Horizon
GPS Chart400
Chart Plotter

Owner's Manual

To Cursor

BRG 123
DTG 234.5 n

COG 000
SOG 23.4kt

CTS 093 M
TTG 10:03

⌂ 36 46.173S
17442.996E

GoTo   Hide   CTR   Zoom In   Zoom Out

— mob —

Standard Communications

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Some states do not allow limitations on the duration of the warranty or exclusions or limitations of incidental or consequential damages so these limitations or exclusions may not apply to you. This warranty gives you specified legal rights which vary from state to state.
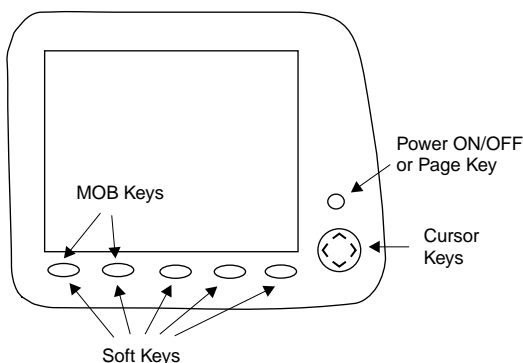
Contents

1.0   GPS CHART400 Introduction

Thank you for purchasing a Horizon 400 SERIES chart plotter. The GPS Chart400 is a compact, ruggedly built, highly integrated navigation instrument. The GPS Chart400 has been designed for ease of use. With this instrument you will be able to display detailed charts of your area, display important navigation information and show your boats position and destination. Complex navigation functions can be performed with a few simple key presses, taking the hard work out of navigation. It can also be connected to an autopilot to allow freedom from the helm.

Charts are provided in the C-MAP NT format utilizing smaller cartridges and significantly more chart detail.

Note: The USA Department of Defence (DoD) introduces a varying offset, known as Selective Availability (SA), to degrade the accuracy of the GPS system. As an approximate guideline it is generally assumed that the accuracy obtained with SA active causes the GPS derived position to be within 100 yards of the true position 90% of the time and within 50 yards of the true position 50% of the time. For increased accuracy some countries provide Differential GPS (DGPS) networks to increase accuracy to within a few yards.

1.1 Front Panel

Page Key (page)	The Page key performs a number of functions. Firstly to switch power on press and release the Page key. To switch power off press and hold the key until the display becomes blank.
	The Page key also functions as the "Next Screen" key. Press the key momentarily to step to the next main screen (Satellite Status, Underway, Waypoint or BirdsEye Highway).
	Lastly, the power on/off key functions as an "Escape" key. If you are stepping through a number of screens you can use this key to back out of the current screen or menu displayed. This function is not active when displaying one of the four main screens.
Cursor keys	The cursor keys control the movement of the screen cursor, enabling movement in eight directions. The cursor keys are also used to select setup fields in the Aux screens and to edit waypoint names and data. See section 3.3 for further details.
Softkeys	The functions of these five softkeys are defined by the display currently selected. The specific function of a softkey is displayed in a small box directly above the key. If the function is displayed in grey or the box is empty the key is inactive.

1.2 Man Over Board (MOB) Function

The **MOB** feature allows the boat position to immediately be saved as a waypoint, named **MOB**, and after confirmation will start navigating to it. The following sequence activates this function:

1. Momentarily press the keys labeled **MOB** (two left most softkeys). The current boat position is stored as a waypoint with the name **MOB**.

2. The display mode is automatically changed to the Underway screen, with a scale of 0.1 miles, North up, with the **MOB** waypoint situated in the center of the screen.

3. The GPS Chart400 beeps five times to indicate that the MOB function has been initiated.

4. The user is prompted with a message asking if an autopilot is active. ie. controlled by the GPS Chart400. This provides an opportunity for you to disengage the autopilot, if required, before going to the **MOB** waypoint.

> *Warning: It is important to note that if the autopilot is active and the you answer Yes to the 'Return to MOB?' prompt the autopilot will cause the vessel to turn in the opposite direction, back toward the MOB location. This may result in a very sudden and dangerous change in direction.*

1.3 Commonly Used Terms

Waypoints	Positions such as fishing spots, favorite anchorages, dive locations and trip destinations can be saved in the GPS Chart400 memory. These are referred to as waypoints. Up to 500 waypoints can be stored in memory. The GPS Chart400 will automatically allocate a name to a waypoint or the user can specify a name. Waypoints are saved by 'clicking' on the actual position displayed on the chart or by entering the latitude and longitude.
Marks	Marks are also positions saved in memory. They are a simplified form of waypoint. Marks are displayed on the chart as a symbol and do not have a name. The latitude and longitude of a mark can not be displayed or edited. Marks can not be used in a route. However, marks can be used as a destination for the GoTo function. Marks can also be converted to full waypoints. See Section 3.23, **Waypoint** Screen, Waypoints.
Route	Two or more waypoints can be linked in sequence to form a route. The route has a start and end waypoint and can be traversed from start to finish or in reverse. Up to 25 routes can be stored in memory.
Legs	Legs are the division of a route between waypoints. A route consisting of four waypoints will have three legs.
GoTo	You can navigate from your current position to any point on the display, by pressing the **GoTo** key. The destination can be a waypoint, mark or simply the cursor position. To activate the GoTo function move the cursor to the required destination and press the **GoTo** key displayed in the **Underway** screen.

1.4 Display Contrast and Backlighting

Display contrast and backlighting are controlled from the General Setup menu available from the Aux

screen, see section 3.3. The Aux functions can be selected by pressing the softkey labeled **Aux** when displaying the **Satellite Status** screen or the **BirdsEye Highway** screen. For more details on the main screens see section 3.0.

Backlighting can also be controlled immediately after power-up. The navigation warning screen displays the **BackLt** softkey for backlighting ON/OFF control.

1.5 Cartridges

The GPS Chart400 contains an inbuilt world wide chart. This is suitable for locating countries and regions within countries, but for details of local regions C-MAP NT chart cartridges must be purchased. The cartridges are inserted into the receptacle in the upper left corner of the display head. The receptacle is accessed by removing the protection cover. This cover must be replaced after the chart has been inserted.

Cartridges are inserted with the label facing forward. Ensure that the edge with the gold contacts, on the rear of the cartridge, enters the receptacle first. The receptacle is keyed to prevent incorrect insertion.

2.0   GPS CHART400 Installation and Wiring Connections

2.1 Packing List

- GPS Chart400 Display Head, including 2 mounting knobs & 2 washers
- Power/data cable
- Mounting Bracket
- DC400 Protection Cover
- User's manual

2.2 Replacement Parts

Description:	SCC Part #
Owners manual	M3408510UA
Mounting Bracket	1600080200
Mounting Bracket Knobs	145004016A
Rubber Shims for Knobs	581004030A
Chart Protection Boot	581004030A

2.3 Installation and Wiring Connections

1. Choose a location for the display head that provides good visibility and protects the unit from direct sun and excessive exposure to water. Insert the four mounting screws to secure the display head bracket. Choose four of the eight available screw holes that best suit your particular installation.
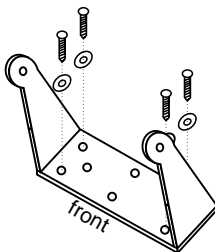
2. Connect the power/data cable to a DC voltage supply (11-16.6 VDC). The power/data cable also provides connections for the NMEA autopilot output and Differential NMEA input, if required. See the following diagram.

POWER/DATA CABLE CONNECTIONS

(Green)   (Red)

2 ○   ○ 3

1 ○   ○ 4

(Shield
& Brown)   (White)

(White)   NMEA +

(Brown)   NMEA -   (optional)
                                 AUTOPILOT

(Green)   NMEA +
                                 (optional)
                 NMEA -   DIFFERENTIAL
                                 RECEIVER

RED   2A FUSE   +

SHIELD   12VDC   −
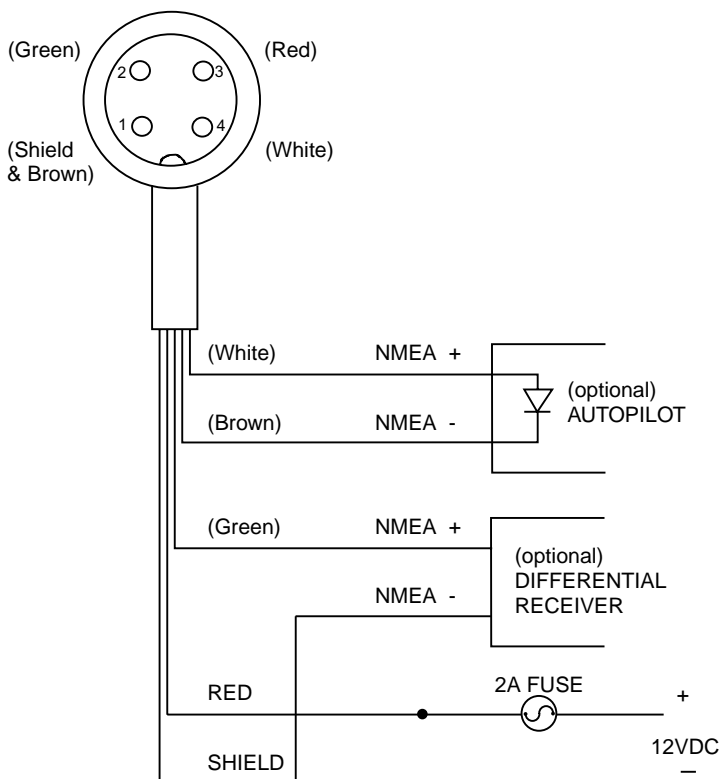
IMPORTANT NOTE:
The GPS Chart400 must be connected to a 2 Amp fused power source.

