

The amount of detail shown varies for different areas and for different scales. The chart scale in use is indicated in the status bar - the number represents the distance in nautical miles from the top of the chart window to the bottom of the chart window.

You can remove and insert cards while a chart is displayed. The chart information is retained on-screen until the chartplotter redraws the screen; for example, when you pan outside the current area, or use the **RANGE** button to change the chart scale.

Chart orientation and motion mode

You can change the way the chart is drawn in relation to your boat's position, by changing the orientation and motion mode.

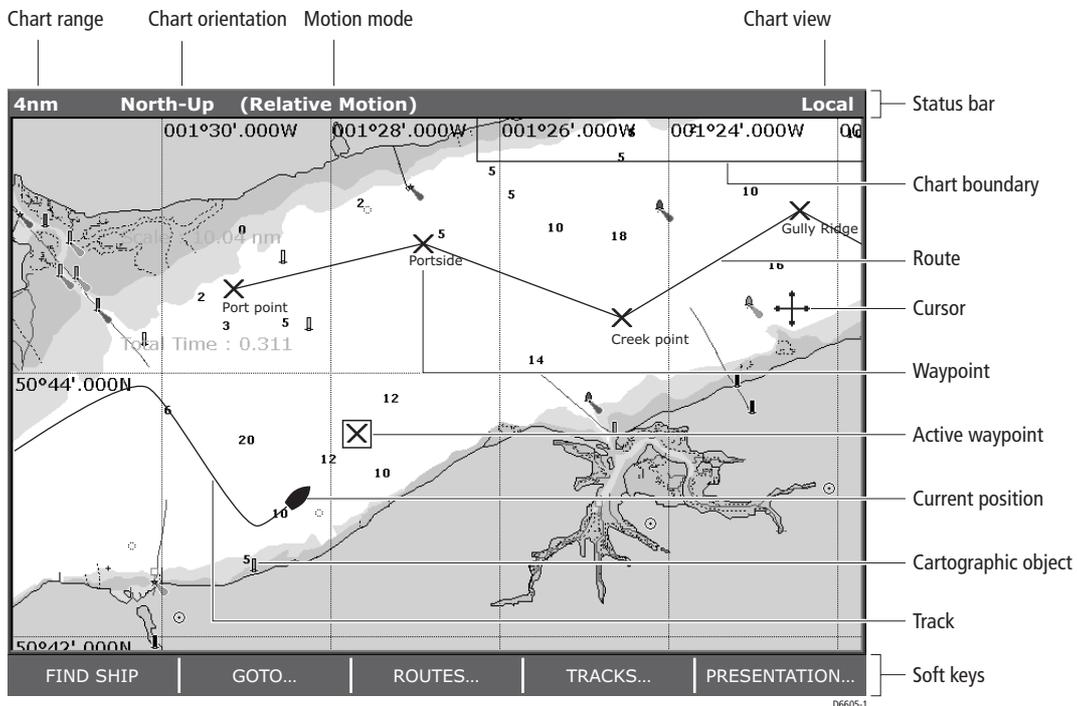
The orientation of the chart refers to the relationship between the chart and the direction that you are travelling in. Your system is set to move the ship's heading marker as the heading changes (North-Up). This can be changed to Course-Up or Head-Up if required.

The motion mode controls the chart-to-boat movement. The system is set to move the chart across the screen and fix your boat (relative motion). This can be changed so that your boat moves and the chart is fixed (true motion) if required. See *How do I set the orientation of the chart?* on page 29 and *How do I set the motion mode?* on page 30, for more detailed information.

Radar overlay

The radar image can be overlaid onto a chart window. This helps to distinguish between fixed, charted objects and other objects that could be moving vessels. For more information on radar overlay see *How do I overlay other radar images onto my chart?* on page 33.

The chartplotter display



4.3 Where am I on the chart?



Your boat is represented on screen by a ship symbol. If you cannot see your boat, press **FIND SHIP**. The chart is redrawn with your boat on screen. Where it appears on the screen depends on the current motion mode (see *How do I set the motion mode?* on page 30). Details of your boat's position is displayed in the status bar and the selected motion mode is reinstated.

Press **WPTS/MOB** twice, to mark your current position with a waypoint.

For more information on waypoints, please refer to the waypoint chapter.

Note: *If neither heading nor COG data is available, the vessel is shown as a solid circle.*

4.4 What can I see around me?

The chartplotter includes features that enable you to interpret your surroundings and make informed decisions based on your location. You can:

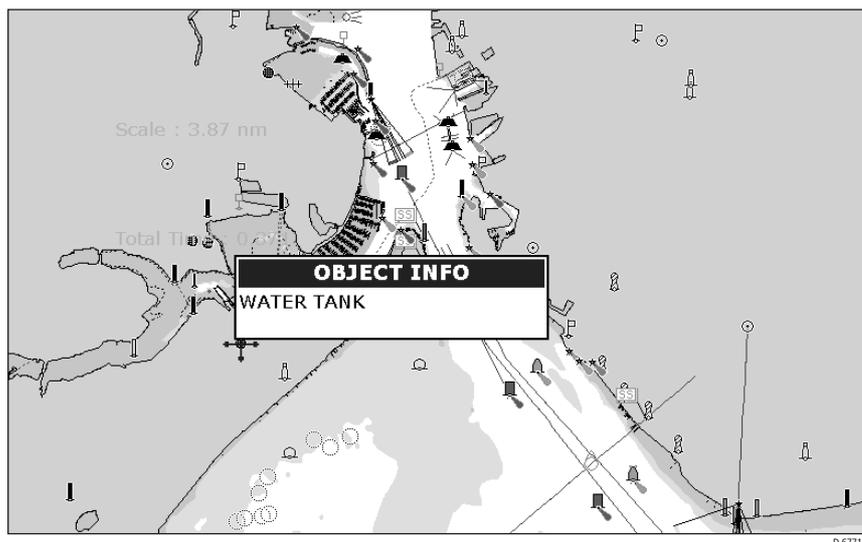
- View details of specific cartographic objects.
- Reduce the level of cartographic detail shown on the chart (see *Cartography set up* on page 39).

- Use the search facility to find the nearest waypoints, ports, port services, wrecks, obstructions or tidal stations. (see *page 35*).
- View details of available port services for a selected port. (see *How do I display details of ports services on page 35*).
- View tide data (see *page 36*)
- Use the ruler facility to accurately measure the distance and bearing between points. (see *You can now: on page 36*)

How do I see details of cartographic objects?

The chart card includes details of each cartographic object that is marked on the chart. They also contain source data for structures, lines, open sea areas etc. Port services and tidal information is also available.

1. Move the cursor over the required cartographic object. Basic information relating to that object is displayed:



2. If you require more detailed information, press **OK**. The Object Info box is re-displayed giving further details relating to the selected object.
3. In the left-hand box, highlight the required subject area for the object you have selected. Details are displayed in the right-hand box.

Note: To scroll through detailed information, use the trackpad to move control to the right-hand box.

The soft keys provide controls to locate the nearest waypoint, port, port service, tidal station, wreck or obstruction to the selected position and obtain data for a named port.

How do I find nearby features and services?

You can use your chartplotter to identify and display the details of the waypoints, port services, ports, tidal stations, wrecks or obstructions that are closest to the cursor position.

To obtain information for the nearest objects:

1. Move the cursor to the required position on the chart.
2. Press **OK**. If the cursor is:
 - Over a cartographic object, its details are displayed in a pop-up.
 - Over an area of water or land not containing a cartographic object, the chart source data is displayed.
3. Press FIND NEAREST, to display the list of categories available for this function:
 - Waypoint.
 - Ports.
 - Port Services.
 - Tidal Stations.
 - Wrecks.
 - Obstructions.
4. Use the trackpad to select the required category. The sixteen nearest to the cursor in the selected category are displayed.
5. You can now use the soft keys to:
 - display detailed data for any of the listed objects. For ports, you can select a specific service and for a selected port service you can find the nearest ports.
 - Show the selected item on the chart.
 - GOTO the selected waypoint
 - View tidal data for the selected tidal station.

Note: A complete list of port, services and tidal information can be found on page 35

How can I simplify the information on the chart?



If there are a large number of cartographic objects in a particular area, you can reduce the amount of detail by de-cluttering the chart display. Turning declutter on hides the following cartographic objects:

- Text.
- Chart boundaries.
- Spot soundings.

- Depth contours.
- Light sectors.
- Caution & routing Information.
- Land and marine features.

For more information on changing the appearance of the chart and cartographic data, see *How do I set up my chart and its cartography?* on page 38

4.5 How do I move around the chart?

To move around the chart and display the area required at the appropriate scale, use a combination of zooming and panning.

Note: *When you are panning or in autorange mode or you change the scale, the motion mode (see page 30) is suspended.*

Panning

Panning moves the chart that is displayed to a different area. To pan a chart, simply press the appropriate arrow (left/right, up/down) on the trackpad. When the cursor reaches the edge of the screen, the chart pans.

Zoom in/out

When you zoom in, the chart scale changes to show a smaller area in more detail. Conversely, if you zoom out the chart area displayed is increased but the detail is reduced.

The cartographic detail available on charts varies according to the chart and the chart scale. Some areas provide detail at smaller scales than others.

To zoom in/out around your boat:

1. Use the trackpad to move the cursor to the required position.
2. To zoom in, press the lower part of the **RANGE** key
To zoom out, press the upper part of the **RANGE** key.

Note: *To zoom in around the cursor, you must first break the motion mode.*

4.6 How do I navigate to a specific point?

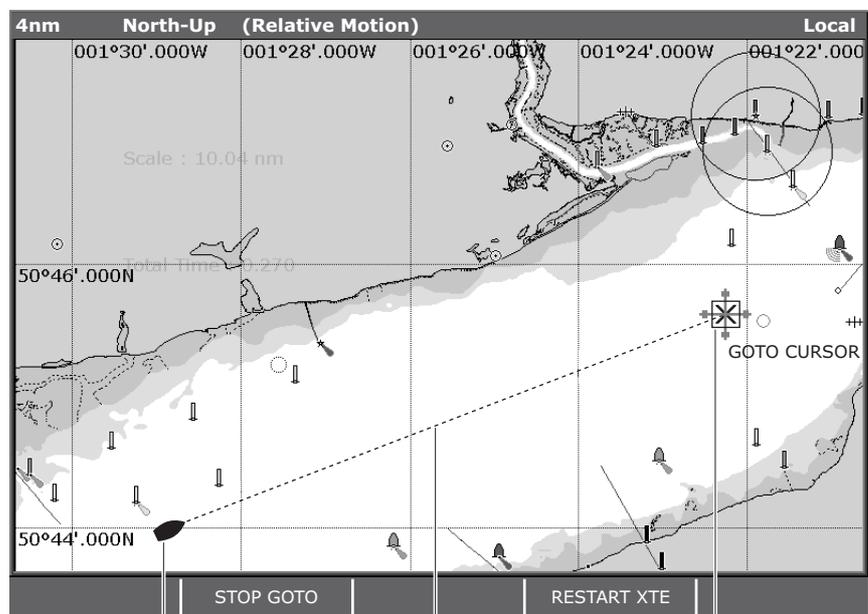
You can use your Chartplotter to navigate to a specific point marked by the cursor or to a waypoint. When you are steering manually, you can also use the chartplotter to determine the bearing or direction to steer.

Go to the cursor position



Navigating using the cursor is a very simple and quick technique that involves travelling directly to a point selected by the cursor position:

1. Position the cursor at the desired destination
2. Press GOTO. If you are currently navigating to a waypoint, following a route or already navigating to the cursor, you will need to press STOP GOTO, before the system will allow you to go to the position currently marked by the cursor.
3. Press GOTO CURSOR:
 - A temporary waypoint entitled *Go to cursor* is placed at the cursor position.
 - A dashed line is drawn between your original vessel position and the temporary waypoint.
 - This target waypoint is also identified on the radar.



Boat's heading changes to follow course to temporary waypoint

Dashed line marking original course of GOTO

Temporary waypoint (within white box) placed at cursor

- When you arrive at the target waypoint an alarm sounds and a warning message is displayed. To de-activate this alarm, either wait 10 seconds or press ACKNOWLEDGE.

Note: *To stop navigating to the cursor, press STOP GOTO. The GOTO CURSOR waypoint is removed.*

Go to a waypoint

You can navigate to an existing waypoint by either selecting the appropriate waypoint on screen with the cursor or from the waypoint list:

... selected with the cursor

This option navigates you to the waypoint that you select on screen.



- Move the cursor over the appropriate waypoint.
- Press GOTO WAYPOINT.

... selected via the waypoint list

This option selects the waypoint that you wish to navigate to from the waypoint list.



- Press **WPTS (MOB)** key or GOTO soft key.
- Press GO TO WAYPOINT OPTIONS.
The waypoint list is displayed.
- Highlight the required waypoint in the list.
- Press GOTO WAYPOINT.

Notes: (1) *To stop navigating towards the selected waypoint, press STOP GOTO.*

(2) *To set the cross track error (XTE) to zero and move the origin to the actual vessel position press RESTART XTE.*

(3) *If you are navigating to a waypoint, setting the motion mode to autorange selects the largest chart scale possible that will display both the boat and the target waypoint (see Autorange on page 31).*

(4) *For more information on navigating with Waypoints, please refer Chapter 3: Working with Waypoints.*

4.7 How do I build and follow a route?

This section describes how to use routes and includes the following:

- What is a route?
- Building and saving a route.
- Following a route.
- Displaying routes on the chart

Once created you have the option to view its details, amend its course, edit its name and color or erase it (see *How do I change the course of a route?* on page 23).

All route options can be accessed via the ROUTES soft key.

What is a route?

SHOW/HIDE ROUTES ...	FOLLOW ROUTE OPTIONS ...	BUILD NEW ROUTE ...	REVIEW AND EDIT ROUTES ...
-------------------------	-----------------------------	------------------------	-------------------------------

A route is a series of waypoints used to navigate a course. A route is displayed on screen as a series of waypoints linked by a line.

You can either:

- Build a temporary route that you follow immediately (Quick Route). If you do not rename a quick route, it will be overwritten and its waypoints deleted when a new quick route is built.
- Build and save a route for later use, in which case the route is stored in the route list.
- Convert a track of your course into a route (see *How do I create a route from a track?* on page 20).

How do I build a route?

Routes can either be built on screen or via the waypoint list. A route consists of:

- New waypoints that you have specifically placed for that route.
Or:
- Existing waypoints that are already stored in the system.
Or:
- A combination of new and existing waypoints.

Up to 100 routes can be added to your system, each consisting of up to 50 waypoints. As each waypoint is added, it is assigned an index number corresponding to its position in the route, and drawn on the chart using the currently specified symbol. Once built a route can either be saved and immediately followed (QuickRoute) or saved for later use.

The following should be noted:

- When a route is being built it is not active and does not affect any current navigation.
- You can include a waypoint more than once in a route, but the same waypoint cannot be placed consecutively.
- You can create a new route when the route list is full but on saving this, you will be prompted to choose an existing route to overwrite.
- You cannot save a new route if any of the waypoints within it are currently active..
- The way in which the **OK** and **CANCEL** buttons operate is different when you are building and editing routes (see below).

Building routes on screen

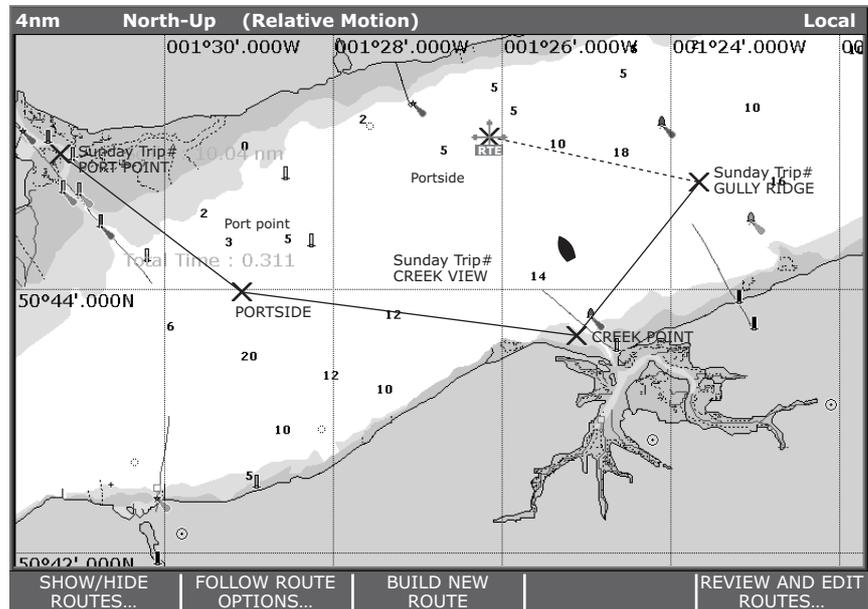
You can build a route on screen that consists of either new or existing waypoints.

... using new waypoints

You can build routes using a series of new waypoints.



1. Press ROUTES and BUILD NEW ROUTE.
2. Press PLACE WAYPOINT.
A new waypoint is placed at the cursor's position.
 - If you make an error when you are building your route and wish to remove the last waypoint, press UNDO WAYPOINT. The waypoint and its dotted line are removed from the screen and the cursor moves back to the previous waypoint. If you repeatedly press these keys, successive waypoints are removed.
 - If you wish to abandon the route that you are building, press CANCEL. You are asked to confirm your request to delete the route.
3. Move the cursor to the next position.
The cursor is joined to the waypoint with a dashed line. As subsequent waypoints are added, the dashed line becomes a solid line i.e.



4. Continue entering new waypoints until your route is complete.
5. You now have the following options:
 - i. To save and immediately follow the built route:
Press FOLLOW (QUICK) ROUTE. The route is saved under the name 'Quick Route'. If a Quick Route already exists it is overwritten. The system then initiates a follow route.
 - ii. To save the built route for later use (and rename it if required):
Press SAVE ROUTE or **OK**. The Save Route dialog box is displayed. You can edit the route name or color or press **OK** to accept the defaults..

Note: *If you want to keep the Quick Route, you will need to rename it (see How do I change the name or color of a route or track? on page 26).*

... using existing waypoints

You can use waypoints that already exist, to build a new route.



1. Move the cursor over the appropriate waypoint.
2. Press USE THIS WAYPOINT to include this waypoint in the current route.
 - If you make an error when you are building your route and wish to remove the last waypoint, press UNDO WAYPOINT. The dotted line joining it to the route is deleted (but not the waypoint itself). The cursor moves back to the previous waypoint. To remove successive waypoints, press this key repeatedly.

- If you wish to abandon the route that you are building, press CANCEL. You are asked to confirm your request to delete the route.
3. Continue entering waypoints until your route is complete.
 4. You now have the following options:
 - i. To save and immediately follow the route:
Press FOLLOW (QUICK) ROUTE. The route is saved under the name 'Quick Route'. If a Quick Route already exists it is overwritten. The system then initiates a follow route.
Or:
 - ii. To save the route for later use (and rename it if required):
Press SAVE ROUTE or **OK**. The Save Route dialog box is displayed. You can edit the route name or color or press **OK** to accept the defaults..

Note: *If you want to keep the Quick Route, you will need to rename it (see How do I change the name or color of a route or track? on page 26).*

Building routes using the waypoint list



You may prefer to build routes using existing waypoints in the waypoint list:

1. From the BUILD NEW ROUTE option, press USE WAYPOINT LIST. The Make Route list is displayed
2. Highlight the required waypoint in the Waypoint column, by using the trackpad (up/down) or the rotary control.
3. Use the trackpad (right) to move control to the New Route column.
4. In the New Route column, use the trackpad (up/down) to highlight the route waypoint that is to immediately precede the waypoint that you are inserting.
5. Return to the waypoint column.
6. Press INSERT WAYPOINT.
 - The waypoint highlighted in the waypoint column is added to the new route column below the highlighted route waypoint.
 - If you insert a waypoint incorrectly into a route you are building, you can remove it by highlighting the necessary waypoint in the New Route column and then pressing the REMOVE WAYPOINT key. The remaining waypoints close up to fill the gap.
7. Continue entering waypoints until your route is complete.
8. You now have the following options:
 - i. To save and immediately follow the built route, press FOLLOW (QUICK) ROUTE.

- ii. To save the built route for later use (and rename it if required), press SAVE ROUTE.

Using the display and the waypoint list to build your route

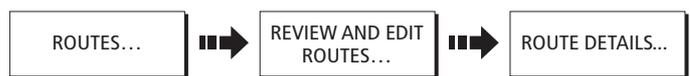
You can build your route using both the on-screen and the waypoint list methods described on the previous pages. This will necessitate alternating control between the MAKE ROUTE list and the chart.

To change control from:

- the chart to Make Route list, press USE WAYPOINT LIST.
- the Make Route list to the chart, press USE CURSOR.

Add the required waypoints and save the route.

How do I see details of my routes?



Details of any routes that you create are held in the Route List. To display the Route List:

1. Press ROUTES and then press REVIEW AND EDIT ROUTES. The Route List is displayed.
2. Use the trackpad (up/down) to highlight the route whose details you wish to view.
3. Press ROUTE DETAILS. A box detailing the selected route is displayed e.g

Waypoint	Position	BRG °T	Dist. nm	Total nm	Time
01 Waypoint 1	52°43'.564N, 000°02'.643W	184	2.506	2.506	02:04:09 01/01/2004
02 Waypoint 2	52°43'.564N, 002°35'.360E	090	96.00	98.50	04:53:39 04/01/2004
03 Waypoint 3	54°05'.042N, 002°35'.360E	000	81.51	180.0	20:25:45 06/01/2004
04 Waypoint 4	54°05'.042N, 005°00'.377E	090	85.41	265.4	15:00:11 09/01/2004

Date: 01/01/2004 Time: 00:06:58 Planned SOG: 1.3kts

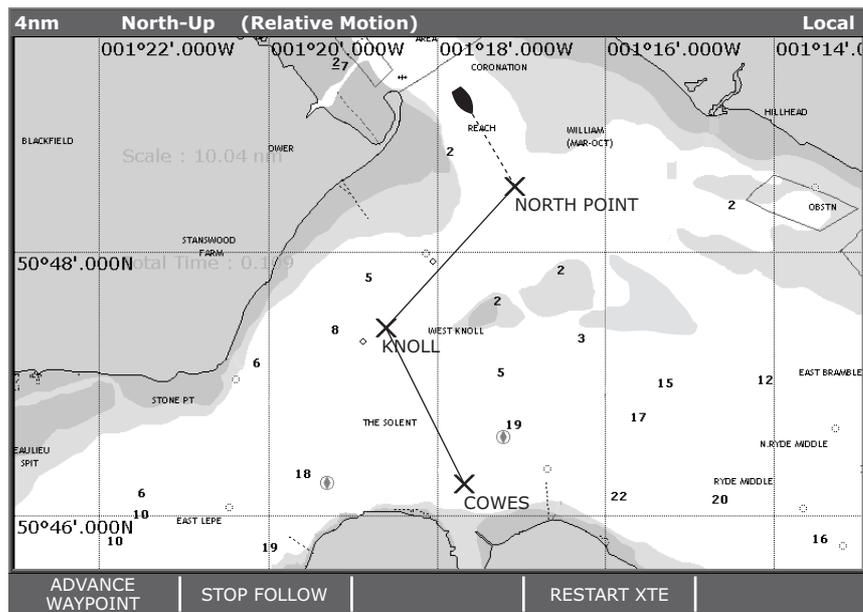
ETA TIME HOURS SOG ACTUAL SOG PLANNED SET SOG 1.3kts

As an aid to passage planning, you can toggle the time calculations between estimated time of arrival and actual hours and the speed over ground between actual and planned.

How do I follow a route?

There are several ways that you can follow a route:

- Using Quick Route.
- Using the cursor.
- Via the route list.



In addition to these basic options you can also follow a route in reverse order or advance to the next waypoint in a route that you are currently following

When you are navigating a route the chart displays the following:

- Your boat's heading indicated by a dashed line between your current position and the target waypoint.
- The target waypoint is highlighted.
- When the distance to the waypoint is less than that specified for the arrival alarm radius (see *Navigation Alarms Setup on page 9*), or your boat reaches the closest point to the target (defined by a line passing through the waypoint and perpendicular to the route leg), a warning dialog is displayed and an alarm sounds.
- Once the alarm is acknowledged, the system updates the display to indicate the next leg of the route.
- You can stop following an active route at any time by pressing STOP FOLLOW.

... using Quick Route

This option follows a route as soon as it is built.

... using the cursor



You can either use the cursor to select and follow a route from the start, or to follow a route from a selected waypoint within the route.

