ML GPS R

Dear Customer,

Thank you for choosing the MLR FX412 DGPS Navigator. We are confident it will give you many years excellent service and you will enjoy exploring the numerous functions available from this state of the art DGPS.

For further information or technical help, please do not hesitate to contact your local Dealer or MLR Electronique in Vallet, who will be pleased to help you.

Yours sincerely,

Jean Pierre MAQUAIRE
C.E.O

ATTENTION: IMPORTANT NOTES

The United States of America Department of Defence is responsible for the operation and management of the GPS System. The accuracy is by "Selective Availability" which is equivalent to plus or minus 100 metres.

The MLR FX412 high accuracy DGPS is an AID TO NAVIGATION ONLY and should not be used as a substitute for more traditional methods of navigation

When connecting your DGPS to other manufacturers equipment i.e. autopilots, video plotters etc., you must still ensure a permanent watch is always kept as all electronic instruments are designed to be an AID TO NAVIGATION ONLY.

MLR Electronique and their network of Distributors do not accept any responsibility for any consequential losses resulting from the use of this device.

CONTENTS

MLR Electronique, 12 February 1999

A – PRESENTATION

The MLR FX412 DGPS is a radio–positioning receiver using signals from the NAVSTAR GPS (Global Positioning System) satellite constellation and signals from DGPS radio-beacons. The GPS offers: high accuracy, continuous coverage and world-wide availability simultaneously.

The FX412 displays 5 function screens and 5 MENUS linked to these functions. You have easy access to these screens with the new direct access concept (DIRECT ACCESS™).

B – USING YOUR DGPS

1 – POSITION DISPLAY

IMPORTANT NOTE FOR FIRST TIME USERS: WE SUGGEST YOU BROWSE THROUGH CHAPTER C, BEGINNERS GUIDE, AND CHAPTER E, ADVICE ON INSTALLATION.

Press the **Pos** key to display the POSITION function. The geographical position of the vessel is displayed in the centre of the screen in degrees, minutes, tenths, hundredths and thousandth of minutes. The position can also be displayed in other types of co-ordinates (Lambert, Swiss Grid, English Grid, Irish Grid etc.) which you select from the SYSTEM MENU. The position is updated every second when the symbol representing a satellite is displayed at the top left of the screen.

You will find at the top of the screen:

- The symbol representing a satellite when the FX412 calculates and validates the displayed position.

- The letter D when the FX412 calculates and validates the position in differential mode.

- The letter M when a message has been received from the Differential Station. To read this message select 8 – DGPS MESSAGE in the MAIN MENU.

- The date and the time. To display the local time, enter the time difference between local time and UTC in the SYSTEM MENU. In UK the time difference is 1 hour in summer and 0 in winter.

- Your altitude, your accuracy (ACC) or no data, dependant on your choice from the SYSTEM MENU.

- Your speed and course over ground are displayed at the bottom of the screen.

```
┌─────────────────────────────┐   ┌─────────────────────────────┐
│►◄D │02.02.99  13:20:17│ALT:00070M│   │►◄D │02.02.99  13:20:44│ACC:002M│
│                             │   │                             │
│    47N̊10.718              │   │    47N̊10.722              │
│                             │   │                             │
│    001W̊15.712             │   │    001W̊15.713             │
│                             │   │                             │
│SOG:   0.0 KT │ COG: ---°   │   │SOG:   0.0 KT │ COG: ---°   │
└─────────────────────────────┘   └─────────────────────────────┘
```
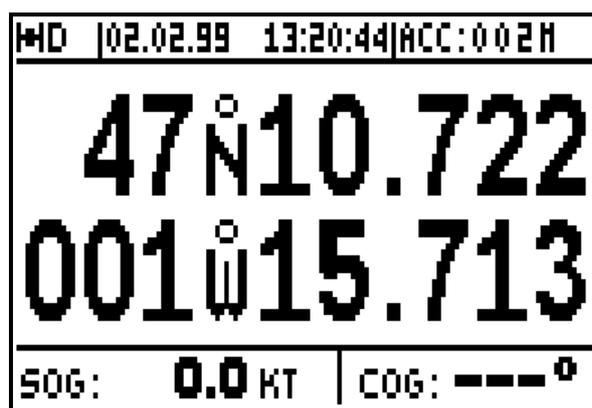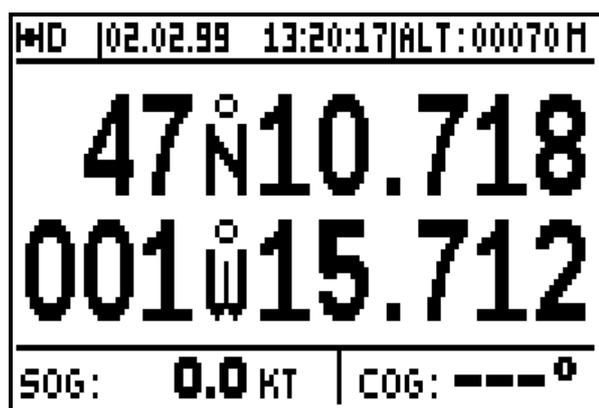
Note 1: The accuracy displayed is also called ECP (Error Circular Probability), it is the radius of the circle that contains 50% of the positions calculated by your DGPS. The accuracy automatically integrates working in differential mode.

Note 2: From the Navigation Menu you may select 2D, 3D or Auto mode. The altitude measurement unit i.e. metres or feet can be selected from the NAVIGATION MENU.

—————————————

2 – NAVIGATION DISPLAY: SPEED AND COURSE OVER THE GROUND

Press the **Nav** key to display the NAVIGATION function. The central part of the screen shows: speed over the ground **SOG** (in knots, kilometre/hours or in mile/hours) and course over the ground **COG** (in degrees) on the lower line.

Note: When the speed is zero, the course cannot be calculated and dashes are displayed.

Information displayed in the top part of this screen is identical to the POSITION screen.

```
┌─────────────────────────────┐
│►◄D │02.02.99  13:21:02│ACC:002M│
│                             │
│          0.0              │
│ SOG:          KT          │
│                    °      │
│                           │
│ COG:       ═══           │
│                           │
│L1:00.00 NM │L2:0.00 NM   │
└─────────────────────────────┘
```
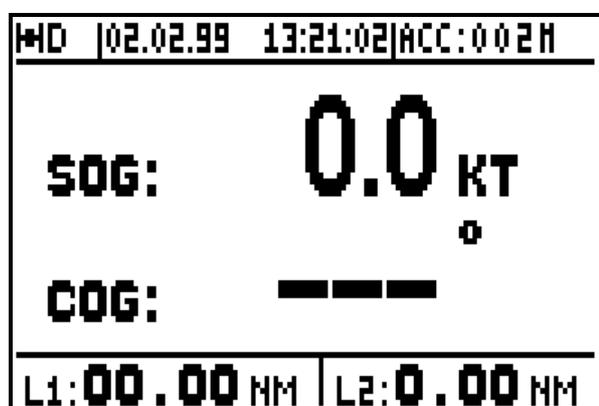
Two logs, L1 and L2 display the distances travelled (in the unit selected i.e. km, miles etc. from the NAVIGATION MENU) in the lower part of the screen.

Note: From the NAVIGATION MENU you can zero each log individually and configure the following parameters: unit of distance, unit of altitude, 2D/3D/Auto mode, speed filter and compass variation.

_____

3 – GO TO WAYPOINT DISPLAYS

3.1. – ACTIVATE THE GOTO WAYPOINT FUNCTION

Press **the GoTo** key. The GOTO options are displayed unless a waypoint or a route has already been selected; in which case you get the Compass, 3D Road or Radar displays.

You now have the option of choosing a WAYPOINT FROM THE LIST, NEW WAYPOINT, ROUTE FROM THE LIST or NEW ROUTE.

To select a waypoint from the list, press the **0** key (0-WAYPOINT FROM THE LIST). Use the ▲ ▼ arrow keys to move the cursor in the list and press **Enter** when you have selected the desired waypoint.

You can of course **Enter** a new waypoint when the list of waypoints is empty (refer to paragraph 3.5 CREATE A NEW WAYPOINT)

You also have the option to activate a route in from list or to create a new route (see Chapter 4-GOTO ROUTE).
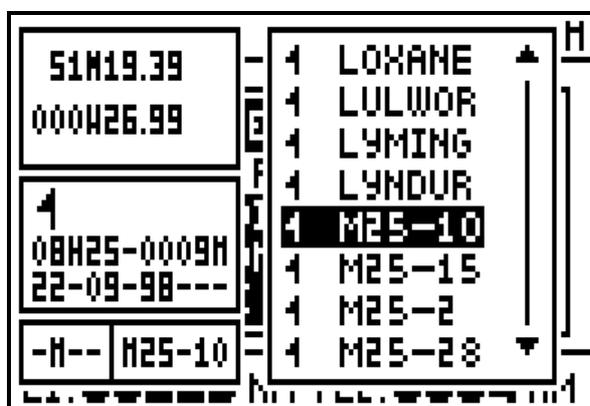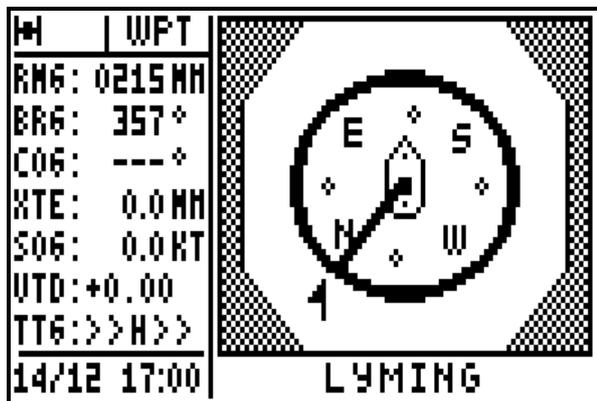
Tip: For quick access to the required waypoint, use the alphanumeric keys. For example to search for a waypoint starting with the letter R, push repeatedly on the **7PRS** key to bring the cursor on to the first waypoint starting with a R, then use the ▲ ▼ arrow keys to select the waypoint required.

Tip: The GOTO WAYPOINT function can also be activated from the WAYPOINT MENU by pressing **0** (0 - ACTIVATE).

On the GOTO WPT function you will see on the left hand side seven lines of information, and on the right hand side a display which can be either COMPASS, 3D ROAD or RADAR (see chapter B.3.3). At the bottom left of the screen, the date and time are displayed and on the right, the name of the active destination waypoint.

Abbreviations – Navigation

RNG = Range between your position and the position of the destination waypoint in the selected unit. C-B segment on the diagram below.
BRG = Bearing, angle between your position and the position of the destination waypoint in degrees. If your compass variation is zero, this angle is referenced in relation to true north. Angle β on the diagram below.
COG = Course over the ground of the vessel in relation to North. Angle α.
XTE = Cross Track Error, the error between the vessels course being steered and the actual course you are taking. An arrow indicates if you must go on the left or to the right to reduce the error. C-D segment.
SOG = Speed over the ground. C-E vector.
VTD = This is the velocity to destination. If this figure is positive you are heading towards your target waypoint but if it is negative you are heading away from the waypoint. C-F vector.
TTG = Time to go to your destination waypoint. It is the VTD information that is used to calculate the time to go.
ETA = Estimated time of arrival to your destination waypoint. It is calculated using the TTG information and current time.

NORTH

β

α

E

Waypoint of destination

B

C

F

D

A
Start position
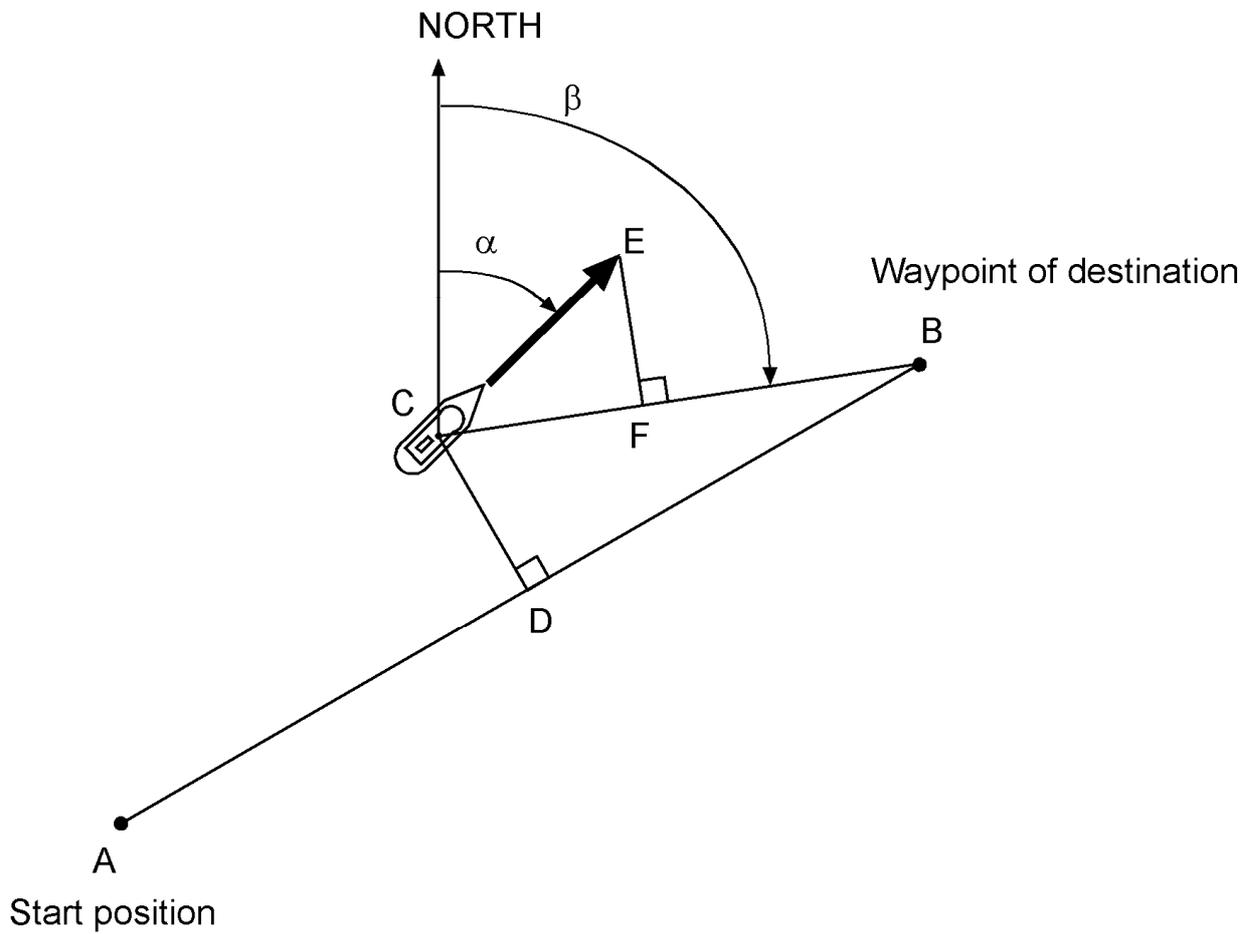
α = COURSE over the ground or route
β = BEARING to the waypoint of destination
A - B = direct line to the destination waypoint
C - B = Range to the destination waypoint
C - E = Speed over the ground
C - F = Velocity to destination
C - D = Cross Track Error XTE

Note: VTD, TTG and ETA are individually represented (compass, 3D road and radar).

Tip: To reach your destination waypoint using the shortest path, ensure that:
- Your COG is equal to your BEARING.
- Your XTE must is zero.
- Your Velocity to destination must be positive and equals your Speed over the ground.

3.2. – DEACTIVATE THE GOTO WAYPOINT FUNCTION

From the GOTO WAYPOINT function, press the **Menu** key and press key **1** (1-DEACTIVATE) to deactivate the GOTO WAYPOINT function.

Tip: To activate a route when a waypoint is active. You can first deactivate the current waypoint using the WAYPOINT MENU. You may now select a route from the GOTO Menu. Select Item 2 - ROUTE FROM THE LIST or Item 3 - NEW ROUTE to ACTIVATE THE GOTO ROUTE function.

3.3. – DISPLAY MODE SELECTION: COMPASS, 3D ROAD OR RADAR

From the GOTO WAYPOINT function, press the **Menu** key, press key **2** (2-GOTO DISPLAY). Select the display mode required using the ▲ ▼ arrow keys then press **Enter**.
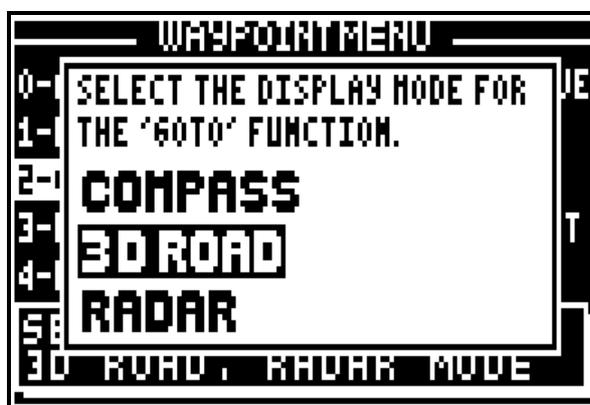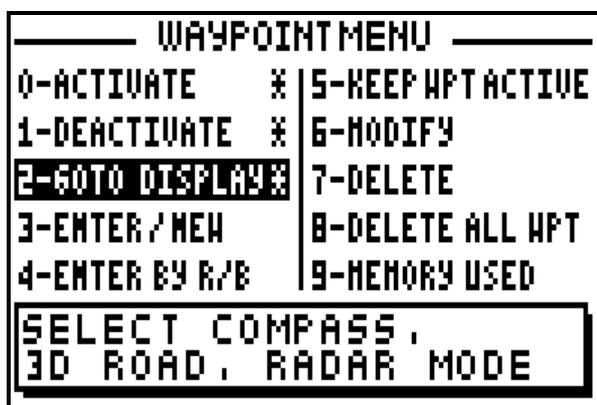
3.3.1 – GOTO WAYPOINT COMPASS
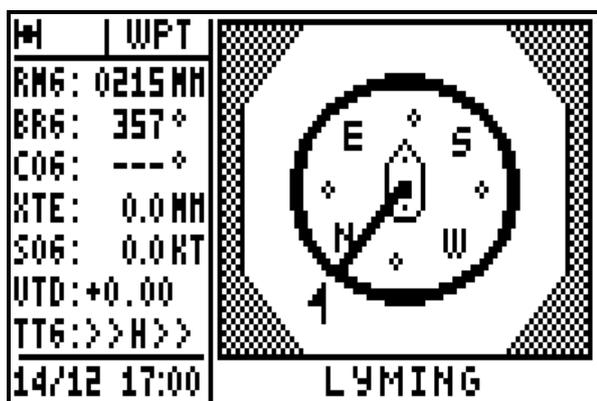
The compass pointer indicates the vessel's course, with the icon representing the waypoint.