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3. Insert the display head, rubber washers and mounting knobs in to the mounting bracket. The rubber washers are located between the bracket and the case of the display head. Connect the power/data cable and the antenna cable to the display head. For a detailed description of the antenna installation procedure see the separate installation guide supplied with the antenna.

NOTE:
In some installations it may be easier to connect the power and antenna cables
to the display head before inserting the head into the mounting bracket.

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4. Adjust the angle of the display head for optimum viewing before tightening the mounting knobs.

3.0   GPS CHART400 Operation

3.1   Overview

GPS Chart400 operation is based on four main screens. All functions and displays are accessed from these screens. The four main screens are:

1. **Satellite Status:**   Shows status of all visible satellites
2. **Underway:**   Screen showing boat movement and position
3. **Waypoint:**   Edit screen for waypoint and route functions
4. **BirdsEye Highway:**   Highway screen, including speed and course information.
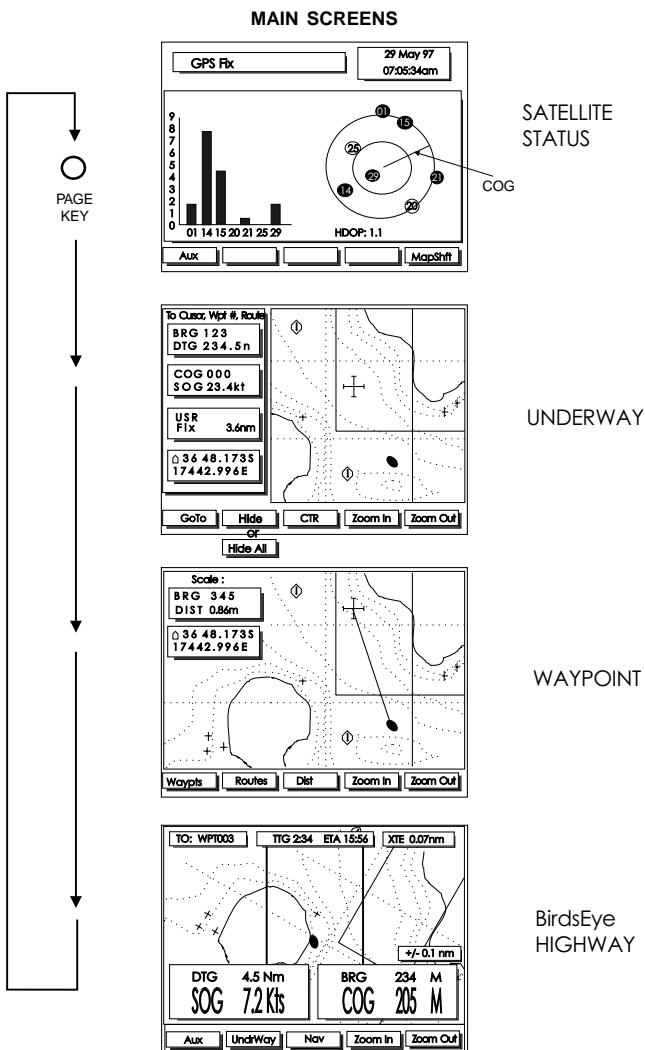
MAIN SCREENS

3.2 Main Screens

At initial power-up the GPS Chart400 displays chart cartridge information and the following navigation warning:

```
C-MAP electronic  charts (ECs)  are  derived from
geographical  data - including  official government  charts
- which  we  believe  to  be accurate. They are neither
verified nor approved by  Hydrographic  Authorities. C-
MAP  ECs  are designed  only  to  ease and  speed
navigation calculations and so must not be relied  upon as
a primary source of navigation information, but rather  a
backup  to  the  use of official government  charts  and
prudent  navigation habits.
There is  no direct  relationship  between  the color  of
water  areas  and  their  depth. The  navigator  shall always
query the area for depth information and use the official
paper charts. The  ECs  contained  in this C-MAP  product
have  been  derived  on agreement  with  the following
Hydrographic Authorities:
```
```
Confirm                                       BckLgt
```

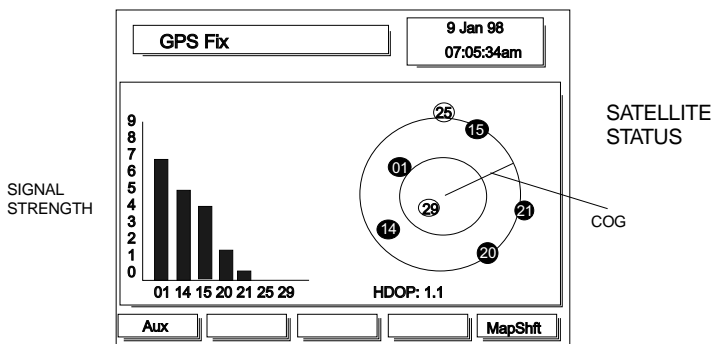At this point backlighting can be adjusted by pressing the **BackLt** key to switch the backlighting on or off. Press the **Confirm** key to proceed to the **Satellite Status** screen, the first of the four main screens.

3.21 Satellite Status Screen

The GPS constellation comprises 24 satellites orbiting the earth. From any one point on the earth's surface 12 satellites are "visible" to the GPS receiver. The position of these satellites is constantly changing. The Horizon GPS antenna tracks all visible satellites simultaneously and selects four satellites that produce the optimum geometry for determining a 3-D position. The superior performance achieved with the GPS Chart400 12 channel receiver provides increased accuracy and reduced Time to First Fix (TFF).

```
GPS Fix                          9 Jan 98
                                 07:05:34am

                                              SATELLITE
9                          25                 STATUS
8                              15
7
6                       01
5
4                            29              21
3                                                 COG
2                         14
1                                   20
0
 01 14 15 20 21 25 29   HDOP: 1.1

SIGNAL
STRENGTH

Aux                              MapShft
```

The time from initial power-up to the time the GPS Chart400 calculates the latitude and longitude of the current position is known as the Time to First Fix (TFF). The TFF varies in relation to a number of factors, but primarily varies due to the amount of time that has passed since the GPS Chart400 last obtained a fix. If the GPS Chart400 was last used within four hours the TFF will typically acquire a position within 18 seconds. The TFF will extend out to 2 minutes if the GPS Chart400 has not been used for periods longer than a few weeks. If the GPS Chart400 has moved a significant distance, typically greater than 50 miles, since the last time it was used it will automatically go into a cold start

mode and "search" the sky for satellites. This is fully automatic and requires no user intervention. This process can take several minutes. The TFF is also influenced by the current satellite geometry and position of the antenna. The antenna must have an unobstructed view of the sky. See the separate antenna installation guide for more details.

The **Satellite Status** screen displays the signal strengths of the visible satellites and their current positions. Signal strength is displayed in bar graph form, displaying the signal levels of the seven strongest satellites. Satellite position is displayed within two concentric circles. The outer circle indicates zero degrees elevation (the horizon), the inner circle indicates 45° elevation and the center of the circles indicate 90° (directly above). If the GPS Chart400 is moving the current Course Over Ground (COG) will also be displayed (if enabled).

The geometric quality (HDOP) and date/time are also displayed. A low HDOP indicates a more precise fix. A higher HDOP indicates a less accurate fix. The USA Department of Defence (DoD) introduces a varying offset, known as Selective Availability (SA), to degrade the accuracy of the GPS system. As an approximate guideline it is generally assumed that the accuracy obtained with SA active causes the GPS derived position to be within 100 yards of the true position 90% of the time and within 50 yards of the true position 50% of the time. For increased accuracy some countries provide Differential GPS (DGPS) networks to increase accuracy to within a few yards.