Follow a route from the start



1. Move the cursor over any **leg** of the appropriate route.
2. Press FOLLOW ROUTE.

Note: To stop following an active route at any time, press STOP FOLLOW.

Follow a route from a selected waypoint within the route



1. Move the cursor over the appropriate waypoint.
2. Press FOLLOW FROM HERE.

Note: To stop following an active route at any time, press STOP FOLLOW.

... via the route list

This option directs you to the start of the route that you have selected on the route list and then follows it:



1. Press ROUTES.
2. Press FOLLOW ROUTE OPTIONS. The route list is displayed with the highlight on the most recently built, edited or followed route.
3. Select the appropriate route on the list.
4. Press FOLLOW ROUTE.

Notes: (1) To stop following an active route at any time, press STOP FOLLOW.

(2) This option can also be accessed via the GOTO soft key

... in reverse order

This option reverses the waypoint order in the selected route and then follows it.



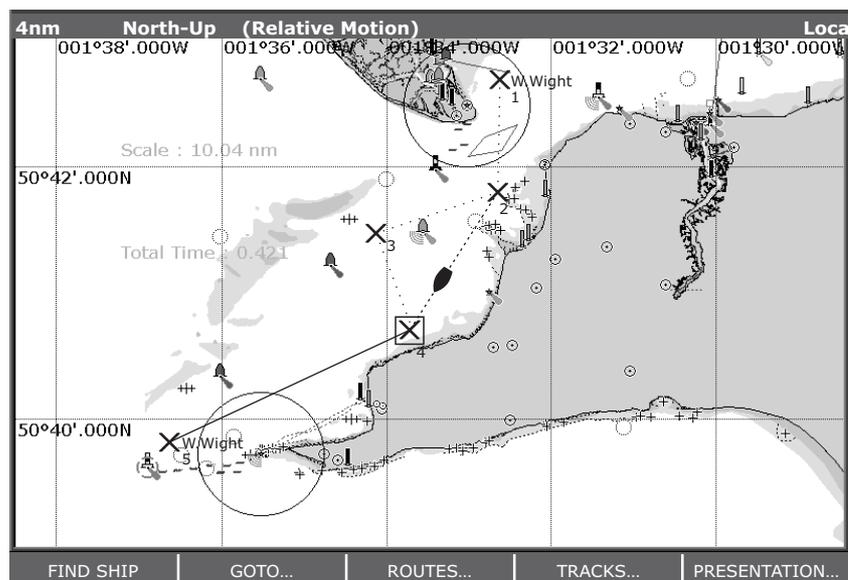
1. Press ROUTES.
2. Press FOLLOW ROUTE OPTIONS. The route list is displayed with the highlight on the most recently built, edited or followed route.
3. Select the required route on the list.
4. Press REVERSE ROUTE. The route is reversed; the last waypoint of the original route is now the first, the waypoints renumber and the route name moves accordingly. The system then automatically activates the follow route function.

Note: To stop following an active route at any time, press STOP FOLLOW.

... to advance to the next waypoint within a route



If you are following a route, you have the option to advance to the next waypoint in that route. In the example below, the advance waypoint option was selected at Waypoint 2. This has resulted in Waypoint 3 being dismissed and the course of the route advancing to Waypoint 4



Note: If the current destination is the last waypoint, then it advances on to the first waypoint in the route

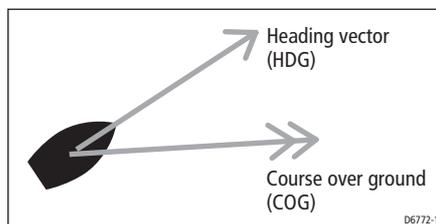
4.8 How do I monitor where I am going?

... using chart vectors



You can display a variety of graphical indicators to help monitor where you are going:

Heading (HDG) and course over ground (COG) vectors



The ship's heading (HDG) is displayed as a line with an open arrow head. It does not take account of winds or tides.

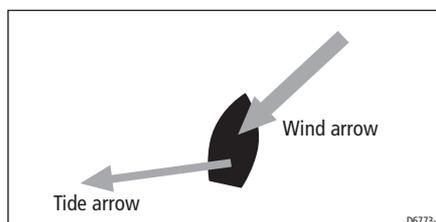
The course over ground (COG) indicates the boat's actual course and is displayed as a line with two arrow heads.

The length of these lines is determined by the distance your boat will travel in the time you have specified (3 mins, 6 mins or infinite) in the Chart Setup Menu (see *Chapter 2: General Operation and System Setup*) at the current speed.

Any times that you specify will apply to all chart views and if INFINITE is selected the vector will extend to the edge of the chart window.

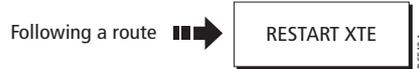
Note: *If neither the speed over ground (SOG) or heading are available, vectors cannot be displayed.*

Wind and tide arrows



Winds and tides are displayed as lines with solid arrow heads in the direction of the wind or tidal set. Winds arrows point into your boat and tidal arrows point away. The width of the arrow indicates its strength.

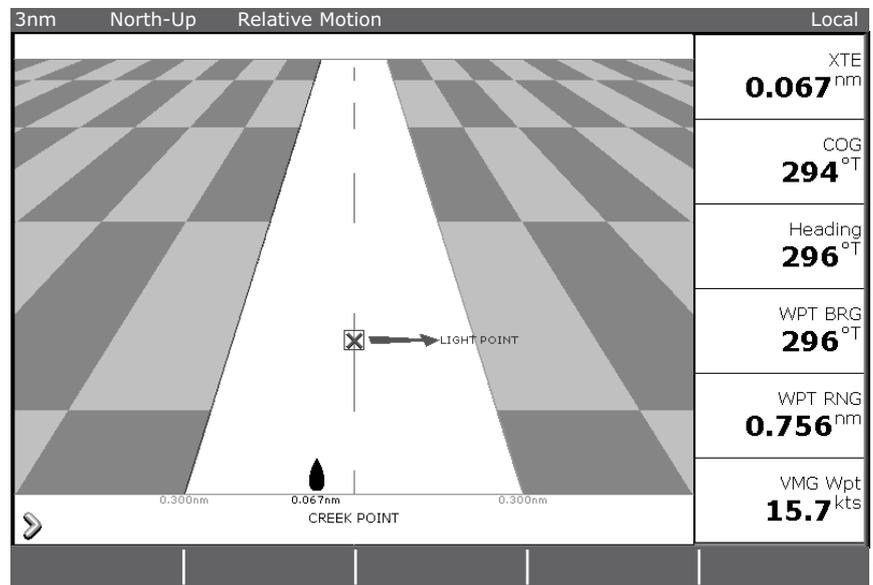
... using cross track error (XTE)



When you are following a route or going to a waypoint, you can restart the XTE. This sets the XTE to zero and moves the origin to the actual vessel position.

Restarting XTE is useful if you find yourself off track and want to go straight to your target, rather than get back onto the original track.

... using the Course Deviation Indicator (CDI)

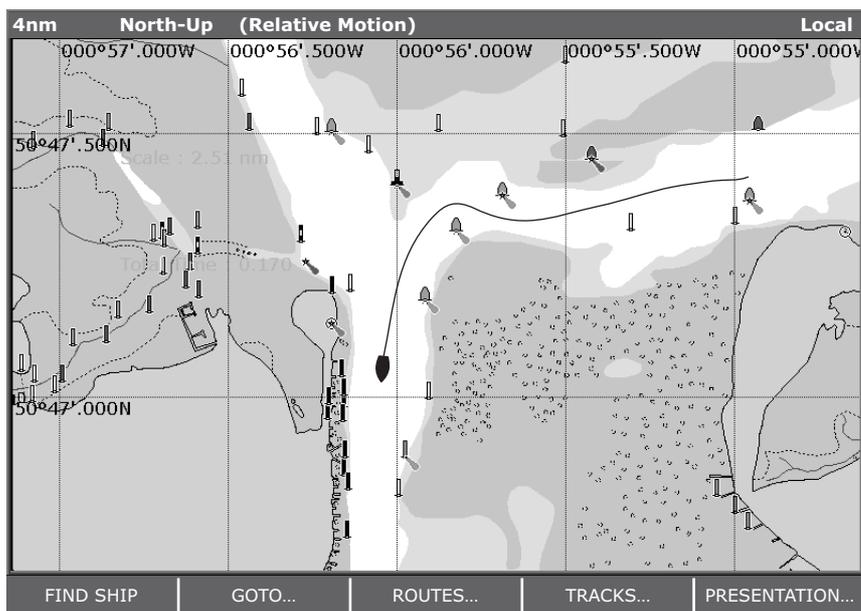


The CDI assists with accurately maintaining your course to your destination. A 'rolling road' in three dimensional perspective provides a real-time display of your boat's course. See *Chapter 6: Using the Course Deviation Indicator* for more information.

4.9 How do I record where I have been?

What is a track?

A track is an on-screen trail that represents the course you have taken. This trail is made up of a series of track points which are created automatically. You can save the track to create a permanent record of where you have been. All track functions described in this section are accessed via the TRACKS soft key



How can I use tracks?

Tracks can be used to:

- Review where you have been.
- Retrace your original journey by converting the track to a route and automatically reversing it.

You have the option to personalize your tracks by renaming them or changing their color.

How do I create a track?

To start tracking...



Press START TRACK.

A track starts to be laid from the stern of the boat using the minimum number of track points necessary. If the maximum number of tracking points is reached, you will be warned. The track will continue to be recorded with the earlier tracking points being overwritten.

Note: *If the power fails whilst a track is being recorded or the position fix is lost, a break will occur in the track. In this case only the last segment can be converted into a route.*

To stop tracking...



To stop laying a track, press STOP TRACK.

You are asked what you want to do with your track:

- To save this track, press SAVE. The Save Track box is displayed to enable you to change the track's name or color. See *How do I change the name or color of a route or track?* on page 26.
- To delete this track from the system, press DISCARD TRACK. A warning message is displayed.
- To resume tracking, press CANCEL STOP COMMAND.

How do I create a route from a track?

Creating a route from a track enables you to retrace a saved track.

When a track is converted the system creates the closest route through the recorded track, using the minimum number of waypoints. Each waypoint created will be saved with the depth and temperature data (if applicable) for that position.

On completion, the maximum deviation of the route from the recorded track is displayed and the new route is added to the route list. It can now be displayed, edited and erased etc. in the same way as other routes in the system.

Note: *If a track break occurs, only the last segment is converted to a route.*

... from the current track?

You can create a route from the track that you are currently laying. This method will take a snapshot of the track to date, convert it to a route and then continue laying the track:



1. Press CREATE ROUTE FROM TRACK. The track list is displayed.

2. Press CREATE ROUTE FROM TRACK again.
The system generates the route, displays the maximum deviation from the recorded track and asks if you want to give the route a name of your choosing.
3. Press:
 - YES to assign this route a name of your choice. (see *How do I change the name or color of a route or track?* on page 26).
 - Or:*
 - NO to assign this route a default name.

...from a saved track?

You can create a route from a track that you have already saved:



1. Move the cursor over the appropriate track or highlight it on the track list.
2. Press CREATE ROUTE FROM TRACK.
The system generates the route, displays the maximum deviation from the recorded track and asks if you want to give the route a name of your choosing.
3. Press:
 - YES to assign this route a name of your choice (see *How do I change the name or color of a route or track?* on page 26).
 - Or:*
 - NO to assign this route a default name.

4.10 How do I edit my routes and tracks?

Once you have created a route or track, it can be edited in a variety of ways. You can:

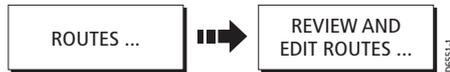
- Reverse a route (see page 23)
- Amend the course of a route (see page 23).
- Change the name of a route or track (see page 26).
- Change the color of a route or track (see page 26).
- Erase a route or track (see page 27).

For a route or track to be edited it must first be selected

Note: *An active route can be edited, with the exception of the target waypoint. If a waypoint being edited becomes the target, then the system shall cancel the edit; the waypoint shall remain in its original position.*

How do I select a route or track for editing?

To select a route...



1. Press REVIEW & EDIT ROUTES. The route list together with the associated soft keys are displayed:

Route List	
Colour Name	On Chart: <input type="text" value="Shown"/>
<input checked="" type="checkbox"/> COASTAL TRIP	Summary:
<input type="checkbox"/> HARBOUR TOUR	Waypoints: 9
<input type="checkbox"/> ISLAND HOP	Distance: 4.561nm
<input type="checkbox"/> LONG ROUND TRIP	Start Position:
<input type="checkbox"/> SHORT ROUND TRIP	50°44'.029N 001°29'.960W
	End Position:
	50°45'.368N 001°31'.728W

ERASE ROUTE	AMEND ROUTE COURSE...	ROUTE DETAILS...	EDIT NAME AND COLOUR...
-------------	-----------------------	------------------	-------------------------

2. Select the required route.
You can now edit the route as described on *page 23*.

Note: Alternately, the appropriate route can be selected on screen with the cursor.

To select a track...



1. Press REVIEW & EDIT TRACKS. The track list and associated soft keys are shown:

Track List	
Colour Name	On Chart: <input type="text" value="Shown"/>
<input checked="" type="checkbox"/> COASTAL TRIP	Summary:
<input type="checkbox"/> HARBOUR TOUR	Track Points: 1000
<input type="checkbox"/> ISLAND HOP	Distance: 73.58nm
<input type="checkbox"/> LONG ROUND TRIP	Start Position:
<input type="checkbox"/> SHORT ROUND TRIP	50°44'.757N 001°29'.766W
	End Position:
	50°45'.057N 001°31'.171W

ERASE TRACK			EDIT NAME AND COLOUR...
-------------	--	--	-------------------------

2. Select the required track. You can now edit the track as described on *page 23*.

Note: Alternately, the appropriate track can be selected on screen with the cursor.

How do I reverse a route?

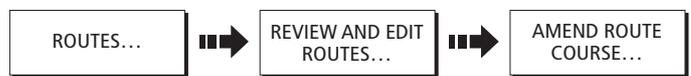


You can reverse the course of a route as follows:

1. Select the appropriate route on screen.
2. Press REVERSE ROUTE. The route name moves to new starting point and the waypoints within the route renumber accordingly .

Note: For details of how to reverse and immediately follow a route, see page 23.

How do I change the course of a route?



You can amend the course of a route by:

- Adding a waypoint to the beginning or end of the route or between two existing waypoints.
- Moving a waypoint within a route.
- Removing a waypoint

You can affect these changes either via the Make Route dialog box or by selecting the route on screen and then using the appropriate soft keys (not applicable when adding a waypoint at the beginning of a route).

Note: You will not be able to edit the waypoint that you are currently navigating to (target waypoint).

Adding a waypoint

... at the beginning of your route

This option changes the course of a route by adding an existing waypoint to the start of the route:

1. Select the appropriate route for editing via the REVIEW AND EDIT ROUTES soft key or select the route on screen and then press REVIEW AND EDIT THIS ROUTE.
2. Press AMEND ROUTE COURSE.
3. Press USE WAYPOINT LIST.
The Make Route screen is displayed.

Make Route	
Waypoints	New Route
Harbour Ent.	01 Midchannel
Midchannel	02 Outer Harbour
Outer Harbour	03 Harbour Ent.
Pierhead	
Waypoint 4	
50°46'.751N 001°06'.095W	50°47'.356N 001°06'.604W

- Use the trackpad (right) to move control from the Waypoint column to the New Route column.
- Use the trackpad (up) to move the highlight immediately above the waypoint that is currently **first** in the route. column. A blank line is created:
- Move control back to the Waypoint column and select the waypoint that is to be added to your route.
- Press INSERT WAYPOINT.
The waypoint is inserted at the beginning of the route and the route index renumbers accordingly.

Make Route	
Waypoints	New Route
Harbour Ent.	01 Pierhead
Midchannel	02 Midchannel
Outer Harbour	03 Outer Harbour
Pierhead	04 Harbour Ent.
Waypoint 4	
50°44'.484N 001°09'.682W	50°44'.484N 001°09'.682W

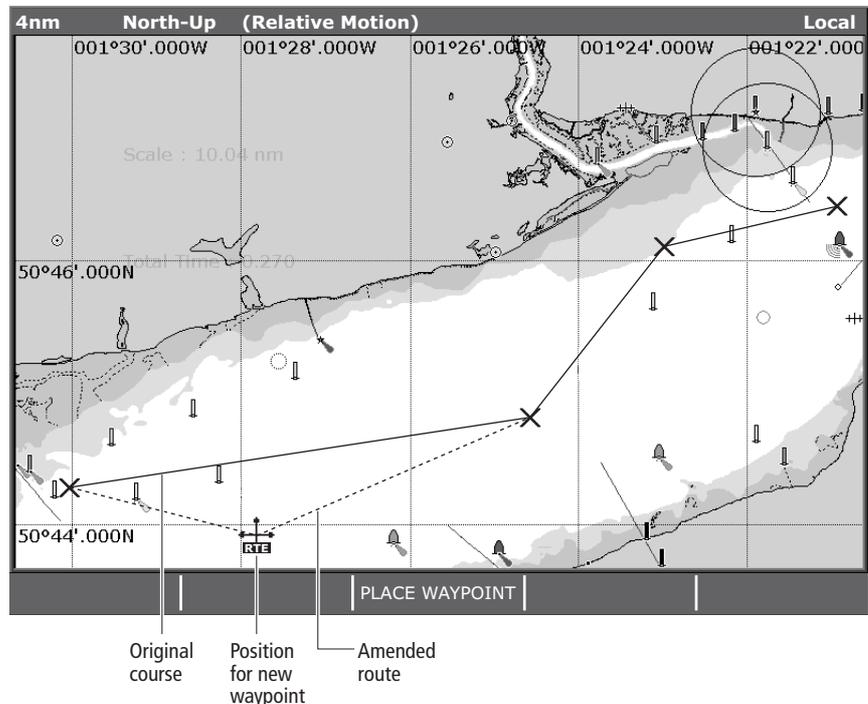
- Press SAVE ROUTE.

... within your route

This option inserts a waypoint within a route in order to change its course. You can either create a new waypoint for this purpose or use a waypoint that already exists in the system.

- Move the cursor over the appropriate leg of the route.
- Press INSERT WAYPOINT.
- Stretch the leg of the route and select either:

- An existing waypoint for inclusion in your route. The soft key USE THIS WAYPOINT is displayed or:
- The position for a new waypoint. The soft key PLACE WAYPOINT is displayed.



4. Press PLACE WAYPOINT or USE THIS WAYPOINT.
The new leg is incorporated into the route. The dashed line changes to a solid line and the route index re-numbers accordingly.

... by adding a waypoint(s) to the end of your route

1. Select the appropriate route for editing via the REVIEW AND EDIT ROUTES soft key or select the route on screen and then press REVIEW AND EDIT THIS ROUTE.
2. Press AMEND ROUTE COURSE.
Your cursor is joined to the last waypoint in the route with a dashed line.
3. Either drag the cursor to select:
 - An existing waypoint. The soft key USE THIS WAYPOINT is displayed.
Or:
 - The position where you want a new waypoint to be placed. The soft key PLACE WAYPOINT is displayed.
4. Press USE THIS WAYPOINT or PLACE WAYPOINT.
The dashed line changes to a solid line to indicate that the new leg has been added to the end of your route.
5. If required, you can add further waypoints to the end of the route by repeating steps (3) and (4) above.

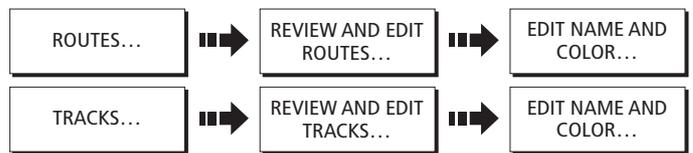
... by moving a waypoint

1. Move the cursor over the waypoint that is to be repositioned within the route.
2. Press MOVE WAYPOINT.
The route legs connected to the selected waypoint are now represented by a dashed line.
3. Drag the cursor to the new position.
4. Press **OK**.
The waypoint is fixed at the new location and the route legs connected to it revert to a solid line.

Note: *A waypoint's new position will be reflected in all other routes that make use of it.*

... by removing a waypoint

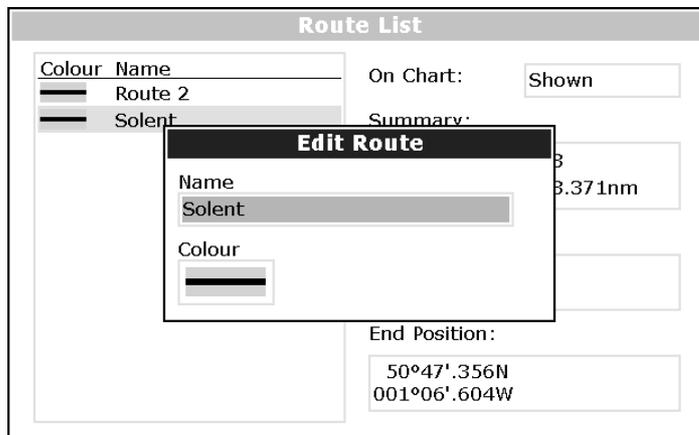
1. Move the cursor over the waypoint that is to be removed.
2. Press REMOVE WAYPOINT.
Provided that this waypoint was created as part of that route, and it has not been used in another route, the system deletes it from the system. If the waypoint is used in another route, the system will warn you that it cannot be removed.

How do I change the name or color of a route or track?

You can change the name for a more meaningful one and/or change the color if required. This will make them easier to distinguish from one another, particularly if you have numerous routes or tracks in your system.

To change the route or track name/color proceed as follows:

1. Select the appropriate route or track on screen or via the route or track list.
2. Press EDIT NAME & COLOR.
The edit route or track screen is displayed:



3. Use the trackpad to select the name or color box.
4. Press EDIT NAME or EDIT COLOUR to access the appropriate editing option.
5. Edit the required setting.
6. Press **OK** to save your selection.
The route or track list is updated accordingly.
7. Press **OK** again to return to the chart.

Note: If the route has been saved by pressing FOLLOW (QUICK) ROUTE, the route is named 'Quick Route'.

How do I erase a route or track?



You can delete any route or track in your system except for the one that you are traveling to.

1. Select the appropriate route or track.
2. Press ERASE ROUTE or ERASE TRACK.
A warning box is displayed asking you whether you want to proceed.
3. If you choose to proceed, the route or track is erased.

Note: Routes only - when you erase a route the system deletes only those waypoints created with this particular route. Waypoints that have been created separately or are used in other routes, are not deleted.

4.11 How can I change what I see in the chart window?

The chart screen can be tailored to your particular needs. You can:

- Change the chart view (see below).
- Change how the chart is orientated (see *page 29*).
- Change your boat position (motion mode) in relation to the chart (see *page 30*).
- Show or hide the chart grid (see *page 31*).
- Show or hide waypoints (see *page 31*).
- Show or hide the waypoint index of a route (see *page 33*).
- Choose which routes and tracks are displayed (see *page 33*).
- Switch the preset list of cartographic objects on or off (see *page 5*).
- Switch selected cartographic features on or off (see *page 39*).
- Show or hide chart vectors for COG, heading, tide and wind (see *page 17*).
- Overlay radar onto chart (see *page 33*).

Can I work with multiple chart views?



If you have more than one chart view, you can either share the presentation or present each window independently. The option you have chosen is indicated on the chart status bar as LOCAL or SYSTEM.

Note: *Whenever you initially open a chart window, its chart presentation will be the same. If you want to display two chart windows with different presentation, you need to change one view to be LOCAL and then adjust the presentation as required.*

Local chart view

When local chart view is selected the presentation for each window is set independently.

System chart view

Any windows set to system view, will have the same presentation as other system windows for:

- Chart mode and orientation.
- Radar/chart overlay
- Show/hide waypoints, routes and tracks.
- Declutter.
- Vectors.

If you change any of these options in one window, ALL system windows will update. When a chart application is started it defaults to system view.

Note: *The motion mode will be set but not synchronized across windows when the chart view is set to shared.*

How do I set the orientation of the chart?



The orientation of a chart refers to the relationship between the chart and the direction that you are travelling in. It is used in conjunction with motion mode (see page *page 30*) to control how your boat and chart relate to one another and how they are displayed on screen. The mode that you choose is restored at power up and consists of the following:

Head Up (H-up)

Head Up mode displays the chart with your boat's current heading upwards. As the heading changes the boat symbol remains fixed and the chart picture rotates accordingly.