3.3.2 – GOTO WAYPOINT 3D ROAD

```
|H  | WPT |
|RMG: 0215MM|
|BRG:  357°|
|COG:  291°|
|XTE: ▶0.0MM|
|SOG:  1.0KT|
|VTD:+0.40|
|ETA:>>H>>|
|14/12 17:01|    LYMING
```
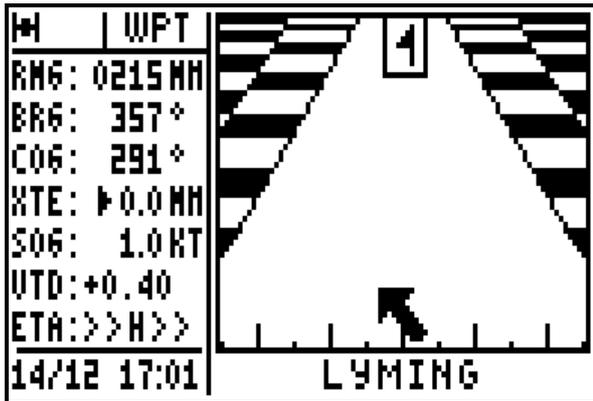
The arrow representing your vessel turns in relation your course and the bearing to the waypoint. The arrow also moves horizontally according to the amount of cross track error. Every graduation is equal to 0,25 KM or NM or MI. Keep the arrow centred and pointing to the top for the most direct track to your waypoint. The icon representing your destination waypoint moves down the display as you approach it.

3.3.3 – GO TO WAYPOINT RADAR

```
|   | WPT |▶
|RMG: 0215MM|
|BRG:  357°|
|RTE:  338°|
|XTE: ▶0.0MM|
|SOG:  1.7KT|
|TTG:>>H>>|
|ETA:>>H>>|
|14/12 17:02|    LYMING
```
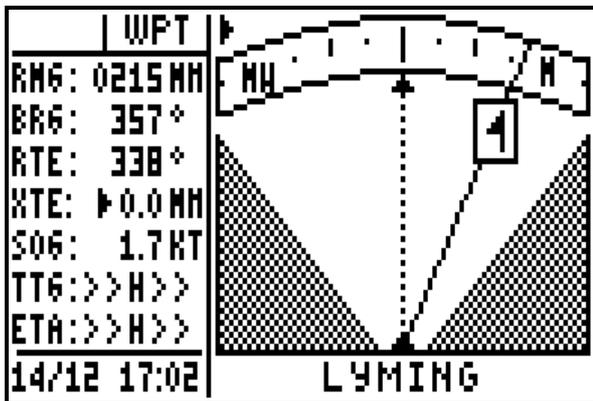
Your course is represented by the dotted line in the centre of the screen. A continuous line with the destination waypoint icon is displayed to show the bearing of the waypoint from your current course. When the dotted line (vessels course) is directly over the line with the waypoint you are on course. If two arrows are shown simultaneously this indicates that the waypoint is outside of the display area.

3.4. – CHANGING THE DESTINATION WAYPOINT

From the GOTO WAYPOINT function, press the **9wxY List** key to display the list of your waypoints, then select the new destination waypoint while proceeding in the same way as paragraph B.3.1 ACTIVATE THE GOTO WAYPOINT FUNCTION.

```
|   | WPT |▶
|RMG: 0215MM|
|BRG:  357°|
|RTE:  338°|
|XTE: ▶0.0MM|
|SOG:  1.7KT|
|TTG:>>H>>|
|ETA:>>H>>|
|14/12 17:02|    LYMING
```

```
| 50N48.66 |      N165-1  ▲
| 001W38.21|      N165-2
|          |      N171-1
|          |      NANCY
|          |      NEWFOR
| 11H30-0100M|    NIDECK
| 28-08-98---|    NOVOTE
| --M- N165-1|    NOZAY   ▼
```
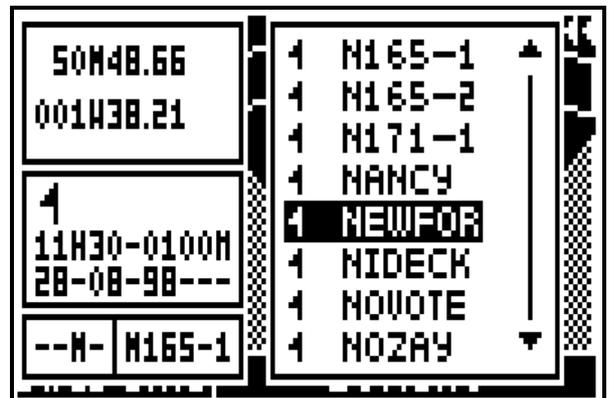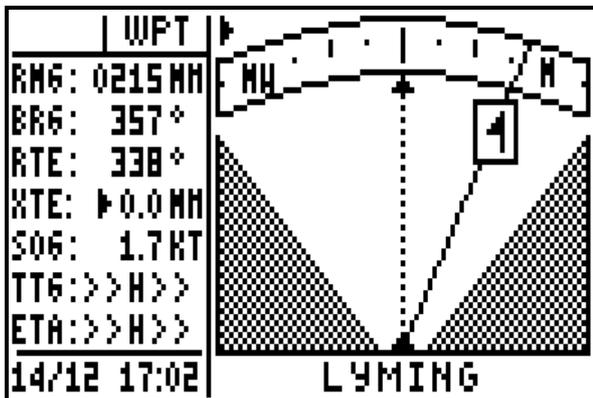
3.5. – CREATING A NEW WAYPOINT

With your FX412 you can create a new waypoint by following the instruction windows displayed after pressing the **GoTo** key or from the WAYPOINT MENU.

From the GOTO WAYPOINT function, press the **Menu** key and press key **3** (3-ENTER/NEW).

When the enter waypoint window is displayed, write the NAME of the waypoint, select an ICON for representation in the PLOTTER function, write a COMMENT (optional), write the LATITUDE and the LONGITUDE then press **Enter** to validate your entry and store the new waypoint.

Note: To enter a letter, press repeatedly on the corresponding key (e.g. to enter a B, press 3 times on key **2**). Once the letter or the number is displayed, the cursor will advance automatically to the next character. If you make a mistake, use the ◄ ► arrow keys to move back or to advance the cursor. Use the ▲ ▼ arrow keys to go back to the previous line or to go forward to the next line.

Note: To select North or South for the latitude, use the key **6**(MN_) for North and **7**(PRS) for South. To select East or West for the longitude, use the key **3**(DEF) for East and **9**(WXY) for West.

```
———— WAYPOINT MENU ————
0-ACTIVATE      * 5-KEEP WPT ACTIVE
1-DEACTIVATE    * 6-MODIFY
2-GOTO DISPLAY* 7-DELETE
3-ENTER/NEW       8-DELETE ALL WPT
4-ENTER BY R/B   9-MEMORY USED
ENTER  A  NEW
WAYPOINT
```

↓

```
WPT NAME: ■-----
ICON:  ⚑ ⚑▶▨◪⚓☗✦➤⚒
COMMENT: -----------
         -----------
LATITUDE  :  00°00.000N
LONGITUDE: 000°00.000W
```

→

```
WPT NAME: T H A R O N
ICON:  ⚓ ⚑▶▨⚓☗✦➤⚒
COMMENT: -----------
         -----------
LATITUDE  :  00°00.000N
LONGITUDE: 000°00.000W
```

↙
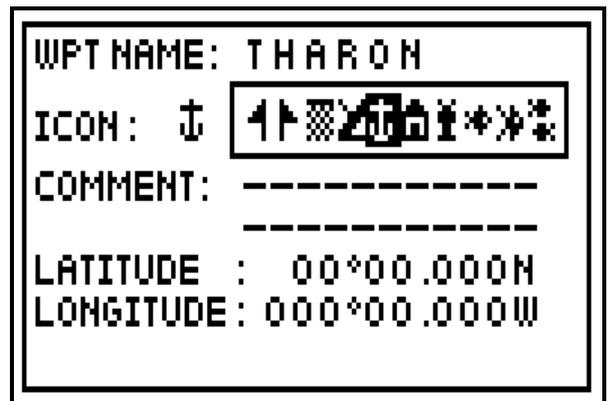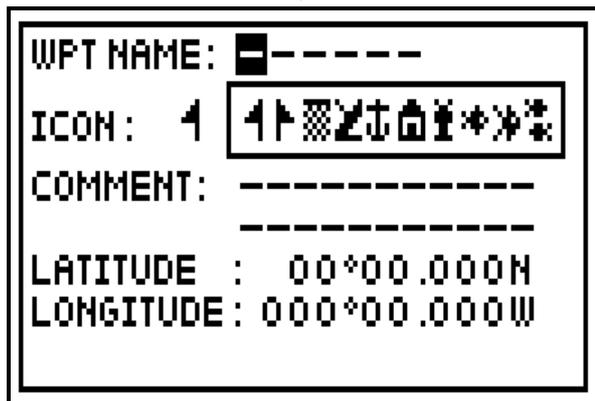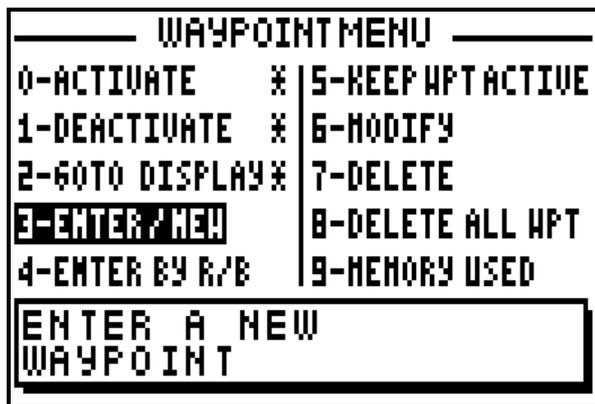
```
WPT NAME: T H A R O N          ➔    WPT NAME: T H A R O N
ICON:  ⚓ |4▸▨∡⚓♀★≫▧|              ICON:  ⚓ |4▸▨∡⚓♀★≫▧|
COMMENT: MARINA-OF--                COMMENT: MARINA-OF--
         COMBERGE■--                         COMBERGE---
LATITUDE :  00°00.000N              LATITUDE :  47°09.770N
LONGITUDE: 000°00.000W              LONGITUDE: 002°09.850W
```

Tip: Do not forget to press the **Enter** key to validate your entry and store your new waypoint.

3.6. – WAYPOINT ENTRY BY RANGE AND BEARING

This function allows you to create a waypoint when you know its distance and bearing in relation to a known position, another waypoint or your position.

From the GOTO WAYPOINT Menu, press key **4** (4–ENTER BY R/B) to display the options window. Select your reference position from the options pressing the **0**, **1** or **2** keys. Follow the procedure detailed in paragraph 3.5 - CREATING A NEW WAYPOINT for entering the name of the waypoint, selecting an icon and writing a comment (optional). Now enter the distance and bearing between the reference position and the waypoint position and press **Enter** to validate. The FX412 now calculates and stores the position of the waypoint


```
──── WAYPOINT MENU ────    ➔    ══ WAYPOINT MENU ══
0-ACTIVATE    ✗|5-KEEP WPT ACTIVE         SELECT RANGE AND BEARING
1-DEACTIVATE  ✗|6-MODIFY                  FROM:
2-GOTO DISPLAY✗|7-DELETE                  0-PRESENT POSITION
3-ENTER/NEW    |8-DELETE ALL WPT          1-WAYPOINT FROM THE LIST
4-ENTER BY R/B |9-MEMORY USED             2-NEW WAYPOINT
ENTER A WAYPOINT                          USING RANGE/BEARING
USING RANGE/BEARING
```

↙


```
WPT NAME: L I G H T 1
ICON:  ♀ |4▸▨∡⚓♀★≫▧|
COMMENT: -----------
         -----------
RANGE    : 0012.5NM
BEARING  : ■70.5°
```

Tip: Do not forget to press the **Enter** key to validate your entry and store your new waypoint.

3.7. – KEEPING YOUR WAYPOINT PERMANTLY ACTIVE

You have the option of keeping your waypoint active after switching off your DGPS. If a waypoint is active before you switch off the DGPS, it will be active again when you switch on.

From the GOTO WAYPOINT function, press the **Menu** key and press key **5** (5-KEEP WPT ACTIVE) to display the option window. Select YES to keep the waypoint active and press the **Enter** key.

```
┌──── WAYPOINT MENU ────┐        →   ┌──── WAYPOINT MENU ────┐
│ 0-ACTIVATE    * 5-KEEP WPT ACTIVE │   │0-│DO YOU WANT TO KEEP THE WPT│IVE│
│ 1-DEACTIVATE  * 6-MODIFY          │   │1-│ACTIVE AFTER SWITCHING THE │   │
│ 2-GOTO DISPLAY* 7-DELETE          │   │2-│GPS OFF?                   │   │
│ 3-ENTER/NEW     8-DELETE ALL WPT  │   │3-│                           │PT │
│ 4-ENTER BY R/B  9-MEMORY USED     │   │4-│                           │   │
│ ┌─────────────────────────────┐   │   │KE│      YES?   NO?           │   │
│ │KEEP THE WPT ACTIVE          │   │   │AF│                           │   │
│ │AFTER SWITHING OFF           │   │   └──┴──TER SWITHING OFF──────────┘
│ └─────────────────────────────┘   │
└───────────────────────────────────┘
```
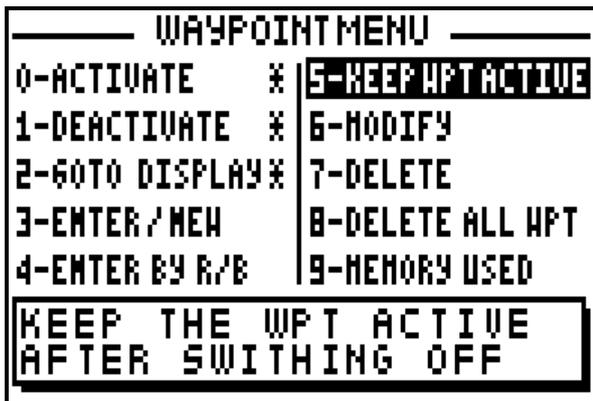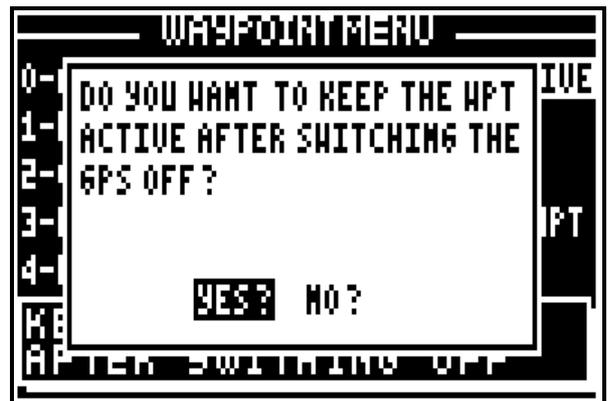
3.8. – MODIFY A WAYPOINT

From the GOTO WAYPOINT function, press the **Menu** key and press key **6** (6-MODIFY), your waypoint list will be displayed. Select the waypoint you wish to modify and press **Enter**.

The identical option window to the ENTER/NEW waypoint function is displayed. Use the ◀ ▲ ▼ ▶ arrow keys to move your cursor and to make the desired modifications. Once the modification is made, press **Enter** to store your changes.

```
┌──── WAYPOINT MENU ────┐        →   ┌──────────┬──────────────┐
│ 0-ACTIVATE    * 5-KEEP WPT ACTIVE │   │ 51N27.54 │ ◀ COOLE    ▲ │UE
│ 1-DEACTIVATE  * 6-MODIFY          │   │ 000E15.02│ ◀ CORA       │
│ 2-GOTO DISPLAY* 7-DELETE          │   │          │ ◀ CORA D     │
│ 3-ENTER/NEW     8-DELETE ALL WPT  │   │ ◀        │ ◀ CORACO     │
│ 4-ENTER BY R/B  9-MEMORY USED     │   │ 09H04--006M│ ◀ COURTA   │T
│ ┌─────────────────────────────┐   │   │ 09-07-98---│ ◀ CROISI   │
│ │MODIFY A WAYPOINT            │   │   │          │ ◀ DAMGAN     │
│ └─────────────────────────────┘   │   │ -D--|DAMGAN│◀ DARTFO   ▼ │
└───────────────────────────────────┘   └──────────┴──────────────┘
```

```
WPT NAME: ⬛A R T F O
ICON:    ╡ │╡▶▓�ⴲ🏠👤✦❯❖│
COMMENT: 09H04--006M
         09-07-98---
LATITUDE :  51°27.541N
LONGITUDE: 000°15.021E
```
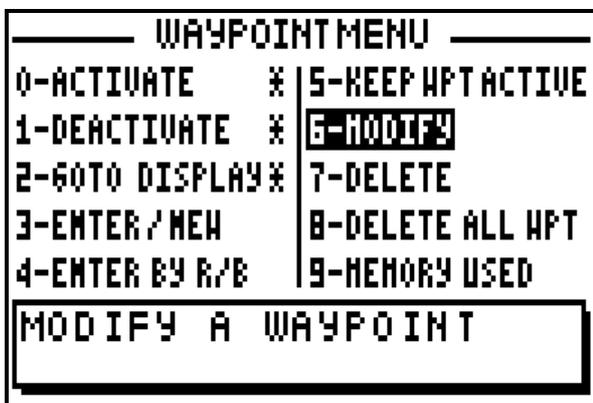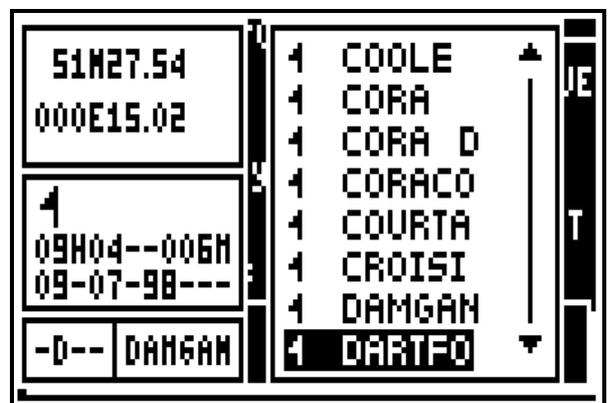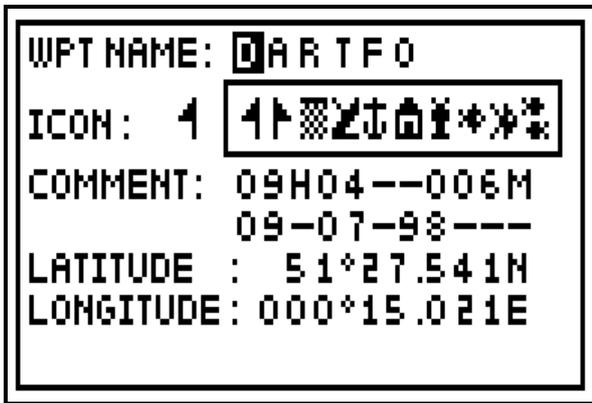
Tip: Do not forget to press the **Enter** key to validate your modifications and store them.