Mapshift and Datums

Satellite derived positions are based on a worldwide reference (datum) known as WGS 1984. Many paper charts are based on datums other than WGS 1984. This results in an offset between a Lat/Lon plotted on the paper chart and the same Lat/Lon plotted on the GPS Chart400. To match the GPS Chart400 with your local charts you must enter the datum for your local area, see section 7 for a list of available datums. Once your local datum has been entered all latitudes and longitudes, including waypoints, will match the paper charts. See section 3.3 for details on how to access the datum menu.

If you prefer to retain the WGS84 datum (no local datum) but find that the boat position is offset you can correct this offset with the Mapshift function. To use the mapshift function first locate your boat at a known point on the chart and select a scale (Zoom In, Zoom Out) similar to the paper chart. From the **Satellite Status** screen press the **Mapshift** key. Use the cursor keys to move the cursor to the correct location for the boat. Press the **Set** key to select the new location. Press the **Done** key to save to memory. The Mapshift offset is displayed on screen in the Waypoint data window. Verify the setting by performing the same procedure at other known locations.

> ### *NOTE:*
> *The mapshift function provides a method for eliminating minor offsets. It can not be used to correct Lat/Lon values to match local charts. After mapshift is applied all Lat/Lon values remain in the WGS84 datum.*

3.22 Underway Screen
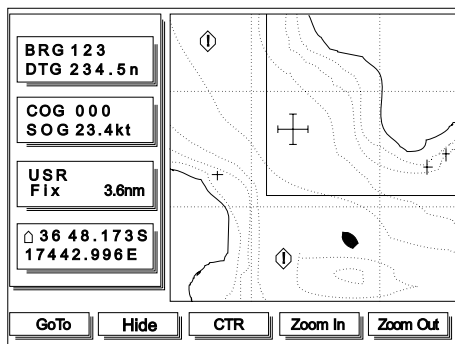
The **Underway** screen displays the boat position and track. It also displays full chart detail as well as navigation information such as speed, course, routes and waypoint information The underway screen is the main screen for displaying your current location and heading. It has limited editing functions. To edit routes and waypoints see the following **Waypoint** screen section.

Zoom In & Zoom Out

The scale of the displayed chart can be instantly changed by pressing the **Zoom In** or **Zoom Out** key. To see more detail press the **Zoom In** key. To see a larger area but less detail press the **Zoom Out** key.

CTR

This key centers the boat or cursor on the screen. Press the key once to center the cursor. Press the key twice, within one second, to center the boat. This method allows centering of the boat or cursor when initially not displayed on the screen.

NOTE:

After centering the screen around the boat or cursor you can change the scale by pressing the Zoom In or Zoom Out keys and the Chart400 will retain the scale selected. This is a very usefull feature, for example, you can center the display around the cursor and zoom out to see the entire route, you can then center the display around the boat and press zoom in to see more detail. You can then switch between these displays by pressing the CTR key as described above. The different scales will be retained even if the cursor and the boat can be viewed simultaneously on the same display.

Hide

Windows containing speed, course and navigational data can be removed by pressing the **Hide** key.

This allows a larger proportion of the chart to be displayed. Press the key twice to remove remaining borders and softkeys. The chart will occupy the entire screen. Press the hide key (not labeled) to return to the previous display.

NOTE:

While in the full screen mode the Zoom In and Zoom Out keys are active.

Lat/Lon Window

The latitude and longitude of the boat are displayed in a window at the bottom left of the display. A boat symbol appears next to the lat/lon to indicate that it is the position of the boat. If the cursor has been moved in the last ten seconds the latitude and longitude displayed is the position of the cursor and the boat symbol is not displayed.

Scale

The chart scale is displayed on most screens, including the **Underway** and **Waypoint** screens. The figure displayed (eg. scale=8nm) is the horizontal distance across the bottom of the currently visible chart area. For example if the scale is 8 nm then a portion of chart eight nautical miles wide is currently displayed.

Autopan

Autopan changes the area of chart displayed to automatically maintain the boat position on the screen. This function can only be enabled while the **Underway** screen is displayed. The Autopan function is enabled by pressing the **Ctr** key twice to center the boat. A suitable chart scale can be selected by pressing the **Zoom In** or **Zoom Out** keys. It is important to note that pressing any key, other than the **Zoom In** and **Zoom Out** keys, will disable the autopan function.

GoTo

The GoTo function provides a simple method of navigating from the boat position to the current cursor position, waypoint or mark.

1. Position the cursor at the destination waypoint. The destination can also be a mark or the current cursor position. Press the **GoTo** key when the cursor is positioned at the required destination.

2. The course from the boat to the destination will be displayed on the screen. Once the **Confirm** key has been pressed the distance and bearing to the destination will be displayed.
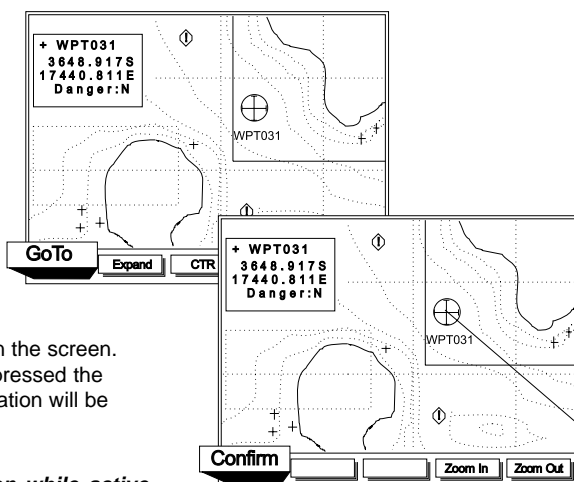
***NOTE: To cancel the GoTo function while active, press the GoTo Key.***

Markers and Navigation Aids

Detailed information explaining markers and navigation aids can be displayed by positioning the cursor over the particular symbol of interest. The diagram below shows three examples of symbols typically found on CMAP NT charts. Once the cursor is moved near a symbol, such as the buoy in this example, a small window appears displaying data in short form. To increase the amount of data available press the **Expand** key and use the cursor keys to step through the various information pages.

The SSh symbol shown in the example below indicates the type of sea bed (sand, shells). This can be expanded as described above.

In some areas information (!) symbols are also displayed. These are only present in attention areas. See section 3.3, 4. Map Configuration for a further explanation of attention areas.

Note: Marker and navigation information can only be expanded from the Underway screen
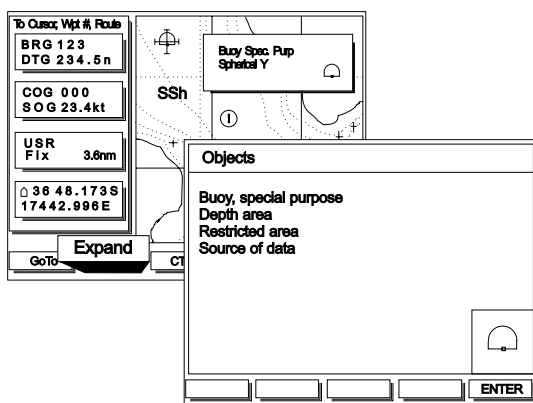
3.23 Waypoint Screen

The **Waypoint** screen is used to create and edit waypoints and routes. It can also be used to calculate distances between locations on the chart. In addition to the usual **Zoom In** and **Zoom Out** keys three additional keys are provided to give access to the following functions.

Waypoints

Waypoints can be created, saved, deleted and moved. The following diagrams illustrates these functions.

There are two types of waypoints.

1. A **conventional waypoint** which is a location saved as a latitude and longitude. These waypoints have all the features usually associated with waypoints. You can GoTo them, include them in routes and they can be moved, deleted or renamed.
2. A **Danger waypoint**. These are locations you wish to avoid. Any normal waypoint can be designated a Danger waypoint. All Danger waypoints are permanently active. If the vessel

travels within the arrival circle of any Danger waypoint the alarm will sound. These waypoints can not be disabled and the user can not GoTo them or included them in any route.

Strictly speaking, there is a third type of waypoint known as a **Mark**. Marks do not have all the attributes of normal waypoints but they do have very similar characteristics. Positions on charts can be saved by using Marks. These symbols are used to mark a location of interest. This is a simple way of marking a spot on the chart without creating a full waypoint. There are four symbols to choose from. It is not possible to name them or edit them and the lat\lon is not displayed. However, Marks can be converted to full waypoints. See Section 3.23, Converting Marks to Waypoints. Marks also remain on the chart until deleted and you are able to GoTo them.