Notes: (1) *To prevent continuous backwards and forwards rotations as the boat yaws from side-to-side, the chart will not update unless the heading changes by at least 10 degrees from the last displayed orientation.*

(2) *It is not possible to select Head Up when the motion mode is set to True.*

North Up (N-up)

In North Up mode, the chart orientation is fixed with true north upwards. As your heading changes the boat symbol moves accordingly. This is the default mode for the chart application.

Course Up (C-UP)

In Course Up mode, the chart picture is stabilized and shown with your current course upwards. As your boat's heading changes, the ship symbol moves accordingly. If you select a new course, the picture will reset to display the new course upwards.

The reference used for Course-Up depends upon the information available at a given time. The system always prioritises this information in the following order:

1. Bearing from origin to destination, i.e. intended course .
2. Locked heading from an Autopilot.
3. Bearing to waypoint.
4. Instantaneous heading.

If heading data becomes unavailable whilst in this mode, a warning message will be shown and the chart uses 0° heading in relative motion.

How do I set the motion mode?



The motion mode controls the relationship between the chart and your boat. The three motion modes are:

- Relative motion.
- True motion.
- Autorange.

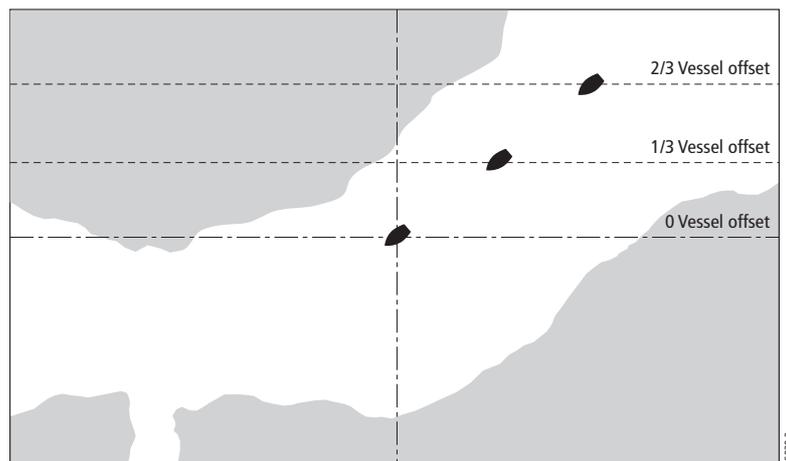
When you pan the chart, the motion mode is suspended. This is indicated in the status bar by () around the motion mode and enables you to view another area of the chart whilst navigating. To reset the motion mode and return your boat to the screen, press FIND SHIP. Manually changing the range in autorange also suspends motion mode.

The default setting is relative motion with zero offset. The mode that you select is restored at power up.

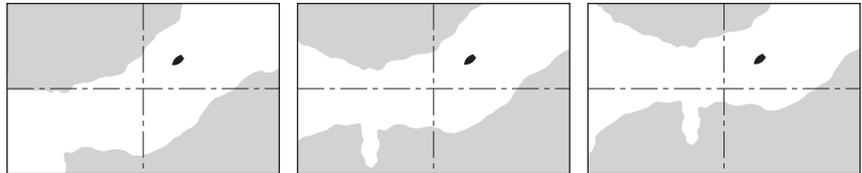
Relative motion (RM) with optional vessel offset

When the motion mode is set to Relative, the position of your boat is fixed on the screen and the chart picture moves relative to your boat.

You can specify using the VESSEL OFFSET soft key, whether the boat is fixed in the center of the window(0 offset) or offset by 1/3 or 2/3.



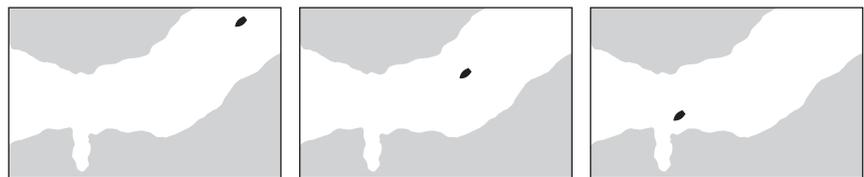
In the following example the motion mode has been set to Relative with a vessel offset of 1/3. The boat is fixed in the offset position and the chart moves accordingly:



True motion (TM)

When the motion mode is set to True, the chart is fixed and the boat moves in true perspective to fixed landmasses on the screen. As the boat's position approaches the edge of the screen, the chart picture is automatically reset to reveal the area ahead of the boat.

Note: It is not possible to select True Motion when the orientation is set to Head Up.



Autorange

Autorange selects and maintains the largest possible scale of chart that will display both the boat and the target waypoint.

How do I show or hide the chart grid?

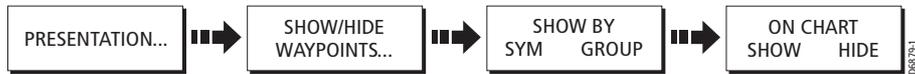
The display of grid lines on the chart is controlled via the Cartographic Setup Menu.

How do I show or hide waypoints/waypoint information?

The system has various options to control the display of waypoints and waypoint information: You can show or hide all your waypoints and their names or show or hide waypoints by group or by symbol.

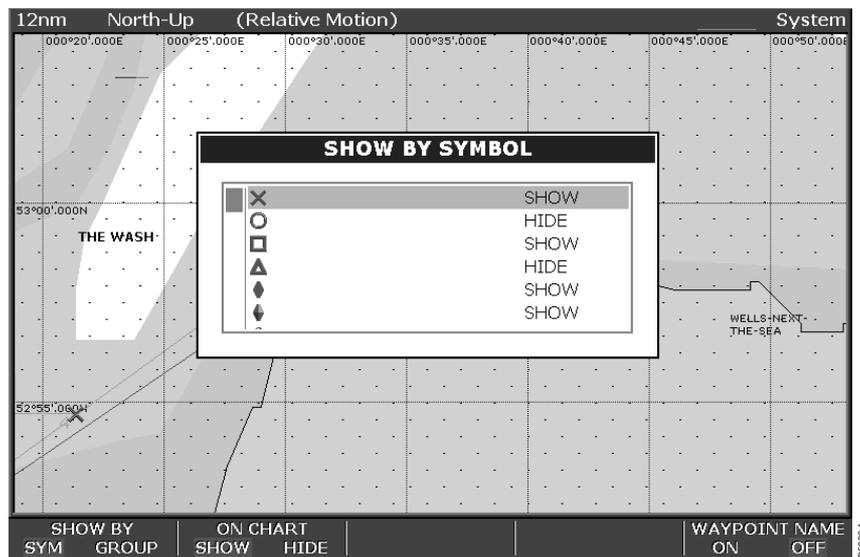
These options are particularly useful when you have placed a large number of waypoints in a small area and rendered your chart difficult to interpret. For more information please refer to *Chapter 3: Working with Waypoints*.

Showing/hiding waypoints by group/symbol



You can show or hide waypoints that have a particular symbol or belong to a specified group:

1. Press PRESENTATION and then SHOW/HIDE WAYPOINTS.
2. Toggle SHOW BY to:
 - SYM - to list all the waypoint symbols and their current display status e.g.



- GROUP - to list all the waypoint groups and their current display status e.g.
3. Use the trackpad (up/down) to highlight the appropriate symbol or group.
 4. Toggle ON CHART to SHOW or HIDE as appropriate.

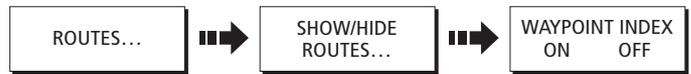
Showing/hiding the waypoint name



You can show or hide the waypoint names from the screen:

1. Press PRESENTATION and then SHOW/HIDE WAYPOINTS.
2. Toggle WAYPOINT NAME to ON or OFF as appropriate:

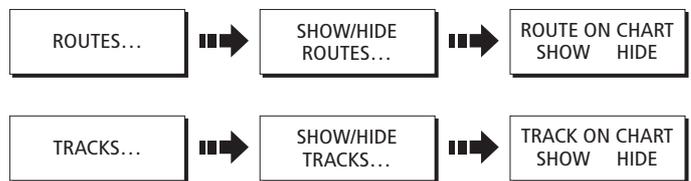
How do I show or hide the waypoint index?



The order of waypoints within a route is indicated by the waypoint index. To show/hide this index:

1. Press SHOW/HIDE ROUTES. The Route list is displayed.
2. Press WAYPOINT INDEX to highlight either ON or OFF as appropriate.

How do I show or hide a route or a track?



To show/hide a route or track:

1. Press SHOW/HIDE ROUTES or SHOW/HIDE TRACKS.
The Route/Track list is displayed.
2. Select the required route or track from the list. Its current display status is noted on the right-hand side of the list.
3. Press ROUTE ON CHART or TRACKS ON CHART to highlight either HIDE or SHOW as appropriate.

Notes: (1) *Alternately, move the cursor over the appropriate route or track and then press HIDE ROUTE or HIDE TRACK.*

(2) *The active route is always displayed irrespective of the display status.*

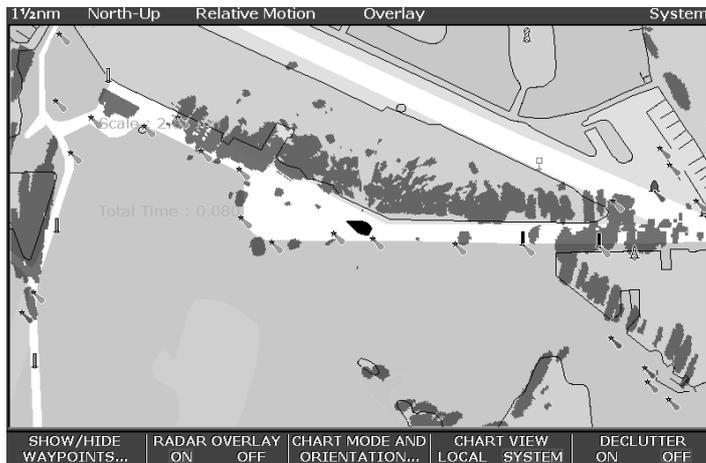
How do I overlay other radar images onto my chart?



You can overlay radar image data over your chart image allowing better distinction between fixed objects and other marine traffic.

To turn on radar overlay:

1. Press the PRESENTATION soft key.
2. Toggle RADAR OVERLAY to ON. If a radar is connected, the radar image will be overlaid on the chart and confirmed in the status bar e.g.



3. Press **OK** to exit the presentation options. The top level soft keys for the chart application change to reflect that radar overlay is in operation:



4. You can now use:
- **RADAR OPTIONS** - to access the target tracking, gain and target display for radar. See *Chapter 5: Using the Radar* for more information.
 - **NAVIGATION OPTIONS** - to access route and track options. See *How do I build and follow a route?* on page 9 and *How do I record where I have been?* on page 19 for more information.

Note: *When the overlay is turned on, the RANGE key only controls the chart scale. However, when RADAR OPTIONS is pressed to access the radar controls, the RANGE key will control the radar scanner range and not the chart scale.*

To turn off radar overlay:

1. Press the PRESENTATION soft key.
2. Toggle RADAR OVERLAY to OFF.

4.12 How do I get more from my chartplotter?

This section details additional features that will help you to interpret your surroundings and therefore get the most from your chart. These include:

- Displaying details of Port Services.
- Displaying tide data.
- Displaying graphical indicators.
- Measuring distances.

How do I display details of ports services

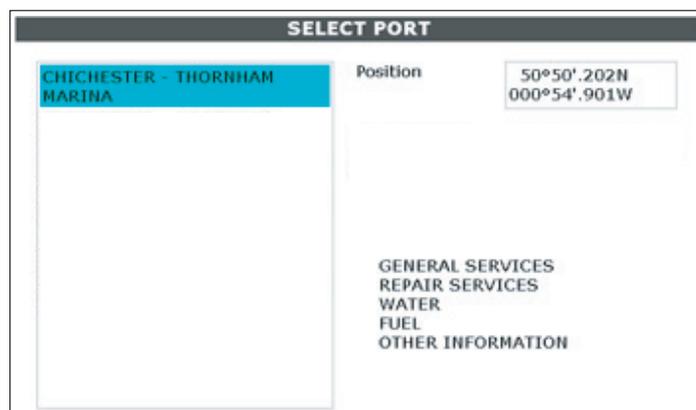
You can display details of port services by either selecting the appropriate port symbol with the cursor or by using the port search option.

Port symbol



You can display the services available at a particular port by selecting it on screen with the cursor.

1. Place the cursor over the port symbol for the required port.
2. Press **OK**. The services for the selected port are displayed e.g.



3. You can now:
 - Press **PORT INFORMATION**, to display port facilities and services in more detail.
 - Press **SHOW ON CHART**, to centre the screen on the selected port.

Search for a port

The port search option allows you to key in the name of the required port and display the available services.

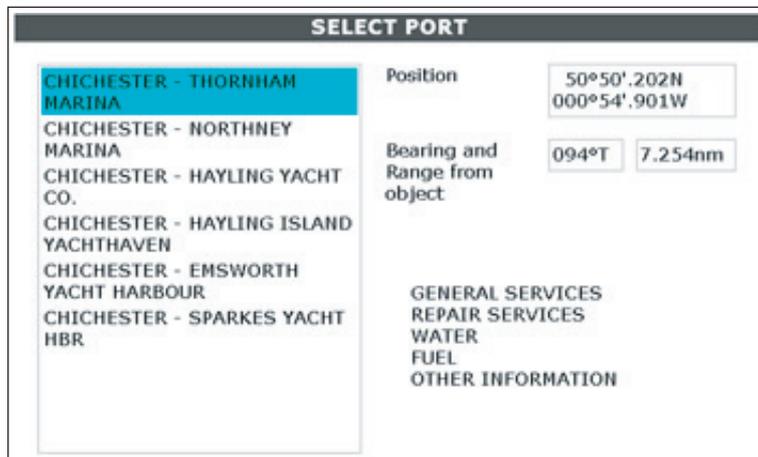
1. Press **OK** anywhere on the screen.
The Object Info box or chart source data box is displayed.
2. Press **SEARCH BY NAME**. The Search By Name edit box is displayed.
3. Press **EDIT NAME** and then type in the port name (or the first few characters of the port name) e.g.



4. Press **OK**.

5. Press SEARCH.

The port(s) that match your search are displayed in the Select Port pop-up e.g



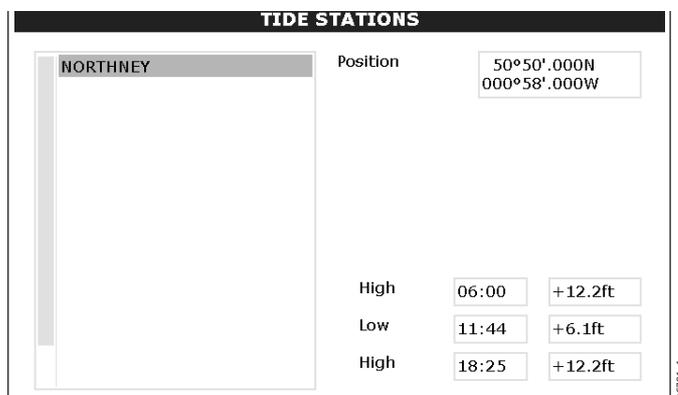
6. Use the trackpad to select the appropriate port. A list of the facilities and services available at that port are displayed.
7. You can now:
 - Press PORT INFORMATION, to display the available facilities and services in more detail.
 - Press SHOW ON CHART, to centre the screen on the selected port.

How do I display details of tides?



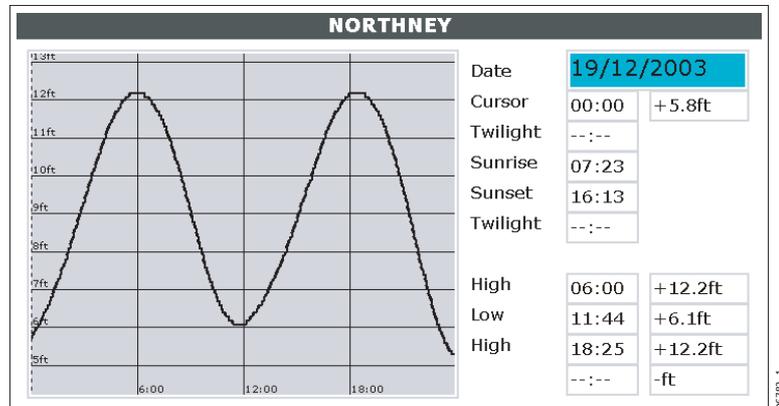
You can display details of tides by selecting the appropriate tidal diamond with the cursor.

1. Place the cursor over the tide diamond symbol.
2. Press **OK**. Details of the selected tidal station are displayed:



3. You can now:

- Press TIDAL DATA, to display the tidal curve:



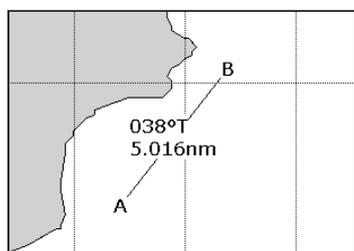
- Press SHOW ON CHART, to centre the screen on the selected port.

How do I measure distances on the chart?

You can use your C-Series display to obtain an accurate measurement of the distance and bearing between two points:



1. Press RULER from the **DATA** menu.
2. Press the ADJUST A key and then use the trackpad to place the start point.
3. Repeat using ADJUST B for the end point and press **OK**.
The range and bearing from A to B is displayed.
4. To move either point, press the appropriate ADJUST key and use the trackpad accordingly.
Press **OK** to fix the new positions.



4.13 How do I set up my chart and its cartography?

The set up for your chartplotter and its cartography can be changed from the standard configuration to suit your particular needs. Although you will probably only do this when you first use the chartplotter, you may decide to make subsequent adjustments once you become more familiar with the system. Any settings that you change are retained even when you power off.

To select the chartplotter set up menus, press **MENU** and then select either Chart Setup or Cartographic Setup.

Chart Setup

FUNCTION Description	OPTIONS (Default in bold)
<p>Object Information When set to ALL ON, details of cartographic area (including objects) is displayed when selected with the cursor. When set to POINTS ON, details of individual cartographic objects is displayed when selected with the cursor.</p>	<p>OFF All ON Points ON</p>
<p>Vector Length The time period specified for drawing COG and Heading vectors.</p>	<p>3 Mins 6 Mins Infinite</p>
<p>*Datum Grid moves according to datum selected and the lat/long of cartographic features change. System attempts to set up any GPS to the new mode and indicates whether successful or not.</p>	<p>WGS 84 List of datum provided</p>

CAUTION:

*** Changing the chart datum does *not* cause any waypoint or routes stored in the chartplotter to move on the display, although their latitude and longitude changes to reflect the new datum.**

When adding waypoints numerically to the waypoint list, or via SeaTalk, NMEA OR *hsb*², it is important that they are referenced to the same datum to which the display is currently set.

Cartography set up

FUNCTION Description	OPTIONS (Default in bold)
Chart Display The level of detail shown on the chart.	Detailed Simple
Chart Grid Grid lines of latitude and longitude.	ON OFF
Chart Text Text appearing on the chart e.g. place names etc.	ON OFF
Chart Boundaries The line indicating the boundary of the chart.	ON OFF
Spot Soundings Number on the chart indicating depth.	ON OFF
Safety Contour Areas with depths shallower that the specified value, are shaded in a darker blue than those areas with depths greater than the specified value.	OFF 7ft 16ft 33ft 66ft (Contour always drawn at or deeper than the selected depth).
Depth Contour A line indicating the depth at a particular position.	ALL 5m 10m 20m OFF
Nav. Marks	ON OFF
Nav. Marks Symbols The set of symbology used for navigation marks. Corresponds to paper charts.	International US
Light Sectors The sector of light cast by a fixed beacon.	ON OFF
Caution & Routing Data	ON OFF
Marine Features The cartographic features that are displayed on the water.	ON OFF
Land Features The cartographic features that are displayed on the land.	ON OFF

Note: See Chapter 2: General Operation and System Setup for all other set up menus.

4.14 How does my chart warn me of potential dangers?

If switched on, the following alarms will be triggered when you are in the radar application:

- System alarms - Anchor, Timer, Alarm clock and Temperature
- Navigation alarms - Arrival and Off track
- Radar alarms - Guard zones

When an alarm is triggered, a buzzer sounds and a pop-up window describing the alarm and how to clear it is displayed.

In some cases, the appropriate action is taken by the Radar. For example, following an arrival alarm, the next route leg is activated.

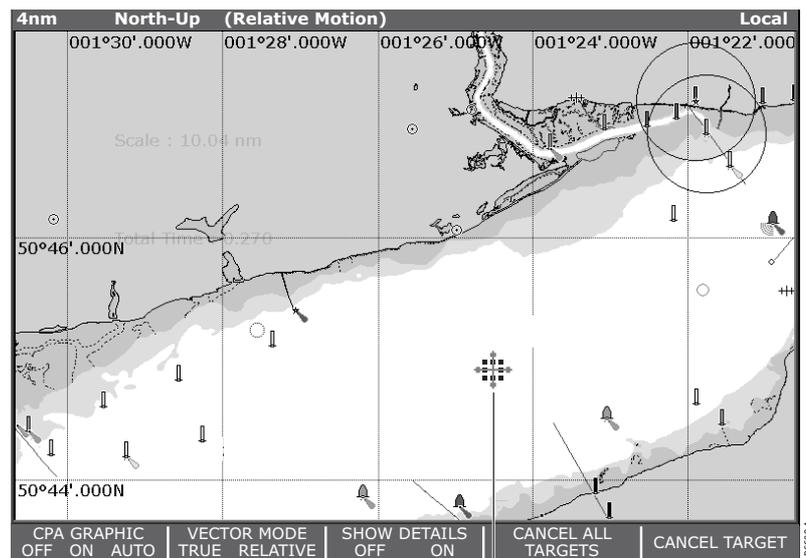
To switch these alarms on/off and set the limits, press **MENU** and select Alarm Setup. You should then select System or Navigation or Radar Alarms Setup as appropriate.

Note: For more details of alarms, see Chapter 2: General Operation and System Setup.

4.15 What radar functions can I see?

The Mini Automatic Radar Plotting Aid (MARPA) function is used for target tracking and risk analysis. Although set up in radar mode or radar overlay, all MARPA targets are displayed in the chart window and selected MARPA functions can be accessed via the chart. Detailed information on MARPA is available in *Chapter 5: Using the Radar*.

To access the MARPA controls when you are in chartplotter mode, select the MARPA target with the cursor.



MARPA target selected

Chapter 5: Using the Radar

5.1 Introduction

This chapter describes the basics of radar and the things that can affect your radar picture. It then shows you how to use your radar and its various functions including:

- Setting up the radar display.
- Getting the best radar picture.
- Changing orientation and motion mode.
- Collision avoidance using VRM/EBLs, Guard Zones and MARPA.
- Using waypoints to mark positions.
- Measuring distances and bearings.
- Radar alarms.

5.2 What is radar?

Radio Detection And Ranging (RADAR) is something that is in use all around us, although it is normally invisible. One of the most common uses of radar at sea is to detect the presence of objects, known as 'targets' at a distance, and if they are moving, detect their speed.

This chapter of the Reference manual provides the information and instructions to enable you to start using the radar so that you know what is around you and use the in-built Mini Automatic Radar Plotting Aid (MARPA) functions to help in collision avoidance.

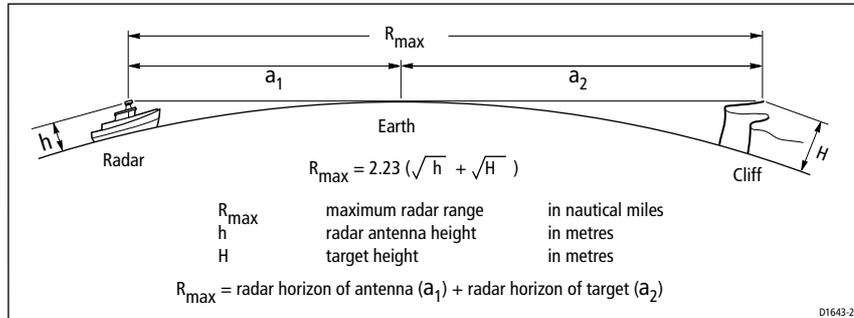
Until you are familiar with interpreting the radar display, every opportunity should be taken to compare the radar screen patterns with visual targets, such as other boats, buoys and coastal structures. You should practise harbor and coastal navigation during daylight hours and in clear weather conditions.

Detecting targets

Radar works by transmitting radio pulses, then detecting reflections of these pulses (echoes) from objects in the area and displaying the reflections as targets on your display.

What is the maximum range of my radar?