3.9. – DELETE A WAYPOINT

From the GOTO WAYPOINT function, press the **Menu** key and press key **7** (7-DELETE). The list of your waypoints is displayed. Select the waypoint to delete, press **Enter** then select YES? and press **Enter** to confirm.

```
——— WAYPOINT MENU ———
0-ACTIVATE    *│5-KEEP WPT ACTIVE
1-DEACTIVATE  *│6-MODIFY
2-GOTO DISPLAY*│7-DELETE
3-ENTER/NEW    │8-DELETE ALL WPT
4-ENTER BY R/B │9-MEMORY USED
DELETE  ALL  OF  THE
WAYPOINTS
```

➜

```
┌─────────┐ ┌──────────┐
│ 48N38.36│ │╡ VILLE  ▲│UE
│ 007E26.57│ │╡ VILLED  │
└─────────┘ │╡ VIRGIN  │
┌─────────┐ │╡ VITRY   │
│╡        │ │╡ VVE     │T
│19H02-0214M│╡ WASSEL │
│17-08-98---│╡ WESTDI  │
│-W--│WASSEL│╡ WINCHE ▼│
└─────────┘ └──────────┘
```
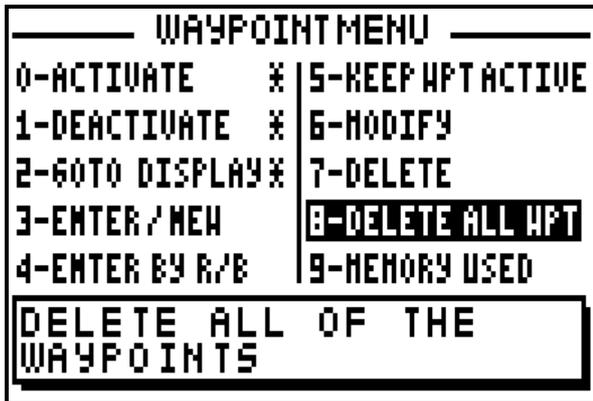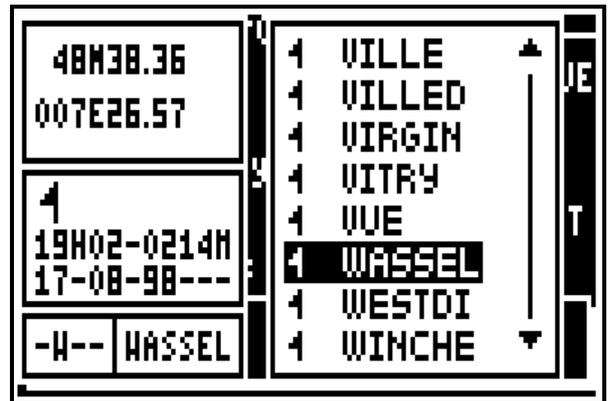
Tip: If you do not want to delete the waypoint, press the **Pos**, **Nav**, **GoTo**, **Plot** or **Menu** function keys to cancel the operation.

3.10. – DELETE ALL WAYPOINTS

From the GOTO WAYPOINT function, press the **Menu** key and press key **8** (8-DELETE ALL WPTS) select YES? then confirm by pressing **Enter.**

```
 ―――― WAYPOINT MENU ――――          ―――― WAYPOINT MENU ――――
0-ACTIVATE    * 5-KEEP WPT ACTIVE    0┌──────────────────┐VE
1-DEACTIVATE  * 6-MODIFY             1│DO YOU WANT TO DELETE│
2-GOTO DISPLAY* 7-DELETE             2│ALL THE WAYPOINTS?│
3-ENTER/NEW     8-DELETE ALL WPT     3│THIS OPERATION WILL│
4-ENTER BY R/B  9-MEMORY USED        4│RESTART THE GPS.│PT
┌──────────────────┐                  │                  │
│DELETE ALL OF THE │                  │  YES?  NO?       │
│WAYPOINTS         │                 └──────────────────┘
└──────────────────┘                 WAYPOINTS
```

→
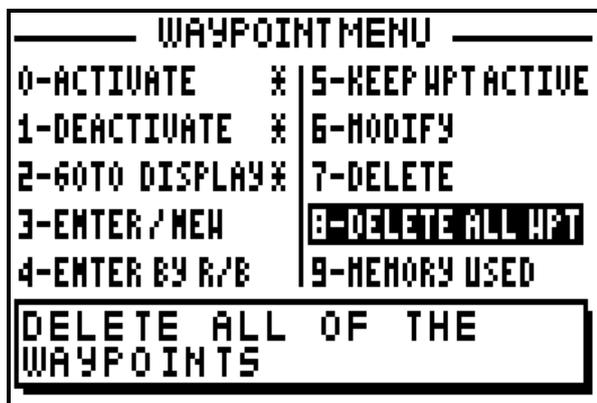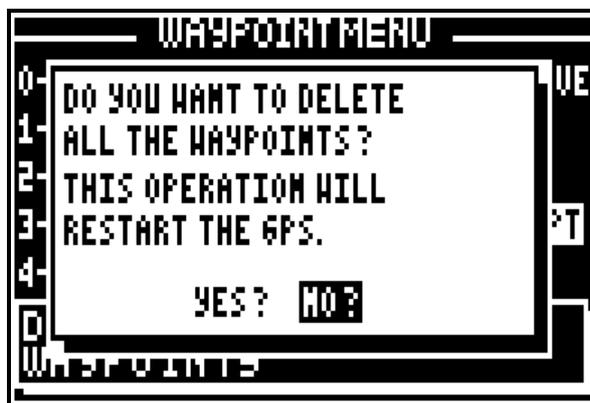
Tip: If you do not want to delete all your waypoints, select **NO?** and press **Enter** or press the **Pos**, **Nav**, **GoTo**, **Plot** or **Menu** function keys to cancel the operation.

Note: Once all your waypoints are deleted, it will not be possible to reinstate them, it will also erase all your routes.

3.11. – WAYPOINT MEMORY ALLOCATION: USED AND FREE MEMORY

From the GOTO WAYPOINT function, press the **Menu** key and press key **9** (9-MEMORY USED).

```
 ―――― WAYPOINT MENU ――――          ―――― WAYPOINT MENU ――――
0-ACTIVATE    * 5-KEEP WPT ACTIVE   ┌──────────────────┐
1-DEACTIVATE  * 6-MODIFY            │ WAYPOINT MEMORY USED│
2-GOTO DISPLAY* 7-DELETE            │MIN ┌──────────┐ MAX│
3-ENTER/NEW     8-DELETE ALL WPT    │  0 └──────────┘ 500│
4-ENTER BY R/B  9-MEMORY USED       │        240         │
┌──────────────────┐                └──────────────────┘
│DISPLAY THE WPT   │                 DISPLAY THE WPT
│MEMORY USED       │                 MEMORY USED
└──────────────────┘
```

→
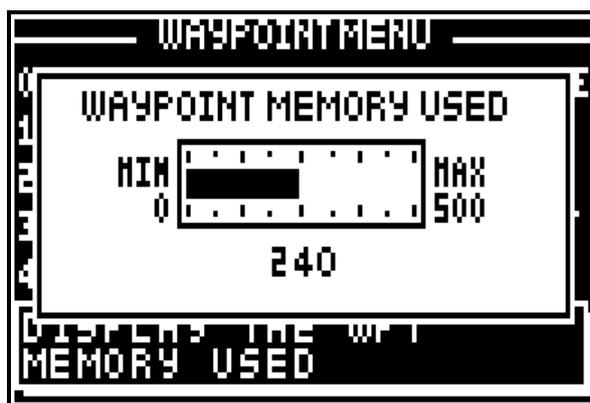
Note: The capacity of the memory is 500 waypoints.

――――――――――――――――――

4 – GOTO ROUTE DISPLAY: FOLLOWING A ROUTE

The GOTO ROUTE function is similar in operation to the GOTO WAYPOINT function, may we suggest you read paragraph B.3 for additional information. A route is a number of waypoints linked together in any sequence chosen by the user.

4.1. – ACTIVATE THE GOTO ROUTE FUNCTION

Press the **GoTo** key. Select either GOTO RTE or GOTO WPT this will activate the selected function. Select a route from the list or create a new route. You also have the option to activate a waypoint from the list or create a new waypoint (see the chapter GOTO WAYPOINT).
To select a route from the list press key **2** (2- ROUTE FROM THE LIST)
Use the ▲ ▼ arrow keys to move the cursor through the list and to select the desired route, press **Enter**.
Select the route direction using the ◄ ► arrow keys and press **Enter**.
Select the first waypoint in the route using the ◄ ► arrow keys and press **Enter**.
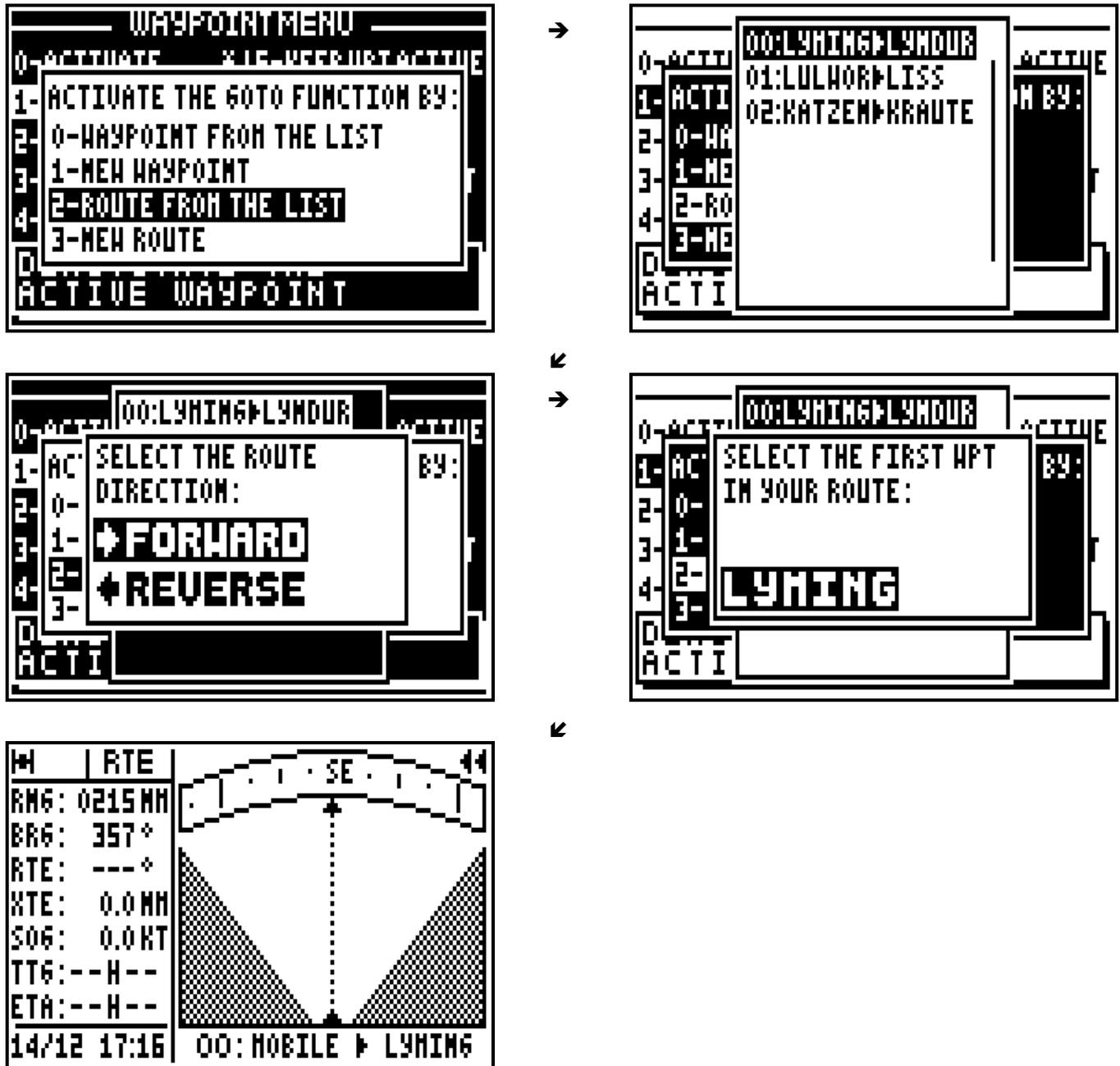
Note: The GOTO ROUTE function can also be activated from the ROUTE MENU by choosing 0 - ACTIVATE.

The displayed information and the representation diagrams are identical to those of the GOTO WAYPOINT function. The only difference is located on the bottom right of the screen where the name of the waypoint is replaced by the number of the active route along with the departure waypoint name and the next waypoint name in the route. The advance to the next waypoint is selected using the Alarm function, when the waypoint alarm distance has been reached the next waypoint is automatically selected.
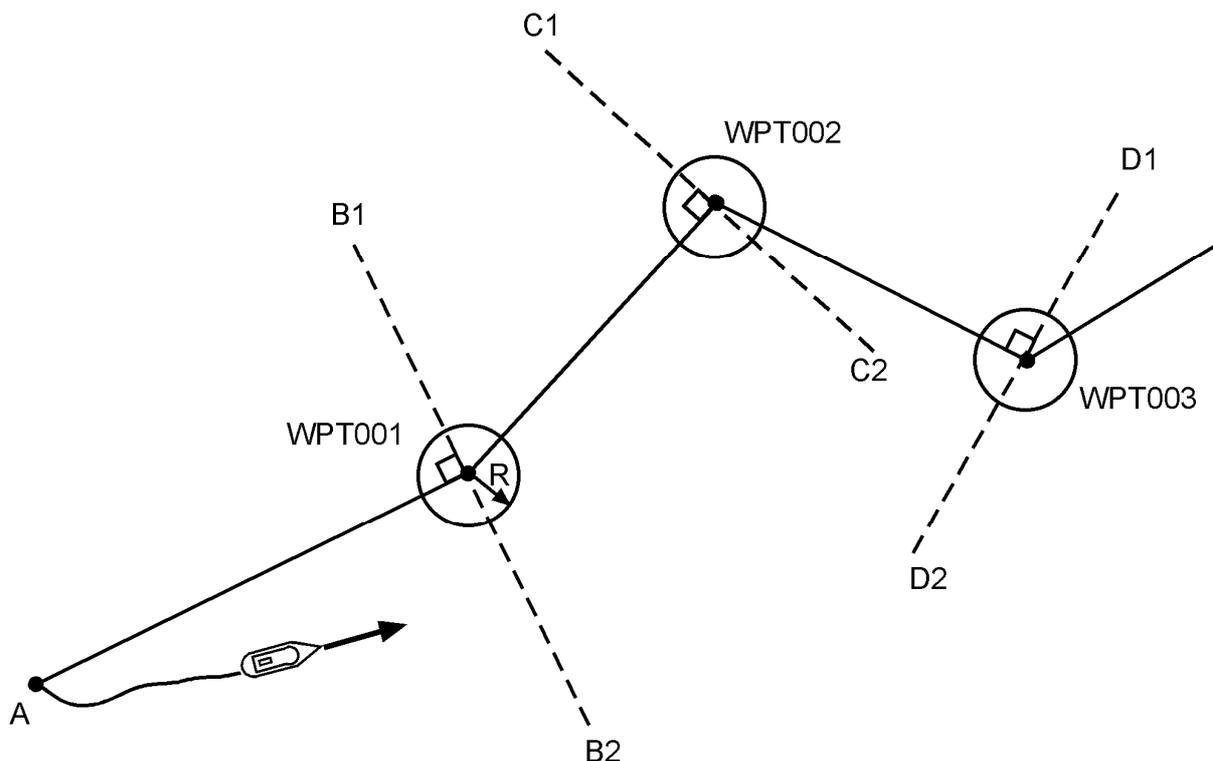
In the above example the vessel goes to waypoint WPT001. The GOTO ROUTE function calculates the required navigational information to automatically move to waypoint WPT002 when the vessel moves into the circle of radius R, or when it crosses line B1 - B2 and so on, until the last waypoint. The radius R is the distance programmed in the arrival alarm (see NAVIGATION MENU).

4.2. – DEACTIVATE THE GOTO ROUTE FUNCTION

From the GOTO ROUTE function, press the **Menu** key and press key **1** (1-DEACTIVATE) to deactivate the GOTO ROUTE function.

4.3. – DISPLAY MODE SELECTION: COMPASS, 3D ROAD OR RADAR

From the GOTO ROUTE function, press the **Menu** key and press key **2** (2-GOTO DISPLAY). Select the display mode using the ▲ ▼ arrow keys then press **Enter**.

Note: The COMPASS, 3D ROAD and RADAR displays are identical to those of the GOTO WAYPOINT function.

4.4. – CHANGING THE ROUTE IN USE

From the GOTO ROUTE function, press the **9wxy List** key to display the list of your routes, then select the new route to follow in the same way as paragraph 4.1 ACTIVATE THE GOTO ROUTE FUNCTION.
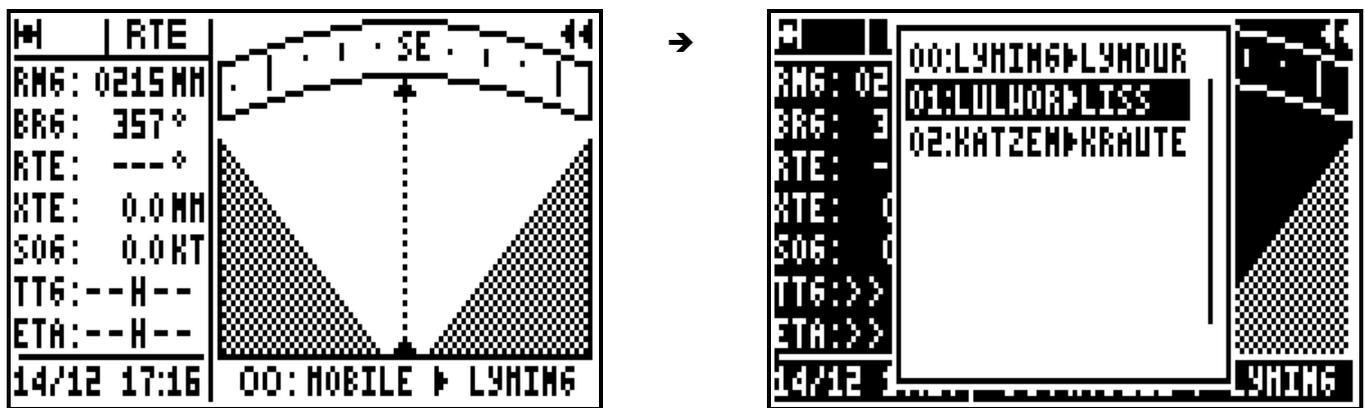
4.5. – ENTER A NEW ROUTE

In your FX412 you can enter a new route whilst following instructions from the windows displayed when you press the **GoTo** key or from the ROUTE MENU. From the ROUTE MENU, press key **3** (3-ENTER/NEW).