Waypoint Screen

Pressing the **Waypts** key in the main **Waypoint** screen will produce one of two possible screens.
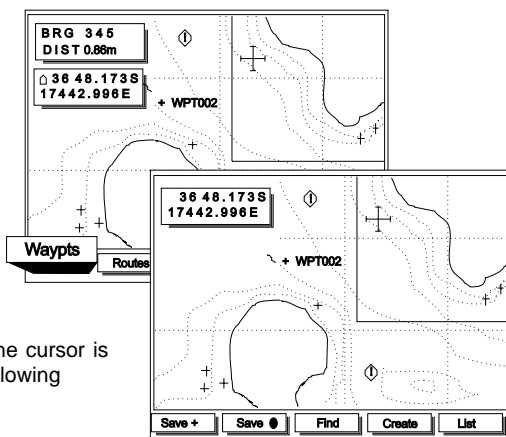
If the **Waypts** key is pressed when the cursor is *not* positioned over a waypoint the following screen appears
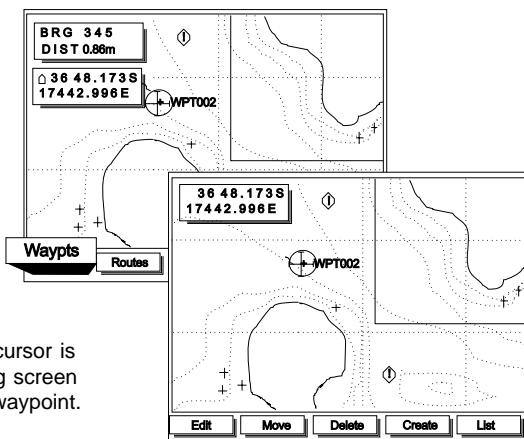
If the **Waypt** key is pressed when the cursor is positioned over a waypoint the following screen appears, to edit or modify the existing waypoint.

Creating a New Waypoint

Waypoints can be saved in **three** ways. The vessel position can be saved. The cursor position can be saved or you can enter a latitude and longitude as a waypoint.

Saving the current cursor position or boat position

1. Select **Waypts** from the main **Waypoints** screen to display the waypoint options.

2. Press the **Save +** key to save the cursor position as a waypoint or press the **Save** ⌂ key to save the boat position as a waypoint.

— OR —

3. Press the **Waypt** key to save as a waypoint. Alternatively you may save the position as a *mark* by selecting one of the four symbols displayed on this screen.

4. At this point you can change the name of the waypoint or edit it's lat/lon by pressing the **Edit** key. Press the **Save** key to save the new waypoint to memory. For a description of the editing functions see the following section **Waypoint Editing Functions**.
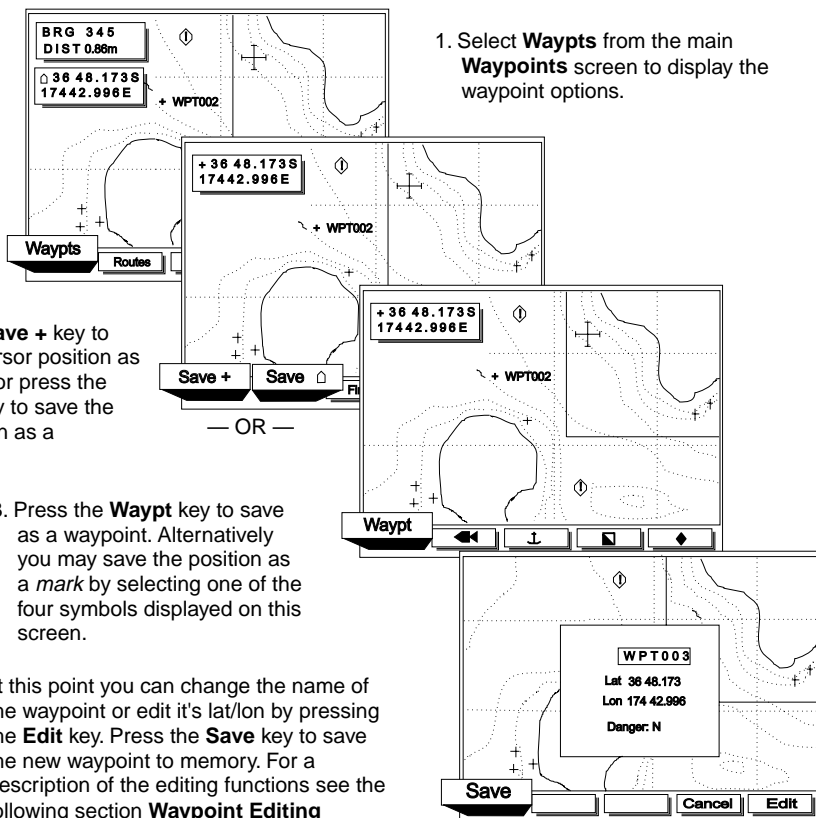
Creating a waypoint by entering the latitude and longitude
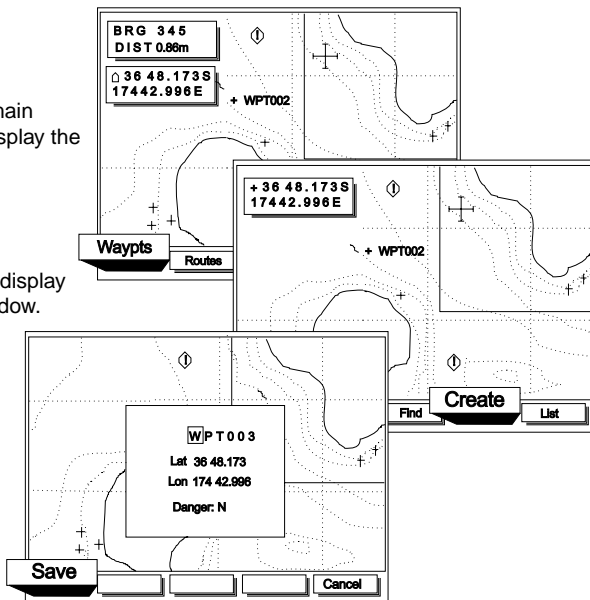
1. Select **Waypt** from the main **Waypoints** screen to display the waypoint options.

2. Press the **Create** key to display a new waypoint edit window.

3. Enter a name and lat/lon for the new waypoint. Press the **Save** key to save the new waypoint to memory.

Waypoint Editing Functions

There are a number of ways of changing existing waypoints. You can change the name, lat/lon, danger status or waypoint type by positioning the cursor over the waypoint and pressing the **Edit** key. You can also delete a waypoint in the same manner by positioning the cursor over the waypoint and pressing the **Delete** key. These functions are accessed from the **Waypoint** screen.

To change the name, lat/lon or danger status of a waypoint the Edit **Waypoint** screen must be displayed. An example of this is shown in step 3 above. Other methods of displaying the Edit **Waypoint** screen are described throughout this section. Initially, when the Edit **Waypoint** screen is first displayed the name of the waypoint is highlighted with reverse video. At this point you can use the cursor keys to select the name, lat/lon or danger fields. Once you have selected the required field press the **Edit** softkey to start the editing process. To change the contents of the field press the right or left cursor key to highlight the appropriate letter or number and then press the up or down cursor key to step through the alphabet to the required letter or number. After completing the changes press the **ENTER** softkey to move to the next field. Once all changes have been completed press the **Save** softkey to save the changes to memory.
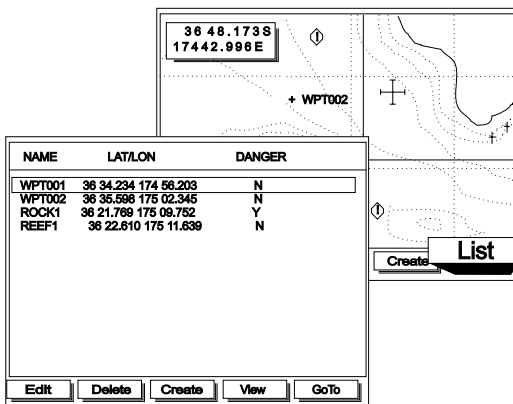
Converting Marks to Waypoints

With the Waypoint screen displayed, Marks can be converted to full waypoints by positioning the cursor over the Mark. Press the **Waypts** softkey to access the various edit functions. Press the **Convert** softkey to convert the Mark to a full waypoint.

List Waypoints

Waypoints can also be accessed by displaying a list of all waypoints stored in memory.

From the List screen you can GoTo a waypoint, you can display the waypoint on the chart by pressing **View** or you can edit it, delete it or create a new waypoint. Any active waypoint will be displayed in a shaded form to indicate that it can not be edited.

The GPS Chart400 will not allow you to delete a waypoint that is used in a route.

NAME	LAT/LON	DANGER
WPT001	36 34.234 174 56.203	N
WPT002	36 35.598 175 02.345	N
ROCK1	36 21.769 175 09.752	Y
REEF1	36 22.610 175 11.639	N

Edit | Delete | Create | View | GoTo

Finding a Waypoint

To see the location of a waypoint on the chart press the **View** key, from the Waypts screen and enter the waypoint name. The GPS Chart400 will display a portion of the chart containing the waypoint.