Maximum radar range is essentially line-of-sight, so is limited by the height of the scanner and the height of the target as illustrated below:



The table below shows typical maximum radar ranges for various radar antenna heights and target heights. Remember that although the radar horizon is greater than the optical horizon, the radar can only detect targets if a large enough target is above the radar horizon.

Antenna height (m)	Target height (m)	Maximum range (nm)
3	3	7.7
3	10	10.9
5	3	8.9
5	10	12.0

What factors can impair a radar picture?

Not all radar echoes are produced by valid targets. Spurious echoes may be caused by:

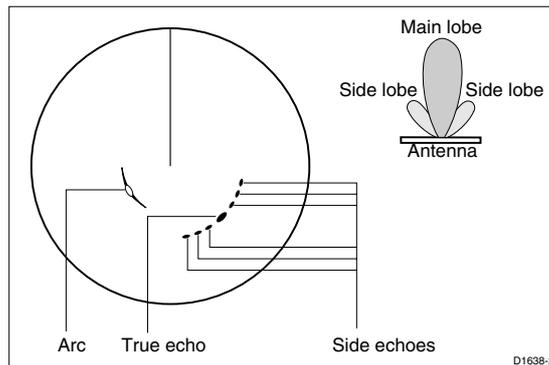
- Side lobes.
- Indirect echoes.
- Multiple echoes.
- Blind sectors.
- Sea, rain or snow clutter.
- Interference.

Through observation, practice, and experience, you can generally detect these conditions very quickly and use the radar controls to minimize them.

Side lobes

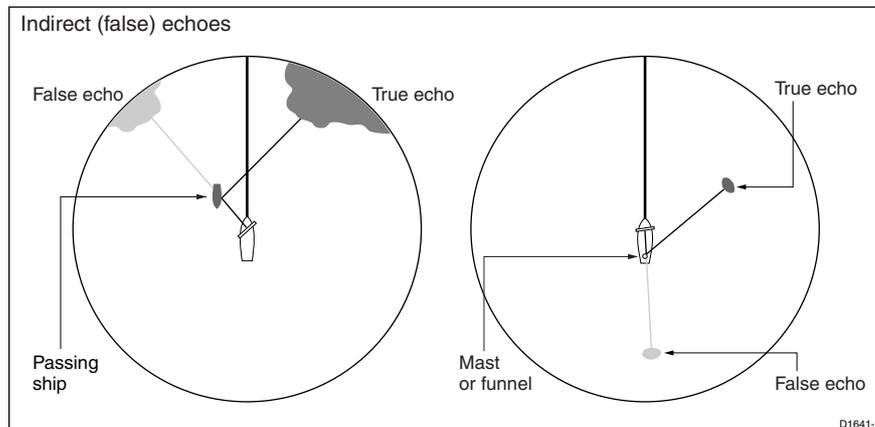
Side lobe patterns are produced by small amounts of energy from the transmitted pulses that are radiated outside the narrow main beam.

The effects of side lobes are most noticeable with targets at short ranges (normally below 3 nm), and in particular with larger objects. Side lobe echoes form either arcs on the radar screen similar to range rings, or a series of echoes forming a broken arc.



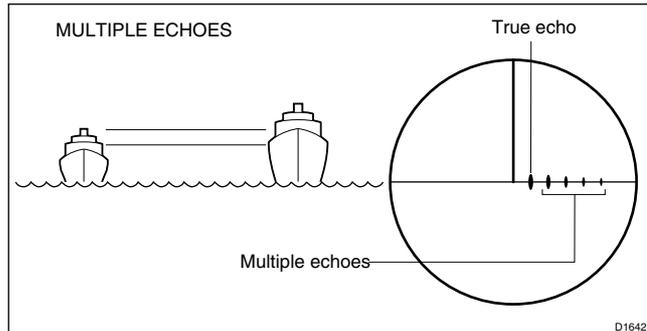
Indirect echoes

There are several types of indirect echoes or ghost images. These sometimes have the appearance of true echoes, but in general they are intermittent and poorly defined.



Multiple echoes

Multiple echoes are not very common but can occur if there is a large target with a wide vertical surface at a comparatively short range. The transmitted signal will be reflected back and forth between the target and your own ship, resulting in multiple echoes, displayed beyond the range of the true target echo, but on the same bearing.

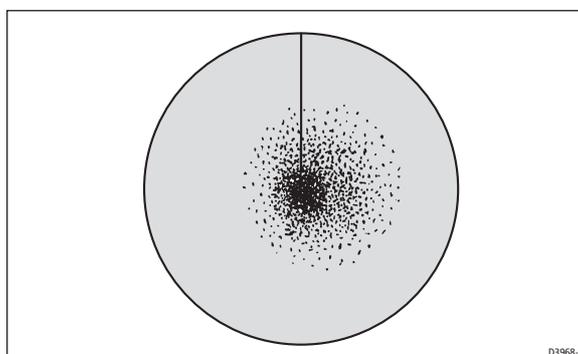


Blind sectors

Obstructions such as funnels and masts near the radar antenna may obstruct the radar beam and cause radar shadows or 'blind sectors'. If the obstruction is relatively narrow, there will be a reduction of the beam intensity, though not necessarily a complete cut-off. However, for wider obstructions there may be a total loss of signal in the shadow area. There may also be multiple echoes which extend behind the obstruction. Blind sector effects can normally be minimized by careful selection of the scanner site prior to installation.

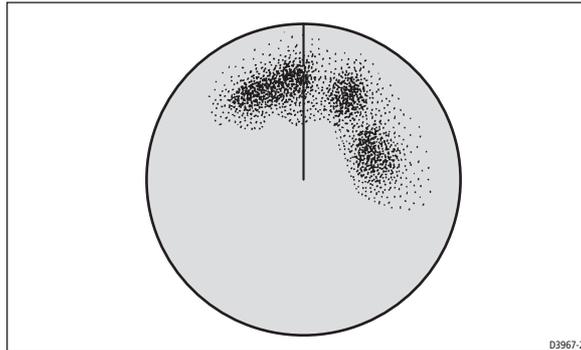
Sea clutter

Radar returns from waves around the vessel can clutter the centre of the radar picture, making it difficult to detect real targets. Such 'sea clutter' usually appears as multiple echoes on the display at short range scales, and the echoes are not repetitive or consistent in position. With high winds and extreme conditions, echoes from sea clutter may cause dense background clutter in the shape of an almost solid disc.



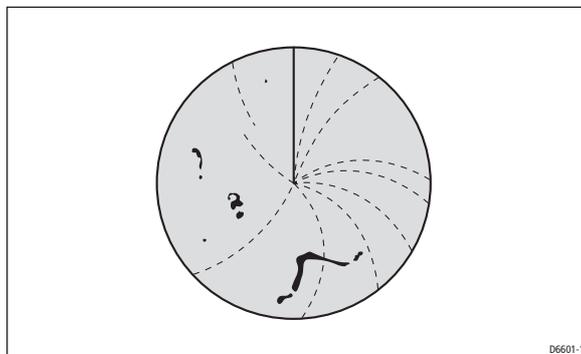
Rain clutter

The radar can see echoes from rain or snow. Returns from storm areas and rain squalls consist of countless small echoes that continuously change size, intensity and position. These returns sometimes appear as large hazy areas, depending on the intensity of the rainfall or snow in the storm cell.



Interference

When two or more radar-equipped vessels are operating within range of each other mutual radar interference can occur. This usually appears as a spiral of small dots from the display center. This type of interference is most noticeable at long ranges.



5.3 How do I power on /off the various operating modes

RADAR TX STDBY	SCANNER ON OFF		PALETTE DAY NIGHT
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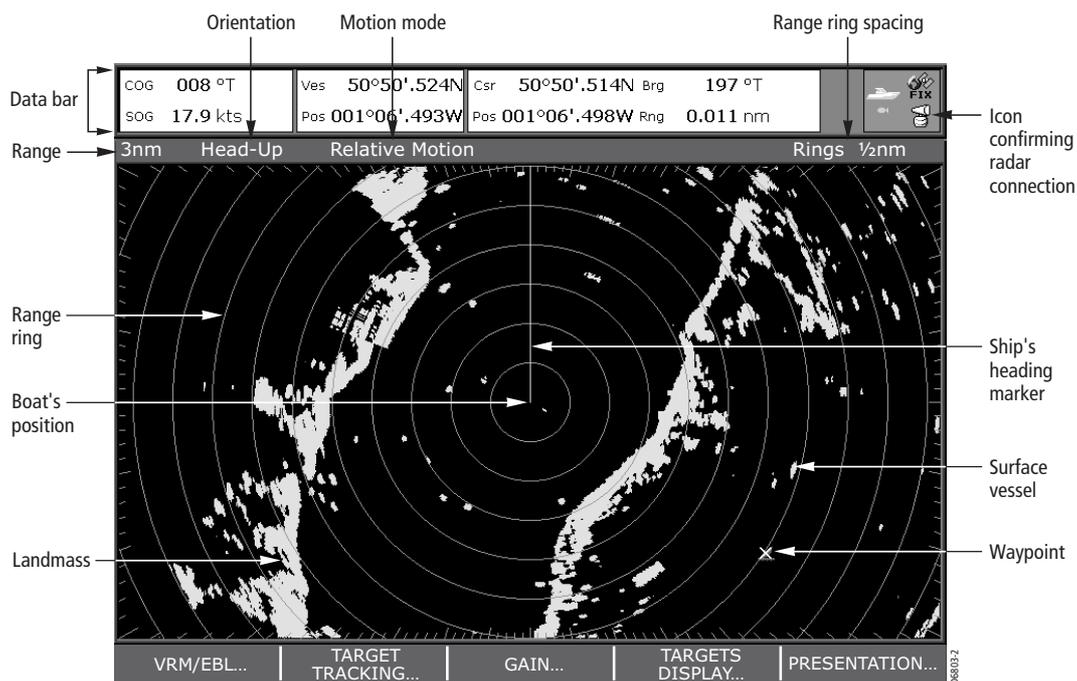
To control the power to the radar, press the **POWER** button and use the appropriate soft key or menu to to select the required operating mode. The scanner icon in the data bar indicates the chosen status.

- Scanner Off**
 Select SCANNER OFF mode when you do not require the radar, but you are using the display unit for other tasks, say, using the chart. The system applies a count-down, during which time you cannot re-power the scanner. This mode is indicated in the data bar by a greyed-out scanner icon.
 - Transmit (TX)**
 When the SCANNER is set to ON, select RADAR TX mode to activate the scanner. This mode is indicated in the data bar by a rotating scanner.
 - Standby (STDBY)**
 When the SCANNER is set to ON, select RADAR STDBY mode when you are not operating the radar for short time periods. The antenna does not rotate, the scanner does not transmit and the radar data is removed from the screen. This results in the radar using less power although the scanner remains powered so that when you return to transmit mode, the magnetron does not need to warm up. Standby Mode is indicated in the data bar by a static scanner. This is the default mode.
- Note:** *When an open array antenna is fitted, the system stops the antenna in the forward facing position when Standby mode is selected.*
- Timed Transmit**
 In this mode the scanner alternates between transmitting for a number of scans and then entering standby for a number of seconds. This mode is selected and set up via the Radar Setup Menu (see *How do I set up my radar?* on page 27). Timed Transmit mode is indicated in the data bar by a scanner that alternates between static and rotating.

5.4 What does the radar picture show me?

You will need heading and position data for full functionality of your radar. A fast heading sensor is also needed for operation of MARPA and radar/chart overlay functions.

With your radar scanner connected and the radar in transmit mode, the radar picture, provides a map-like representation of the area in which the radar is operating e.g.



Typically, your boat's position is at the centre of the display, and its dead ahead bearing is indicated by a vertical heading line, known as the Ship's Heading Marker (SHM).

On-screen targets may be large, small, bright or faint, dependent on the size of the object, its orientation and surface. Strongest target returns are displayed in yellow with weaker returns in two shades of blue. Be aware that the size of a target on screen is dependent on many factors and may not necessarily be proportional to its physical size. Nearby objects may appear to be the same size as a distant larger objects.

With experience, the approximate size of different objects can be determined by the relative size and brightness of the echoes. You should bear in mind that:

The size of each on-screen target is affected by:

- The physical size of the reflecting object.
- The material from which the object is made. Metallic surfaces reflect signals better than non-metallic.

- Vertical objects such as cliffs reflect signals better than sloping ones such as sandbanks
- High coastlines and mountainous coastal regions can be observed at longer radar ranges. Therefore, the first sight of land may be a mountain several miles inland from the coastline. Although the coastline may be much nearer, it may not appear on the radar until the vessel is closer to shore.
- Some targets, such as buoys and small boats, can be difficult to discern, because they do not present a consistent reflecting surface as they bob and toss about in the waves. Consequently, these echoes tend to fade and brighten and at times, to disappear momentarily.
- Buoys and small boats often resemble each other, but boats can often be distinguished by their motion.

What does the status bar tell me?

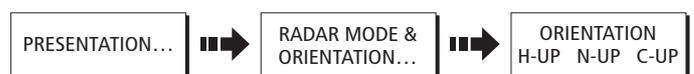
The status bar, as shown below, at the top of the radar picture provides at-a-glance information about the picture and your selected settings.

5.5 How can I change what I see in the radar window?

The radar screen can be tailored to your particular needs. You can:

- Change how the radar is orientated (see *page 8*).
- Change where your boat is positioned (motion mode) in relation to the radar (see *page 9*).
- Show or hide waypoints (see *Chapter 3: Working with Waypoints*).
- Show or hide range rings (see *page 10*).
- Change the bearing mode for EBLs (see *page 10*).

How do I set the orientation of the radar?



The orientation of the radar refers to the relationship between the radar and the direction that you are travelling in. It is used in conjunction with motion mode (see *page 9*) to control how your boat and radar relate to one another and how they are displayed on screen. Any changes that you make to the orientation of the radar are retained when you switch off. There are three orientation modes to choose from:

Head Up (H-UP)

Head Up mode displays the radar picture with your boat's current heading (SHM) upwards. As the heading changes the radar picture rotates accordingly.

This is the default mode for the radar application.

North Up (N-UP)

In North Up mode, the radar picture is fixed with true north upwards. As your boat changes its heading, the SHM will move accordingly.

Notes: (1) *If heading data becomes unavailable whilst in this mode, a warning message will be shown and the radar uses 0° heading in relative motion. When heading data becomes available once more, North-Up mode is reinstated.*

(2) *It is not possible to select Head Up mode when the motion mode is set to True.*

Course Up (C-UP)

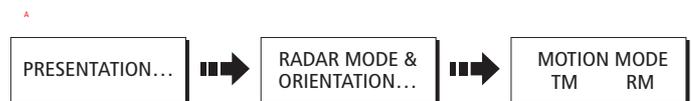
In Course Up mode, the radar picture is stabilized and shown with your current course upwards. As your boat's heading changes, the SHM moves accordingly. If you select a new course, the picture will reset to display the new course upwards.

The reference used for Course-Up depends upon the information available at a given time. The system always prioritises this information in the following order:

1. Bearing from origin to destination, i.e. intended course .
2. Locked heading from an Autopilot.
3. Bearing to waypoint.
4. Instantaneous heading.

Note: *If heading data becomes unavailable whilst in this mode, a warning message will be shown and the radar uses 0° heading in relative motion. When heading data becomes available once more, Course-Up mode is reinstated.*

How do I set the motion mode?



The motion mode controls the relationship between the radar and your boat. There are two modes:

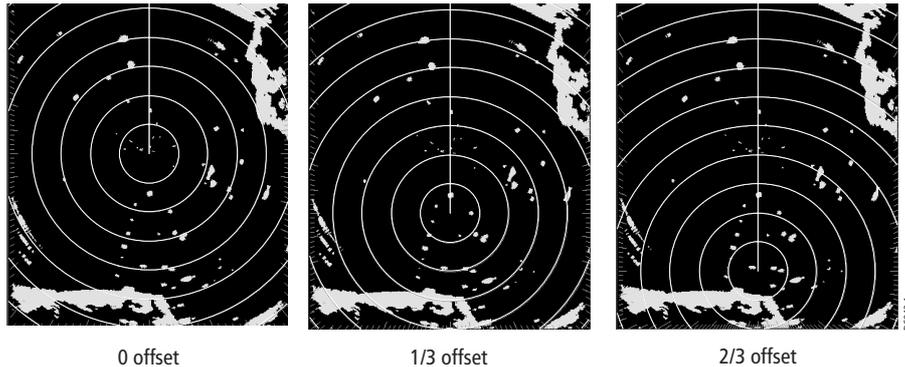
- Relative motion.
- True motion.

The selected motion mode is displayed in the status bar. The default setting is relative motion with zero offset

Relative motion (RM) with optional vessel offset

When the motion mode is set to Relative, the position of your boat is fixed on the screen and all the targets move relative to the boat.

You can specify using the VESSEL OFFSET soft key, whether the boat is fixed in the center of the window (0 offset) or offset by 1/3 or 2/3:



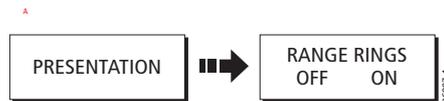
The default mode for the radar application is Relative with zero offset.

True Motion (TM)

When the motion mode is set to True, fixed radar targets maintain a constant position and moving vessels (including your boat) travel in true perspective to each other and to fixed landmasses on the screen. As the boat's position approaches the edge of the screen, the radar picture is automatically reset to reveal the area ahead of the boat.

- Notes:** (1) *If heading and position data become unavailable when True motion is selected, a warning message will be shown, and the mode will revert to relative motion.*
- (2) *It is not possible to select True Motion when the orientation is set to Head Up.*

How do I show/hide the range rings?



To turn the range rings on/off:

1. Press PRESENTATION.
2. Toggle RANGE RINGS to OFF or ON as required.

How do I change the bearing mode for EBLs?

The default bearing mode for EBLs is relative to your vessel's heading. If heading data is available, this bearing information can be displayed as magnetic, true or relative.



To change the EBL reference:

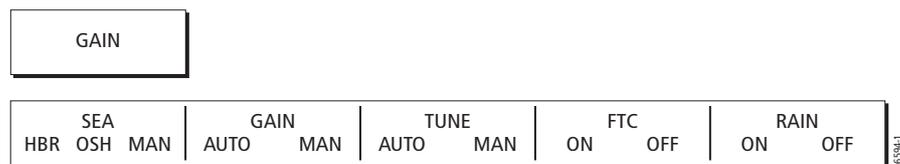
1. Press PRESENTATION.
2. Toggle EBL REFERENCE to M/T. Dependant on the equipment connected, the EBL bearings will now be expressed as either 'T' (True) or 'M' (Magnetic) on both the radar screen EBL label and on the ADJUST EBL soft key.

5.6 How can I get the best picture?

You can improve the quality of the radar picture by using:

- The GAIN soft key and associated controls - Sea, Gain, Tune, FTC and Rain.
- The TARGET soft key and associated controls - Interference Rejection, Expansion, Wakes.

How do I use the GAIN functions?



The gain function reduces the effects of false echoes and clutter. For the best results Raymarine recommends that you retain the AUTO default setting. You can however adjust these settings if required. Any adjustments that you make are retained by the radar when it is switched off.

Sea

Radar echoes from waves around your boat can clutter the centre of the radar picture, making it difficult to detect real targets (see *page 4*).

Adjusting the sea gain will reduce this clutter for up to 3-5 nautical miles (depending on wave and sea conditions) from your boat. This has the effect of reducing the sea echoes to intermittent small dots whilst small targets remain visible.. Gain levels further from your boat remain unchanged.

To change the sea clutter gain, toggle the SEA soft key to the appropriate mode for your working area:

- **HBR (Automatic harbor mode)** - this takes account of the effects of land clutter so that small targets are not lost. It should be used when you are in harbor or in close proximity to land.

- **OSH (Automatic Offshore mode)** - the system continually calculates the required level of sea clutter control.
- **MAN (Manual mode)** - this enables you to select the sea clutter level and then adjust the settings to ensure that all close small targets are visible.. On short range scales, do not set the SEA control so high that all clutter is removed, since this could stop you seeing echoes from close targets. This should be used in conjunction with the GAIN function (described below).

Any changes that you make are retained when you power off your system.

Gain

The gain function makes the radar picture clearer by changing the sensitivity of radar reception.

If you set the GAIN to MAN (manual), you should check it every time you change the range scale:

- **For long ranges** - select a sensitivity level that gives a slight speckle in the background. Be careful not to set the gain too low, or you may miss weak or small targets
- **For shorter ranges** - reduce the gain slightly to reduce the speckle and therefore improve target definition.

Tune

The TUNE function is used to fine tune the receiver in the scanner for maximum target returns on the display. In AUTO mode, the radar tunes itself automatically on all range scales. **It is recommended that you leave the TUNE function in AUTO mode, to ensure that the radar receiver is always tuned to receive the maximum signal.**

If you do set the TUNE function to MANUAL, you will need to adjust it about 10 minutes after you have turned on the radar, since the required setting will change after the magnetron has warmed up. You should adjust the control to obtain the maximum signal strength (indicated by the eight step horizontal bar.). If you cannot tune the radar successfully, refer to C-Series Displays - Installation Manual.

FTC

You can use the Fast Time Constant (FTC) function to remove areas of clutter at a distance from your boat or to distinguish between two very close echoes on the same bearing, which may otherwise merge and appear as one echo

When the FTC function is turned up, only the leading edge of large (rain clutter) echoes is shown, while the effect on smaller (ship) echoes is only slight. As the receiver is less sensitive, and background noise and fill-in returns from land and other large targets reduced, you should turn the FTC function down when its use is not required. Since

storm cells are usually visible for long distances due to their extreme altitude, you may wish to leave them displayed so that you can observe the location of bad weather.

Notes: (1) *You should use this function in conjunction with the RAIN function to obtain the best picture.*

Rain

Your radar detects echoes from rain or snow. The strength of these echoes is dependent upon the altitude, range, density and size of the snow flakes or rain droplets and will appear on screen (see *page 5*) as countless small echoes continuously changing size, intensity and position.

Turning the RAIN clutter function on suppresses the bulk effect of rain returns from around your boat, so that detection of actual targets is made easier

How do I manually adjust the gain modes?

If necessary you can set the gain controls manually.

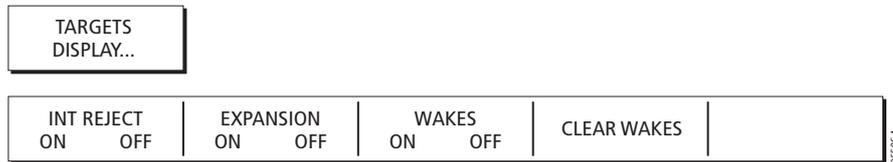
The new values remain set even when you switch off the display and are applied to both the active window and any other fishfinder windows displaying that frequency.

To change the gain manually:

1. Select GAIN and then toggle the GAIN option to MAN. The adjustment slider is displayed above the soft key.
2. Use the rotary control to adjust the value in the slider. This value takes immediate effect:
 - GAIN MODE - this should be set high enough to see fish and bottom detail but without too much background noise. Generally, a high gain is used in deep and/or clear water; a low gain in shallow and/or murky water.
 - COLOR GAIN - this sets the lower limit for the top color band. All echoes with a signal strength above this value are displayed in the strongest color. Those with a weaker value are divided equally between the remaining colors. Setting a low value produces wide band for the weakest color, but a small signal band for the other colors; setting a high value gives a wide band for the strongest color, but a small signal band for the other colors. You will need to re-adjust the color gain as conditions change.
 - TVG - A low TVG value has little effect on gain in shallow water.; a high value decreases the gain in shallow water so that only the strongest echoes are displayed.
3. Press **OK** or **CANCEL** twice to return to the default display.

How do I use the TARGET functions?

You can use the TARGET functions to improve target visibility.



Interference Rejection

The interference rejection function automatically reduces any mutual radar interference when two radar equipped vessels are operating within range of each other (see *What is radar?* on page 1). This function is normally left switched on, however, if you wish to detect the presence of other radars in the vicinity, you can turn off the interference rejection.

The two levels of interference rejection (NORMAL or HIGH) are selected in Radar Setup Menu, see page 27. To access this menu, press and hold the INT. REJECT key.

Expansion

The expansion function overrides the pulse length so that the target returns are stretched. This will make targets easier to see but may compromise range resolution.

The two magnification levels available. (LOW or HIGH) are selected in the Radar Setup Menu, see page 27. To access this menu, press and hold the EXPANSION key.

Wakes

You can see the direction and speed of moving targets relative to your boat, by selecting the wakes function.