The first available route number is displayed. Press the **Enter** key if you wish to proceed, should you wish to use an alternative number, make your choice and press **Enter.**

To display the list of waypoints now press key **9 List.** Select your first waypoint then press **Enter**. The name of this waypoint is displayed in the route and the cursor advances to the following slot. Repeat this operation to enter all waypoints. When you have finished entering your route, move the cursor to OK? using the ▶ ▼ arrow keys and press **Enter** to validate and to store your new route.

```
  ┌──── ROUTE MENU ────┐        →   ┌──── ROUTE MENU ────┐
  │0-ACTIVATE   *│5-DELETE        │0-ACTIVATE   *│5-DELETE
  │1-DEACTIVATE *│6-DELETE ALL RTES│1-DEACTIVATE *│6-DELETE ALL RTES
  │2-GOTO DISPLAY*│7-ADVANCE WPT  │2-GOTO ┌──────────┐E WPT
  │3-ENTER/ NEW │8-MEMORY USED   │3-ENTER│ROUTE N°: 03│USED
  │4-MODIFY     │                │4-MODIFY└──────────┘
  │ENTER A NEW ROUTE │            │ENTER A NEW ROUTE
  └──────────────────┘            └──────────────────┘
```

↙
→

```
  ┌──────────────────────┐    ┌──────────────────────┐
  │RTE:03      LENGTH:----MM│  │50M45.56 │ ⊣ LORIEN  ▲│
  │██████│------│------│------│ │001H32.09│ ⊣ LOXANE   │
  │------│------│------│------│ │         │ ⊣ LULWOR   │
  │------│------│------│------│ │ ⊣       │ ⊣ LYMING   │
  │------│------│------│------│ │19H21--064M│ ⊣ LYNDUR │
  │------│------│------│------│ │27-08-98---│ ⊣ M25-10  │
  │    ▼    ▼    ▼  OK?│      │---- │------│ ⊣ M25-15   │
  └──────────────────────┘    │         │ ⊣ M25-2  ▼ │
                              └──────────────────────┘
```

↙

```
  ┌──────────────────────┐
  │RTE:03      LENGTH:0147MM│
  │LYMING│PORTSM│------│------│
  │LYNDUR│ROUNDH│------│------│
  │NEWFOR│GUILDF│------│------│
  │LULWOR│------│------│------│
  │RINGWO│------│------│------│
  │    ▼    ▼    ▼  [OK?]│
  └──────────────────────┘
```

Note: On completion of the route entry the total length of the route is shown at the top right of the display.

4.6. – MODIFY A ROUTE

From the GOTO ROUTE function, press the **Menu** key, press key **4** (4-MODIFY), the route list is displayed. Select from the list the route to modify and press **Enter**.

The list of waypoints in the route will now be shown, select the waypoints to be modified using the ◄ ▲ ▼ ► arrow keys. You may also add a new waypoint to the end of the route. To validate your modifications select the OK? using the ► ▼ arrow keys and press **Enter**.

4.7. – DELETE A ROUTE

From the GOTO ROUTE function, press the **Menu** key and press key **5** (5-DELETE). The list of your routes is displayed. Select from the list, the route to delete, press **Enter,** then select YES? and press **Enter** to confirm.

4.8. – DELETE ALL ROUTES

From the GOTO ROUTE function, press the **Menu** key, press key **6** (6-DELETE ALL RTES), select YES? and press **Enter** to confirm.

4.9. – ADVANCE TO THE NEXT WAYPOINT IN AN ACTIVE ROUTE

This function allows you to advance to the next waypoint (or to change leg) in your route without having to deactivate the route.

From the GOTO ROUTE function, press the **Menu** key, press key **7** (7-ADVANCE WPT) and press **Enter**.

Tip: To advance several waypoints, repeat the operation as required.

4.10. – ROUTE MEMORY: USED AND FREE MEMORY

From the GOTO ROUTE function, press the **Menu** key and press key **8** (8-MEMORY USED).

```
━━━━━━━ ROUTE MENU ━━━━━━━
0-ACTIVATE    ✻ 5-DELETE
1-DEACTIVATE  ✻ 6-DELETE ALL RTES
2-GOTO DISPLAY✻ 7-ADVANCE WPT
3-ENTER / NEW   8-MEMORY USED
4-MODIFY
┌──────────────────────────┐
│ DISPLAY  THE             │
│ ROUTE  MEMORY  USED      │
└──────────────────────────┘
```

```
━━━━━━━ ROUTE MENU ━━━━━━━
┌──────────────────────────┐
│    ROUTE MEMORY USED     │
│ MIN ┌──────────────┐ MAX │
│     │ ▓▓           │     │
│  0  └──────────────┘ 20  │
│           04             │
└──────────────────────────┘
ROUTE  MEMORY  USED
```
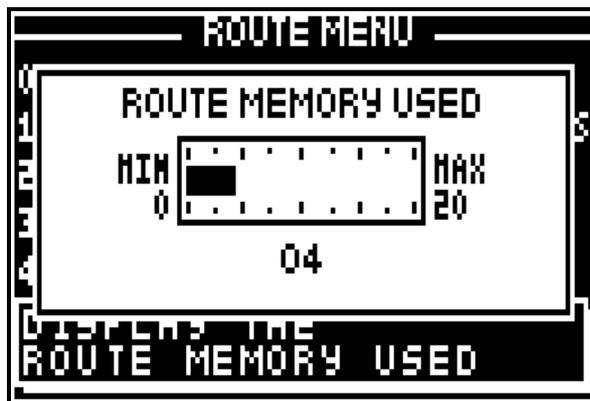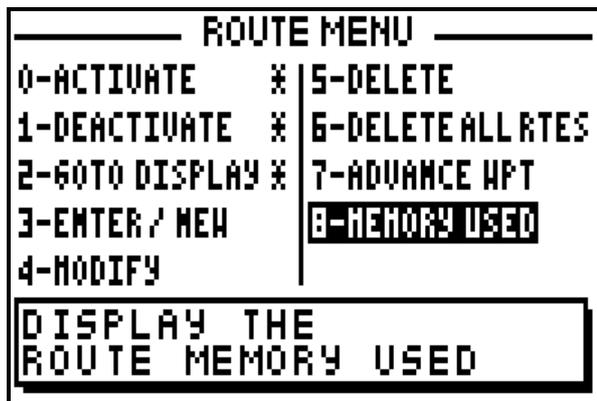
Note: The capacity of the memory is 20 routes.

_____

5 – PLOTTER DISPLAY: VIEW YOUR TRACK AND CURRENT POSITION RELATIVE TO SURROUNDINGS

The PLOTTER function shows a graphic representation of the route you have covered in relation to the vessels current position (shown as a small circle), other entered waypoints and the outline of the chart that may be entered with the PMS™ (Personal Map System). This chart is 2 dimensional and the chart is always shown north up. This function may be configured within the Plotter Menu.

5.1. – ACTIVATE THE HOME FUNCTION

The HOME function stops the plotter from tracking to enable you to retrace your track to return to your starting point.

From the PLOTTER function, press the **Menu** key and press key **0** (0-HOME FUNCT). Select ACTIVE with the using the ▲ ▼ arrow keys in the options menu and press **Enter**.

```
|◄◄| |PLOT |                    2.5
ETA:                            NM
>>H>>
SOG:
  0.0KT
RNG:
0222NM   03:LYNING ▶ LYNDUR
```
➔
```
——— PLOTTER MENU ———
0-HOME FUNCT.  ▓|5-ENTER CHART
1-SCREEN MODE  ✱|6-DELETE CHART   ✱
2-DISPLAY WPT  ✱|7-TRACK INT-VAL ✱
3-DISP. SET-UP ✱|8-DELETE TRACK   ✱
4-DISP. CHART  ✱|9-MEMORY USED
ACTIVATE THE
HOME FUNCTION
```
↙
```
——— PLOTTER MENU ———
0-HOME FUNCT.  ✱|5-ENTER CHART
1-SCREEN      NOT ACTIVE      HART   ✱
2-DISPLA      ACTIVE          T-VAL ✱
3-DISP. S                     RACK   ✱
4-DISP. CHART  ✱|9-MEMORY USED
ACTIVATE THE
HOME FUNCTION
```
➔
```
|◄◄| |HOME|                    2.5
ETA:                            NM
>>H>>
SOG:        VALLET
  0.0KT        20NIND
RNG:
0222NM   03:LYNING ▶ LYNDUR
```

Note: When the HOME FUNCTION is active, the PLOT indicator shown in the top left of the screen is replaced by the HOME indicator. To deactivate this function, select the NOT ACTIVE option from the Home Function (in the Plotter Menu) and press **Enter**.

5.2. – SELECT THE FULL SCREEN OR WINDOW MODE

From the PLOTTER function, press the **Menu** key and press key **1** (1-SCREEN MODE). Select the desired mode using the ▲ ▼ arrow keys and press **Enter**.

```
|◄◄| |PLOT |                    2.5
ETA:                            NM
>>H>>
SOG:
  0.0KT
RNG:
0222NM   03:LYNING ▶ LYNDUR
```
➔
```
——— PLOTTER MENU ———
0-HOME FUNCT.  ✱|5-ENTER CHART
1-SCREEN MODE  ▓|6-DELETE CHART   ✱
2-DISPLAY WPT  ✱|7-TRACK INT-VAL ✱
3-DISP. SET-UP ✱|8-DELETE TRACK   ✱
4-DISP. CHART  ✱|9-MEMORY USED
SELECT FULL SCREEN
OR WINDOWS PLOTTER
```
↙
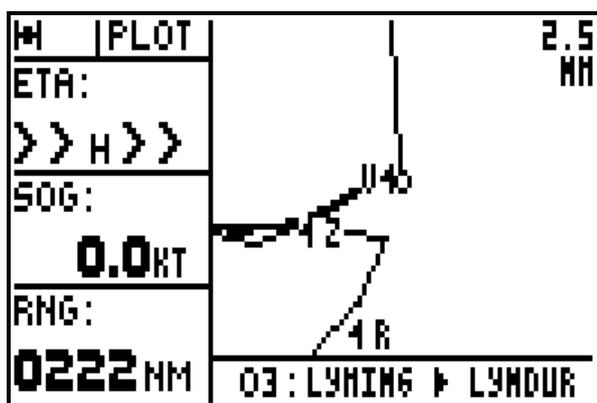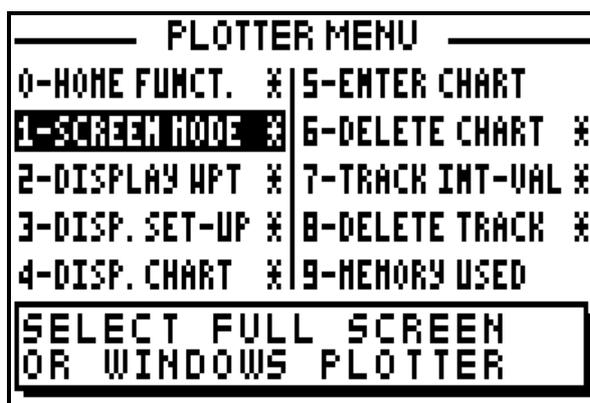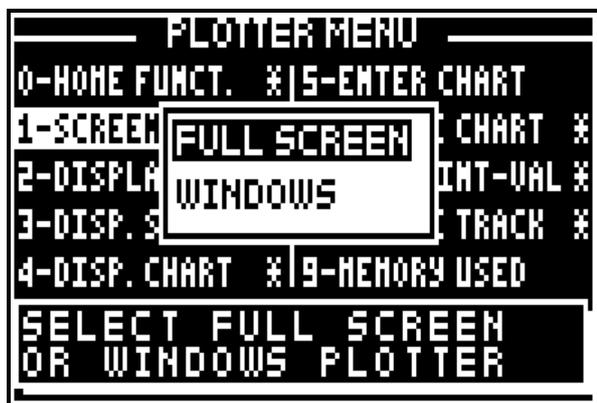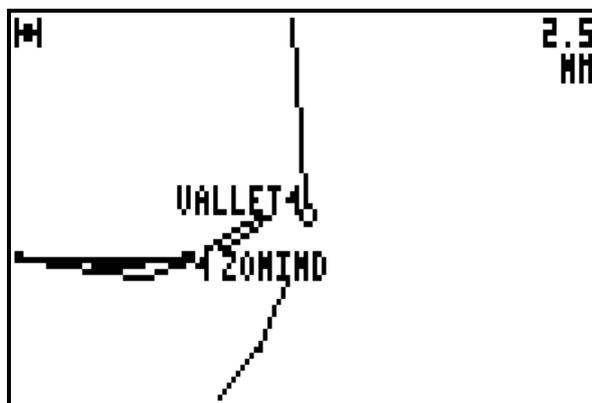
5.3. – SELECTION OF WAYPOINT NAMES ON PLOTTER DISPLAY

From the PLOTTER function, press the **Menu** key and press key **2** (2-DISPLAY WPT). Select the type of display required i.e. Icon or full name using the ▲ ▼ arrow keys then press **Enter**.
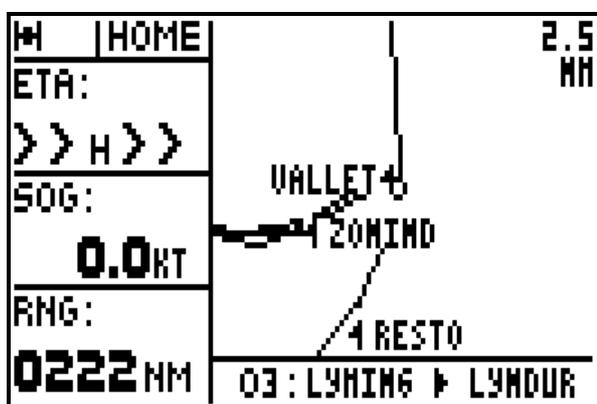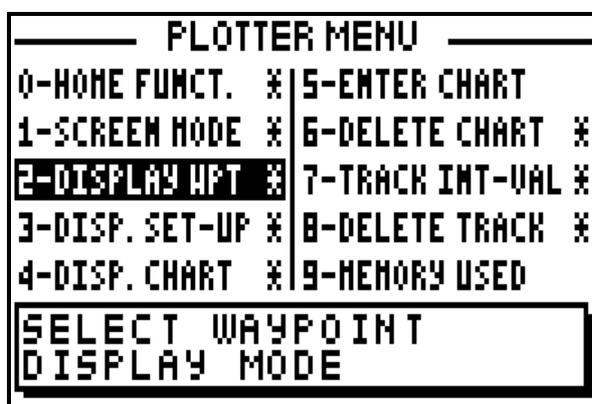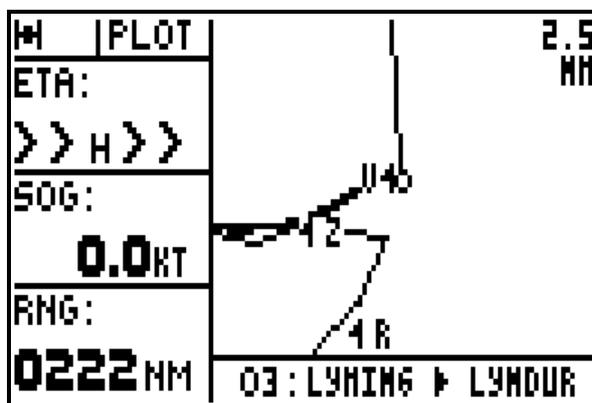
Waypoints can be represented by their icons only or by their icons plus the first letter of their names or by their icons plus their complete names.

5.4. – SELECTION ON TYPE OF INFORMATION DISPLAYED

From the PLOTTER function, press the **Menu** key and press the key **3** (3-DISP. SET-UP). Use the ▲ ▼ arrow keys to move the cursor within the set up menu and use the ◄ ► arrow keys to scroll through the different options available. When finished press **Enter** to confirm your entries.

PLOTTER MENU

0-HOME FUNCT. *	5-ENTER CHART
1-SCREEN MODE *	6-DELETE CHART *
2-DISPLAY WPT *	7-TRACK INT-VAL *
3-DISP. SET-UP *	8-DELETE TRACK *
4-DISP. CHART *	9-MEMORY USED

SELECT DATA TO
DISPLAY IN PLOTTER

PLOTTER SET-UP:

CIRCLE(S) : NO CIRCLE
WPT LINE : YES
ZOOM : YES
ZONE 1: ARRIVAL TIME
ZONE 2: SPEED OVER GR
ZONE 3: RANGE TO WPT

PLOTTER SET-UP:

CIRCLE(S) : 2 CIRCLES
WPT LINE : YES
ZOOM : YES
ZONE 1: COURSE OVER G
ZONE 2: SPEED OVER GR
ZONE 3: BEARING TO WP

CIRCLE(S): you can select to display none, 1 or 2 circles. The diameters of the circles are shown either equal to the scale or alternatively half the scale.

WPT LINE: The WPT line is shown as a dotted line which starts at the vessels position when the function was activated and it goes to the destination waypoint (GO TO WAYPOINT function). This is the active waypoint in the GOTO route function. This is the reference line used for calculating the cross track error.

ZOOM: you have the option of displaying the value of the scale on the top right of the PLOTTER screen.

ZONES 1, 2 and 3: you can select information displayed in these 3 zones from the Plotter set up menu.

5.5. – DISPLAY THE CHART OUTLINE

From the PLOTTER function, press the **Menu** key and press key **4** (4-DISP. CHART). Using the ▲ ▼ arrow keys select the option CHART ON to display the chart outline and press **Enter**.

5.6. – ENTER A CHART OUTLINE

This function allows you to produce a chart outline from a paper chart.   This chart outline can be displayed in the plotter function of your DGPS.

To enter your chart outline, connect a YEOMAN plotter (see the connection in the paragraph installation) on your FX412 DGPS.

From the PLOTTER function, press the **Menu** key and press key **5** (5-ENTER CHART): The chart options menu is now displayed.

Use keys 0, 1, 2, 3 and 4:
0 - TYPE OF LINE, to select the type of line.
1 - DELETE LAST WAYPOINT, to erase the last received point in case of mistake.
2 - END OF LINE, to stop a line and to begin a new line.
3 - DISPLAY CHART, to display the outline
4 - SAVE CHART OUTLINE, to validate and store the chart outline.