Moving a Waypoint

A "click and drag" method is used to move waypoints. Position the cursor over the waypoint and press the **Move** key. You can now use the cursor keys to reposition the waypoint to another location on the chart. When you have positioned the cursor in the new position press the **Save** key to save in memory.

1. Position cursor over waypoint and press the **Move** key.
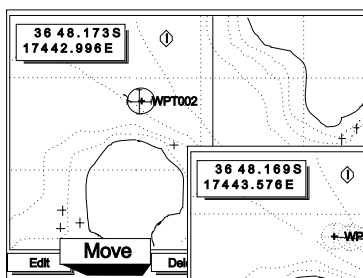
2. Drag waypoint to new location and press **Save**
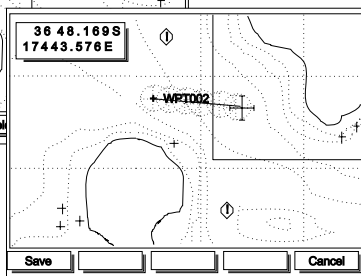
Deleting a Waypoint

Deleting a waypoint is also performed by positioning the cursor over the waypoint, as shown in the above diagram. Press the **Delete** key to delete the waypoint.

Routes

Routes are a sequence of waypoints that are traversed in order. A route can consist of any number of waypoints from a minimum of two to a maximum of 50. Routes can be started from any waypoint within the route and can be traversed in either direction. Routes are a particularly powerful feature when the GPS Chart400 is connected to an autopilot, allowing the vessel to be automatically guided along the route.

Olympic course routes can also be created with the GPS Chart400. In an Olympic course route the start and finish waypoint is the same waypoint.

NOTE: An Olympic route must consist of a minimum of three waypoints.

The **Route** key displayed in the **Waypoint** screen, one of the four main screens, enables access to a wide range of functions. The GPS Chart400 will guide you through the process of creating and controlling routes. The options available are dependant on the particular situation. For example, if a route is active the GPS Chart400 will first give you the options of listing other routes saved in memory or disabling the active route. Once the active route is disabled a range of editing functions will become available. See the following sections. If a route was not active when you pressed the **Route** key you will, again, have the option of listing all routes currently saved in memory or creating a new route.

NOTE: You cannot include a Mark in a route

Creating a New Route

There are two methods of creating routes. Defining a route, using the first method, consists of "clicking" on existing waypoints in the order in which they will be traversed. Waypoints that do not exist can be created as you go.

1. Press the **Routes** key to enter the route edit mode.

2. Press the **Create** key to start the formation of the route.

3. Position the cursor at the start position. Press the **Add** key to create or add the start waypoint.

4. Edit the waypoint name if required and press **Save** to save the waypoint to memory. This screen will not be displayed if you add an existing waypoint

5. Move the cursor to the next waypoint location. Press the **Add** key to complete the first leg of the new route. If you have created a new waypoint at this point press the **Save** key to save it to memory.

6. Continue to add legs as required. At the completion of the route press the **Save** key to save the entire route to memory. You will be prompted with a Route name. You can define your own name if required.
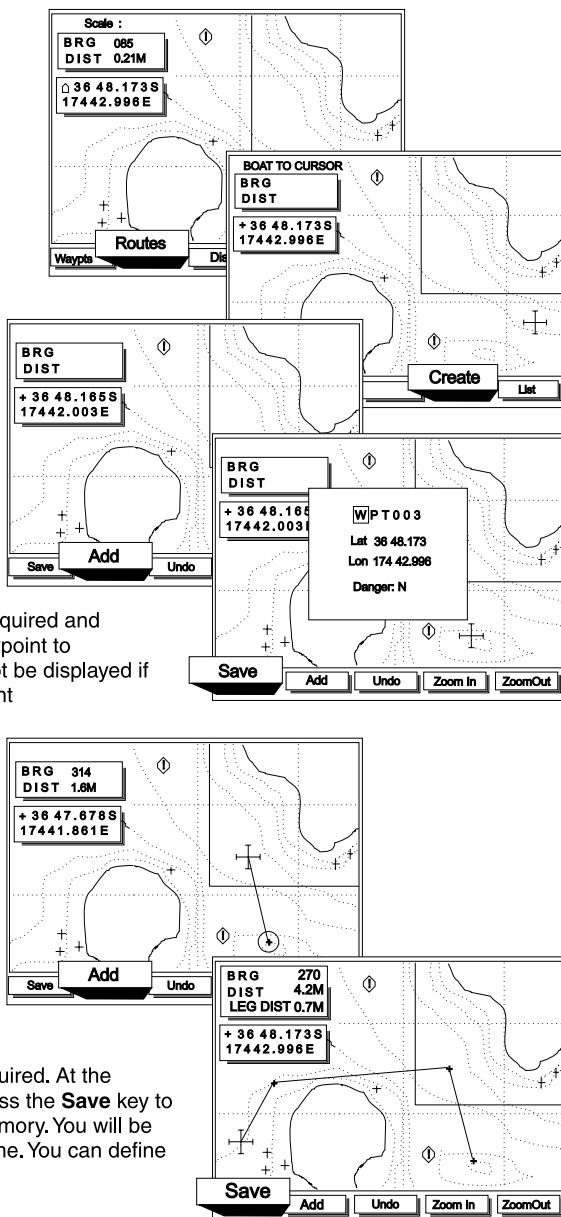
The second method for creating routes consists of forming a route from a list of waypoints.

1. Press the **Routes** key to enter the route edit mode.
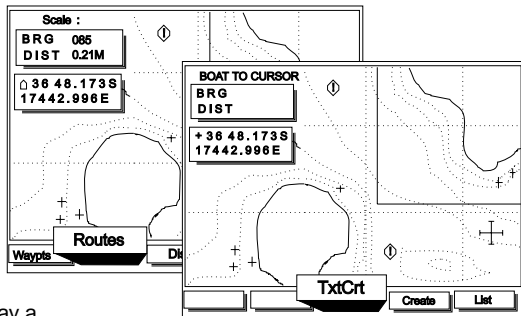
2. Press the **TxtCrt** key to display a new route waypoint list. A default route name will be displayed. The name can be edited with the use of the cursor keys.

3. Position the cursor at the point where you wish to insert a waypoint. Press the **Insert** key to add a waypoint. A list of existing waypoints will be displayed.

4. Repeat this process until all waypoints have been entered. Press the **Done** key to save the new route.

Starting the New Route

At the completion of the above process the **Start** key becomes available. Press this key to activate the new route. You will be prompted to select a start waypoint, which can be any waypoint along the route. You will also be prompted as to whether the route will be traversed in the forward or reverse direction.

Displaying Routes

Routes can be displayed by listing the routes saved in memory and then selecting the appropriate route from the list. A portion of the chart, containing the route, will be displayed on the screen. At this point the route can be activated, edited or deleted by pressing the appropriate softkey.
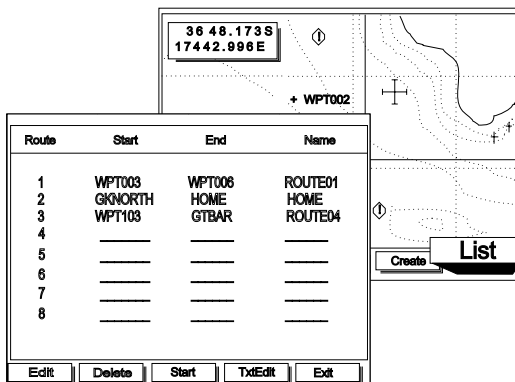
NOTE:

An arrow to the left of the route number indicates the route is active. Route editing cannot be performed while a route is active.

Starting and Deleting Routes

Once a route is displayed on the screen, as described in the previous sections, two options become available. Route navigation can be started or the route can be deleted from memory. These options are only available if the cursor is not positioned over the route or a waypoint within the route, in which case the edit keys (Move, Insert and Delete) are displayed.

Also, when starting a route, an alternate start waypoint within the route can be selected by pressing the **<** or **>** softkeys.

Adding, Moving and Deleting Waypoints in a Route

If you are currently displaying a route as described above, and the route has *not* been activated, you can move, delete or add waypoints to it. For example, to move a waypoint, position the cursor over the waypoint and press the **Move** key. You can then "drag" the waypoint to the new position.