When wakes is switched on, the target is displayed in yellow; as the signal diminishes with time it is shown in paler shades of blue. You can select, via the Radar Setup Menu, (see page 27) whether these wakes are shown for periods of 10 seconds, 30, seconds, 1 minute, 5 minutes or 10 minutes. To access this menu, press and hold the WAKES key.

When the currently displayed wakes are no longer required, press CLEAR WAKES to remove them from your screen.

5.7 How do I set up my radar display?

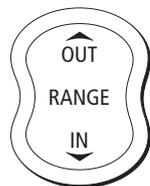
Display ranges

You can zoom in or out to view your radar picture at varying scales. The scale is measured from the centre to the top of the radar picture and is displayed in the right hand corner of the status bar.

The scale you will need is dependent upon where you are navigating and the level of detail that you wish to see:

- **Short range scales** - provide greater detail of radar echoes close to the vessel, and are most suited for use as you approach coastlines, harbors or other vessels in the area. The shortest range scale available is 1/8 nautical miles (or the equivalent in the chosen unit).
- **Long range scales** - provide the best overview of the vessel's relationship to landmasses, weather fronts and large ship targets in or beyond the field of vision. The longest range scale available is between 24 and 72 nautical miles (or the equivalent in the chosen unit) depending upon the scanner fitted.

How do I change the displayed range?



The range of the radar is adjusted by pressing the **RANGE** button.

Press **IN** to decrease the range scale or 'zoom in'.

Press **OUT** to increase the range scale or 'zooms out'.

Each press of the button changes the range by one setting. Pressing and holding the button will change the range quickly in the required direction.

Note: *When the radar is overlaid onto the chart, a range change in the chart application shall not affect the range in any radar windows. To activate the radar range when the chart application is active and radar is overlaid, select the RADAR OPTIONS soft key.*

5.8 How do I measure distances, ranges and bearings?

When you are using the radar application, you can measure distances, ranges and bearings in a variety of ways.. These options are detailed in the table below:

Functions	Distances	Ranges	Bearings
Range Rings	Yes (approx.)	Yes (approx.)	-
Cursor	-	Yes	Yes
Variable Range Markers (VRMs)	-	Yes	-
Electronic Bearing Lines (EBLs)	-	-	Yes
Floating VRMs	Yes	-	-
Floating EBLs			Yes

... Using the range rings

Use the range rings to gauge the approximate distances between points. Range rings are concentric circles displayed on the screen and centred from your boat at pre-set distances. The number of rings shown and their spacing changes as you range in and out. The current setting is displayed in the status bar e.g. RR 2nm.

... Using the cursor

To measure the bearing and range from your boat to a specified target, move the cursor to the appropriate position on the screen. The bearing and range is displayed in the data bar at the top of the screen.

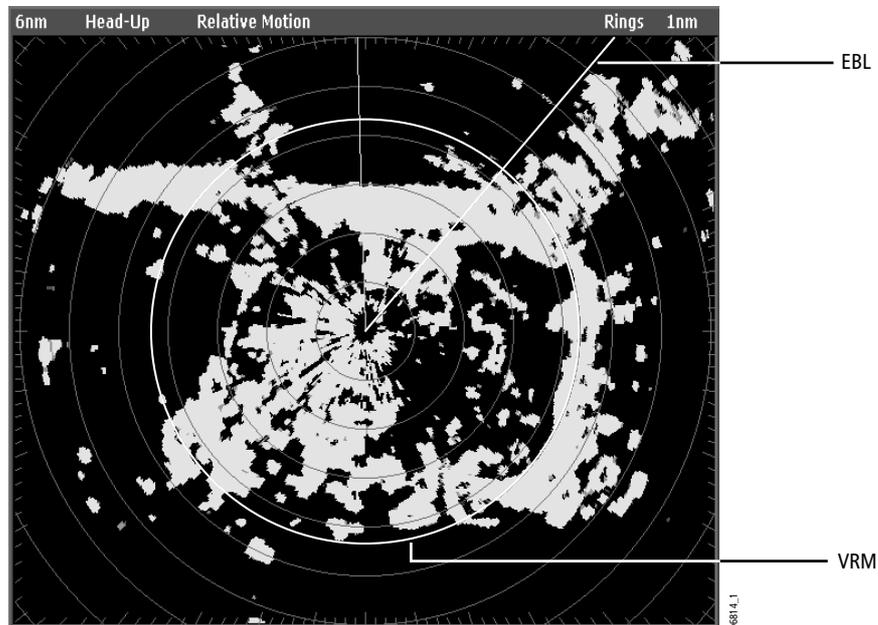
... Using VRMs and EBLs

A VRM is a circle centred on your vessel's position and fixed with respect to the heading mode. When this circle is adjusted to align with a target, its range from your boat is measured and displayed on the ADJUST VRM soft key.

An EBL is a line drawn from your boat to the edge of the window. When this line is rotated to align with a target, its bearing relative to your boat's heading is measured and displayed on the ADJUST EBL soft key.

A VRM and an EBL can be combined to measure both the range and the bearing of the specified target.

Note: *To change the EBL reference from relative to magnetic or true, see page 10).*



How do I create a VRM/EBL?



The first VRM/EBL will be placed at a location of 1/3 of the current range and 030° relative to your boat's head. If this setting is adjusted, the display will retain the adjustments and use them when the VRM/EBL is next turned on.

To use VRMs/EBLs to tell you the range/bearing of a target:

1. Toggle VRM/EBL soft key to ON. The VRM/EBL will be shown on the radar picture with your boat at its center.
2. ADJUST VRM and VRM are highlighted to indicate it can be adjusted.
3. Use the rotary control to adjust the VRM to the required size.
4. Press **OK** to remove the highlight and retain the adjustment.
5. Press ADJUST EBL. This will highlight the EBL.
6. Use the rotary control to place the EBL over the required target.
7. Press OK to remove the highlight and retain the adjustment.

Note: You can also push the rotary control to accept an adjustment and toggle control to the other object (VRM or EBL).

The distance and bearing of the target is now shown in the ADJUST VRM and ADJUST EBL soft key labels. You will be able to tell which way the target is traveling by watching how it moves in relation to the EBL. If it continues traveling directly along the EBL, it shows that it is on a possible collision course with your boat - take the appropriate action.

To place a second VRM/EBL use the SET UP VRM/EBL 2 soft key and repeat steps 1 to 7 above. This VRM/EBL will be placed at a location of 2/3 of current range and a bearing of 330°.

... Using floating VRMs/EBLs

You can use the VRM/EBL float function to measure the range and bearing between any two points on the radar screen. This function allows you to move the VRM/EBL away from your boat's position and onto a target. You can then change the radius of the VRM to determine the distance between two points and change the angle of the EBL, relative to its new origin, to obtain the bearing..

How do I float a VRM/EBL?

1. Create the VRM/EBL as described previously.
2. Press FLOATING EBL.
3. Press ADJUST FLOAT . This will highlight the VRM/EBL.
4. To set the origin to a difference position:
 - i. Use the trackpad to move the centre of the VRM/EBL over the first target.
 - ii. Press **OK** to retain the adjustment and remove the highlight.
5. To adjust the VRM:
 - i. Press **OK** to access the soft keys.
 - ii. Press ADJUST VRM to highlight the VRM.
 - iii. Use the rotary control to move the VRM over the second target. The distance between the first and second target is shown on the ADJUST VRM soft key.
6. To adjust the EBL:
 - i. Press ADJUST EBL to highlight the EBL.
7. Use the rotary control to adjust the EBL over the second target. The bearing between the first and second target is shown on the ADJUST EBL soft key.
8. Press **OK** to retain the adjustment.
9. If required, you can float a second VRM/EBL:
 - i. Press SET UP VRM/EBL 2.
 - ii. Toggle the VRM/EBL 2 to ON.
 - iii. Repeat steps 1 to 8 above.

Unfloating a VRM/EBL

- To unfloat VRM/EBL 1, toggle VRM/EBL 1 to CENTER.
- To unfloat VRM/EBL 2, press SET UP VRM/EBL 2 and repeat the above.

5.9 How do I use radar to avoid a collision?

Your radar includes numerous functions to help you avoid a collision. You can:

- Assess how far away a target is and its bearing (VRMs/EBLs).
- Set an alarm to trigger when a target is within a specified zone (Guard Zones).
- Display detailed information on tracked targets (MARPA).
- Display the range and bearing of a target.

Guard Zones

Guard zones are fixed with respect to the SHM, moving as it moves. They also move if the center is offset or the range scale is changed, so that the pre-marked area is maintained. A guard zone only operates when the whole zone is displayed on the screen. An audible alarm sounds to alert you when a target enters the zone.

Guard zones are inactive for 10 seconds after being placed or re-sized, to avoid inappropriate alarms whilst they are being positioned.

You can set up guard zones to be either sector zones or 360° (circular) zones. Your radar can be set up using one or two zones.

How do I set up guard zones?



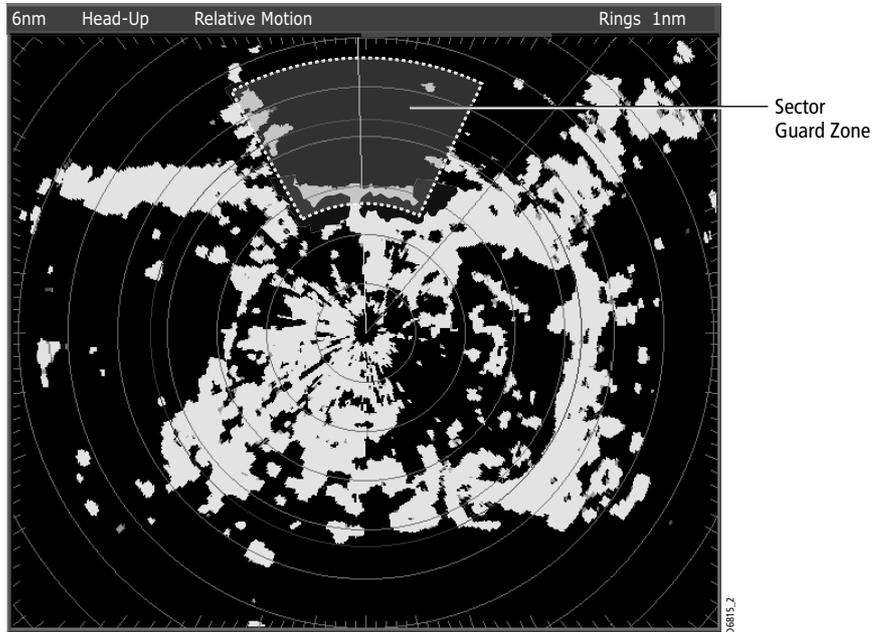
To set up a guard zone:

1. Select TARGET TRACKING and then MONITOR IN ZONES.
2. Toggle ZONE 1 to ON. The default for Zone 1 (sector zone, 30° either side of the SHM, between 1/3 and 1/2 of the current range) is displayed
3. Press SET UP ZONE 1. The following soft key are displayed:

Note: *The same procedure detailed above is used for setting Zone 2. The default for Zone 2 is a sector zone, 30° either side of the SHM, between 1/3 and 1/2 of the current range.*

You can now select the guard zone to be either a sector or a circular zone.

Sector guard zone



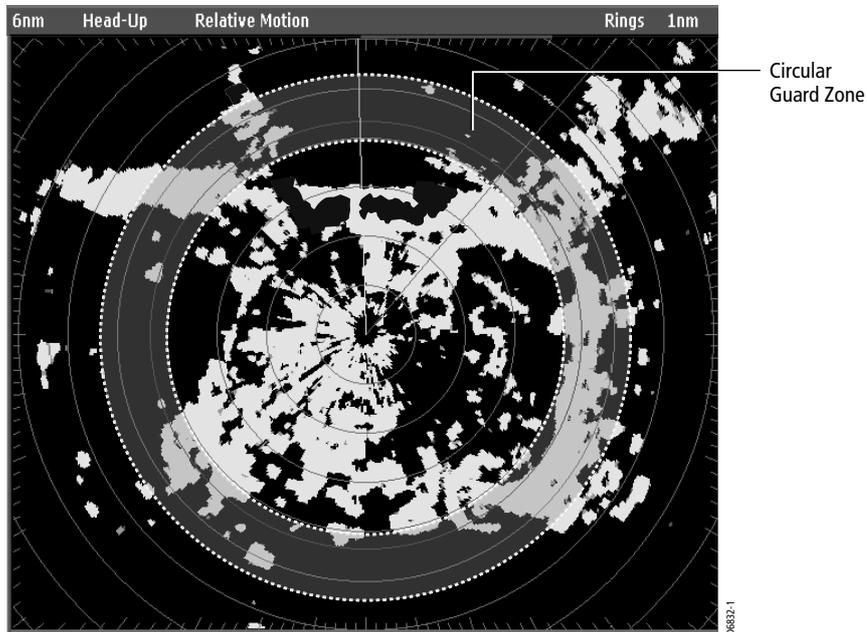
To set up a sector guard zone:

ZONE SHAPE	SET INNER	SET OUTER	SET WIDTH	SET BEARING
SECTOR CIRCLE	xx.xx nm	xx.xx nm	xx	xxx

1. Toggle ZONE SHAPE to SECTOR.
2. Press SET INNER to highlight the soft key label. The inner limit is highlighted.
3. Use the rotary control to set the inner limit of the guard zone..
4. Press **OK** to accept the adjustment.
5. Repeat steps 2 to 4 for the SET OUTER, SET WIDTH and SET AZIMUTH (in relation of the SHM) limits for this guard zone.

Note: You can also push the rotary control to accept an adjustment. Doing this also toggles control to the next setting.

Circular guard zone



To set up a circular guard zone:

ZONE SHAPE	SET INNER	SET OUTER		
SECTOR CIRCLE	xx.xx nm	xx.xx nm		

1. Toggle ZONE SHAPE to CIRCLE.
2. Press SET INNER to highlight the soft key label. The inner limit is highlighted.
3. Use the rotary control to set the inner limit of the guard zone..
4. Press **OK** to accept the adjustment.
5. Repeat steps 2 to 4 for the SET OUTER limit.

Note: You can also push the rotary control to accept an adjustment. Doing this also toggles control to the next setting.

MARPA

SAFETY NOTICES

MARPA can improve collision avoidance when used wisely. It is the User's responsibility to exercise common prudence and navigational judgements.

There are conditions where acquiring a target may become difficult. These same conditions may be a factor in successfully tracking a target. Some of the conditions are:

- The target echo is weak. The target is very close to land, buoys or other large targets.
- The target or your own ship is making rapid manoeuvres.
- Choppy sea state conditions exist and the target is buried in excessive sea clutter or in deep swells.
- Choppy sea state conditions exist yielding poor stability; own boat's heading data is very unstable.
- Inadequate heading data.

Symptoms of such conditions are that acquisition is difficult and the MARPA vectors are unstable; the symbol wanders away from the target, locks on to another target or changes to a lost symbol target.

If any of these conditions are present, acquisition and tracking may need to be re-initiated or, in some cases be impossible to maintain. Improving the quality of the heading data will reduce the effect of the other conditions.

Introduction to MARPA

You can use the Mini Automatic Radar Plotting Aid (MARPA) functions for target tracking and risk analysis. MARPA improves collision avoidance by obtaining detailed information for up to 10 automatically tracked targets and provides continuous, accurate and rapid situation evaluation.

MARPA automatically tracks acquired targets, calculates target bearing and range, true speed and course, Closest Point of Approach (CPA), and Time to Closest Point of Approach (TCPA).

Each target tracked can be displayed with a CPA graphic which shows the target vessel, course and speed (as a vector) and indicates the CPA. The calculated target data can also be shown on your screen. Each target is continually assessed and an audible alarm is sounded if a target becomes dangerous, or is lost.

Effective MARPA operation is dependant on accurate own-ship's heading plus Speed Over Ground (SOG) and Course Over Ground (COG) information. The better the quality of the heading data, the better MARPA will perform. MARPA will function without

SOG and COG, but only relative vector, CPA, and TCPA are shown. Target course and speed cannot be calculated.

How is a risk assessed?

Each target is monitored to see if it will be within a certain distance from your boat within a certain time. If so, the target is designated as dangerous and an audible warning is sounded along with an on-screen warning being shown. The target symbol changes to the dangerous target symbol and flashes to indicate that it is a dangerous target. Pressing the appropriate soft key will silence the alarm and remove the warning.

If a target is lost, either because the MARPA software has lost contact with it, or because it has moved out of range, an audible alarm is sounded and an on-screen warning appears. The on screen symbol will change to the target lost symbol. Pressing the appropriate soft key will silence the alarm and remove the on-screen warning and the target lost symbol.

How far from my boat does MARPA work?

MARPA target acquisition is only available at radar range scales of up to 12nm, although tracking continues at all ranges.

If you change to a smaller range scale, targets may be beyond the range of your scanner and will be lost. In such cases, an on-screen warning will indicate that the target is off-screen.

What happens to target data?

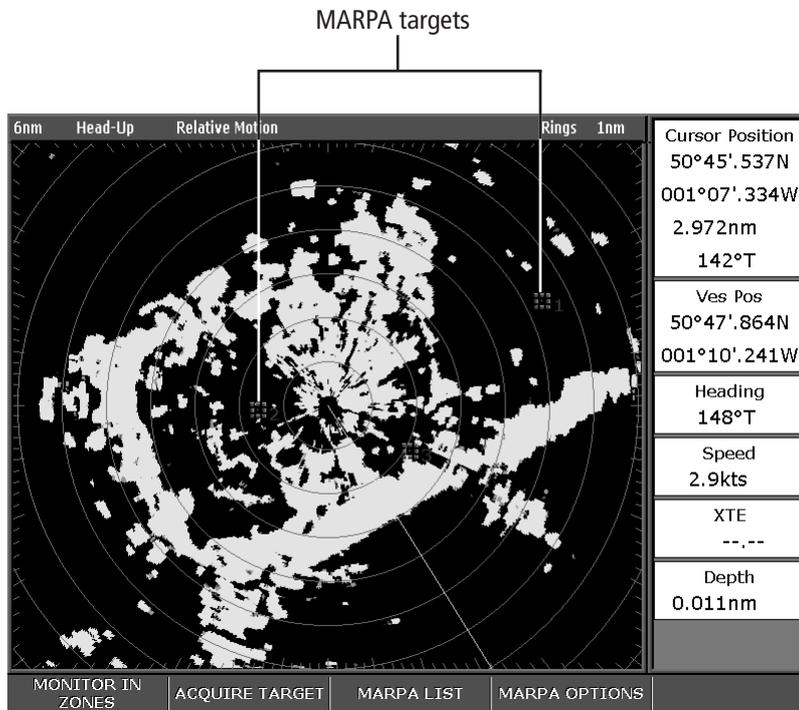
All MARPA targets are stored in a MARPA database list which shows the following information when an individual target is identified:

MARPA LIST						
ID	Bearing	Range	Course	Speed	CPA	TCPA
1	022°T	0.000nm	180°T	0.0kts	0.000nm	00h00m00s
2	025°T	0.000nm	180°T	0.0kts	0.000nm	00h00m00s

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How are targets displayed on screen?

Each target is displayed as a symbol which indicates its status:



*The 'dangerous' and 'lost' symbols will flash when displayed on-screen.

What are CPA graphics and what do they show me?

CPA graphics show vectors for your vessel and a selected target. A vector is a line on-screen showing the predicted courses of your vessel and the selected target if you both remain on your present course. These vectors are infinite and extend to the edges of the screen.

CPA GRAPHIC OFF ON AUTO	SHOW DETAILS OFF ON	CANCEL ALL TARGETS	CANCEL TARGET
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With the CPA GRAPHICS soft key set to:

- AUTO - when you place the cursor over any part of a MARPA symbol, the CPA graphic is displayed.
- ON - the CPA graphic will be displayed for as long as the target is being tracked.
- OFF - no CPA graphic is shown.

True mode

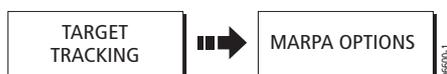
With vectors set in True mode, the vectors of your vessel and the target are shown extended to their intersection point. The CPA is shown as an arrow that is placed on

your boat's vector at the point of the CPA. The length and direction of the arrow indicate the distance and bearing of the target at CPA. The text indicates CPA and TCPA. The text next to the target symbol indicates its course and speed.

Relative mode

With the graphic set in Relative mode, no vector extension is shown. The CPA arrow emerges from your own boat, with the target vector extension being shown as relative, not true. The text next to the target indicates its course and speed.

How do I set up MARPA?

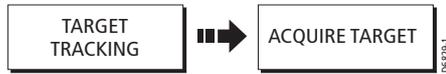


1. Press TARGET TRACKING. The MARPA soft keys are displayed.
2. Press MARPA OPTIONS. The MARPA Options menu is now displayed.
3. Use the trackpad or the rotary control, to highlight the required parameter.
4. Use the trackpad to set the parameter to the required level.

The options menu allows you to set up the following parameters:

Parameter	Options (Default in bold)
Vector Length The time period specified for drawing vectors	0.5min, 1 min, 3 min, 6min , 12min, 30 min, 60 min
Target History Plots a target's previous position at specified intervals. The four most recent position points are displayed. If True target vectors are selected, the four most recent vessel position points are also displayed	OFF , 0.5 min, 1 min, 3 min, 6 min
Own vessel safe zone The safe zone is a ring, centered on your boat, within which a target is considered dangerous.	0.1 nm, 0.2nm, 0.5nm , 1.0 nm, 2.0nm
Time to safe zone The time within which a target is considered dangerous.	3 mins , 6 mins, 12 mins, 24 mins
Safe zone ring Controls whether the safe zone ring is displayed or hidden on screen	Visible Hidden

How do I acquire targets to track?



1. Press TARGET TRACKING. The MARPA soft keys are displayed.
2. Use the trackpad to place the cursor over the target you want to acquire.
3. Press ACQUIRE TARGET.

The cursor changes to the target being acquired symbol. If a target is present for several scans the radar will lock onto it and the symbol changes to indicate a safe target. If set to ON, the CPA graphic is displayed.

4. Press **OK** to return to the default radar.

How do I cancel targets?

from the screen

To cancel a target from the screen:

1. Use the trackpad to place the cursor over the target you wish to cancel.
2. Press CANCEL TARGET to cancel target tracking and remove the symbol from your screen.
Press CANCEL ALL TARGETS to remove all the targets in the MARPA list.
The MARPA soft keys are displayed.

...from the MARPA list

To cancel a target from the MARPA list:

1. Press MARPA LIST. The MARPA database list is shown.
2. Use the trackpad to highlight the target you wish to cancel.
3. Press CANCEL TARGET to remove the selected target or
Press CANCEL ALL TARGETS to remove all the targets in the MARPA list.
4. Press **OK** to remove the MARPA database list.

5.10 How do I mark a position on the radar screen?

You can mark a position on the radar screen by using a waypoint. Waypoints are positions marked on the screen as a reference or destination point and are stored in the Waypoint list. They can also be used to build routes and assist in passage planning.

Waypoints are placed on the radar screen via the **WPTS/MOB** button in the same way as they are placed on a chart.

For full details on using waypoints and passage planning see *Chapter 3: Working with Waypoints* and *Chapter 4: Using the Chart*.

5.11 How do I set up my radar?

The set up for your radar can be changed from the standard configuration to suit your particular needs. Although you will probably only do this when you first use the radar, you may decide to make subsequent adjustments once you become more familiar with the system. Any settings that you change are retained and become the default settings even when you power off.

To select the Radar Setup menus, press MENU when a radar window is active and then select Radar Setup.

Note: *When a radar window is active, you can also access this menu by pressing the TARGETS DISPLAY soft key and then pressing and holding the INT.REJECT, EXPANSION OR WAKES key.*

Function Description	OPTIONS (Default in bold)
Interference Rejection When Interference Rejection is switched ON, any mutual radar interference between two radar equipped vessels operating within range of each other, is automatically reduced.	NORMAL HIGH
Target Expansion When Target Expansion is switched ON, targets are magnified to make them easier to see.	LOW HIGH
Wakes Period When wakes is switched ON, the target is displayed at the brightest level and its previous positions are retained at successively fainter levels on the screen.	10 seconds 30seconds 1 minute 5 minutes 10 minutes
Timed Transmit Controls the radar's timed transmission power-save mode	OFF ON
Transmit Period When Timed Transmit set to ON, the scanner performs the number of scans specified and then shuts down for the number of minutes specified by the Standby Period.	10 scans 20 scans 30 scans
Standby Period Indicates the number of minutes that the system shuts down - the scanner does not rotate and the display is in standby mode.	3 minutes 5 minutes 10 minutes 15 minutes
Bearing alignment Corrects for display azimuth error. Please refer to the C-Series Installation Guide.	
Radar Advanced Setup Please refer to the C-Series Installation Guide.	OFF ON

5.12 How does my radar warn me of potential dangers?

If switched on, the following alarms will be triggered when you are in the radar application:

- System alarms - Anchor, Timer, Alarm clock and Temperature
- Navigation alarms - Arrival and Off track
- Radar alarms - Guard zones

When an alarm is triggered, a buzzer sounds and a pop-up window describing the alarm and how to clear it is displayed.