Note: The position of the last received point is displayed at the bottom of the screen.
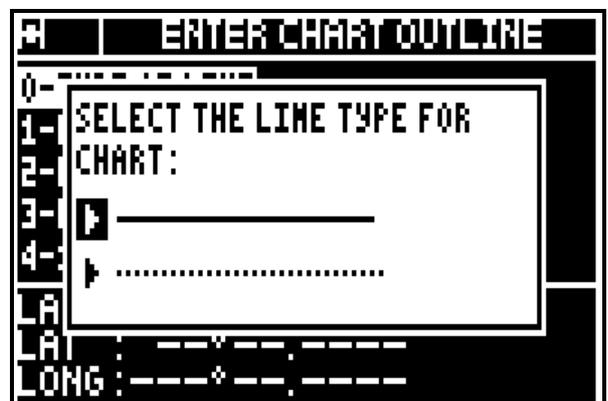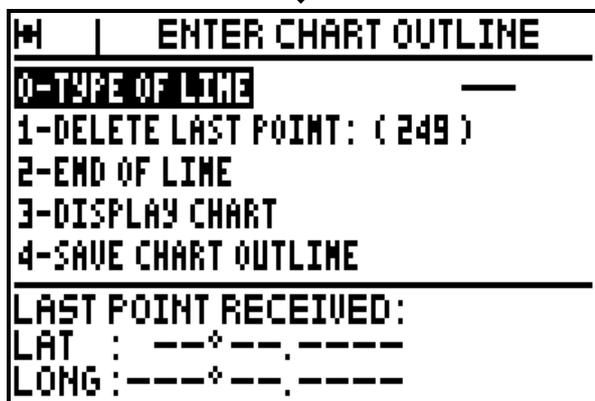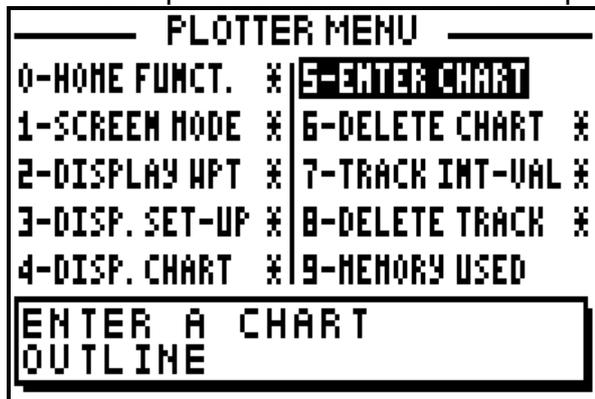
```
┌─────────────────────────────────┐        ┌─────────────────────────────────┐
│ ▐◄┤   ENTER CHART OUTLINE        │   ➜    │ ▐◄┤   ENTER CHART OUTLINE        │
├─────────────────────────────────┤        ├─────────────────────────────────┤
│ 0-TYPE OF LINE          ──       │        │ 0-TYPE OF LINE          ──       │
│ ▌1-DELETE LAST POINT:▐ (250)     │        │ ▌1-DELETE LAST POINT:▐ (249)     │
│ 2-END OF LINE                    │        │ 2-END OF LINE                    │
│ 3-DISPLAY CHART                  │        │ 3-DISPLAY CHART                  │
│ 4-SAVE CHART OUTLINE             │        │ 4-SAVE CHART OUTLINE             │
├─────────────────────────────────┤        ├─────────────────────────────────┤
│ LAST POINT RECEIVED:            │        │ LAST POINT RECEIVED:            │
│ LAT  : 47°26.280N               │        │ LAT  : 47°26.280N               │
│ LONG:001°38.400W                │        │ LONG:001°38.400W                │
└─────────────────────────────────┘        └─────────────────────────────────┘
```

```
┌─────────────────────────────────┐        ┌─────────────────────────────────┐
│ ▐◄┤   ENTER CHART OUTLINE        │   ➜    │ ▐█▌ ▐ENTER CHART OUTLINE▌        │
├─────────────────────────────────┤        ├─────────────────────────────────┤
│ 0-TYPE OF LINE          ──       │        │0 ┌───────────────────────────┐   │
│ 1-DELETE LAST POINT: (249)       │        │1-│DO YOU WANT TO STOP THE    │   │
│ ▌2-END OF LINE▐                  │        │2-│LINE?                      │   │
│ 3-DISPLAY CHART                  │        │3 │THE NEXT POINT WILL BE THE │   │
│ 4-SAVE CHART OUTLINE             │        │4 │START OF A NEW LINE.       │   │
├─────────────────────────────────┤        │  │                           │   │
│ LAST POINT RECEIVED:            │        │LA│   ▌YES?▐   NO?            │   │
│ LAT  : 47°26.280N               │        │LA└───────────────────────────┘   │
│ LONG:001°38.400W                │        │LONG:001°38.400W                │
└─────────────────────────────────┘        └─────────────────────────────────┘
```

```
┌─────────────────────────────────┐        ┌─────────────────────────────────┐
│ ▐◄┤   ENTER CHART OUTLINE        │   ➜    │ ▐◄┤                              │
├─────────────────────────────────┤        │                                  │
│ 0-TYPE OF LINE          ──       │        │                                  │
│ 1-DELETE LAST POINT: (249)       │        │                                  │
│ 2-END OF LINE                    │        │                                  │
│ ▌3-DISPLAY CHART▐                │        │                                  │
│ 4-SAVE CHART OUTLINE             │        │                                  │
├─────────────────────────────────┤        │                                  │
│ LAST POINT RECEIVED:            │        │                                  │
│ LAT  : 47°26.280N               │        │                                  │
│ LONG:001°38.400W                │        │                         ▌OK?▐   │
└─────────────────────────────────┘        └─────────────────────────────────┘
```

```
┌─────────────────────────────────┐        ┌─────────────────────────────────┐
│ ▐◄┤   ENTER CHART OUTLINE        │   ➜    │ ▐█▌ ▐ENTER CHART OUTLINE▌        │
├─────────────────────────────────┤        ├─────────────────────────────────┤
│ 0-TYPE OF LINE          ──       │        │                                  │
│ 1-DELETE LAST POINT: (249)       │        │        SAVING CHART              │
│ 2-END OF LINE                    │        │                                  │
│ 3-DISPLAY CHART                  │        │    0 ▐████░░░░░░▌ 100%            │
│ ▌4-SAVE CHART OUTLINE▐           │        │                                  │
├─────────────────────────────────┤        │        PLEASE WAIT...            │
│ LAST POINT RECEIVED:            │        ├─────────────────────────────────┤
│ LAT  : 47°26.280N               │        │ LAT  : --°--.----               │
│ LONG:001°38.400W                │        │ LONG:---°--.----                │
└─────────────────────────────────┘        └─────────────────────────────────┘
```

Advice: When you have displayed the chart outline, press **Enter** to return to the chart options MENU. To save your work it is imperative to select option 4 – SAVE CHART OUTLINE or to

confirm when the back-up window is displayed (this window is displayed after pressing a non-authorised key).

Advice: You can erase as many waypoints as you wish by selecting option I (DELETE LAST POINT), this operation may be carried out as many times as necessary. The number of stored points is automatically updated at the conclusion of this operation.

5.7. – DELETE THE CHART OUTLINE

From the PLOTTER function, press the **Menu** key and press key **6** (6-DELETE CHART), select YES? and press **Enter** to confirm.

Note: Once your chart outline has been erased, it cannot be reinstated.

5.8. – SELECT TRACKING INTERVAL BY DISTANCE

From the PLOTTER function, press the **Menu** key and press key **7** (7-TRACK INT-VAL). Using the ◀ ▲ ▼ ▶ arrow keys select the desired track interval and press **Enter**.
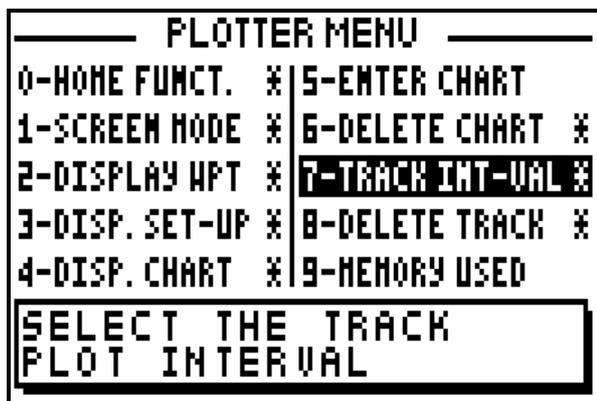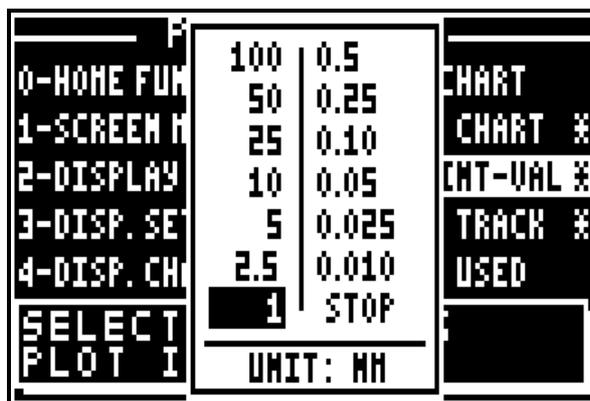
Advice: The track memory capacity is 250 points e.g. if you select the 1 Km interval you will be able to store 250 kilometres of track. If you select STOP your track will no longer by stored. The track up to this point will be stored.

5.9. – DELETE THE CURRENT TRACK

From the PLOTTER FUNCTION, press the **Menu** key and press key **8** (DELETE TRACK), select YES? and press **Enter** to confirm.

Note: Once your track has been deleted, it will not be possible to reinstate.

5.10. – TRACK AND CHART MEMORY: USED AND FREE MEMORY

From the PLOTTER FUNCTION, press the **Menu** key and press key **9** (9-MEMORY USED).
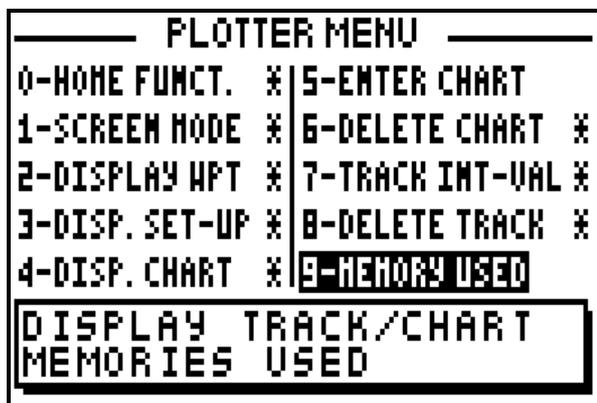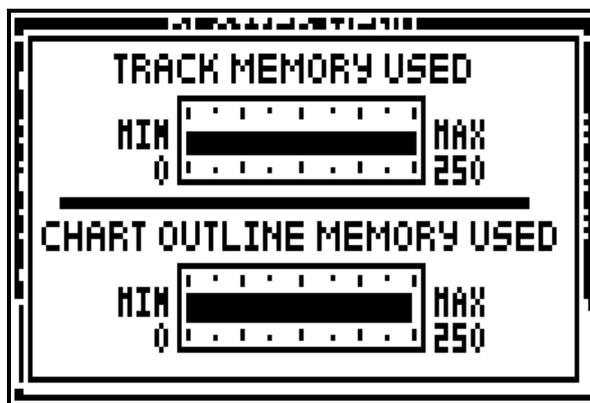
Note: The track memory capacity is 250 points including the memory for the chart outline.

5.11. – CHANGE THE ZOOM SCALE ON THE PLOTTER SCREEN

From the PLOTTER function, press directly on to key **7PRS (Zoom)** (Direct Access™), then select the desired scale using the ◄ ▲ ▼ ► arrow keys and press **Enter**.
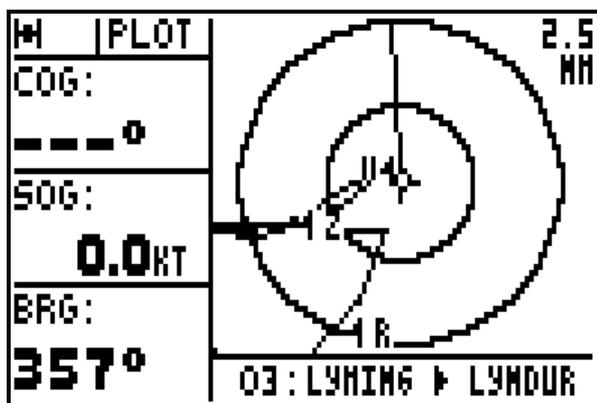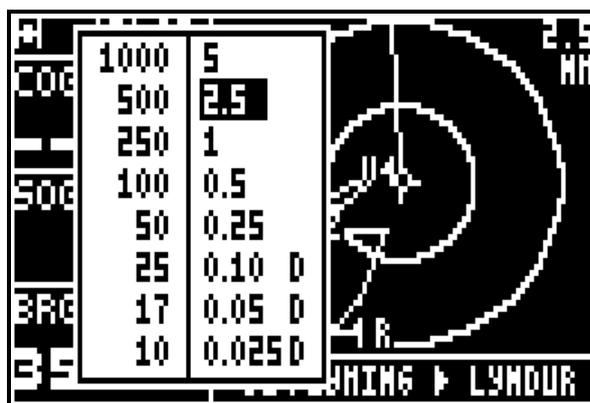
Note: The value of the scale corresponds to the height of the screen. Scales with a D can be used in differential mode.

5.12. – CURSOR MODE

From the PLOTTER function use the ◄ ▲ ▼ ► arrow keys to resite the plotter screen over an object or position other than the vessels current position. When in this mode, CURS will be displayed in the top left part of the screen instead of PLOT. This is to indicate that the plotter is in CURSOR MODE. Pressing the plot key again will return you to plotter mode where vessels position is centred on the screen.

```
┌─────────────┬──────────────────────────┐
│ ⊩ │ CURS  │                    2.5   │
│ COG:        │                     NM   │
│ ━━━ °       │                          │
│ SOG:        │            +             │
│  0.0kт      │                          │
│ BRG:        │                          │
│ 357°        │ 03:LYMING ▶ LYNDUR       │
└─────────────┴──────────────────────────┘
```

_____
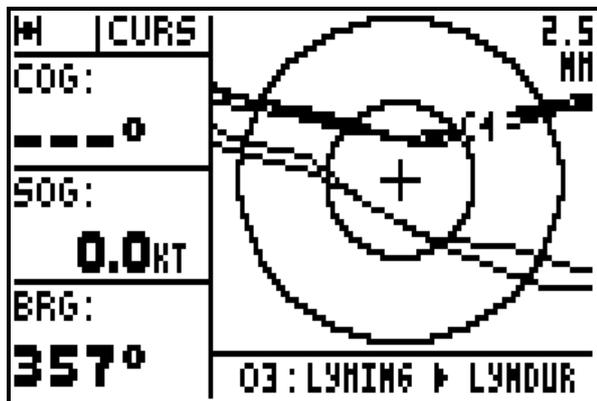
6 – MAN OVER BOARD (MOB) AND MARK FUNCTIONS

The MAN OVER BOARD and the MARK functions are activated with the **Mark/Mob** key. The operation of these two functions depends on the MARK/MOB configuration within the SYSTEM MENU (see chapter 7 paragraph C.7.1.7). Your DGPS is pre-set in MOB.

MOB function = One press only on the **Mark/Mob** key to activate the MAN OVER BOARD (MOB) function.

MARK AND MOB function = One press only to activate the MARK (EVENT / WAYPOINT) function and at least three presses (or a continuous press) to activate the MAN OVER BOARD (MOB) function.

6.1. – MOB ACTIVATION

This function allows you to instantly record in an emergency your position (e.g. man overboard).

The MOB function displays the bearing to follow to return to the MOB position. The distance, your speed and course are also displayed. The circle in which the MOB is displayed is intended to give greater accuracy for returning to the MOB position. If you move off the MOB position, the screen scale will be modified automatically to keep the MOB position permanently in the centre of the screen.
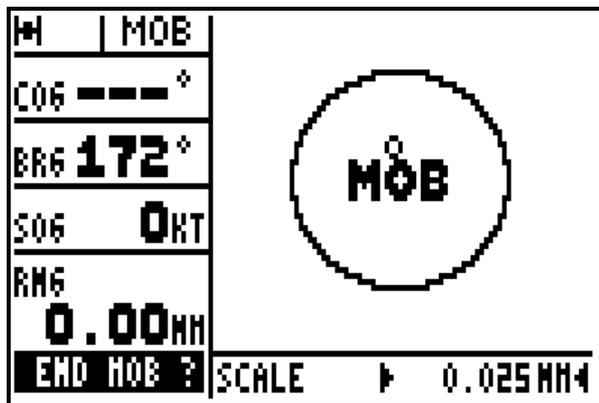
To stop the MOB function, press the **Enter** key when the MOB function is displayed.

Note: The plotter function (PLOT) is not available when the MOB function is active.

Advice: In practice, it is advisable to press the Mark/Mob key at least three times in order to activate this function as this covers both configurations.

6.2. – MARK (EVENT / WAYPOINT) ACTIVATION

This function allows you to store event waypoint MARKS (or points of passage). An event waypoint allows you to store very quickly and easily the position of an object at your current position. This function is only available when your DGPS is set to MARK AND MOB.

From any function you may press the Mark/Mob key to display a list of event waypoints. This window is very similar to the waypoint list window   A name, icon and a comment are proposed, press **Enter** to accept them or to validate your modifications.

The proposed name is formed bythe three WPTS letters and three figures in numerical order e.g. WPT001, WPT002, WPT003...

The proposed icon is a flag.

The proposed comment comprises of the time, altitude and the date calculated by the FX412 at the time you press on the **Mark/Mob** key.
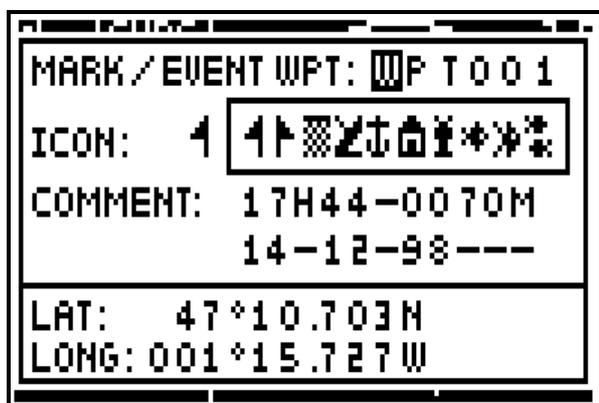
Tip: You can alter the Mark / Event waypoint by using MODIFY from the WAYPOINT MENU.

7 – SIMULATOR FUNCTION

This function allows you to simulate all the navigation functions available on your DGPS.

To activate the SIMULATOR function, from MAIN MENU press Key **5** (5-Simulator)**.** Using the ▲ ▼ arrow keys, select Active in the Simulator Menus and press the **Enter** key. In the displayed window, enter the different navigation parameters, e.g. COURSE, SPEED, DATE, TIME and the start position (LATITUDE and LONGITUDE) then press the **Enter** key.

```
———————— MAIN MENU ————————
0-SYSTEM MENU  |5-SIMULATOR  ※
1-NAVIGAT. MENU| 6-SATELLITES
2-WAYPOINT MENU| 7-DGPS
3-ROUTE MENU   | 8-DGPS MESSAGE
4-PLOTTER MENU | 9-VERSION
SIMULATOR SET-UP
OPTIONS
```

➔

```
———————— MAIN MENU ————————
0-SYSTEM MENU  |5-SIMULATOR  ※
1-NAVIG   NOT ACTIVE   LITES
2-WAYPO
3-ROUTE   ACTIVE       MESSAGE
4-PLOTTER MENU | 9-VERSION
SIMULATOR SET-UP
OPTIONS
```

↙
➔

```
———————— MAIN MENU ————————
0    SIMULATOR SET-UP:
1|COG:   000.0 °
2|SOG:   000.0 KT
3|DATE:  00/00/00
4|TIME:  00:00:00
 |LAT:    47°10.7048N
 |LONG: 001°15.7316W
```

➔

```
———————— MAIN MENU ————————
0    SIMULATOR SET-UP:
1|COG:   255.0 °
2|SOG:   010.5 KT
3|DATE:  14/12/98
4|TIME:  18:00:00
 |LAT:    51°35.0000N
 |LONG: 002°15.0000W
```

↙

```
┌─────────────────────────────────────────┐
│ SIMU.│14.12.98  18:00:00│ALT:00050 M     │
│ ┌───────────────────────────────────────┐│
│    51ℕ34.995                             │
│    002W15.027                            │
│ ├───────────────────────────────────────┤│
│ │SOG: 10.5 KT │ COG: 255°               ││
└─────────────────────────────────────────┘
```

Note: When the simulator is active, the SIMU indication is displayed on the top left of the screen. To stop the simulator function, select NOT ACTIVE from the ACTIVE/NOT ACTIVE window and press the **Enter** key.

_____

8 – SATELLITES

From the MAIN MENU, press key **6** (6-Satellites).