Important: **It is important to note that the method of editing a route, as described in this section, is the only method of moving or deleting waypoints that are used in routes. The normal waypoint edit functions for moving and deleting waypoints described in the previous section, 3.23 Waypoints, can not be used with waypoints that have been included in routes. Also, regardless of the above situation, no changes at all can be made to waypoints that are part of an active route.**

1. Position cursor over waypoint and press the **Move** key.
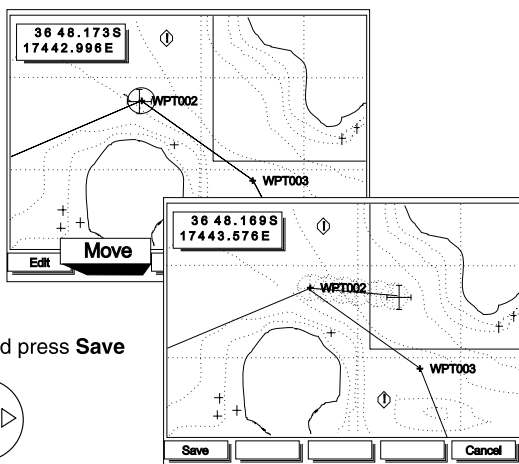
2. Drag waypoint to new location and press **Save**

Deleting a waypoint is also performed by positioning the cursor over the waypoint. Press the **Remove** key to delete the waypoint from the route.

To **add a waypoint** to the route, position the cursor over the leg in which a waypoint is to be inserted. A softkey labeled **Insert** becomes available. Press the **Insert** key and move the cursor to the required location for the new waypoint. Press the **Add** key to create a new waypoint. Press the **Save** key to save the waypoint to memory. The new location can also be an existing waypoint.

Distance Calculations

The third function available from the **Waypoint** Screen is the distance and bearing calculator. The following diagram illustrates the method used to determine distance and bearing between points on the chart.

Calculating Distances and Bearings

1. Press the **Dist** key to enter distance mode.

2. Position the cursor at the start position. Press the **Start** key to start the distance measurement.

3. Press the **Next** key at the end of the first leg. The distance and bearing are displayed in the upper left section of the display.

4. Move the cursor to the position required for the second leg. Press the **Next** key to add this leg to the distance calculation.

5. Continue to add legs as required. At the completion of the measurement press the **Next** key to add this leg to the distance calculation.

   You also have the option of saving the displayed course as a route. Press the **Save** key for this option.

   Alternatively, you can press the **End** key to exit the Distance function
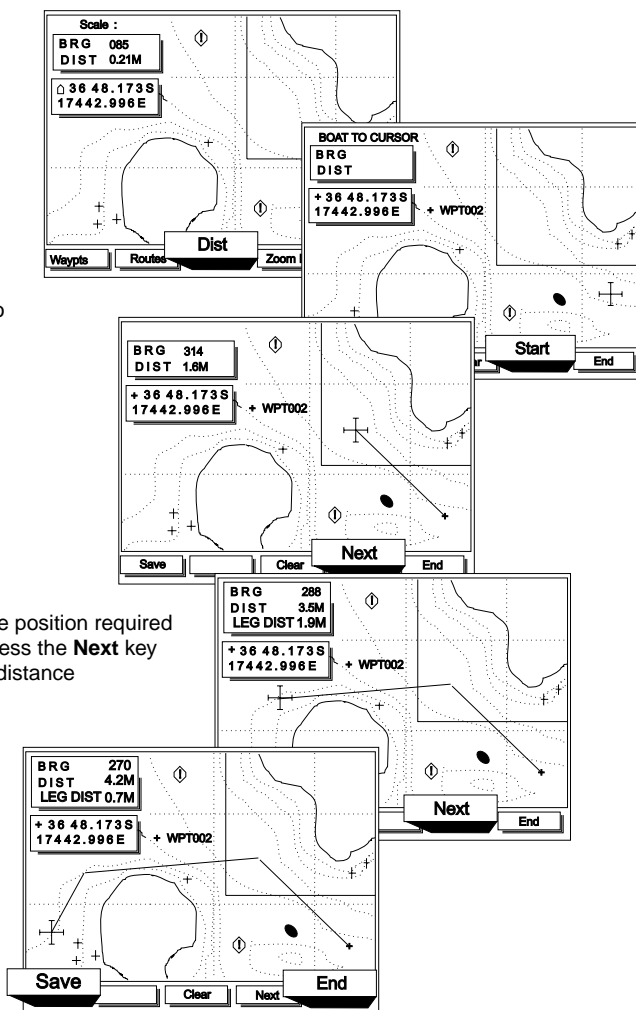
3.24 BirdsEye Highway Screen

The **BirdsEye Highway** screen is the last of the four main screens. It displays navigation data with large digits allowing essential navigation data to be easily visible when the display is located some distance from the helm. This screen also features the highway screen, where your current course is displayed in a manner similar to a highway, but from a bird's point of view the destination waypoint is automatically positioned directly ahead, at the center top of the display. Two vertical lines are displayed indicating cross track error limits, as set in the CDI/Units/Alarms screen (CDI Scale), located in the Aux setup pages.

In the **BirdsEye Highway** screen the boat position is automatically maintained in the central area of the display, allowing a clear view of surrounding chart information.

The data displayed in upper right window is user configurable. The Nav Screen Setup function, accessible in the Navigation Setup menu, allows you to choose one of four navigational funct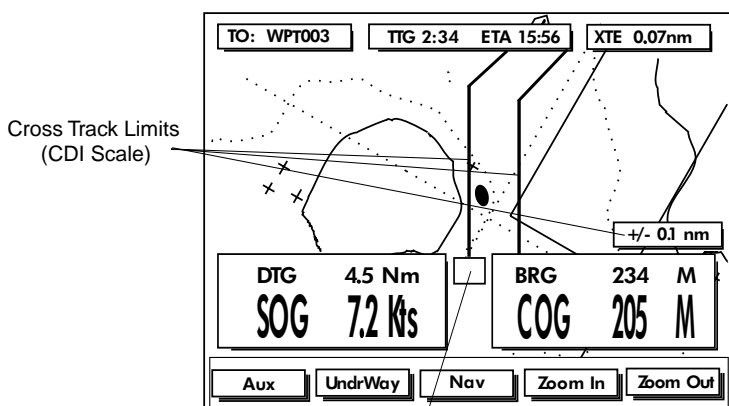ions to display in this window. The choices are XTE, CTS, STR and VMG. See section 6.0 for an explanation of these terms. Also, refer to section 3.3, CDI scale, for a description of the Course Deviation Indicator displayed in the lower section of this screen.

Cross Track Limits
(CDI Scale)

TO: WPT003   TTG 2:34   ETA 15:56   XTE 0.07nm

+/- 0.1 nm

DTG   4.5 Nm   BRG   234   M
SOG   7.2 Kts   COG   205   M

Aux   UndrWay   Nav   Zoom In   Zoom Out

If the boat moves outside the cross track limits, indicated by the vertical lines, a steerage indicator is displayed. The indicator will show the direction to steer, to return to the original course.

or
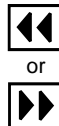
NOTE:

The same data is also displayed in the data windows displayed in the Waypoint screen.

3.3 Auxiliary Screen

Setting up your GPS Chart400

The GPS Chart400 setup functions are located in the Auxiliary menu. To personalise your GPS Chart400 move to either the **Satellite** or **BirdsEye Highway** screen. Press the **Aux** key to enter the Auxiliary menu.

AUX SCREEN MENUS

1. General Setup

Contrast	6
Backlight	8
Local Time ofst	+13:00
NMEA Output	ON
Language	English

2. Navigation Setup

Map Datum	WGS 1984
North Reference	True
Map Orientation	North Up
Velocity Averaging	20 Secs
Projected Course	OFF
Nav Screen Setup	VMG

3. CDI/Units/Alarms

CDI Scale	0.5 Nm
Distance Units	Nm
Speed Units	Kts
Depth Units	Ft
Alarm Activated	ON
Arrival Radius	OFF
Anchor Alarm	OFF
Guard Zone	OFF

4. Map Configuration

5. Track History

Track History	ON
Plotting Interval	Distance
Resolution by Dist.	0.05 Nm
Resolution by Time	10 sec
Track Memory Used	23%
Clear Track Memory	

6. Simulation Mode

Mode	Normal
Speed	9.5 Kts
Heading	027 T
Starting Waypoint	MARINA
Dest. Waypoint	ANCH RCK
Active Simulation	OFF

Land Settings Menu

Natural Features	ON
Rivers & Lakes	ON
Cultural Features	ON
Landmarks	ON

Marine Settings Menu

Water Turbulence	OFF
Bathymetric Lines	OFF
Depth Area Limits	00033 Ft
Bathymetrics & Soundings Range	00000 Ft - 00200 Ft
Spot Soundings	OFF
Bottom Type	OFF

Nav-Aids and Features Menu

Ports & Services	ON
Attention Areas	ON
Tracks & Routes	OFF
Lights	OFF
Bouys & Beacons	ON
Signals	ON
Cartograph. Objects	ON

Other Settings Menu

Names	ON
Compass	ON
Chart Generation	ON
New Objects	ON
Complex Object Icon	Multiple
Info Level	Detailed

Chart Settings

Lat/Lon Grid	OFF
Chart Boundaries	OFF
Waypoint Icons	ON
Track Display	OFF
Plotter Mode	OFF

Navigating the Menus

The GPS Chart400 uses the cursor keys to scroll, enter or leave the various setup menus. The up and down arrows on the cursor key scroll the highlight bar through the menus. The right arrow on the cursor key enters the highlighted menu title. In most menus an **Enter** softkey will become available. The **Enter** key must be pressed to save the changes to memory. The **Page** key is used to escape from the menus without making permanent changes.