In some cases, the appropriate action is taken by the Radar. For example, following an arrival alarm, the next route leg is activated.

To switch these alarms on/off and set the limits, press **MENU** and select Alarm Setup. You should then select System or Navigation or Radar Alarms Setup as appropriate.

Note: *For more details of alarms, see Chapter 2: General Operation and System Setup.*

Chapter 6: Using the Course Deviation Indicator

6.1 Introduction

With your display receiving accurate heading and position information, you can use the Course Deviation Indicator (CDI) to monitor your course and accurately steer to a target waypoint.

6.2 How do I display the CDI application?

To select the CDI application:

1. Press and hold the **PAGE** button. The Select Page Set screen is displayed.
2. Use the trackpad to scroll to the appropriate page set.
3. Press **OK**.
4. Press the **PAGE** button to display at the bottom of the screen, the applications available in that set.
5. Press the soft key that corresponds to the CDI display of your choice.

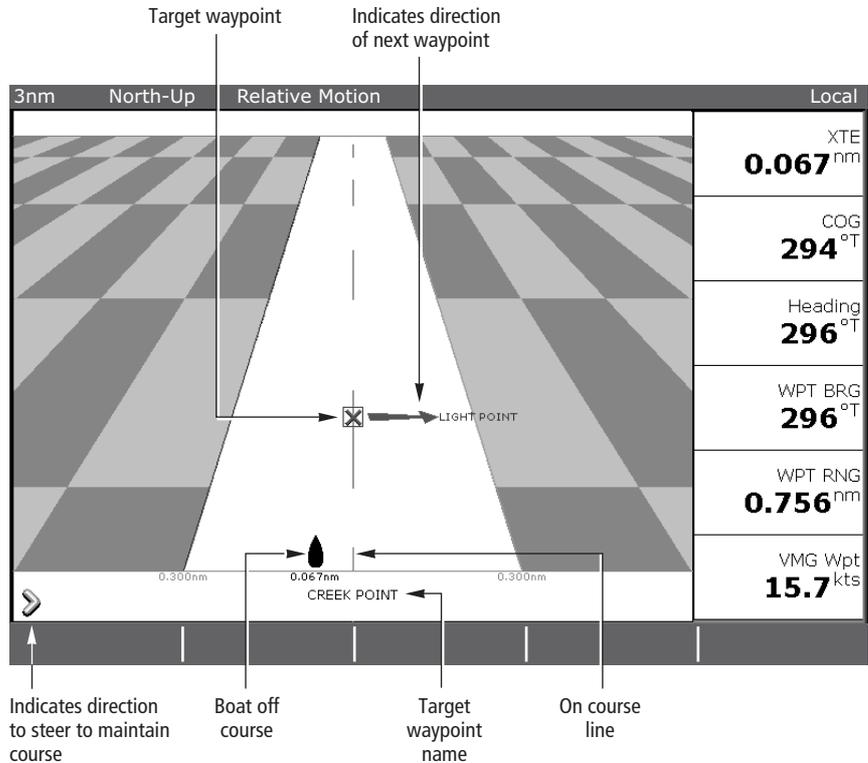
Notes: (1) *Once the CDI application is displayed, no use is made of the soft keys. You will therefore need to open a radar, chart or fishfinder window in order to access any functions activated via the soft keys.*

(2) *If the CDI application is placed in multiple windows, the same data is displayed in each.*

6.3 What does the screen show me?

The CDI gives a graphical representation of your boat's course in a 'rolling road' format.

The 'rolling road' represents a width of sea equal to the Cross Track Error (XTE) limits that you have specified in the Setup menu. As you travel towards the target waypoint, the checkered pattern and the waypoint will move down the screen at a rate proportional to your boat's speed.



What do the steering instructions tell me?

The steering instructions below the rolling road tell you what correction is needed to maintain your course and arrive at the target waypoint.

Instruction	Cause
STEER STARBOARD	XTE error to port is more than a 1/4 of the maximum XTE error limit in the Setup menu
STEER PORT	XTE error to starboard is more than a 1/4 of the maximum XTE error limit in the Setup menu

Indication arrows are placed either side of the steering instruction, pointing towards the center line. The greater the error the more arrows appear.

You should correct your course by steering in the direction indicated by the arrows.

Chapter 7: Using the Fishfinder

7.1 Introduction

This chapter describes the how Fishfinder uses sonar to see fish, bottom structure and texture, and underwater obstructions such as wrecks.

The standard fishfinder image is a historical, scrolling bottom graph at an automatically selected range and frequency. Various functions are provided to improve the underwater view, select what is displayed and sound an alarm including:

- Changing the view displayed (A-Scope, Zoom or Bottom Lock)
- Pausing the scrolling image.
- Switching the depth digit on/off.
- Setting the range and frequency.
- Manually adjusting the sensitivity, color gain, time varied gain and transducer power.
- Using waypoints to mark positions.
- Fishfinder alarms (fish, depth or water temperature).
- Measure depth-below and distance-from-boat using a Variable Range Marker (VRM).

Note: Please refer to the C-Series installation manual for fishfinder calibration information.

7.2 How does the Fishfinder work?

The fishfinder application uses a Digital Sounder Module (DSM) to process sonar signals from a suitable transducer and provide a detailed underwater view.

The transducer located on the bottom of the boat sends pulses of sound waves into the water and measures the time it takes for the sound wave to travel to the bottom and back. The returning sound echoes are affected by bottom structure and by any other objects in their path, e.g. fish, wrecks, reefs.

The Digital Sounder Module (DSM) processes these echoes and sends data to the fishfinder which displays a visual interpretation of the underwater view. The strength of echoes is indicated on the display by different colors. You can use this information to determine the bottom structure, the size of fish and other objects in the water e.g. debris, air bubbles..

Notes: (1) *The DSM will operate at a frequency of 50 kHz or 200 kHz.*

(2) *Some transducers will also enable the fishfinder to display water temperature and/or speed.*

7.3 What can the fishfinder show me?

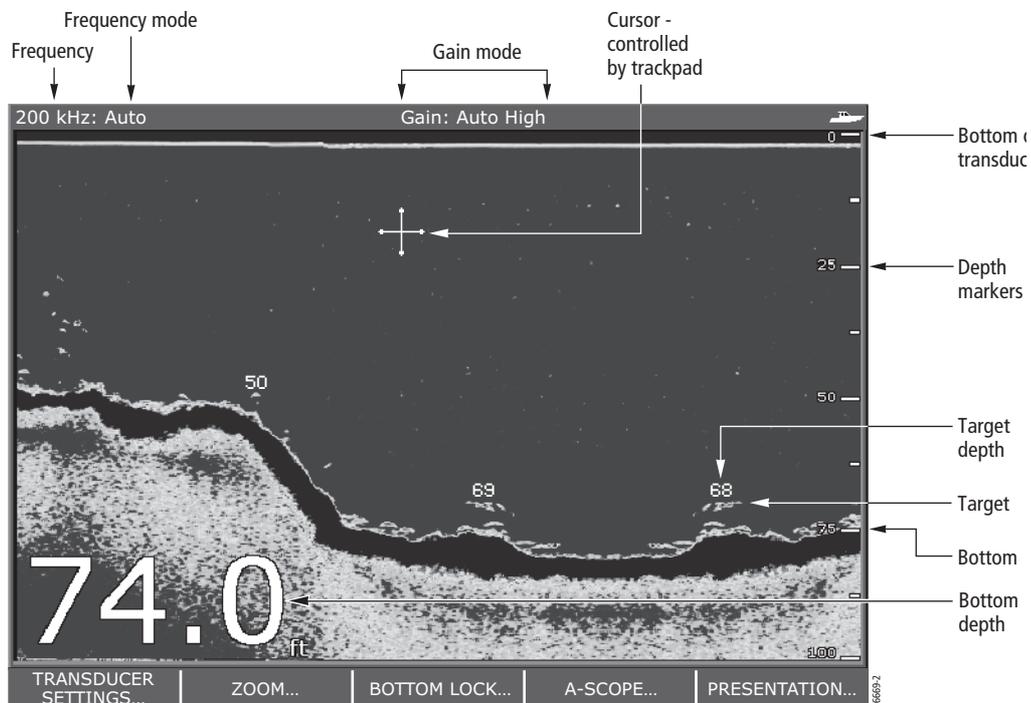
When you first view the fishfinder application, an image representing the echoes seen by the DSM is displayed. As time passes this image scrolls from right to left and becomes a record of the echoes seen. The images at the right hand side of the display are therefore the most recent.

The fishfinder window will display :

- The bottom together with any bottom structure such as reefs and shipwrecks etc.
- Target images indicating fish.
- A status bar noting the frequency and gain settings
- The bottom depth

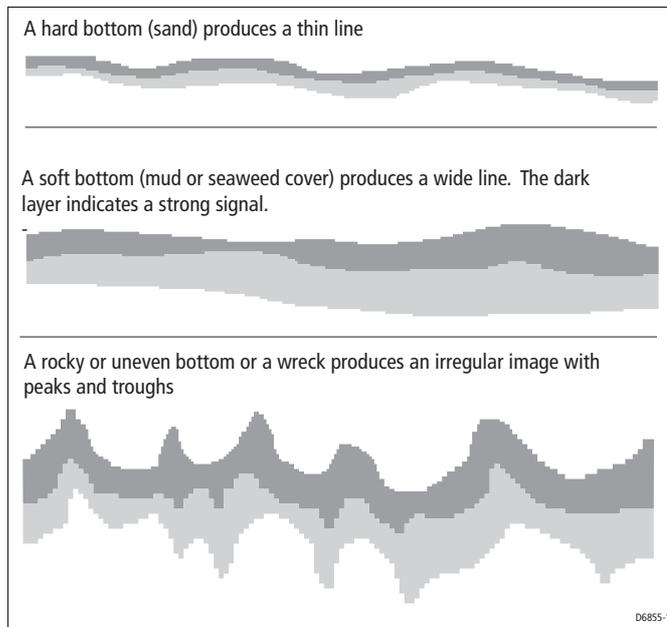
You can customize the fishfinder to:

- Hide the depth of the targets.
- Show the depth lines.
- Change the color palette and the depth displayed.
- Pause or change the scroll speed.
- Enable a fish, shallow or deep water alarm
- Adjust the DSM and Transducer to suit local conditions.



How do I interpret the bottom structure?

The bottom usually produces a strong echo . These images indicate the bottom conditions as follows:.



The dark layers indicate a good echo; the lighter areas weaker echoes. This could mean that the upper layer is soft and therefore allowing sound waves to pass to the more solid layer below.

It is also possible that the sound waves are making two complete trips – hitting the bottom, bouncing off the boat, then reflecting off the bottom again. This can happen if the water is shallow, the bottom is hard, or gain is set high.

The C-Series Fishfinder provides various features to help you interpret the fishfinder picture; these are described in *page 7*.

How are targets displayed?

When a target is detected, it is displayed on screen as a mark.

What factors influence how targets are displayed?

The shape and size of this mark is influenced by a combination of factors:

Boat speed

The shape of the target changes along with your speed. Slower speeds return flatter, more horizontal marks. As your boat's speed increases, the target will tend to thicken and arch slightly; until at fast speeds the mark resembles a double vertical line..

The depth of the target

The closer the target to the surface the larger the mark on screen.

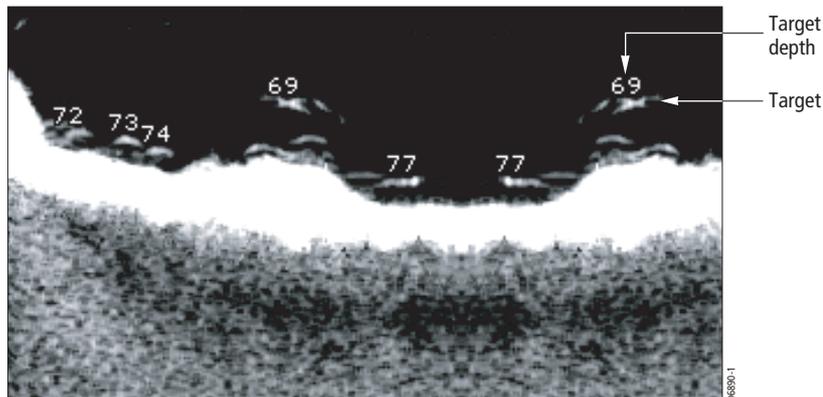
Note: *The depth of individual targets can be displayed by switching on the Target Depth ID in the Fishfinder Setup Menu. The number of target depths displayed is influenced by the fish alarm sensitivity level (see General Operation and System Setup).*

The size of the target

The larger the target, the larger the return on the fishfinder display. The size of a fish target is however dependent upon the size of the fish's swim bladder rather than its overall size. This swim bladder will vary in size between different breeds of fish.

The frequency of the transducer

The same target will appear differently when the transducer frequency is changed. The lower the frequency the broader the mark.



What factors can impair a fishfinder picture?

Although weaker than the fish or bottom echoes, your fishfinder picture may be impaired by echoes received from floating or submerged debris, air bubbles or from your boat's movements. This is known as background noise or clutter and is controlled by the gain modes (gain, color gain and TVG). Raymarine recommends that you allow your system to automatically control the ideal sensitivity level based on depth and water conditions. You can however adjust these settings manually if you prefer. For more details, please refer to *page 27*.

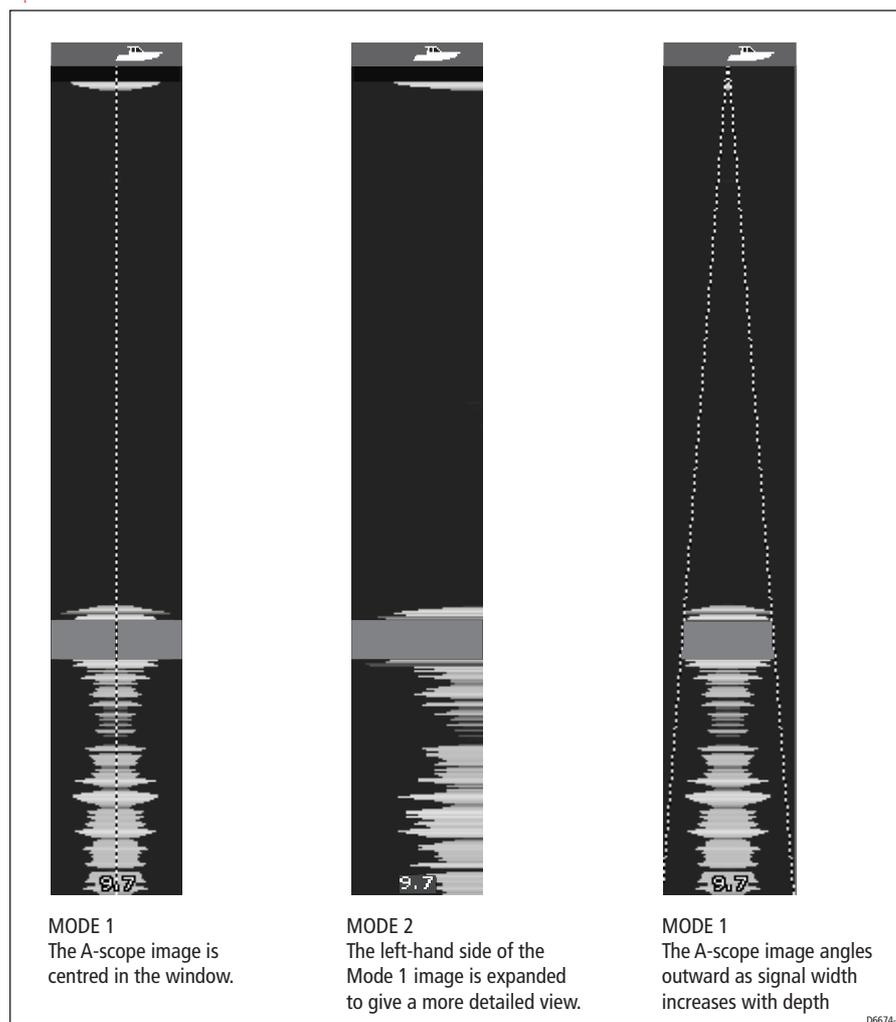
How do I see a live image?

A-SCOPE OFF ON	A-SCOPE MODE 1 2 3		
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The standard fishfinder display shows a historical record of fishfinder echoes. If required, you can display a live image of the bottom structure and the fish directly

below the transducer by using the A-Scope feature. The width of the bottom covered by the A-Scope is indicated at the bottom of the window. A-Scope provides a more precise and easier to interpret indication of the target strength.

There are three A-Scope modes which are selected for individual fishfinder windows:



To display the A-Scope image:

1. Press A-SCOPE and toggle the A-SCOPE to ON. The active window is split vertically, with the A-Scope image on the right hand side (including the bottom coverage value) and the standard fishfinder image on the left.
2. Toggle to the required A-SCOPE MODE (see illustration above).
3. Press **OK** or **CANCEL** to return to the default display.

Note: *If the Bottom Lock or Zoom image was displayed, selecting A-Scope automatically switches OFF Bottom Lock and Zoom.*

7.4 How can I enhance what I see?

You can enhance the image by applying the following options:

- Change the range (Range).
- Shift the selected viewing range (Range Shift).
- View a zoomed area (Zoom).
- Flatten the bottom image to help separate fish from the bottom (Bottom Lock)
- Isolate bottom fish (White Line/Bottom Fill)
- Pause the scrolling image or adjust the rate at which the image scrolls (Scroll Pause/Scroll Speed)
- Change the size of or remove the depth digit.

How do I change the range?

The DSM automatically adjusts the display to show the shallowest required range. Alternatively, you can select to range in/out on the image (up to the maximum depth displayed on the scrolling bottom and A-Scope images).

To range in/out on an image:

1. Press the **RANGE** button.
2. Toggle to RANGE soft key to MAN.
3. Press the **RANGE** button OUT or IN as required.
4. To return to the automatic range adjustment, toggle the RANGE soft key to AUTO.

Note: Changes to the range are reflected in all Fishfinder windows.

How do I shift the image?

The DSM automatically adjusts the display to keep the bottom in the lower half of the display window. Alternatively, you can shift the image within the current range.

To shift the image:

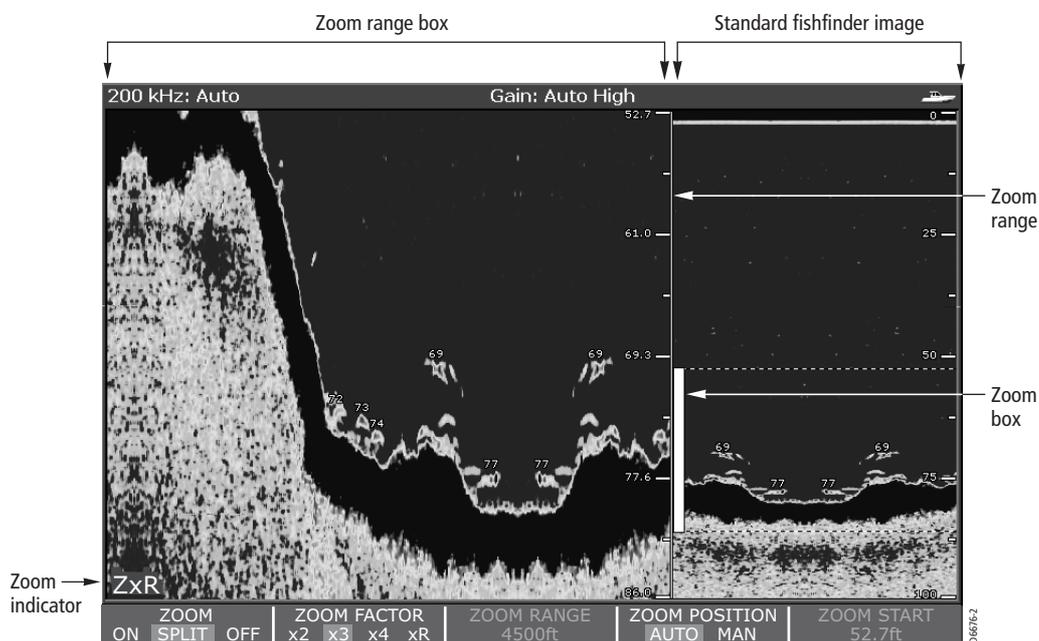
1. Press the **RANGE** button.
2. Toggle the RANGE soft key to MAN.
3. Press RANGE SHIFT. The soft key is highlighted.
4. Use the rotary control to adjust the shift. The value of the shift is displayed on the soft key.
5. To return to the standard fishfinder image, toggle the RANGE soft key to AUTO.

Note: Changes to the range shift are reflected in all Fishfinder windows.

How do I zoom in on the bottom?

ZOOM ON SPLIT OFF	ZOOM FACTOR x2 x3 x4 xR	ZOOM RANGE 20ft	ZOOM POSITION AUTO MAN	ZOOM START 0.0ft
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The fishfinder automatically keeps the bottom image in the lower half of the window. When you need to see more detail of the bottom structure, target images etc, you can zoom in and enlarge a portion of the image. This zoom range box can either replace or appear alongside the standard fishfinder image and is selected for individual fishfinder windows:



Adjusting the zoom

1. Press ZOOM.
2. Toggle to:
 - ZOOM ON to replace the standard fishfinder image with a zoomed image.
 - ZOOM SPLIT to display both the standard fishfinder and a zoomed image.
3. Toggle ZOOM FACTOR to select:
 - x2, x3, or x4 - for a predefined zoom level. The greater the factor, the smaller the area you are viewing and therefore the smaller the zoom box. These factors are proportioned to the range. Therefore, as the range increases, the area shown in the zoom window also increases.

Or:

- xR - to adjust manually the range shown in the Zoom window. When using Ranged Zoom, the area shown in the zoom window does not change when the range changes. Press ZOOM RANGE and use the rotary control to adjust the range as required.

If you have chosen the split screen option, the zoomed section is indicated on the standard fishfinder screen by a zoom box(see illustration above).

4. Press **OK** or **CANCEL** to return to the standard fishfinder soft keys.

Adjusting the position of the zoomed area

1. Press ZOOM.
2. Toggle to:
 - ZOOM ON to replace the standard fishfinder image with a zoomed image.
 - ZOOM SPLIT to display both the standard fishfinder and a zoomed image.
3. Toggle ZOOM POSITION to:
 - AUTO to automatically select the zoom position so that the bottom details are always in the lower half of the display.
 - MAN and select ZOOM START. You can now use the rotary control to select the portion of the image to be zoomed.
4. Press **OK** or **CANCEL** to return to the default display.

Note: *Selecting Zoom automatically switches off Bottom Lock and A-Scope images.*

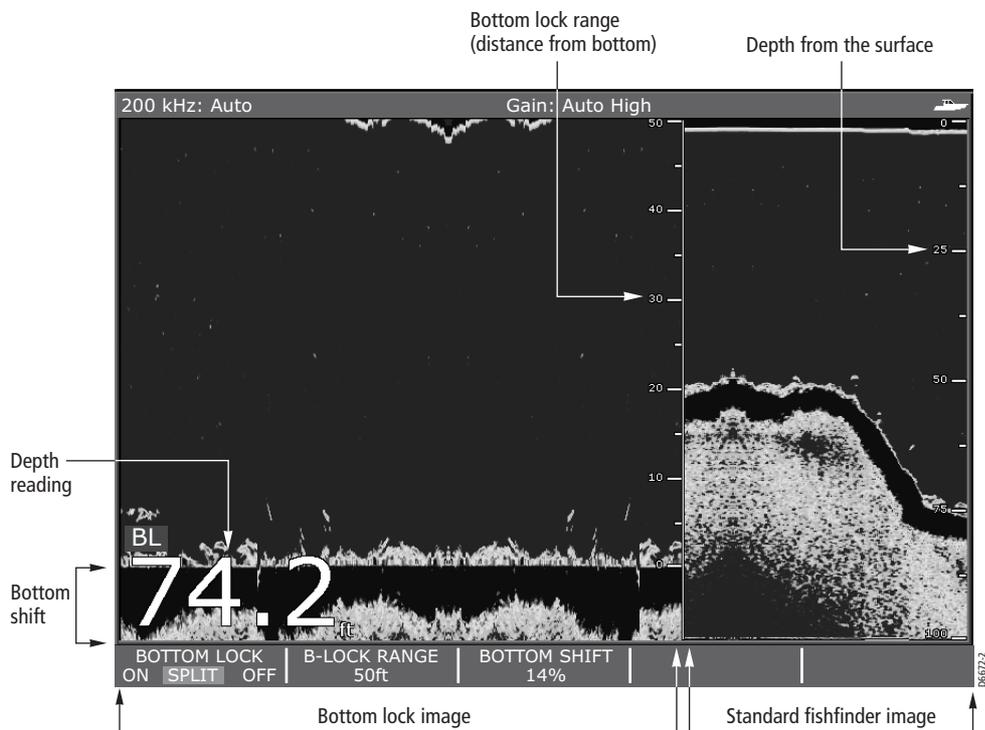
How do I simplify the bottom image?