You will find further information about satellites in the chapter C, paragraph 2, SATELLITES.

```
┌──────── MAIN MENU ────────┐        ┌──────────────────────────┐
│0-SYSTEM MENU │5-SIMULATOR X│  →    │        ▲N      DOP:       │
│1-NAVIGAT. MENU│6-SATELLITES │       │                --.-      │
│2-WAYPOINT MENU│7-DGPS       │       │      14                  │
│3-ROUTE MENU  │8-DGPS MESSAGE│       │           04    ▐▌▐▌▐▌   │
│4-PLOTTER MENU│9-VERSION     │       │    25                    │
│┌─────────────────────────┐ │       │    29    30  05 24       │
││DISPLAY SATELLITE        │ │       │          06 08   01040506080│9
││CONSTELLATION            │ │       │            09            │
│└─────────────────────────┘ │       │          ▐▌▐▌▐▌▐▌       │
└───────────────────────────┘        │          1424252930      │
                                      └──────────────────────────┘
```

_____
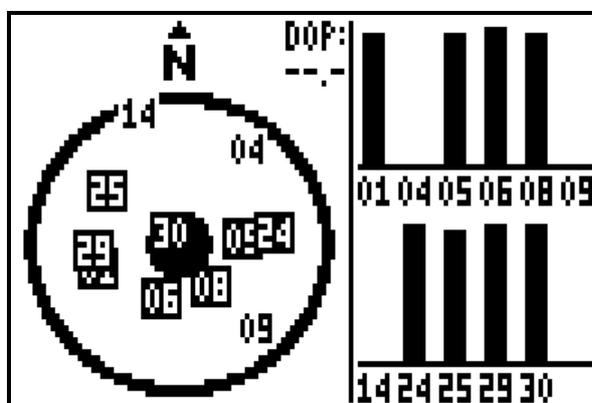
9 – USING THE FX412 IN DGPS MODE

The FX412 is a GPS navigator with an integral DGPS receiver, which can function in the DGPS mode without any other equipment. However it is possible for test purposes to use an external DGPS receiver should this be desired.

To use your FX412 in the DGPS mode, you just have to select the DGPS station you wish to receive, your FX412 will automatically ensure the correct reception, decoding and the processing of the DGPS information. When the FX412 calculates the position in DGPS mode, the letter D is display in the top left-hand corner of the screen near the satellite symbol.

9.1. – SELECTION OF A DGPS STATION

From the MAIN MENU press key **7** (7-DGPS). On the left of the screen the signal strength is displayed as a bar graph, (a good signal = ¾ of black in the bar graph) and the percentage of error on the data should be a low figure.   At the bottom of the screen the DGPS station identification number is displayed together with a list of the satellites which are being corrected.
To change parameters of the DF300, press the **Enter** key to display SET-UP THE DGPS PARAMETERS. Use the ▲ ▼ arrow keys to move the cursor in the window. Use the numeric keys and the ◀ ▶ arrow keys to enter your new parameters then press **Enter**.

DGPS PARAMETERS:

TYPE = Selection of the internal DGPS receiver of the FX412 or of an external DGPS receiver.

FREQ. T = Frequency of the station to receive (frequency transmitted to the DF300).

BAUD= Data transmission speed of the DGPS station. (Rate transmitted to the DF300).

MODE = Working Mode of the FX412 (Normal, Diff and Auto)

NORMAL = Calculation of the position will take place without differential corrections. If differential corrections are found they will be applied.

DIFF = Calculation of the position with differential corrections, if the differential signal is not found the position is not calculated.

AUTO = The FX412 selects the best mode, either Normal or Diff, according to the differential corrections being received.

FREQ.R = DGPS frequency that the FX412 (or external DGPS receiver) receives and operates on.

To use your FX412, be sure that you have correctly selected INTERN for the TYPE, and AUTO or DIFF for the mode together with the correct DGPS station (frequency and Baud rate) with the help of ANNEXE 4.

```
 ────── MAIN MENU ──────          →    ┌──────────── DGPS ────────────┐
0-SYSTEM MENU    5-SIMULATOR  *         SIGNAL LEVEL    │TYPE  :INTERN
1-NAVIGAT. MENU  6-SATELLITES          [□|.|.|.|.|.|.]  │BAUD  :100
2-WAYPOINT MENU  [7-DGPS]               % ERROR         │MODE  :AUTO
3-ROUTE MENU     8-DGPS MESSAGE        [█|█|█|█|█|.|.]   │FREQ.T:287.5KHZ
4-PLOTTER MENU   9-VERSION                              │FREQ.R:---.-KHZ
 ┌────────────────────────┐            STATION:----    --------------
 │ DGPS SET-UP AND        │            CORRECTED SATELLITES:
 │ STATUS OPTIONS         │            -- -- -- -- -- -- -- -- -- -- -- --
 └────────────────────────┘
```

```
┌──────── DGPS ────────┐        →      ┌──────── DGPS ────────┐
SIG│SET-UP THE DGPS │ERM              SIG│SET-UP THE DGPS │ERM
   │PARAMETERS:     │                     │PARAMETERS:     │
  %│TYPE  : INTERN  │5KHZ              %│TYPE  : INTERN  │5KHZ
   │FREQ.T: 287.5 KHZ│5KHZ               │FREQ.T: 298.0 KHZ│5KHZ
STAT│BAUD  : 100    │---              STAT│BAUD  : 100    │---
CORRE│MODE  : AUTO  │                 CORRE│MODE  : AUTO  │
```

```
┌D       DGPS ─────────┐        →      ┌D 02.02.99  13:20:44 ACC:002M┐
SIGNAL LEVEL   │TYPE  :INTERN
[█|█|█|█|.|.|.]│BAUD  :100                    47 N 10.722
 % ERROR       │MODE  :AUTO
[□|.|.|.|.|.|.]│FREQ.T:298.0KHZ              001 W 15.713
               │FREQ.R:298.0KHZ
STATION:0463   WORKING                 SOG:   0.0 KT │ COG:----°
CORRECTED SATELLITES:
01 04 05 06 08 09 24 25 29 30 -- --
```

Note: The D letter is displayed in the top left of the screen when the FX412 calculates its position in differential mode. The indication of accuracy (ECP) automatically takes into account the precision of the differential mode.

Tip: Select the nearest DGPS station using the ANNEXE 4. If after 5 minutes your FX412 does not work in DGPS mode, check the data entered or try other stations.

9.2. – USING THE FX412 WITH AN EXTERNAL DGPS RECEIVERS

Connect the FX412 to the DGPS receiver with the help of instructions in Paragraph 3 (INSTALLATION INSTRUCTIONS) and configure the data input of the FX412 for DIFFERENTIAL format. Set up your FX412 on EXTERN for the TYPE and select the working mode for the DGPS (see previous paragraph). Please read your DGPS receiver manual for further information. The letter 'D' is displayed on the top left of the screen when the FX412 calculates its position in differential mode.

_____

10 – DGPS RECEPTION MESSAGES

The letter M is displayed on the top left of the screen indicates a message from the differential correction station has been received.

From the MAIN MENU, press key **8** (8-DGPS MESSAGE) to display the message. Press the **Enter** key to delete the DGPS message. To save the message, leave the MESSAGE on the screen whilst pressing one of the function keys, **Pos**, **Nav**, **GoTo**, **Plot** or **Menu**.

```
|HDM|02.02.99  13:20:44|ACC:002H|      →    ———— MAIN MENU ————
                                           0-SYSTEM MENU  | 5-SIMULATOR  X
  47N10.722                                1-NAVIGAT. MENU| 6-SATELLITES
                                           2-WAYPOINT MENU| 7-DGPS
 001W15.713                                3-ROUTE MENU   | 8-DGPS MESSAGE
                                           4-PLOTTER MENU | 9-VERSION
SOG:   0.0 KT | COG: ———°                  DISPLAY  THE  DGPS
                                           MESSAGE  RECEIVED
```

                                              ↙

```
DGPS MESSAGE RECEIVED ON:
24/01/99  20:56 UTC

THLS TRIAL SERV
ICE



                      OK?
```

11 – SOFTWARE VERSION OF YOUR FX412

From the MAIN MENU press key **9** (VERSION).

```
———— MAIN MENU ————
0-SYSTEM MENU   | 5-SIMULATOR  *
1-NAVIGAT. MENU | 6-SATELLITES
2-WAYPOINT MENU | 7-DGPS
3-ROUTE MENU    | 8-DGPS MESSAGE
4-PLOTTER MENU  | 9-VERSION
DISPLAY THE GPS
SOFTWARE VERSION
```

➔

```
         FX412
———— SOFTWARE ————
VERSION: 1.30    F-GB
   DATE: 08/12/98
———————— BOOT ————————
VERSION: 1.0
   DATE: 05/10/98
        OK?
```

C – BEGINNERS GUIDE

1 – POWER ON/OFF

Press the **PWR** key to switch on your DGPS, an audible beep is given out and the FX412 begins a sequence of autotests. Then the FX412 model number, software version and OK are displayed. From this moment you have access to all functions. If no function is selected within 10 seconds, the POSITION function is displayed.
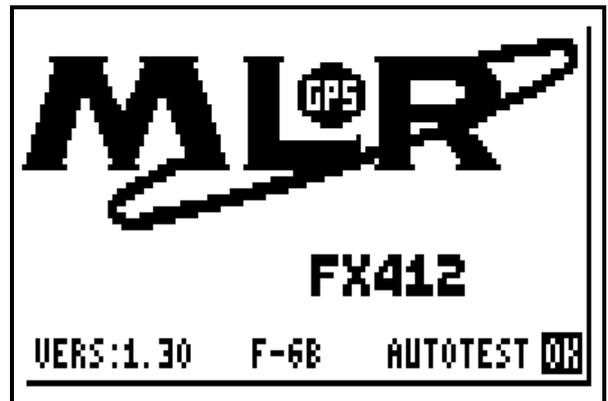
The date and time are displayed on receipt of the first satellite signal. When sufficient satellite signals are received: the position, altitude, speed and the course are calculated. The symbol representing a satellite is displayed in the top left of the screen indicating that your DGPS is receiving enough satellite signals to calculate and validate its position.
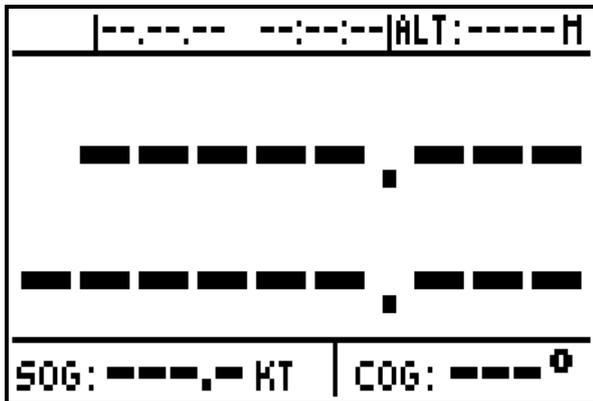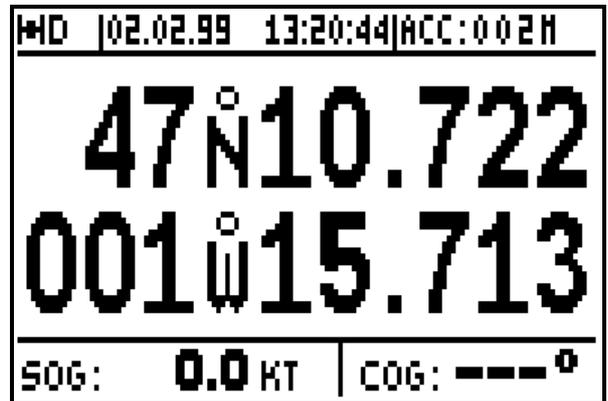
To switch off your DGPS press **PWR** and hold down until unit powers down.

_____
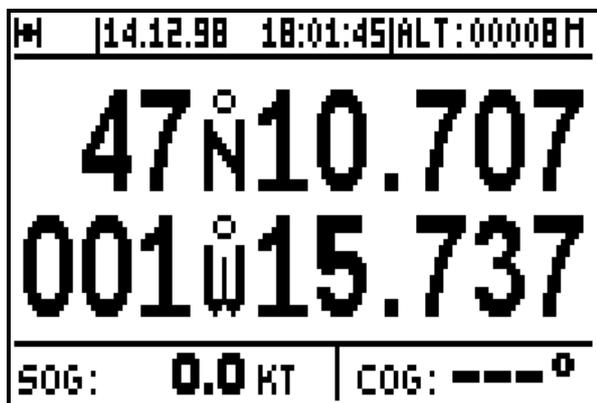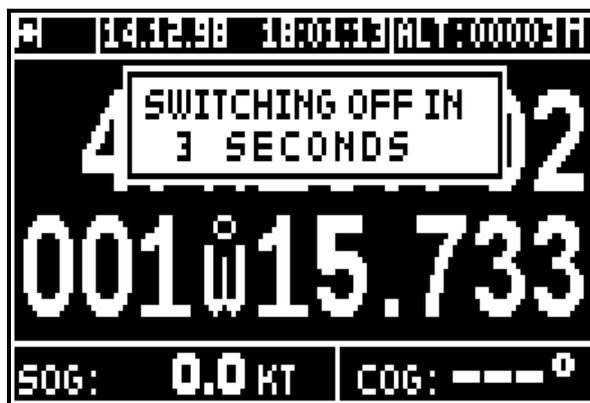
2 – SATELLITES

From the POSITION function press the **Menu** key and press key **6** (6-SATELLITE) to view the satellites and signal strengths being received.
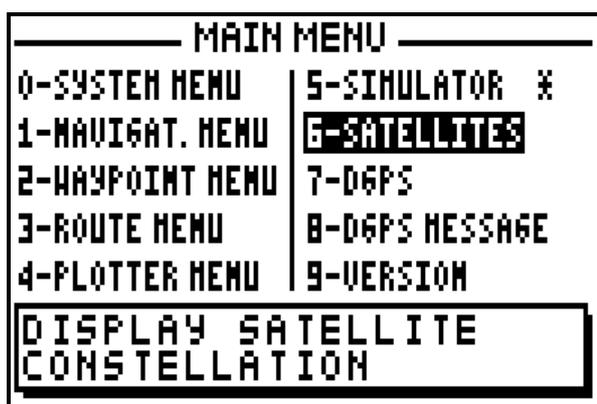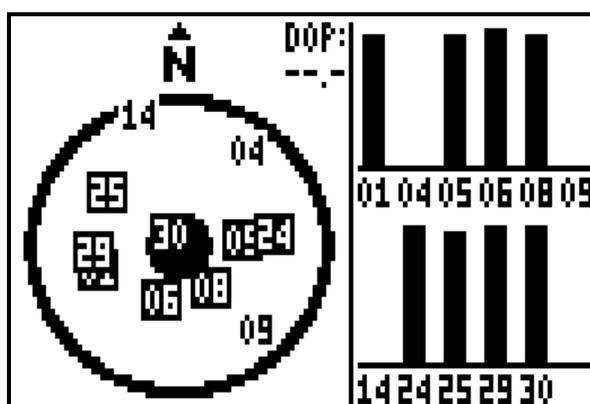
The left hand side of the screen details currently received satellites. The outside circle represents the horizon and the central disk represents the zenith. A satellite close to the outside circle will present a very weak elevation over the horizon; it will be difficult to receive. A satellite close to the centre has an greater elevation (close to 90°); it will be received without any problem. In the right part a bargraph details the quality of reception of every satellite, no bar = no reception, black bar at 3/4 of the height = perfect reception. The D O P (Dilution of Position) is an indication of calculated accuracy of the horizontal position, this depends on the respective positions of satellites in relation to each other. The best accuracy will be obtained when the D O P (Dilution of Position) is 1.

Note: Every DGPS satellite circles the earth in 11 hours and 58 minutes. According to the time of day the number of available satellites in the sky varies from 6 to 12. On average 9 satellites are visible.

3 – CONTRAST AND BACKLIGHT ADJUSTMENT

When the DGPS is on, briefly press the **PWR** key to illuminate the display and keyboard. This action will also activate the display menu.

  →
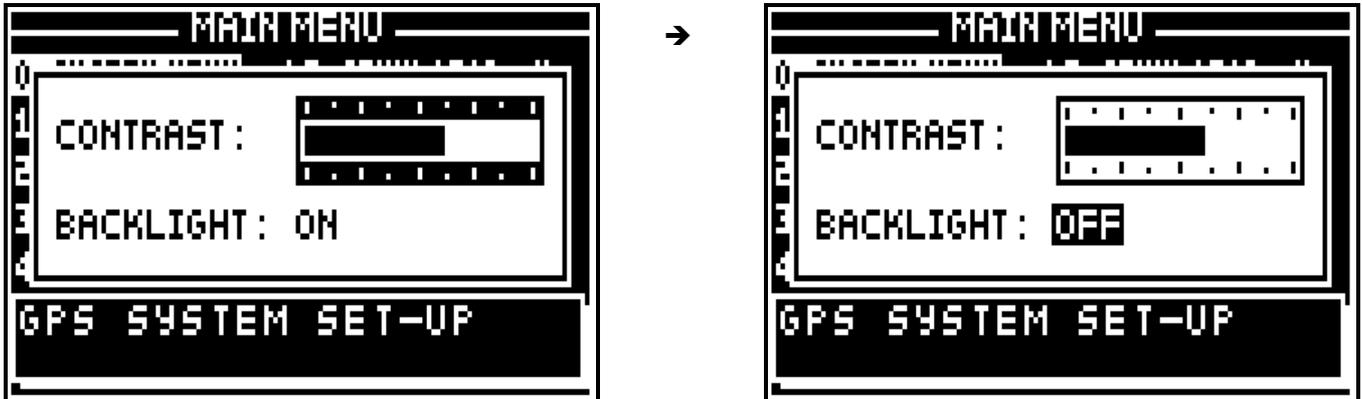
Use the vertical ▲ ▼ arrow keys to move the cursor from contrast to backlight or from backlight to contrast.

Contrast:
To use the horizontal ◀ ▶ arrow keys to adjust the contrast when the cursor is on the contrast bargraph.

Light:
Use the horizontal ◀ ▶ arrow keys to switch the backlight on or off .

Press **Enter** to validate your adjustment and to erase the window.

Tip: To illuminate the DGPS quickly press **PWR** and **Enter**.