1. General Setup

Contrast	Display contrast (16 levels)
Backlight	Backlight Intensity (16 Levels)
Local Time ofst	Time zone offset from UTC (GMT) for your local region.
NMEA Output	Enable/Disable the autopilot NMEA0183 output
Language	The available languages are: English, Italian, French, German and Spanish.

2. Navigation Setup

Map Datum	128 chart datums are provided. The satellite derived positions displayed on the GPS Chart400 can be adjusted to match your local paper charts by selecting the appropriate datum for your region.
North Reference	This option applies if charts are displayed North up. See Map Orientation below. The North Reference options are true and magnetic.
Map Orientation	Charts can be displayed either North up, so that North is always at the top of the display, or Projected Track up. Projected Track up maintains the boat direction toward the top of the screen. The chart is automatically rotated to achieve this affect. In this mode a small square appears in the upper right corner of the LCD, indicating the direction of North. This a mode of operation is particularly useful for navigating narrow harbors or rivers.
Velocity Averaging	The GPS Chart400 is able to show instantaneous velocity or velocity averaged over a selected period. The available averaging options are OFF, 20 seconds and 60 seconds. The COG damping is also derived from this setting.
Projected Course	The GPS Chart400 can plot your likely course using current speed and heading. The projected course is displayed as a solid line originating from the boat position. The projected course is also displayed in the Satellite Screen. There are six options for the historical period from which the projected course is calculated. The options are OFF, 2 minutes, 10 minutes, 30 minutes, 1 hour and 2 hours.
Nav Screen Setup	The **Waypoint Screen** and the **BirdsEye Highway** screens have a data window that displays a user definable data field. In the **Waypoint** screen the window is located immediately below the COG/SOG window. In the **BirdsEye Highway** screen the data window is located in the center of the display. Four data choices are available: XTE, CTS, STR and VMG.

3. CDI/Units/Alarms

CDI Scale	The Course Deviation Indicator (CDI) is displayed on the **BirdsEye Highway** screen. It is a graphical indication of the cross track error (XTE), indicating the magnitude of the course adjustment required to return to the original track. See section 6.0 for a description of XTE. Available scale options are available 0.5, 1.0, 2.0, 4.0, 10.0 distance units.
Distance Units	Available options are Nautical miles, statute miles or kilometers.
Speed Units	Available options are Knots, miles per hour and kilometers per hour.
Depth Units.	Available options are Feet, fathoms or meters.
Alarm Activated	The chart plotter's alarms (Arrival alarm, Anchor Alarm and Guard Zone) can be selected on or off. The alarm values remain in memory when the alarms are selected off and become active again when the alarms are enabled.
Arrival Radius	An alarm will sound (if active) when your boat comes within a set distance of a waypoint. If a route is active the GPS Chart400 will automatically start navigating to the next waypoint in the route. This radius can be set anywhere from OFF to 9.99 distance units, in 0.01 steps. The same setting is used for Danger waypoints.

> *Note: The arrival alarm is also activated when the waypoint passes abeam of the boat, while the boat is outside the arrival circle. This results in the alarm being triggered when you go past the waypoint without entering the arrival circle.*

Anchor Alarm	Setting an anchor alarm value will enable the anchor watch function. The GPS Chart400 will save the current boat position and sound the alarm whenever the distance from this point to the boat's current position exceeds the value chosen. This radius can be set anywhere from OFF to 9.99 distance units, in 0.01 steps. The Anchor Alarm function is intended for differential GPS operation, where the error introduced by Selective Availability (SA) has been significantly reduced.
Guard Zone	Guard Zone is a cross track error (XTE) alarm. The alarm is sounded when the distance from the boat to the intended track (XTE) exceeds the Guard Zone value. This distance can be set anywhere from OFF to 9.99 distance units, in 0.01 steps.

4. Map Configuration

The Map Configuration screen provides access to five sub menus allowing you to enable or disable an extensive range of chart features. You can configure a display format that best suits your needs. Some important points to note are:

Plotter Mode. Occasionally it is desirable to Zoom In to a range that exceeds the chart information in the cartridge. An example of this is if you wish to track very small movements of the boat, or are using the GPS Chart400 in an area where detailed C-MAP charts are unavailable. To enable plotter mode you must set Plotter Mode to ON in the Other Settings Menu. In this situation, when you Zoom In beyond the chart limits the GPS Chart400 will enter track plot mode and will only display the boat position and track (if enabled). Chart and map information will no longer be displayed.

Bathometric Lines and soundings. The C-MAP cartridges contain a large amount of depth data in the form of spot soundings and bathometric lines (depth contours). These can be selectively displayed. The Bathometric & Soundings Range setting allows the user to set the range in which spot soundings and bathometric lines are displayed. Also, the maximum depth to which shallow water patterns are displayed can be set by changing the Depth Area Limits setting. All these functions are available from the Marine Settings Menu.

Attention Areas. Areas of importance, such and restricted anchorages and shallow areas, are highlighted as Attention Areas. Three options are available for the display of Attention Areas, ON, OFF and Contour. This settings is accessed from the Nav-Aids and Features Menu. The **ON** option displays the attention areas as a dot pattern. Also, displayed are information (!) icons. When the cursor is positioned over these icons more detailed information about the Attention Areas is displayed. The **Contour** option removes the dot pattern and only displays the information (!) icons. It is important to note that in some earlier CMAP chart cartridges the information (!) icons are inactive. The final Attention Areas option, **OFF**, removes both the dot pattern and the information (!) icons from the display.

> *Note: Detailed Attention Area information is only available from the Underway screen and in some earlier CMAP chart cartridges the information (!) icons are inactive.*

5. Track History

The Track History function allows plotting of the track of the boat as it moves. To obtain a track history the GPS Chart400 saves the boats position to memory at regular interval. These intervals can be time intervals or distance intervals. The Track History Menu allows the user to select distance or time intervals and the resolution. The time intervals can be set from a minimum of 1 second to a maximum of 1 minute. The selectable distance range is from 0.01 to 10.0 distance units.

The Track History Menu also displays the amount of available memory used to track the boat movements and provides a memory clear function. The track plot data is retained when power is removed from the GPS Chart400. To erase the track from the GPS Chart400 memory select Clear Track Memory from this menu.

6. Simulation Mode

Simulation mode provides a method of becoming familiar with the GPS Chart400 functions. There are two simulator modes to choose from. In both modes boat movement and satellite data are simulated and all navigation functions are available. The first simulation method, **Demo** mode, allows an existing route to be selected for simulation. When this mode is activated the boat will travel along the chosen route, simulating the journey along the entire route. When the end of the route is reached the direction of the boat is reversed and the route is traversed in reverse. The boat will continue to travel back and forth along the route indefinitely. This simulation method is activated as follows:

1. Create a route as described in section 3.23, Creating a New Route. Alternatively, you may use any existing route in memory.

2. Select **Simulation Mode** from the **Aux** menu.

3. Set the **Mode** field to **Demo**.

4. Enter the desired **Speed** value and the **Route** number of an existing route.

5. Set **Activate Simulation** to **ON.**

The second simulator method, **Normal** mode, simulates a single leg journey. In this simulator mode the boat continues indefinitely on the course specified. This simulation method is activated as follows:

1. Select **Simulation Mode** from the **Aux** menu.

2. Set the **Mode** field to **Normal**.

3. Enter the desired **Speed**, **Heading** and **Starting Waypoint** values. All three fields must contain a value to successfully enable the simulator.

4. Enter an optional **Destination Waypoint.** The waypoint entered in this field is used as a destination to simulate the **GoTo** function. The boat will actually head in the direction defined in step 3, **Heading**. It will not head toward the **Destination Waypoint** unless the appropriate **Heading** value is entered in step 3.