BOTTOM LOCK OFF ON SPLIT	B-LOCK RANGE 20ft	BOTTOM SHIFT 10%		
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When you are looking for fish that feed close to the bottom, you can use the Bottom Lock function to filter out and flatten the bottom structure and display the fish (or any other objects directly above the bottom) more clearly.

Bottom Lock is selected for individual fishfinder windows and can either replace or appear alongside the standard fishfinder image.



Note: *If the A-Scope or Zoom image was displayed, selecting Bottom Lock automatically switches OFF A-Scope and Zoom.*

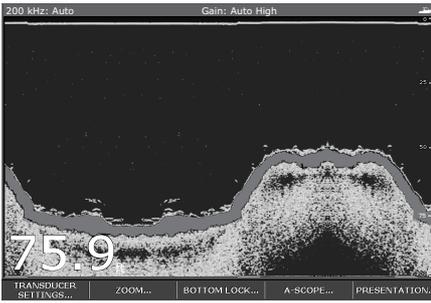
To display or remove the Bottom Lock image:

1. Press **BOTTOM LOCK**. The Bottom Lock soft keys are displayed.
2. Toggle to:
 - **BOTTOM LOCK ON** to replace the standard fishfinder image with the bottom lock image.
 - **BOTTOM LOCK SPLIT** to display both the standard fishfinder and bottom lock image in a single window.
 - **BOTTOM LOCK OFF** to return to the standard fishfinder image.
3. To adjust the range of the Bottom Lock image, press **B-LOCK RANGE** and then use the rotary control to adjust the range.
4. To re-position the Bottom Lock image to view more bottom details, press **BOTTOM SHIFT** and then use the rotary control to adjust the shift between the bottom of the window (0%) and the middle of the window (50%).
5. Press **OK** or **CANCEL** to return to the default display.

How can I isolate bottom fish?

VRM	DEPTH DIGIT OFF ON	WHITE LINE OFF ON	BOTTOM FILL OFF ON	SCROLL PAUSE RESUME
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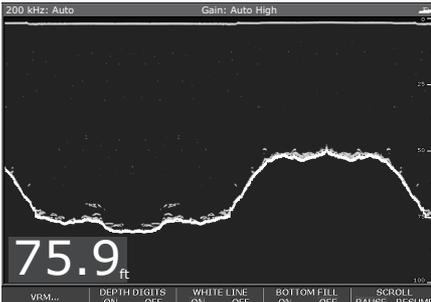
You can separate the echoes from fish near the bottom and from the bottom itself by using the White Line and/or the Bottom Fill features accessed via the PRESENTATION button:



200 kHz: Auto Gain: Auto High
75.9
TRANSDUCER SETTINGS... ZOOM... BOTTOM LOCK... A-SCOPE... PRESENTATION...

Standard fishfinder image

The standard fishfinder image displays the bottom as a combination of features (mud, sand, fish targets etc) with various sonar signal strengths.

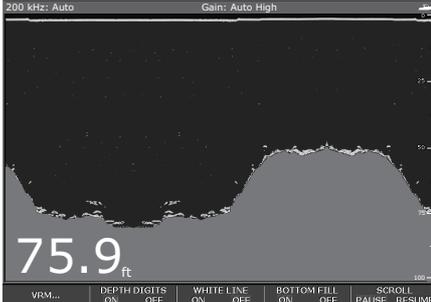


200 kHz: Auto Gain: Auto High
75.9 ft
VRM... DEPTH DIGITS ON OFF WHITE LINE ON OFF BOTTOM FILL ON OFF SCROLL PAUSE RESUME

White line

When this feature is applied, a white line is drawn along the bottom (as defined by the digital depth value) and the detail below the bottom removed.

Fish near the bottom can now be seen more easily.

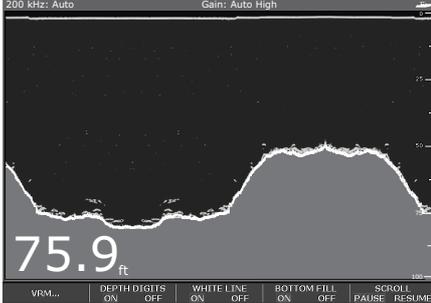


200 kHz: Auto Gain: Auto High
75.9 ft
VRM... DEPTH DIGITS ON OFF WHITE LINE ON OFF BOTTOM FILL ON OFF SCROLL PAUSE RESUME

Bottom fill

When this feature is applied, the detail below the bottom is removed and replaced by a single contrasting color.

The bottom is now clearly defined and the fish near the bottom can be seen more easily.



200 kHz: Auto Gain: Auto High
75.9 ft
VRM... DEPTH DIGITS ON OFF WHITE LINE ON OFF BOTTOM FILL ON OFF SCROLL PAUSE RESUME

White line and bottom fill

When both White Line and Bottom Fill are applied, the bottom is defined by a white line and the detail below it replaced by a single contrasting color.

Both the bottom and fish near the bottom are now clearly defined.

To display/hide White Line and/or Bottom Fill:

1. Press PRESENTATION.
2. Press WHITE LINE or BOTTOM FILL to toggle the feature OFF or ON as required.
3. Press **OK** or **CANCEL** to return to the default display.

Note: *White Line and Bottom Fill are selected for individual fishfinder windows.*

How do I change how the image scrolls?

Adjusting the scroll speed

You can adjust the speed at which the display scrolls, but the same section of the bottom is displayed regardless of scrolling speed. A faster speed displays more detail. This is useful when you are looking for fish. If you select a slower speed the information remains on the display for longer.

The following options are available:

Manual

This allows you to set the scroll speed as a percentage of the maximum scroll rate for that depth. The lower the percentage, the slower the image will scroll. The default is manual adjustment with a full speed scroll (100%).

Automatic

The system automatically adjusts the scroll speed, based on boat speed:

- Less than, or equal to 0.5 kts, scroll speed is constant at 10%.
- Between 0.5–15 kts, scroll speed varies linearly with boat speed.
- Greater than 15 kts, scroll speed is constant at 100%..

Scroll speed is adjusted in the Fishfinder Setup menu (see *page 24*) and is accessed via the MENU button.

Note: *If you have configured a transducer with no paddle wheel, then selecting AUTO will result in full speed scrolling (100%).*

Pausing the scrolling image

VRM	DEPTH DIGIT OFF ON	WHITE LINE OFF ON	BOTTOM FILL OFF ON	SCROLL PAUSE RESUME
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You can pause the display to see a 'snapshot' of the image. Scroll pause affects only the current fishfinder frequency. If you are in dual frequency mode (see *page 25*), you can pause one frequency while the other continues to scroll. This allows you to inspect a paused image, place waypoints or VRMs, while the other frequency continues to scroll and detect fish etc. When in automatic frequency mode and the depth changes, the new frequency will NOT be paused.

To pause or resume scrolling, proceed as follows:

1. Press PRESENTATION.
2. Toggle SCROLL to select PAUSE. The display stops scrolling but the depth indication continues to be updated.
3. To resume the scrolling bottom display, toggle SCROLL to select RESUME.
4. Press **OK** or **CANCEL** to return to the default display.

How do I change how the depth digit is displayed?

The depth under the boat is displayed in the upper or lower left hand corner of the fishfinder window. The size of this depth digit can be adjusted or it can be switched on/off for individual fishfinder windows.

Changing the size of the depth digit

You can decrease the size of the depth digit (to small or medium) and you can change its position to the top of the screen. The size and position of the Depth Digit are adjusted in the Fishfinder Setup menu as described *page 24*.

Note: *No matter what size is selected, the Depth Digits will auto-shrink (when necessary) to fit in the available space.*

Removing the depth digit

VRM	DEPTH DIGIT OFF ON	WHITE LINE OFF ON	BOTTOM FILL OFF ON	SCROLL PAUSE RESUME
-----	--------------------------	-------------------------	--------------------------	---------------------------

Note: *When multiple fishfinder windows are displayed, we recommend that the depth digit is always displayed in at least one window.*

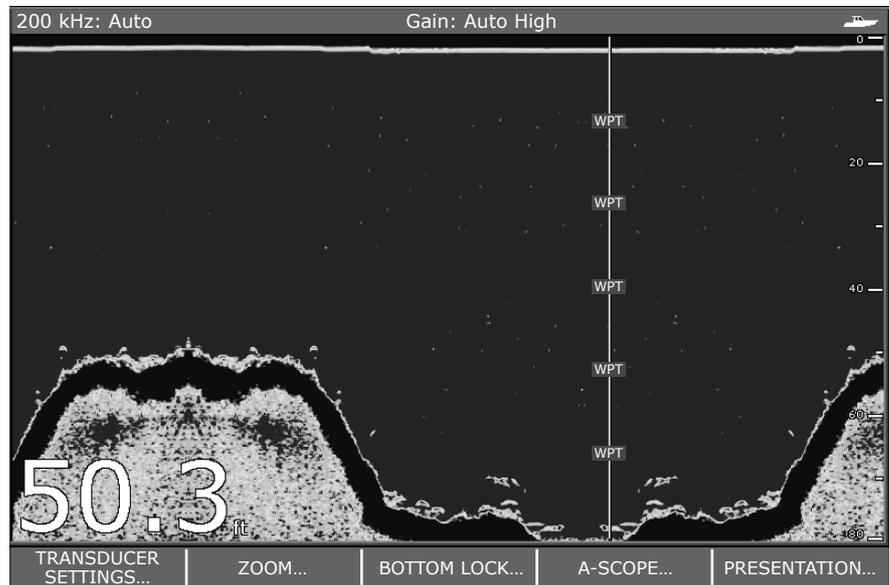
To remove or display the depth digit:

1. Press PRESENTATION.
2. Press DEPTH DIGIT and select OFF or ON as required.
3. Press **OK** or **CANCEL** to return to the default display.

7.5 How do I mark a position?

Marking a position enables you to return to that spot at a later date. A position is marked on the screen with a waypoint. When a waypoint is placed, its details are added to the Waypoint List and a vertical line labelled WPT (see illustration below) is displayed on screen.

Note: For full details on editing and managing waypoints, please refer to *Chapter 3: Working with Waypoints*.



A waypoint can be placed:

... at your current position

1. Press **WPTS** twice (or press **WPTS** and then **WAYPOINT AT VESSEL**). The Edit Waypoint box is displayed.
2. Press **OK** (or wait for 3 seconds) to save the waypoint with the standard settings.

... at the cursor

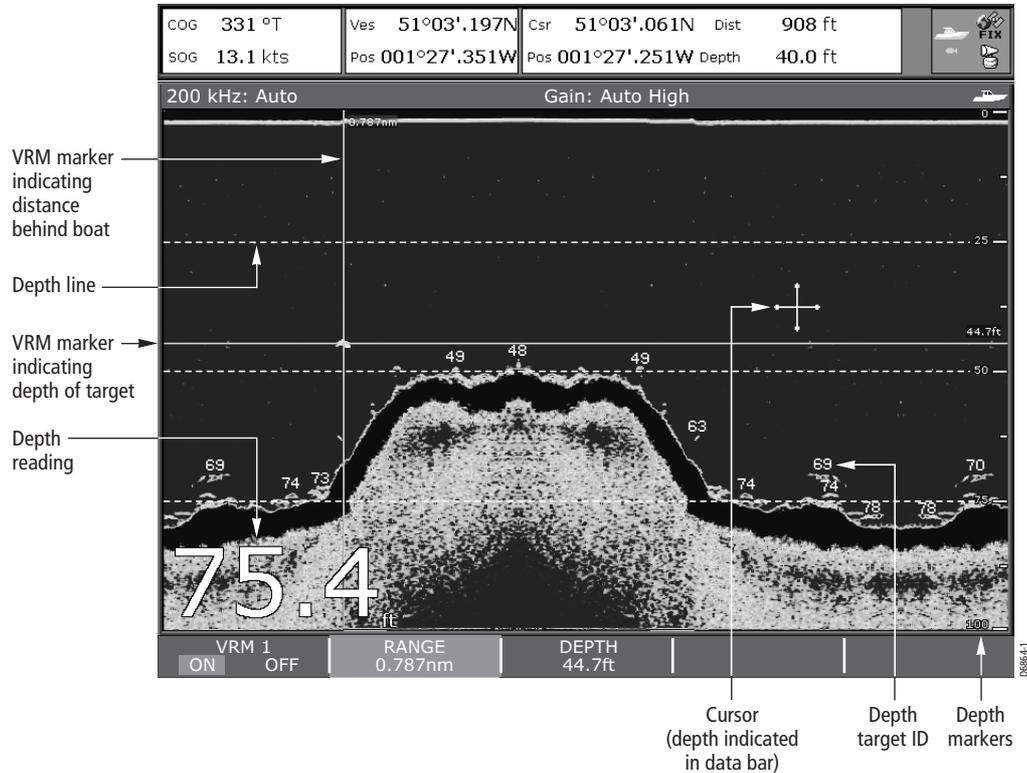
1. To pause the scrolling image so that it is easier to position the cursor over the required site, press **PRESENTATION** and then toggle the **SCROLL** option to **PAUSE**.
2. Press **WAYPOINT AT CURSOR**. The Edit Waypoint box is displayed.
3. Press **OK** (or wait for 3 seconds) to save the waypoint with the standard settings.

... at a specified position

1. Press **WPTS**.
2. Press **WAYPOINT AT POSITION**. The Edit Waypoint box is displayed. For details of how to specify the waypoint's position, please refer to *Chapter 3: Working with Waypoints, page 3*.

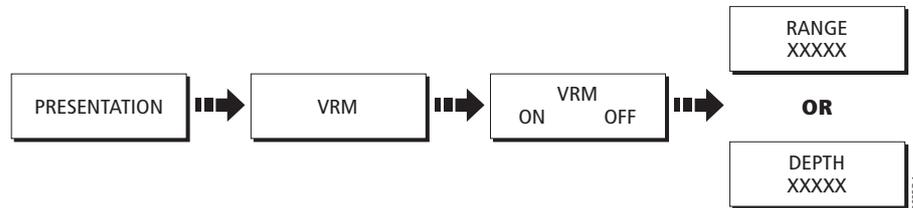
7.6 How do I determine depths and distances of targets?

The fishfinder provides various features to determine depths and distances:



- **Depth reading** - your current depth displayed. The size and position of this digit can be changed via the Fishfinder display Setup menu.
- **Depth lines** - horizontal dashed lines drawn at regular intervals to indicate the depth from the surface. These are switched on/off via the Fishfinder Display Setup menu (see *page 24*).
- **Depth Target ID** - depths noted against recognised targets. The sensitivity of these IDs is directly linked to the Fish Alarm sensitivity; the greater the fish alarm sensitivity, the greater the number of labelled returns. These targets are switched on/off via the Fishfinder Display Setup menu (see *page 24*).
- **Cursor depth** - the depth and the distance from your boat marked by the cursor, is indicated in the data bar at the top of the screen. This performs in a similar way to a VRM, but without lines.
- **VRMs** - to indicate the distance behind your boat and the depth below of selected objects. These are set via the PRESENTATION soft key and are described overleaf.

Using VRMs



You can use a Variable Range Marker (VRM) to determine the depth and distance-behind-boat of an object. These markers consist of a horizontal (depth) line and a vertical (distance-behind-boat) line; each of which are marked with the appropriate measurement and are controlled individually.

To switch on and position the VRM:

1. Press PRESENTATION.
2. If necessary press SCROLL and toggle to PAUSE. Pausing the display will make it easier to position the VRM over an object.
3. Press VRM.
4. Toggle to VRM ON. The RANGE soft key is highlighted.
5. To indicate the distance-behind-boat, use the rotary control to move the range marker over the required object. The distance is indicated both at the top of the marker and on the RANGE soft key. To return the marker to its previous position, press CANCEL.
6. Press **OK** to save the range marker setting.
7. Press DEPTH. The DEPTH soft key is highlighted.
8. To indicate the depth, use the rotary control to move the depth marker over the required object. The depth is indicated both on the right of the marker and on the DEPTH soft key. To return the marker to its previous position, press CANCEL.
9. Press **OK** to save the depth marker setting.
10. Press **OK** or **CANCEL** to return to the Presentation soft keys.

Notes: (1) *You can also use the rotary end push to accept an adjustment and toggle control to the other marker.*

(2) *VRMs set up in Fishfinder are unrelated to those set up in Radar.*

7.7 What alarms does my fishfinder have?

In addition to the system alarms (see *page 8*), the following alarms can be set when you are connected to a DSM or when the simulator is on:

- **Fish Alarms** - sounds when a target meets the specified sensitivity level and, is within the depth limits (if enabled). The greater the fish alarm sensitivity, the greater the number of target image depths displayed.
- **Shallow water and deep water alarms** - sound when the DSM detects that the depth is less than the shallow limit, or greater than the deep limit.

You can switch the alarms on, set the limits and specify the fish alarm sensitivity as described in *Alarm Setup Menu on page 2-8*.

Note: The greater the fish alarm sensitivity, the greater number of target depth IDs will be displayed.

7.8 How do I set up my fishfinder?

The set up for your fishfinder can be changed from the standard configuration to suit your particular needs. Any changes made to the set up are saved when you power off the digital sounder module (DSM) except for the following:.

Type	Function	Reverts to
Soft keys	Gain	AUTO (automatic)
	Auto Gain Mode	MED (medium)
	TVG	AUTO (automatic)
	Range	AUTO (automatic)
	Range Shift	0
	Power	AUTO (automatic)
Setup Menu	Ping Speed Limit	26
	Ping Enable	Enabled

To select the Fishfinder Setup Menus, press **MENU** when you are in the Fishfinder application and then select Fishfinder Setup.

Note: For general information on how to use the Setup Menus, see Chapter 2: General Operation and System Setup.

Transducer Calibration

The C-series display receives the image from a DSM which processes sonar signals from a transducer mounted in the water. If the transducer is equipped with a speed paddle wheel and temperature-sensing thermistor, the DSM calculates speed and temperature. To ensure accurate readings it may be necessary to calibrate the transducer(s) by applying offsets to depth, speed and temperature.

The Fishfinder Setup Menu provides the following set up options for your transducer:

MENU ITEM	OPTIONS (Default in bold)
Select Transducer When selecting a transducer, the DSM reports to the C-Series whether it sees a 600W or 1kW transducer. The C-Series then allows you to select an appropriate transducer from the 600W or 1kW list.	600W detected: P65/66 P79 P319/B117/SS555 B66V/B66VL B744V/b744VL/SS544V B45 1kW detected: B256 B260 R99
Select Speed Transducer Specify the speed of the transducer.	NONE UNKNOWN B120/P120 ST 600 ST69
Depth Offset (Waterline) or (Keel) When the offset is '0' or positive (Waterline), the offset represents how far below the water's surface the transducer is. When the offset is negative (Keel), the offset represents how far below the transducer the keel is.	0 feet +/- 9.9 feet
Speed Offset Specify the offset to calibrate the speed transducer (if fitted).	100% 1- 200%
Temperature Offset Specify the offset to calibrate the thermistor (if fitted).	0°F +/- 9.9°F
Frequency Calibration... Hides the setup menu and brings up a set of softkeys to tune the transducer frequencies.	50 kHz 200 kHz

DSM Setup

Certain conditions, such as a hard bottom or other vessels equipped with a Fishfinder, may affect the DSM.

The Fishfinder Setup Menu provides the following set up options for your DSM:

MENU ITEM	OPTIONS (Default in bold)
DSM Reset... Restore all settings on the DSM to factory default. When performing a DSM Reset, it is normal to briefly lose connection with the DSM.	YES NO
Trip Counter Reset... Resets the Trip Counter of the DSM.	YES NO
SONAR Interference Rejection Removes spikes caused by other fishfinder-equipped vessels	AUTO LOW MEDIUM HIGH
2nd Echo Interference Rejection Minutely adjusts the ping rate according to the 2nd echo level. Results in better sensitivity of the image.	OFF LOW HIGH
Ping Rate Limit (per sec.) Provides a speed limiter; it is useful to adjust the ping rate to suit local conditions. For example, the ping rate may be too fast when there is a hard bottom in shallow water.	26 pings per second 5 to 30 pings per second (15 pings maximum when radar and fishfinder application in more than one pane and when fishfinder frequency is set to SINGLE.)
Ping enable The sonar ping is normally enabled. It can be disabled. This is useful when other equipment is being tested, or if someone is diving beneath the boat.	Disabled Enabled

Controlling the image

Once you have set up the transducer as described above, the DSM will locate the bottom and display a scrolling fishfinder image.

The Fishfinder Display Setup Menu provides controls to change this image as follows:

MENU ITEM	OPTIONS (Default in bold)
Depth Digit Size The size of the digit indicating the depth	SMALL MEDIUM LARGE
Depth Digit Position The position of the digit indicating the depth	BOTTOM TOP
Target Depth ID Controls whether the depth of identified targets are displayed. N.B. The level of targets displayed is directly linked to the level of Fish Alarm sensitivity (see <i>General Operation and System Setup: Fishfinder Alarms Setup</i>).	ON OFF
Depth Lines Controls whether horizontal lines indicating depth are displayed	ON OFF
Color Palette Choose the color palette to suit different conditions/your personal preference.	Classic Blue Classic Black Classic White Sunburst Greyscale Inverted Greyscale Copper Night Vision
Scroll Select AUTO to vary the scroll speed in relation to your boat's speed or MANUAL to specify the <i>Scroll Speed</i> .	MANUAL AUTO
Scroll Speed If Scroll is set to MANUAL, specify the percentage of the normal speed that screen should scroll at (see <i>Adjusting the scroll speed</i> on <i>page 14</i> for more details).	10-100% 100%

7.9 What other settings affect the fishfinder image?

The system automatically adjusts the following settings in order to optimise the fishfinder image:

- Operating frequency.
- Gain modes (Gain, Color Gain, TVG)
- Power setting.

They should not ordinarily require adjustment. You can however make adjustments manually if required.

What are the operating frequency modes?

FREQUENCY		FREQ MODE		SELECTED FREQ		DISPLAYED FREQ	
AUTO	MAN	SINGLE	DUAL	200	50	200	50

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The DSM provides four frequency modes:

- **Automatic** - the system automatically selects the appropriate frequency according to your depth. As the depth increases, the DSM changes the frequency from 200 kHz to 50 kHz; as the depth decreases, it switches from 50 kHz to 200 kHz. This mode is useful for automatically searching for the bottom.
- **50 KHz** - scans a wide area and penetrates water well, so is good for use in deep water.
- **200 KHz** - scans a narrower area, but produces a more detailed view so is good for finding fish that are near the bottom or close together. It is better for use in shallow water.
- **Dual frequency** - Alternates pings between both 200 kHz and 50 kHz. When Dual Frequency is selected, you must select the frequency shown (200 kHz or 50 kHz) in the active window.

How do I manually select the operating frequency?

If required, you can change the frequency to manual and then choose to either display one frequency (single frequency mode) in all fishfinder windows or view both frequencies simultaneously using multiple fishfinder windows.

1. Press FISHFINDER SETTINGS.
2. Press FREQUENCY and then toggle the FREQUENCY to MAN.
3. Toggle the FREQ MODE as required:
 - SINGLE - toggle SELECTED FREQUENCY to either 50 kHz or 200 kHz. The scrolling bottom is displayed using the selected frequency.
 - DUAL - toggle DISPLAYED FREQ to set the frequency for the active window.
4. Press **OK** or **CANCEL** twice to return to the default display.

What gain modes are available?

GAIN MODE		AUTO GAIN			COLOR GAIN		TVG	
AUTO	MAN	LO	MED	HI	AUTO	MAN	AUTO	MAN

The Fishfinder automatically adjusts the gain controls, based on depth and water conditions, and displays the sharpest possible image. Raymarine recommends that you retain this AUTO setting to achieve the the best results.