_____

4 – GENERAL PROCEDURES USING THE KEYBOARD

Key	Function or action	Key	Function or action
PWR		**PWR**	
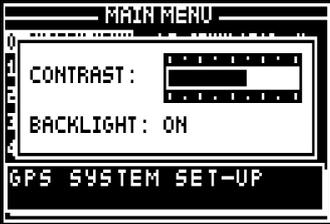
Key	Function or action	Key	Function or action
From every function or display Example : POS	⊞ |15.12.98 13:33:48|ALT:00020M **47°N10.700** **001°W15.739** SOG: **0.0** KT | COG: ---- °	**PWR** For 3 seconds	⊞ |15.12.98 13:33:48|ALT:00065M 4 ┌SWITCHING OFF IN┐ 3 └ 2 SECONDS ┘ **001°W15.737** SOG: **0.0** KT | COG: ---- °
Pos	⊞ |15.12.98 13:33:48|ALT:00020M **47°N10.700** **001°W15.739** SOG: **0.0** KT | COG: ---- °	**Menu**	─── MAIN MENU ─── 0-SYSTEM MENU | 5-SIMULATOR ✗ 1-NAVIGAT. MENU | 6-SATELLITES 2-WAYPOINT MENU | 7-DGPS 3-ROUTE MENU | 8-DGPS MESSAGE 4-PLOTTER MENU | 9-VERSION GPS SYSTEM SET-UP
Nav	⊞ |15.12.98 13:35:05|ALT:00084M SOG: **0.0** KT COG: **━━━━** ° L1:**00647** NM | L2:**1138** NM	**Menu**	─── NAVIGATION MENU ─── 0-DISTANCE UNIT | 5-RESET LOG 1-ALTITUDE UNIT | 6-ARRIVAL ALARM 2-2D/3D MODE | 7-ANCHOR ALARM 3-SPEED FILTER | 8-USER SET-UP 4-COMPASS VAR. SELECT AND RESET THE LOGS
GoTo Wayoint	⊞ | WPT RNG: 0215 NM BRG: 357° COG: ---- ° XTE: 0.0 NM SOG: 0.0 KT VTD:+0.00 TTG:>>H>> 15/12 13:35 LYMING	**Menu**	50N45.56 001W32.09 4 19H21--064M 27-08-98--- ---- |------	◄ LORIEN ▲ ◄ LOXANE ◄ LULWOR ◄ LYMING ◄ LYNDUR ◄ M25-10 ◄ M25-15 ◄ M25-2 ▼
GoTo Waypoint	⊞ | WPT RNG: 0215 NM BRG: 357° COG: ---- ° XTE: 0.0 NM SOG: 0.0 KT VTD:+0.00 TTG:>>H>> 15/12 13:35 LYMING	**9wxy List**	50N45.56 001W32.09 4 19H21--064M 27-08-98--- ---- |------	◄ LORIEN ▲ ◄ LOXANE ◄ LULWOR ◄ LYMING ◄ LYNDUR ◄ M25-10 ◄ M25-15 ◄ M25-2 ▼
GoTo Route	⊞ | RTE RNG: 0215 NM BRG: 357° COG: ---- ° XTE: 0.0 NM SOG: 0.0 KT VTD:+0.00 TTG:>>H>> 15/12 13:37 O3:MOBILE ► LYMING	**Menu**	─── ROUTE MENU ─── 0-ACTIVATE ✗ | 5-DELETE 1-DEACTIVATE ✗ | 6-DELETE ALL RTES 2-GOTO DISPLAY ✗ | 7-ADVANCE WPT 3-ENTER / NEW | 8-MEMORY USED 4-MODIFY DEACTIVATE THE ACTIVE ROUTE
GoTo Route	⊞ | RTE RNG: 0215 NM BRG: 357° COG: ---- ° XTE: 0.0 NM SOG: 0.0 KT VTD:+0.00 TTG:>>H>> 15/12 13:37 O3:MOBILE ► LYMING	**9wxy List**	RNG: 02 BRG: 3 COG: --- XTE: SOG: VTD:+0 TTG:>> 15/12	00:LYMING►LYNDUR 01:LULWOR►LISS 02:KATZEN►KRAUTE 03:LYMING►GUILOF

Key	Function or action	Key	Function or action
Plot		**Menu**	
Plot		**7PRS** **Zoom**	
Plot		◀ ▲ ▼ ▶	
Mark/Mob One press in the MOB mode		**Enter**	To stop the MOB function
Mark/Mob One press in the MOB and MARK mode		**Enter**	To validate the event waypoint
Mark/Mob At least 3 presses in the MOB and MARK mode		**Enter**	To stop the MOB function
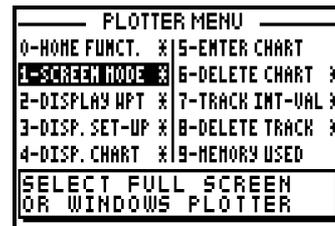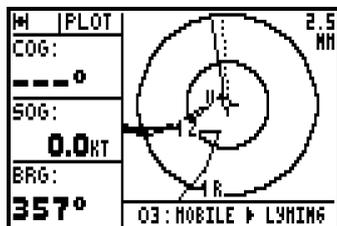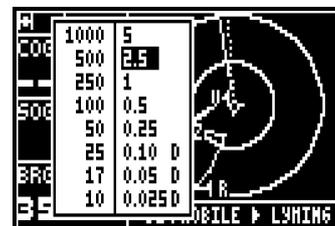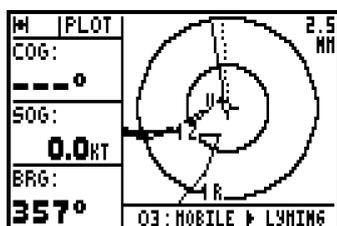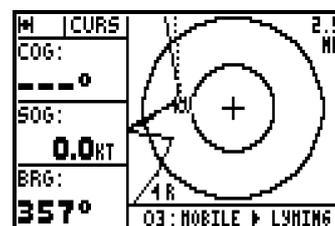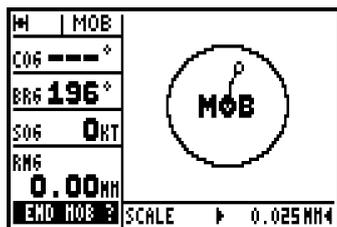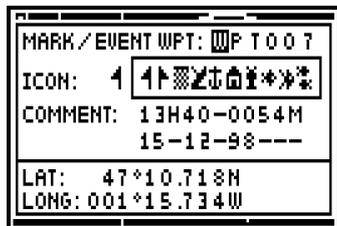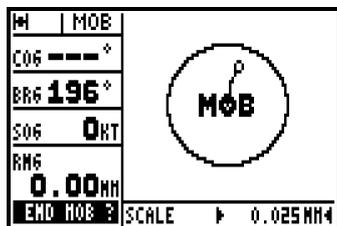
Note: From the POSITION, SYSTEM MENU, NAVIGATION MENU, WAYPOINT MENU, ROUTE MENU or PLOTTER MENU, one press on the **Menu** key gives you access to the MAIN MENU. MENUS with options denoted by a star return you directly to the function menu.

5 – USE OF 'ARROWS' KEYS AND ENTER

```
┌────── MAIN MENU ──────┐
│0-SYSTEM MENU│5-SIMULATOR  ✗│
│1-NAVIGAT. MENU│6-SATELLITES│
│2-WAYPOINT MENU│7-DGPS│
│3-ROUTE MENU│8-DGPS MESSAGE│
│4-PLOTTER MENU│9-VERSION│
│GPS SYSTEM SET-UP│
└───────────────────────┘
```

◄ ▲ ▼ ►
Vertical and horizontal movement of the cursor in a MENU or option window

```
┌────── MAIN MENU ──────┐
│0-SYSTEM MENU│5-SIMULATOR  ✗│
│1-NAVIGAT. MENU│6-SATELLITES│
│2-WAYPOINT MENU│7-DGPS│
│3-ROUTE MENU│8-DGPS MESSAGE│
│4-PLOTTER MENU│9-VERSION│
│DISPLAY SATELLITE│
│CONSTELLATION│
└───────────────────────┘
```

```
┌───────────────────────┐
│MARK/EVENT WPT: WP T 0 0 7│
│ICON:  ◄ │↑▓∠⛴🏠♦♂✳│
│COMMENT: 13H40-0054M│
│         15-12-98---│
│LAT:   47°10.718N│
│LONG:001°15.734W│
└───────────────────────┘
```

▲ ▼
Vertical movement of the cursor in an options window or in a list

```
┌───────────────────────┐
│MARK/EVENT WPT: WP T 0 0 7│
│ICON:  ◄ │↑▓∠⛴🏠♦♂✳│
│COMMENT: 13H40-0054M│
│         15-12-98---│
│LAT:   47°10.718N│
│LONG:001°15.734W│
└───────────────────────┘
```

```
┌───────────────────────┐
│MARK/EVENT WPT: WP T 0 0 7│
│ICON:  ◄ │↑▓∠⛴🏠♦♂✳│
│COMMENT: 13H40-0054M│
│         15-12-98---│
│LAT:   47°10.718N│
│LONG:001°15.734W│
└───────────────────────┘
```

◄ ►
Horizontal movement to select a parameter in a line of options within a window

```
┌───────────────────────┐
│MARK/EVENT WPT: WP T 0 0 7│
│ICON:  🏠 │↑▓∠⛴🏠♦♂✳│
│COMMENT: 13H40-0054M│
│         15-12-98---│
│LAT:   47°10.718N│
│LONG:001°15.734W│
└───────────────────────┘
```

```
┌── PLOTTER MENU ──┐
│  PLOTTER SET-UP:│
│CIRCLE(S) : 2 CIRCLES│
│WPT LINE  : YES│
│ZOOM      : YES│
│ZONE 1: COURSE OVER G│
│ZONE 2: SPEED OVER GR│
│ZONE 3: BEARING TO WP│
└──────────────────┘
```

◄ ►
Highlight the option and scroll through available choices

```
┌── PLOTTER MENU ──┐
│  PLOTTER SET-UP:│
│CIRCLE(S) : 2 CIRCLES│
│WPT LINE  : YES│
│ZOOM      : YES│
│ZONE 1: RANGE TO WPT│
│ZONE 2: SPEED OVER GR│
│ZONE 3: BEARING TO WP│
└──────────────────┘
```

Key	Action
Enter	The **Enter** key allows you:
	- To validate a choice selected by the cursor.
	- To access to a MENU or data in a list
	- To finish and to validate a data option

Note: If you wish to reject or cancel an option press one of the **Pos**, **Nav**, **GoTo**, **Plot** or **Menu** function keys.

_____

6 – ABBREVIATIONS AND SYMBOLS

6.1. – ABBREVIATIONS AND SYMBOLS ON THE SCREEN

The symbol representing a satellite indicates that the FX412 calculates the position
2D =   2 Dimensional
3D =   3 Dimensional
ALT =   Altitude
CURS =   Cursor
D =   Differential (DGPS)
RNG =   Range
DOP =   Dilution of the position
TTG =   Time to go
DER =   Distance to the End of the Route
ECP =   Error circular probability (estimated error)
FREQ R =   Received frequency
FREQ T =   Transmitted frequency
GPS =   Global Positioning System
ETA =   Estimated time of arrival
L1 =   Log 1
L2 =   Log 2
LAT =   Latitude
LONG =   Longitude
M =   Message
MOB =   MAN OVER BOARD
PLOT =   Plotter
R/B =   Range and bearing
RTE =   Route
SIMU =   Simulator
SOG =   Speed over the ground
VTD =   Velocity to destination
WPT =   Waypoint
XTE =   Cross track error

6.2. – MEASUREMENT ABBREVIATIONS

Ft =   Feet
H =   Hour
KHz =   Kilohertz
KM =   Kilometre
KMH =   Kilometre/Hour

M =	Metre
MI =	Status mile
MIN =	Minute
NM =	Nautical mile
MPH =	Status Mile/Hour
KT =	Knot
° =	Degree

1 Nautical mile = 1852 Metres
1 Status mile = 1609 Metres
1 Foot = 0.3048 Metre

_____

7 – INITIALISATION AND CONFIGURATION OF YOUR DGPS

From the MAIN MENU you have access to the SYSTEM MENU (0) and the NAVIGATION MENU (1). These MENUS allow you to set up your DGPS to your own requirements. The WAYPOINT MENU (2), ROUTE MENU (3) and the PLOTTER MENU (4) are used to manage your waypoints, routes and tracks. These 3 MENUS are explained in the GOTO AND PLOT functions.

7.1. – SYSTEM MENU

Press key **0** from the MAIN MENU (0-SYSTEM MENU).

```
——— MAIN MENU ———          ——— SYSTEM MENU ———
0-SYSTEM MENU  5-SIMULATOR  X          0-CO-ORDINATES 5-DISPLAY
1-NAVIGAT. MENU 6-SATELLITES     →     1-MAP DATUM    6-MARK/MOB
2-WAYPOINT MENU 7-DGPS                 2-AREA OF USE  7-KEYPAD BLEEP
3-ROUTE MENU   8-DGPS MESSAGE          3-LOCAL TIME   8-INPUT/OUTPUT
4-PLOTTER MENU 9-VERSION               4-LANGUAGE     9-USER SET-UP
GPS SYSTEM SET-UP                      SELECT THE POSITION
                                       CO-ORDINATES
```

In the SYSTEM MENU the available options are:
- 0 - the choice of geographical co-ordinate
- 1 - the choice of map datums
- 2 - the selection of area of use
- 3 - the selection of time difference
- 4 - the selection of language
- 5 - the units of Altitude/ECP display for the POS and NAV functions
- 6 –the working mode of the MARK/MOB key
- 7 - the selection of audible BEEP for the keyboard
- 8 - the configuration of data input and data output (NMEA)
- 9 - display summary of User Set Up options (SYSTEM MENU)

Note: The window situated at the bottom of the screen explains the selected option

7.1.1 – GEOGRAPHICAL CO-ORDINATES

From the SYSTEM MENU, press the key **0** (0-CO-ORDINATES). Select the type of co-ordinates using the ◄ ▲ ▼ ► arrow keys and press **Enter**.
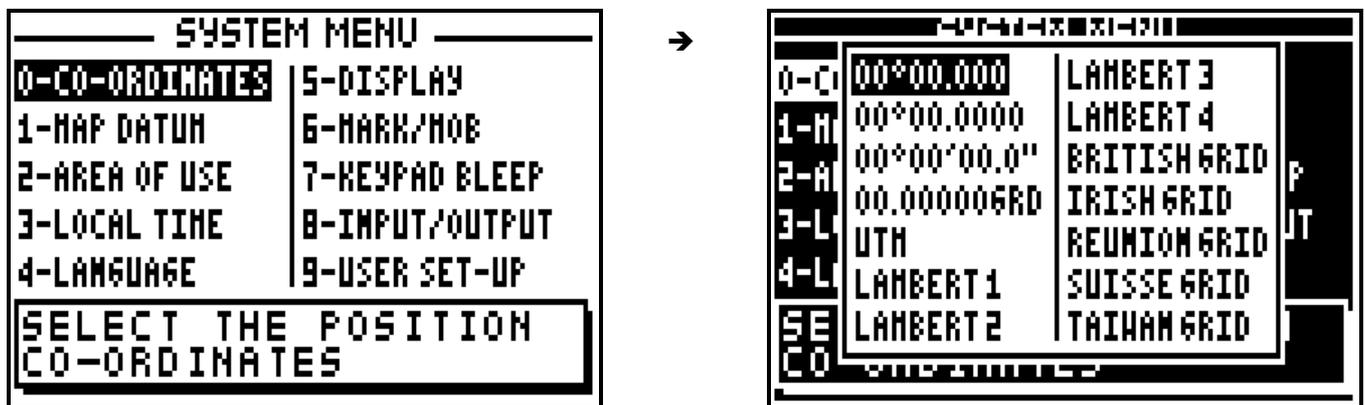
7.1.2 – MAP DATUMS

From the SYSTEM MENU, press the key **1** (1-MAP DATUM). Select the map datum using the ▲ ▼ arrow keys and press **Enter**.
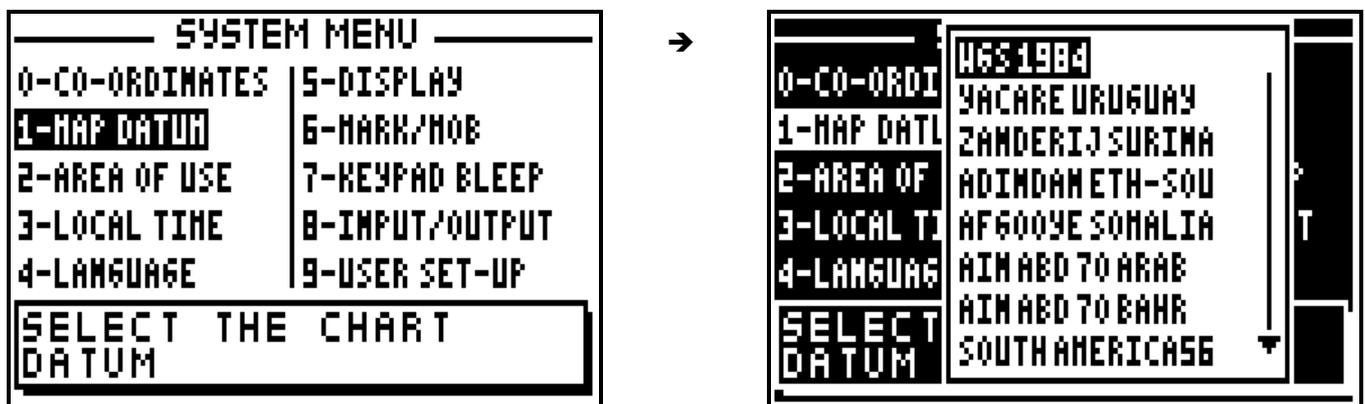
To select the right format, identify the map datum used on your paper chart and check appendix 2 where you will find the list of the available Map Datum formats for the FX412.

Advice: For France use formats EUROPE 1950 - 01 or EUROPE 1950 - 02. For the rest of the world you can use by default the datum's WGS - 72 or WGS - 84.

7.1.3 – AREA OF USE

From the SYSTEM MENU, press key **2** (2-AREA OF USE). Using the ▲ ▼ arrow keys, first select the Continent and press **Enter**, then select the country or the area where you use your DGPS and press **Enter** to confirm**.**
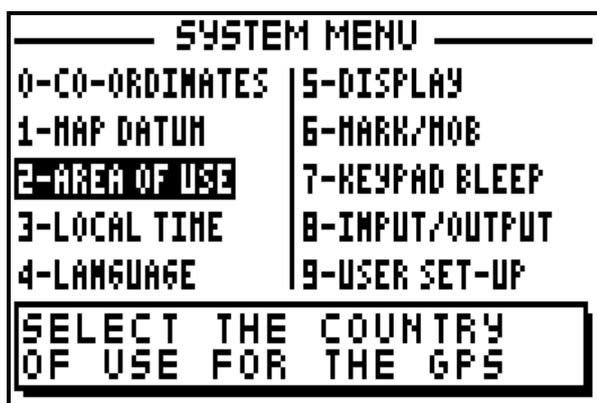
Tip: By selecting the Country of use it allows your DGPS to find its position faster than the automatic mode. When you change Country it is imperative to re-select your area of use or select the automatic mode.