5. Set **Activate Simulation** to **ON.**

4.0   Troubleshooting Guide

Problem	Cause
Chart400 will not switch on	Power/data cable not connected to the display head. Reverse DC power connection. Reconnect power in the correct manner.
Some previously available navigation functions are no longer available. 'No Fix' indication.	GPS no longer has a fix. This may occur occasionally if the antenna does not have a clear view of the sky. The satellite positions are constantly changing. It is essential that the antenna has a clear view of the sky.
Prolonged period to obtain a fix.	This will occur if the Chart400 has been moved more than 100 miles since it was last switched on or if it has not been used for several months. The Chart400 will automatically 'search' the sky for all available satellites. this may take a few minutes. This function is fully automatic and requires no user intervention. Subsequent times to first fix should be less than 20 seconds.
Position indicated on the Chart400 is different from the same position derived from local charts.	Incorrect chart datum. Select the correct chart datum.
Position indicated on Chart400 varies up to 100 yards from true position.	The USA Department of Defence introduce a varying offset known a Selective Availability (SA). The direction and magnitude of the offset is constantly varying. SA will cause errors typically of 50-100 yards but can occasionally cause errors in excess of 300 yards. The effects of SA can be reduced with the installation of a Differential receiver, if this service is available in your area.
Autopilot not responding to Chart400	NMEA output disabled. Select NMEA Enable ON in the General Setup menu (AUX screen). Wiring connections reversed. Check connections.
The Chart400 is functioning correctly but producing navigational and satellite data that is for a different region.	Chart400 in simulate mode. Disable simulator.

5.0   Specification

Waypoints:	500, automatic naming or user entry (alpha-numeric).
Routes:	25 reversible with up to 50 points each.
Plotter Log:	plots by time or distance, saves up to 2000 points
Alarms:	Arrival, Anchor, and Guard zone, individually controlled.
Map Datum's:	128
Mapshift:	one user defined.
Data Format:	C-MAP™ NT format.
Data Cartridges:	C-MAP™ NT-Cards (16Mbit memory, 48Mbit max).
Plotting Scales:	1/8 nm to 4096 nm with push-button zoom (chart dependent).
Operation Features:	One button Boat or Cursor re-centering.
	Dual Speed, 8-way Cursor control.

Interfaces

DGPS Input: NMEA 0183 / RTCM 104 ver 2.0

Autopilot Output: NMEA 0183

Physical characteristics
Chartplotter

Size:	138 mm H x 180 mm W x 67 mm D (5.4" x 7.1" x 2.6")
Weight:	0.62 kg
Display:	90 mm H x 120 mm W (3.5" x 4.75")
Operating Voltage:	11.0 - 16.5 VDC
Power Use:	60mA Typical (Backlight Off)
Operating Temperature:	0°C - 50°C (32°F - 122°F).
Display Matrix:	240 x 180 pixels
Display Type:	STN Temperature Compensated

6.0 Navigation Diagram

BRG   Bearing to destination

COG   Course Over Ground

CTS   Course To Steer (optimum course to steer to return to original track).

DTG   Distance To Go

ETA   Expected Time of Arrival

SOG   Speed Over Ground

STR   Steering (difference between COG and CTS).

TTG   Time To Go

XTE   Cross Track Error
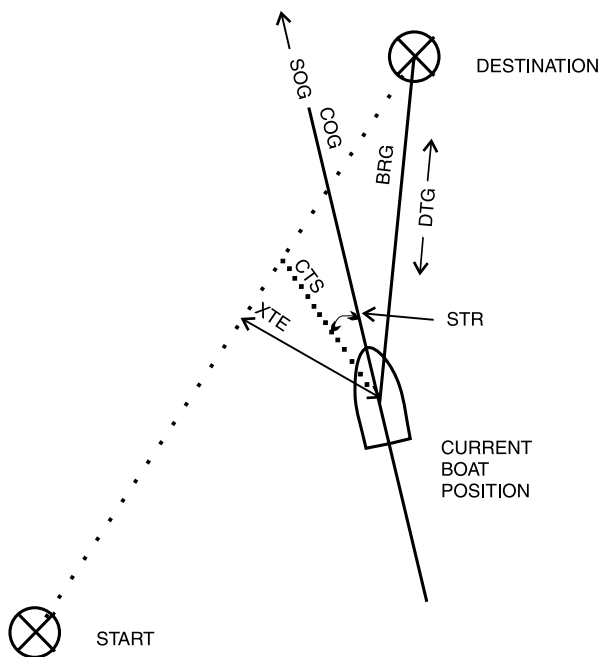
7.0   List of Datums

ADINDAN	CORR. ALEGRE	ISTS 73 AS.69	O.S. IRELAND	SELVAGEM 1938	AFGOOYE
DABOLA	ISTS AS. 1968	O.S.G.B. 1936	SOUTH ASIA	AIN EL ABD 70	DJAKARTA
JOHNSTON 1961	OBSERVAT.1996	SWEDISH	ANNA 1 AS. 65	DOS 1968	KANDEWALA
OLD EGYPTIAN	SWISS CH-1903	ANTIGUA AS. 43	EASTER ISL.67	KERGUELEN 1949	OLD HAWAIIAN
TANANARIVE25	ARC 1950	EUROPEAN 1950	KERTAU 1948	OMAN	TIMBALAI 1948
ARC 1960	EUROPEAN 1979	KUSAIE AS. 51	PTE. NOIRE	TOKYO	AS.BEACON 'E'
F.THOMAS 1955	L.C. 5 ASTRO	P.TO SANTO	TRISTAN 1968	AS.DOS 71/4	FINNISH (KKJ)
LEIGON	PICO NIEVES	VITI LEVU 16	AS.STATION 52	GAN 1970	LIBERIA 1964
PITCAIRN 1967	VOIROL 1875	AS.TERN ISL.	GEOD 1949 (NZ)	LISBOA	POINT 58
WAKE ISL. 1952	ASCENS. ISL.58	GRACIOSA BASE	LUZON	POLISH	WAKE-ENIWETOK
AUS.GEOD. 66	GUAM 1963	M. MERCURY 68	POTSDAM	WGS 1972	AUS.GEOD.84
GUNUNG SEGARA	MAHE 1971	PRV.S.AMER.56	WGS 1984	AYABELLE	GUX 1 ASTRO
MASSAWA	PRV.S.CHIL.63	YACARE	BELLEVUE (IGN)	HERAT NORTH	MERCHICH
PUERTO RICO	ZANDERIJ	BERMUDA 1967	HERMANSKOGE	MERCURY 1960	PULKOVO 1942
BISSAU	HJORSEY 1955	MIDWAY AS. 61	HU-TZU-SHAN	BOGOTA OBS.	HONG KONG 63
MINNA	QORNOQ	BUKIT RIMPAH	QATAR NATION.	MONTSERRAT 58	REUNION
C. CANAVERAL	IGN 1954	M'PORALOKO	REV. KERTAU	CAMP AREA AS.	IGN47
NAD 1927	REV. NAHRWAN	CANTON AS. 66	IGN47-51	NAD 1983	ROME 1940
CAPE	IGN72	NAHRWAN	S. AMERICAN 69	CARTHAGE	INDIAN
NANKING 1960	SANTO(DOS) 65	CHATHAM 1971	INDIAN 1954	NAPARIMA, BWI	SAO BRAZ
CHAU ASTRO	INDIAN 1975	NEW P. SANTO	SAPPER H. 43	CMP.INCHAUSPE	IRELAND 1965
NORWEGIAN	SCHWARZECK				

8.0   NMEA0183 Sentences

8.1 Autopilot Output

The GPS Chart400 provides the following sentences for NMEA0183 compatible autopilots:

APA,APB,GLL,VTG,RMC,BWC,XTE and RMB.

Example:

$GPAPA,A,A,00.13,L,N,V,V,042.3,M,WPT001*6F
$GPAPB,A,A,00.13,L,N,V,V,042.3,M,WPT001,042.3,M,042.3,M*6C
$GPGLL,3651.625,S,17445.246,E,020312.00,A*18
$GPVTG,359.0,T,340.5,M,007.2,N,013.3,K*4C
$GPRMC,020314.00,A,3651.625,S,17445.246,E,000.0,000.0,230197,19.5,E*71
$GPBWC,020315,3649.647,S,17449.861,E,061.8,T,042.3,M,004.2,N,WPT001*78
$GPXTE,A,A,00.13,L,N*5E
$GPRMB,A,00.13,L,,WPT001,3649.647,S,17449.861,E,004.2,061.8,006.3,V*7D

8.2 Differential Input

The GPS Chart400 accepts Differential GPS (DGPS) sentences in RTCM SC-104 format. It will accept and decode all RTCM SC-104 message but not all message are necessary for DGPS operation. Type !,2 and 9 messages are most commonly used for DGPS operation.

8.3 Data Repeater

Standard Communication offers a digital NMEA Repeater that will repeat most NMEA GPS, Depth, Speed, Compass and Wind sentences to a second station. Please contact your local dealer and inquire about the RP100 NMEA for further details.

Standard
Communications