Note: *In addition to the controls described in this section, the Fishfinder Setup options allow you to adjust the Interference Rejection, 2nd Echo Interference Rejection and Ping Rate Limit. These options are described in DSM Setup on page 23.*

Auto Gain

The gain, or sensitivity, of the display adjusts background noise by varying the echo strength for display. The value of the GAIN control determines the strength above which echoes are displayed. There are three AUTO GAIN modes:

- **Low** is ideal for viewing fishfinder images with a minimum of background noise as you are cruising to your fishing spot. Only the strongest echoes are displayed.
- **Medium** is a slightly higher gain setting that displays more detailed echoes as you are trolling. This is the default mode.
- **High** gives the best details of the targets you have located but also displays the most background noise and surface clutter. This is suitable when you are fishing.

With all of these modes, the DSM will automatically adjust the Gain setting for current conditions and adjust separately for each frequency. Any adjustments made apply to all windows using that frequency.

Color Gain

Color gain determines how echoes of different strengths are displayed. As conditions change the color gain adjusts accordingly.

TVG (Time Varied Gain)

The TVG (Time Variable Gain) reduces the clutter by varying the gain throughout the water column. This function is useful for reducing the appearance of 'noise'. Increasing the TVG value increases the maximum depth to which TVG is applied. Decreasing it reduces the maximum depth. TVG has no effect in Fishfinder Simulator Mode.

How do I manually adjust the gain modes?

If necessary you can set the gain controls manually. The new values remain set even when you switch off the display and are applied to both the active window and any other fishfinder windows displaying that frequency.

1. Select FISHFINDER SETTINGS and then GAIN.
2. Toggle the required mode to MAN. The adjustment slider is displayed above the appropriate soft key:
3. Use the rotary control to adjust the value in the slider. This value takes immediate effect:
 - GAIN MODE - this should be set high enough to see fish and bottom detail but without too much background noise. Generally, a high gain is used in deep and/or clear water; a low gain in shallow and/or murky water.
 - COLOR GAIN - this sets the lower limit for the strongest echo color. All echoes with a signal strength above this value are displayed in the strongest color. Those with a weaker value are divided equally between the remaining colors. Setting a low value produces wide band for the weakest color, but a small signal band for the other colors; setting a high value gives a wide band for the strongest color, but a small signal band for the other colors.
 - TVG - A low TVG value has little effect on gain in shallow water.; a high value decreases the gain in shallow water so that only the strongest echoes are displayed.
4. Press **OK** or **CANCEL** twice to return to the default display.

How do I adjust the power setting?

The Power control provides adjustment of the transducer signal. When AUTO is selected (default), the DSM automatically determines the required power setting based on the current depth, speed, and (bottom) signal strength.

If, however, you wish to manually adjust the power to suit current conditions, you can adjust the power level between 0 and 100%, in 10% increments. Lower power levels are normally used in depth ranges less than 8 ft. (2.4 m) and higher power levels are typically selected for depths greater than 12 ft. (3.7 m).

To adjust the Power Setting:

1. Press FISHFINDER SETTINGS.
2. Press POWER.
3. Toggle POWER to either AUTO or MAN. If MAN mode is set the power adjustment slider is displayed. Use the rotary control to adjust the power value. There is a short delay whilst the new setting takes effect.
4. Press **OK** or **CANCEL** to return to the default display.

Chapter 8: Maintenance & Troubleshooting

8.1 Introduction

This chapter provides information on maintaining and troubleshooting your Raymarine C-Series Display, and also information on how to get assistance from Raymarine.

8.2 What maintenance can I do?

At regular intervals, carry out the following servicing procedures:

- Routine checks.
- Cleaning the Display.

Do not attempt any other servicing procedures.

Servicing and Safety

- Raymarine equipment should be serviced only by authorized Raymarine service technicians. They will ensure that service procedures and any replacement parts used will not affect performance. There are no user serviceable parts in any Raymarine product.
- Some products generate high voltages, so never handle the cables or connectors when power is being supplied to the equipment.
- When powered on, 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 Raymarine equipment, guidelines are given in the installations manual, to enable you to ensure minimum interaction between different items of equipment, i.e. ensure optimum Electromagnetic Compatibility (EMC).
- Always report any EMC-related problem to your nearest Raymarine 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 re-setting action, or momentarily may result in faulty operation.

What routine checks should I do?

Carry out the following tasks on a regular basis:

- Examine all cables for signs of damage, such as chafing, cuts or nicks.
- Check that all cables are securely connected.

How do I clean the display?

CAUTION: Cleaning the display

Take care when cleaning the display, to avoid damaging it.

- (1) **Do NOT wipe the display screen with a dry cloth, as this could scratch the screen coating.**
- (2) **Do NOT use acid, ammonia based or abrasive products.**

Regularly clean your Display as follows:

1. Switch off the power to the Display.
2. Wipe the Display with a clean soft cloth. To remove oily finger marks use a spray cleaning agent of the type used for cleaning eyeglasses.

A suitable micro-fibre cloth is supplied with your display and spray can be purchased from your local optician.

8.3 When do I reset a Display?

You can reset the C-Series Display in one of three ways:

- Factory reset.
- Power-on reset.
- Picture reset.

What happens if I reset the system?

When you reset the system, at power-on the last used values are retained for all the options, except for those listed in the following table which are reset to the factory default each time:

Item	Power-on setting
Heading mode	Head-up
Rain	OFF (but value stored) - radar only
Fast Time Constant (FTC)	OFF (but value stored) - radar only
Alarm	ON with last-used value
Zoom	OFF
Windows	OFF
Brightness	ON at 100%

What is a factory reset?

CAUTION: Factory Reset

The factory reset will set all values back to their original factory settings. This reset also clears the Waypoint and Route List databases.

How do I carry out a factory reset?

To carry out a factory reset:

1. Press and hold the left hand soft key.
2. Press **POWER** to power-on the display.

The factory reset will take place during this operation.

What is a Power-on reset?

A power-on reset causes the screen to revert to the chart or radar picture with all the windows cleared.

How do I carry out a power-on reset?

You can carry out a power-on reset by turning the display off and on again.

What is a picture reset?

A picture reset returns the screen to a full screen display of the top window with all other windows cleared.

How do I carry out a picture reset?

You can carry out a picture reset by pressing and holding the **PAGE** button for two seconds.

8.4 How can I troubleshoot my Display?

All Raymarine products are, prior to packing and shipping, subjected to comprehensive test and quality assurance programs. However, if your C-Series Display unit should develop a fault, this section will help you to identify the most likely cause and show the corrective action required to restore normal operation.

If, after referring to this section, you are still having problems with your Display, contact your local dealer, national distributor or Raymarine Technical Services Department for further advice.

Always quote the product serial numbers which are printed on the back of the unit.

What are the common problems and how do I solve them?

Problem	Solution
Display 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 relevant fuses.
"Scanner not responding" message	Check that the cable connecting the scanner to the radar display unit is securely connected and undamaged.
"Invalid scanner software: Version xx.x, Version xx.x required"	Incorrect software version installed. Contact your local Raymarine dealer.
"Open array cannot be powered from the display"	Scanner not compatible with C-Series Display - refer to <i>Important Information</i> Section of this manual.
"Scanner hardware fault"	Scanner not functioning - refer to <i>Chapter 4 - Maintenance & Troubleshooting</i> of this manual.
The bearing displayed on the radar picture is not the same as the actual bearing	Perform the bearing alignment procedures described in <i>Chapter 3 - System Tests and Alignment</i> of this manual.

8.5 How can I get Technical Support?

Raymarine provides a comprehensive customer support service, on the world wide web, through our worldwide dealer network and by telephone help line. If you are unable to resolve a problem, please use any of these facilities to obtain additional help.

World wide web

Please visit the Customer Support area of our website at: www.raymarine.com

As well as providing a comprehensive Frequently Asked Questions section and servicing information, the website also gives e-mail access to the Raymarine Technical Support Department and a details of the locations of Raymarine agents, worldwide.

If you don't have access to the world wide web, contact Technical Support where specialists are available to answer questions about installing, operating and troubleshooting all Raymarine products.

Help us to help you

When requesting service, please quote the following product information:

- Equipment type.
- Model number.
- Serial number.
- Software issue number.

How can I contact Raymarine in the US?

You can contact Raymarine in the US either using the Raymarine world wide web as detailed above or by calling one of the telephone numbers below.

Who do I contact for accessories and parts?

You can obtain many Raymarine accessories and parts directly from your authorized Raymarine dealer. However, if your dealer does not have the item you want, contact Raymarine Technical Services at:

1-800-539-5539 extension 2333, or
(603) - 881 - 5200

You can use these numbers Monday to Friday 0815 to 1700 Eastern Standard Time or Eastern Daylight Savings Time.

If you are not sure which item is appropriate for your unit, you should first contact the Technical Support Department at:

1-800-539-5539 extension 2444, or
(603)-881 -5200

to verify your requirements.

Who do I contact for product repair and service?

In the unlikely event that your Raymarine unit should develop a problem, contact your authorized Raymarine dealer for assistance. The dealer is best equipped to handle your service requirements and can offer timesaving help in getting your equipment back into normal operation.

If repairs cannot be obtained conveniently, obtain product service by returning the unit to:

Raymarine Product Repair Center
22 Cotton Road, Unit D,
Nashua,
NH03603-4219

The Product Repair Center is open Monday to Friday 0815 to 1700 Eastern Standard Time or Eastern Daylight Savings Time.

All products returned to the Repair Center are registered upon receipt and a confirmation letter is sent to acknowledge the repair status and the reference number of the product.

We will make every effort to carry out the repair and return your unit as quickly as possible.

If you wish to enquire about the repair status of your unit, contact the Repair Center at:

1-800-539-5539

How can I contact Raymarine in Europe?

You can obtain Technical Support, service and accessories from your authorized Raymarine dealer, or by contacting:

Raymarine Limited
Anchorage Park, Portsmouth
PO3 5TD, England
Tel +44 (0)23 9271 4713
Fax +44 (0)23 9269 4642

Appendix A: Specification

C70, C80 and C120 LCD Color Displays

General

Approvals		
CE - conforms to		1999/5/EC, EN6095:1997
FCC - conforms to		Part 80 (47CFR) and Part 2 (47CFR)
Size	C70	253 x 175 x 110 mm (9.9 x 6.9 x 4.3 in.) excluding bracket
	C80	283 x 210 x 110 mm (11.1 x 8.2 x 4.3 in.) excluding bracket
	C120	356 x 264 x 114 mm (14.0 x 10.4 x 4.5 in.) excluding bracket
Weight	C70	1.2 kg. (2.6 lbs)
	C80	1.8 kg. (3.9 lbs)
	C120	3.0 kg. (6.6 lbs)
Mounting		Bracket with panel mount option
Power		External 10.7 - 32 v DC required Floating earth/ fully isolated Consumption with full brightness: C70 9 W C80 10 W C120 12 W
Environmental: Op/Storage Temp. Range Humidity limit		Waterproof to CFR46; suitable for external mounting -10° C to +50° C up to 95% at 35°C non-condensing
Controls		9 defined keys, 5 soft keys, trackpad and rotary control
Cursor		Context sensitive, provides range/bearing or lat/lon g or depth/ range on fishfinder
Display type		Color TFT LCD
Resolution	C70	640 x 480 pixels (VGA)
	C80	640 x 480 pixels (VGA)
	C120	800 x 600 pixels (VGA)
Display size	C70	6.5 in
	C80	8.4 in
	C120	12.1 in
Display Windows		Chart, Radar, Fishfinder and CDI
Illumination Day/Night Mode		Screen and keypad: 0 to 100% in 64 steps Day and Night color palettes available
Languages		UK English, US English, Danish, Dutch, Finnish, French, German, Icelandic, Italian, Norwegian, Portuguese, Spanish, Swedish
System Alarms		Alarm clock, Anchor, Arrival, Deep depth, MOB, Offtrack, Shallow depth, Temperature, Timer

General

Connectors	13 pin Radar scanner 4 pin DSM 3 pin SeaTalk 5 pin NMEA 5 pin SeaTalk ² / NMEA2000 3 pin Power
Interfaces	Pathfinder Radar scanner 1 x DSM receive 1 x SeaTalk, receive and transmit 1 x NMEA0183, receive and transmit 1 x SeaTalk ² / NMEA2000 CompactFlash card slot
Waypoints	1000 waypoints entered via cursor, lat/long, range and bearing from present position or at boat's position. 16 character name can be assigned. Waypoint symbols and groups Additional storage available on CompactFlash cards
Waypoint Transfer	Waypoints database via NMEA
Man Overboard (MOB Mode)	Mark placed with course line; readout shows range, bearing, lat/long of MOB and time elapsed since MOB
Screen functions	Full, half and quarter screens available dependant on function. Also 3 window page with 2 x 1/4 page windows and 1 x 1/2 page window
Information	Displayed in horizontal or vertical data bar and includes boat data, navigation data, depth, environmental data and wind data
Radar/Chart overlay	Radar image can be overlaid on all screen charts

Radar Features

Range Scales (Range Rings)	1/8 (1/16)nm to 72 (12) nm dependant on scanner Performance limited by scanner type and position.
Range Ring Accuracy	Better than +/- 1.5% of the max. range scale in use, or 22m (72 ft), whichever is the greatest.
Bearing accuracy	+/- 1°
Variable Range Markers	2 x VRM's, readout nm, sm, km
Electronic Bearing Lines	2 x EBL's, floating if required, resolution 1°
Bearing scale	360° graduated at 10° intervals 2° small ticks 10° large ticks
Minimum range	23m (25 yds)
Range Discrimination	23m (25 yds)
Presentation Modes	Head up, Course up or North up (selectable True or Magnetic) Relative or True Motion

Radar Features

Scanner Control	Interference rejection, standby/transmit modes, pulse selection, Tune, Rain, FTC and Sea controls, with selection of manual or automatic control of gain, sea clutter and tune (Auto GST™)
Magnetic Sensor	NMEA (required for fast heading data, suitable for MARPA), or SeaTalk
Waypoint Display	Target waypoint displayed with User control of symbols and groups
MARPA	Manual acquisition of 10 targets, automatic tracking, dangerous target alarms, safe zone, target history, true or relative vectors, CPA graphics and indication of target speed/course, bearing/ range, CPA and TCPA.
Variation Source	Auto (SeaTalk/NMEA/Internal algorithm) or Manual
Guard Zone Alarm	2 guard zones, selectable sensitivity level, audible alarm
Off Centre function	In Relative Motion, 66% of radius (except at max. range)
Wakes	10s, 30s, 1 min, 5 min, 10 min, OFF
Target Expansion	Operator selectable with 2 levels available, OFF
Timed TX	Rotation periods: 10, 20 or 30 scans Repetition periods: 3, 5, 10 or 15 minutes

Chartplotter Features

Cartography	Navionics Charts on CompactFlash cards Chart of the world built in
Chart scaling	1/64nm (if cartographic detail is available to 4000nm)
Presentation Modes	Head up, Course up or North up (selectable True or Magnetic) Relative or True Motion
Waypoints	1000 waypoints entered via cursor, lat/lon, range and bearing from present position or at boats position. 16 character name can be assigned. Waypoint symbols and groups Additional storage available on CompactFlash cards
Waypoint Transfer	Waypoints database via NMEA
Routes	A route plan may contain up to 50 waypoints. Up to 100 routes can be stored in the units internal memory. Additional storage available on CompactFlash cards. SmartRoute to create a route from track history.
Track History	10 tracks with up to 1000 points in each can be stored in the units internal memory. Track optimisation reduces number of points used. Additional storage available on CompactFlash cards
Alarms	Programmable waypoint arrival, cross track error, anchor alarm, anchor drift, position fix/data loss warning, countdown timer and alarm clock.

Chartplotter Features

Navigation information	Own boats position in lat/lon, XTE, TTG and SOG/COG selectable. Bearing and distance to waypoint. Bearing and distance to cursor and ETA.
Variation Source	Auto (SeaTalk/NMEA/Internal algorithm) or Manual

Fishfinder

Transducer	Transom-mount, in-hull or thru-hull
Output power:	
Standard transducer	Adjustable to 600 watts RMS
High performance transducer	Adjustable to 1000 watts RMS
Frequency	Dual 50 kHz and 200 kHz
Pulse length	100 usec to 4 msec
Maximum Transmit Rate	1580 pulses/ min at 50 ft range
Depth:	
Standard transducer	3 ft (1m) to 3000 ft (1000m)
High performance transducer	3 ft (1m) to 5000 ft (1700m)
Alarms	Fish alarm, fish alarm depth, shallow and deep fish limit

Interfacing

DSM connection	For communication with DSM High Definition Fish Imaging (HDFI)
NMEA Input	NMEA 0183 GLL, GGA, GLC, GTD, VTG, BWC, BWR, RMA, RMB, RMC, XTE, VHW, HDG, HDM, HDT, DBT, DPT, APB, VLW, MWV, WPL, RTE and ZDA
NMEA Output - User selectable	APB, BWC, BWR, DBT, DPT, GGA, GLL, MTW, RMA, RMB, RMC, RSD, TTM, VLW, VHW, VTG, WPL and ZDA
SeaTalk Input	Depth, SOG, COG, Position, Waypoint number, range/ bearing, TTG, Boat speed, Time, XTE, Heading, Wind, data, Log/Trip, Pilot status, Temperature, MOB and cursor position
SeaTalk Output	Cursor data, guard zone and navigational data bridged from NMEA

Appendix B: List of Abbreviations

°C	Degrees Centigrade
°F	Degrees Farenheit
amp	Amperes
Auto	Automatic
CCFL	Cold Cathode Fluorescent Lamp
CDI	Course Deviation Indicator
COG	Course Over Ground
CPA	Closest Point of Approach
DC	Direct Current
DSC	Digital Selective Calling
DSM	Digital Sounder Module
EBL	Electronic Bearing Line
EMC	Electromagnetic Compatibility
FTC	Fast Time Constant
GPS	Global Positioning System
HDFI	High Definition Fish Imaging
KHz	Kilohertz
km	Kilometer
KPH	Kilometers per hour
ky	Kiloyards
LAT	Latitude

Long	Longitude
Man	Manual
MARPA	Mini Automatic Radar Plotting Aid
MPH	Miles per hour
nm	Nautical Mile
NMEA	National Marine Electronics Association
RTE	Route
s	seconds
SHM	Ships Heading Marker
sm	Statute Miles
SOG	Speed Over Ground
TCPA	Time to Closest Point of Approach
TTG	Time To Go
TVG	Time Variable Gain
UTC	Universal Time Constant
VMG	Velocity Made Good
VRM	Variable Range Marker
WPT	Waypoint
XTE	Cross Track Error

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Limited Warranty Certificate

In order to ensure that the equipment continues to operate efficiently and reliably, we recommend that before using the product, the customer carefully read the Owner's handbook and follow the advice on the safe and correct operation and use of the product. We recommend that Raymarine equipment, be installed by an approved Raymarine installer.

Warranty Registration

Please register your warranty on-line at www.raymarine.com to ensure smooth warranty processing.

1. Limited Product Warranty

Raymarine warrants that all of its product, in the course of normal use, will be free from defects in material and workmanship for a period of 2 years (24 months) from date of sale to the original end user, subject to the limitations set forth in this warranty. The Raymarine warranty covers the parts and labor associated with a warranty repair as described above, provided that the product is returned to Raymarine or one of its approved agents in accordance with Section 3 hereof.

2. On-board Warranty

Raymarine will authorize on-board warranty service by the nearest Raymarine approved service agent, subject to maximum mileage and travel times referred to in Section 4, on products where *proof of installation, or commission by Raymarine certified installers is shown*.

The warranty provides for on-board repair or exchange of the product, by Raymarine or its approved service agents, for a period of 1 year (12 months), subject to the limits contained in this warranty.

In the case of a product installed by a Raymarine certified installer or boat-builder, the warranty commences on date of installation or from the date of sale of the boat to the original end user, subject to the limitations set forth in this warranty.

3. Obtaining Warranty Service

In the event of warranty service being necessary, the customer should contact Raymarine Technical Support or the nearest Raymarine approved service agent, the contact details of whom are available on the Internet at www.raymarine.com or directly from Raymarine.

In cases where the customer is requesting a warranty service on a Raymarine product under this warranty, and where a Raymarine certified installer has not installed the product; i.e. *Limited Product Warranty*, the affected product must be returned to the customers local Raymarine approved service agent or direct to Raymarine with a copy of either:

(a) Proof of purchase showing the date of purchase, the name of the seller and the serial number of the affected product; or

(b) A warranty card completed by the seller of the product containing the information required in (a) above.

In cases where the customer is making a warranty claim on a Raymarine product under this warranty, and where the product has been installed by a Raymarine certified installer, (boat-builder, installer dealer etc.) i.e. **On-board Warranty**, the nearest Raymarine approved service agent should be contacted and on-board service requested (which will be subject to the mileage and travel time limits referred to in Section 4 hereof). Before the installed warranty service is performed, the customer must have available, either:

(a) Proof of purchase showing the date of purchase, the name of the seller and the serial number of the affected product and proof of installation by a Raymarine certified installer; or

(b) A warranty card completed by the seller of the product containing the information required in (a) above.

Subject to the limitations and other provisions set forth in this warranty, the product will be either repaired or replaced by Raymarine within a reasonable period of time and at no further cost to the customer. The determination of whether to repair or replace a product shall be at the sole discretion of Raymarine, and shall be the sole remedy of the customer under this warranty.

4. Warranty Limitations

Raymarine warranty does not apply to equipment that has been subjected to accident, abuse or mis-use, shipping damage, alterations, corrosion, incorrect and/or non-authorized service, or to a product on which the serial number has been altered, mutilated or removed.

Raymarine assumes no responsibility for damage incurred during installation or as a result of incorrect installation.

This warranty does not cover routine system checkouts, alignment or calibration, sea-trials or commissioning, unless required by replacement of part(s) in the area being aligned.

Magnetrons, cathode ray tubes (CRTs), thin film transistor (TFT) liquid crystal displays (LCDs) and cold cathode fluorescent lamps (CCFLs, hailer horns and transducers are warranted for 1 year (12 months) from date of sale.

Raymarine is not liable and assumes no responsibility for damage caused by or to other equipment, systems or components occasioned by improper or unauthorized connection, or use of the product.

Consumable items, including, but not limited to; fuses, batteries, drive belts, radar mixer diodes, snap-in impeller carriers, impellers, impeller bearings, and impeller shafts are specifically excluded from this warranty.

Overtime/premium labor portion of services outside of normal working hours is not covered by this warranty.

If repairs are necessary under the warranty, the affected product must be forwarded to a Raymarine facility or an approved Raymarine service agent, at the owners expense in a manner set forth in Section 3 hereof.

This warranty does not cover any differences in material, coloring or size between those alluded to in corporate advertising, literature or published on the Internet, which is not specifically objected to at the time of delivery.

Travel costs other than those qualifying for on-board warranty (up to a maximum of 100 auto miles, tolls and two (2) hours travel time), are specifically excluded from the warranty and shall be the responsibility of the customer. Costs, which are excluded from the coverage of this warranty, include, but are not limited to: taxi fares, launch fees, aircraft rental, subsistence, customs, shipping and communication charges etc.

To the extent consistent with State and Federal Law:

The foregoing warranty is Raymarine's sole warranty and is applicable only to products sold as new. The remedies provided herein are in lieu of:

any and all other remedies and warranties, whether express or implied including but not limited to, any implied warranty of merchantability or fitness for a particular purpose.

all obligations of Raymarine for damages including, but not limited to accidental, consequential or special damages (including punitive or multiple), or any financial loss, loss of profit, business, contracts, opportunity, goodwill or other similar loss arising out of or in connection with the purchase, use or performance of any Raymarine product, even if Raymarine has been advised of the possibility of such damages, and no case shall exceed the cost of the product. The remedies to the customer are herein exclusive.

Some jurisdictions do not allow exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may also have other rights, which vary from jurisdiction to jurisdiction.

The Raymarine warranty terms and conditions as described herein do not affect the customer's statutory rights and comply with EU Directive 1999/44/EC.

Raymarine is the sole author of this policy and makes no further warranties, express or implied unless a separate, specific warranty has been written and provided to the customer. This warranty supersedes and replaces all previous warranties.

All Raymarine products are merely aids to navigation. It is the responsibility of the user to exercise discretion and proper navigational skill, independent of any Raymarine equipment.

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Stick barcode label here

Purchased from

Purchase date

Dealer address

Installed by

Installation date

Commissioned by

Commissioning date

Owners name

Mailing address

This portion should be completed and retained by the Owner

**WHY NOT SAVE TIME AND EFFORT & REGISTER YOUR PRODUCT WARRANTY ON-LINE at
www.raymarine .com**