7.1.4 – LOCAL TIME DIFFERENCE

From the SYSTEM MENU, press key **3** (3-LOCAL TIME). If necessary use the **1** key to change the sign from + to - then amend the time difference with the help of the numeric keys and press **Enter** to validate.

```
 ──── SYSTEM MENU ────          →          ──── SYSTEM MENU ────
0-CO-ORDINATES │5-DISPLAY              0-CO-┌──────────────────┐
1-MAP DATUM    │6-MARK/MOB            1-MAP│ ➕01ʜ00ᴍɪɴ       │
2-AREA OF USE  │7-KEYPAD BLEEP        2-ARE│ NOTE:           │EEP
3-LOCAL TIME   │8-INPUT/OUTPUT        3-LOC│ TO DISPLAY THE LOCAL│PUT
4-LANGUAGE     │9-USER SET-UP         4-LAN│ TIME, ENTER THE TIME│UP
┌──────────────────────┐             SEL  │ DIFFERENCE BETWEEN │
│SELECT THE LOCAL      │             TIME │ UTC AND LOCAL TIME.│
│TIME OFFSET          │                   └──────────────────┘
└──────────────────────┘
```
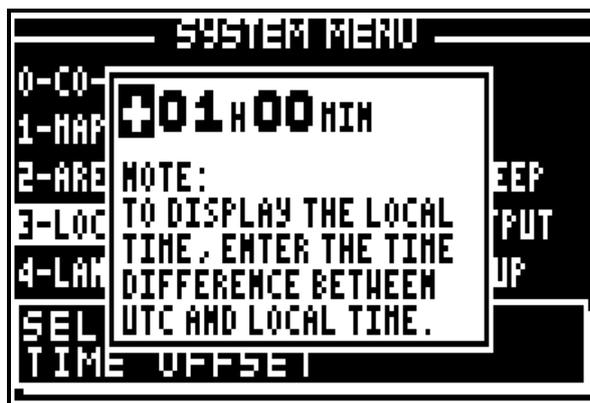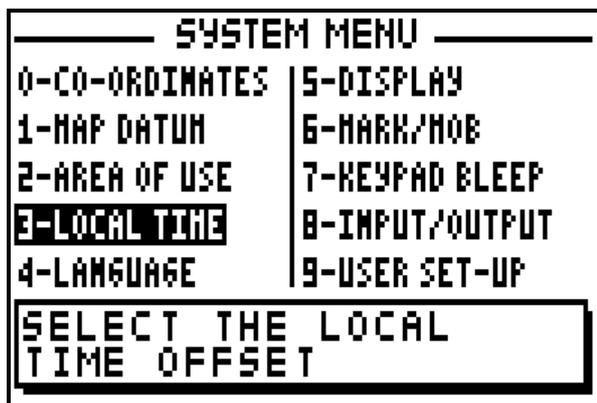
Tip: For UK the time difference is zero hours in the winter and plus one hour in summer.

7.1.5 – LANGUAGE

From the SYSTEM MENU, press key **4** (4-LANGUAGE). Use the ▲ ▼ arrow keys to select the language required and press **Enter** to confirm.

```
 ──── SYSTEM MENU ────          →          ──── SYSTEM MENU ────
0-CO-ORDINATES │5-DISPLAY              0-CO-ORDINATES │5-DISPLAY
1-MAP DATUM    │6-MARK/MOB            1-MAP DATUM    │6-MARK/MOB
2-AREA OF USE  │7-KEYPAD BLEEP        2-AREA O┌──────────┐AD BLEEP
3-LOCAL TIME   │8-INPUT/OUTPUT        3-LOCAL │FRANCAIS  │T/OUTPUT
4-LANGUAGE     │9-USER SET-UP         4-LANGUA│ENGLISH   │USER SET-UP
┌──────────────────────┐             └────────└──────────┘────────┐
│SELECT THE LANGUAGE  │             │SELECT THE LANGUAGE         │
│                     │             │                            │
└──────────────────────┘             └────────────────────────────┘
```
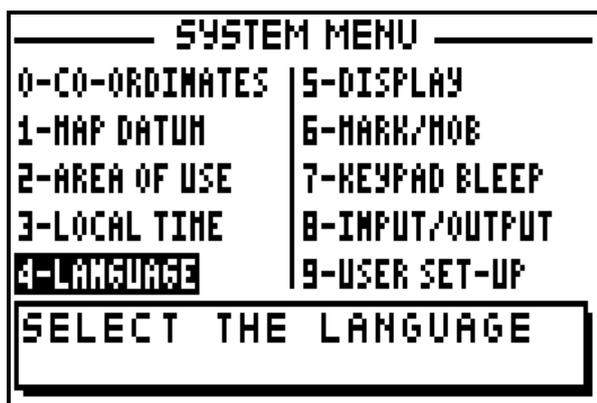
7.1.6 – ALTITUDE / ACCURACY DISPLAY

From the SYSTEM MENU, press key **5** (5-DISPLAY). Use the ▲ ▼ arrow keys to select the display mode required and press **Enter**.

The selected information will be displayed in the top right of the screen in the POSITION and NAVIGATION functions.

```
  ─── SYSTEM MENU ───          →        ═══ SYSTEM MENU ═══
0-CO-ORDINATES │5-DISPLAY             0│SELECT THE DATA TO BE
1-MAP DATUM    │6-MARK/MOB           1│DISPLAYED AT THE TOP RIGHT OF
2-AREA OF USE  │7-KEYPAD BLEEP       2│THE 'POS' AND 'NAV' DISPLAYS:
3-LOCAL TIME   │8-INPUT/OUTPUT       3│     ALTITUDE
4-LANGUAGE     │9-USER SET-UP        4│     ACCURACY
┌─────────────────────────────┐     ─│     NO DATA
│SELECT DATA DISPLAY          │     ══════════════════
│FOR POS AND NAV              │
└─────────────────────────────┘
```
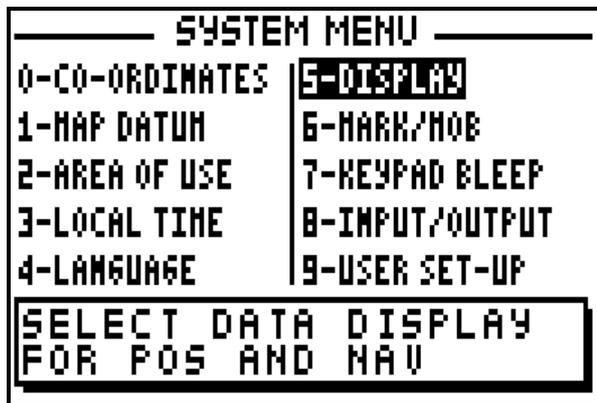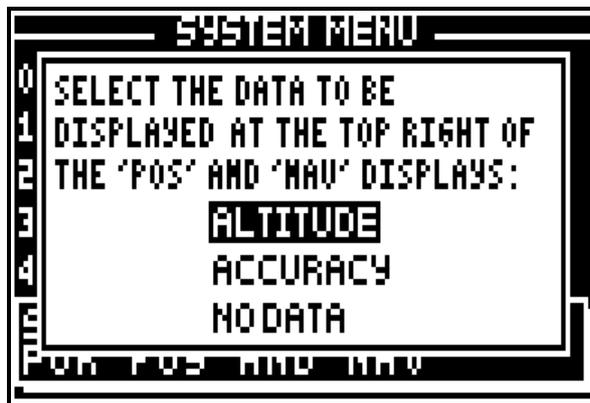
7.1.7 – MARK / MOB KEY FUNCTIONS

From the SYSTEM MENU, press key **6** (6-MARK/MOB). Use the ▲ ▼ arrow keys to select the working mode required and press **Enter**.

```
  ─── SYSTEM MENU ───          →        ═══ SYSTEM MENU ═══
0-CO-ORDINATES │5-DISPLAY             0│─────────────────────
1-MAP DATUM    │6-MARK/MOB           1│SELECT THE MARK/MOB KEY
2-AREA OF USE  │7-KEYPAD BLEEP       2│FUNCTIONS:              P
3-LOCAL TIME   │8-INPUT/OUTPUT       3│MOB FUNCTION ONLY       T
4-LANGUAGE     │9-USER SET-UP        4│MARK AND MOB FUNCTIONS
┌─────────────────────────────┐     ┌─────────────────────────────┐
│SELECT  THE  MARK/MOB        │     │SELECT  THE  MARK/MOB        │
│KEY FUNCTION                 │     │KEY FUNCTION                 │
└─────────────────────────────┘     └─────────────────────────────┘
```
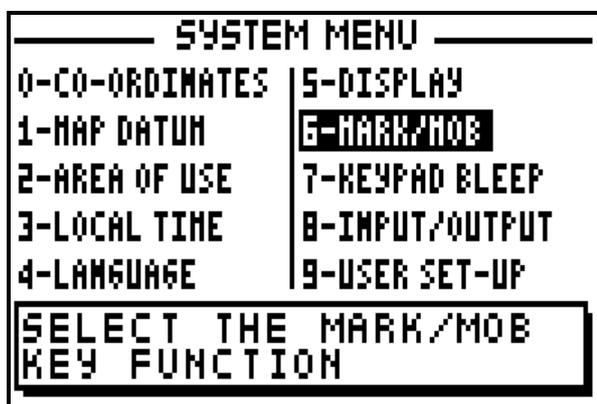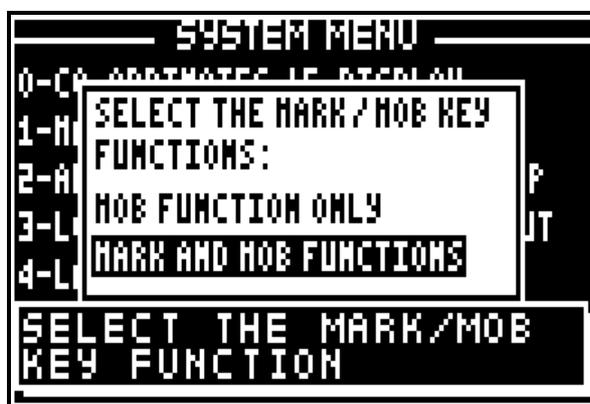
MOB function = A single press on the MARK/MOB key is sufficient to activate the MAN OVER BOARD function (MOB).

MARK and MOB function = A single press activates the MARK (EVENT / WAYPOINT) function and at least three presses activate the MAN OVER BOARD function (MOB).

7.1.8 – KEYPAD BLEEP

From the SYSTEM MENU, press key **7** (7-KEYPAD BLEEP). Use the ▲ ▼ arrow keys to select the mode required and press **Enter**.

```
┌──────── SYSTEM MENU ────────┐        →        ┌──────── SYSTEM MENU ────────┐
│ 0-CO-ORDINATES │5-DISPLAY   │                 │ 0-CO-ORDINATES │5-DISPLAY   │
│ 1-MAP DATUM    │6-MARK/MOB  │                 │ 1-MAP DA┌─────────┐  MOB    │
│ 2-AREA OF USE  │7-KEYPAD BLEEP│               │ 2-AREA Q│NOT ACTIVE│ D BLEEP │
│ 3-LOCAL TIME   │8-INPUT/OUTPUT│               │ 3-LOCAL │ACTIVE   │ /OUTPUT │
│ 4-LANGUAGE     │9-USER SET-UP│                │ 4-LANGUAGE     │9-USER SET-UP│
│ SELECT  THE  KEYPAD         │                 │ SELECT  THE  KEYPAD         │
│ BLEEP  OPTION               │                 │ BLEEP  OPTION               │
└─────────────────────────────┘                 └─────────────────────────────┘
```
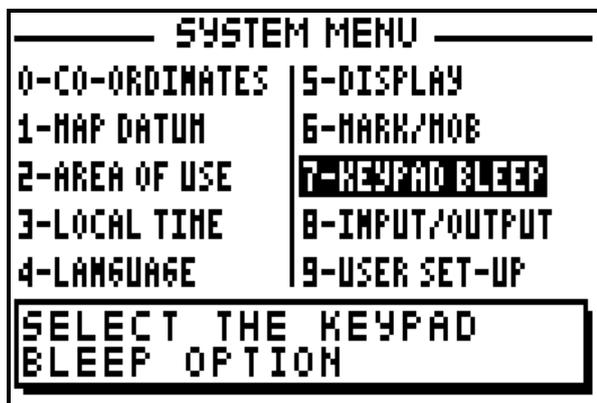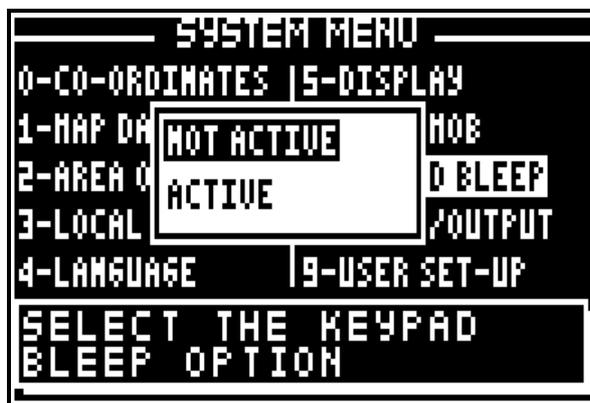
Select active to activate the keypad bleep function, the FX412 will now bleep with every key press.

7.1.9 – DATA INPUT / DATA OUTPUT (NMEA)

From the SYSTEM MENU, press key **8** (8-INPUT/OUTPUT). Use the ▲ ▼ arrow keys to move the cursor in the options window. Use the ◀ ▶ arrow keys to select the required configurations and the press **Enter** to confirm.

```
┌──────── SYSTEM MENU ────────┐    →    ┌──── DATA INPUT/OUTPUT ────┐
│ 0-CO-ORDINATES │5-DISPLAY   │         │ SERIAL INPUT : NMEA183    │
│ 1-MAP DATUM    │6-MARK/MOB  │         │ SERIAL OUTPUT: NMEA183 1.5│
│ 2-AREA OF USE  │7-KEYPAD BLEEP│       │ SENTENCES    :       ▼    │
│ 3-LOCAL TIME   │8-INPUT/OUTPUT│       │ NMEA 183      GGAD    GSA │
│ 4-LANGUAGE     │9-USER SET-UP│        │               BWC     GSV │
│ SELECT  THE  DATA           │         │               APB     MSK │
│ INPUT/OUTPUT  FORMATS       │         │               AAM     VTG │
└─────────────────────────────┘         │                 ▼        │
                                        └───────────────────────────┘

                                              ↙

┌──── DATA INPUT/OUTPUT ────┐      →    ┌──── DATA INPUT/OUTPUT ────┐
│ SERIAL INPUT : NMEA183    │           │ SERIAL INPUT : NMEA183    │
│ SERIAL OUTPUT: NMEA183 2.0│           │ SERIAL OUTPUT: NMEA183 2.0│
│ SENTENCES    :       ▼    │           │ SENTENCES    :       ▼    │
│ NMEA 183      GGAD    GSA │           │ NMEA 183      GGAD    GSA │
│               BWC     GSV │           │               BWC     GSV │
│               APB     MSK │           │               APB     MSK │
│               AAM     VTG │           │               AAM     VTG │
│                 ▼        │            │                 ▼        │
└───────────────────────────┘           └───────────────────────────┘

                                              ↙
```

```
┌─────────────────────────────────┐
│      DATA INPUT/OUTPUT          │
│─────────────────────────────────│
│SERIAL INPUT : NMEA183           │
│SERIAL OUTPUT: NMEA183 2.0       │
│SENTENCES    :         ▼         │
│NMEA 183      ████    GSA        │
│              BWC     GSV        │
│              APB     MSK        │
│              AAM     VTG        │
│                ▼                │
└─────────────────────────────────┘
```

Your DGPS has a data input and a data output to communicate with the other equipment. The data input is used to receive differential correction or loading waypoints and routes from a P.C. The data output is used to transmit the position, navigation information, waypoints and routes to a: P.C., automatic pilot, plotter and radar.

The FX412 allows you to select the NMEA sentences to be transmitted. To de-select a sentence select 4 (- - - -).

You will find specifications of the different formats of communication in APPENDIX - 1.

Advice: To use your FX412 with VALPOINT software for uploading, downloading waypoints and routes, select the format WPTS + RTES for the data output.

7.1.10 – USER SET-UP SUMMARY

From the SYSTEM MENU, press key **9** (9-USER SET-UP).

```
┌──────── SYSTEM MENU ────────┐        ┌──────── SYSTEM MENU ────────┐
│0-CO-ORDINATES │5-DISPLAY    │   ➔    │0┌─────────────────────────┐ │
│1-MAP DATUM    │6-MARK/MOB   │        │1│      USER SET-UP        │ │
│2-AREA OF USE  │7-KEYPAD BLEEP│       │2│COORDINATES : 00°00.000' │ │
│3-LOCAL TIME   │8-INPUT/OUTPUT│       │3│MAP DATUM   : WGS1984    │ │
│4-LANGUAGE     │9-USER SET-UP │       │4│AREA OF USE : GREAT BRITAIN││
│┌───────────────────────────┐│       │ │LOCAL TIME  : +01(0)     │ │
││DISPLAY USER SET-UP        ││       │ │KEYPAD BLEEP: NOT ACTIVE │ │
││FOR SYSTEM MENU            ││       │ └─────────────────────────┘ │
│└───────────────────────────┘│       │FOR SYSTEM MENU             │
└─────────────────────────────┘        └─────────────────────────────┘
```
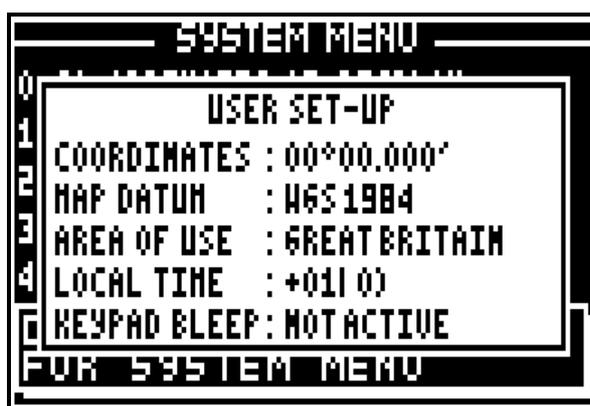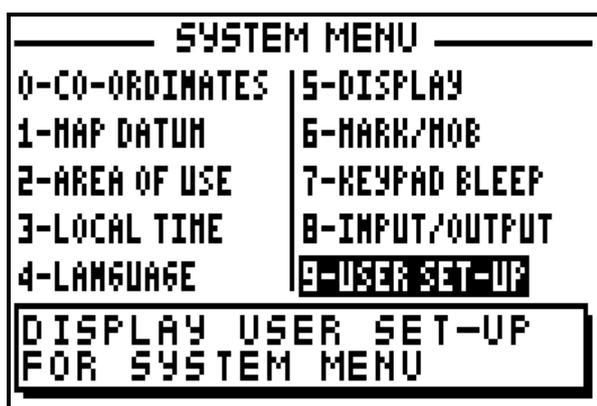
Information that is not directly visible is displayed in the SYSTEM MENU user set up.

7.2. – NAVIGATION MENU

Press key **1** from MAIN MENU (1-NAVIGAT.MENU). It is also possible to reach this MENU from the NAVIGATION function by pressing the **Menu** key.

```
————— MAIN MENU —————         ➜    ————— NAVIGATION MENU —————
0-SYSTEM MENU │ 5-SIMULATOR  X      0-DISTANCE UNIT │ 5-RESET LOG
1-NAVIGAT. MENU│ 6-SATELLITES       1-ALTITUDE UNIT │ 6-ARRIVAL ALARM
2-WAYPOINT MENU│ 7-DGPS             2-2D/3D MODE    │ 7-ANCHOR ALARM
3-ROUTE MENU   │ 8-DGPS MESSAGE     3-SPEED FILTER  │ 8-USER SET-UP
4-PLOTTER MENU │ 9-VERSION          4-COMPASS VAR.
┌──────────────────────┐            ┌──────────────────────┐
│NAVIGATION  UNITS     │            │SELECT  AND  RESET  THE│
│AND SET-UP OPTIONS    │            │LOGS                  │
└──────────────────────┘            └──────────────────────┘
```
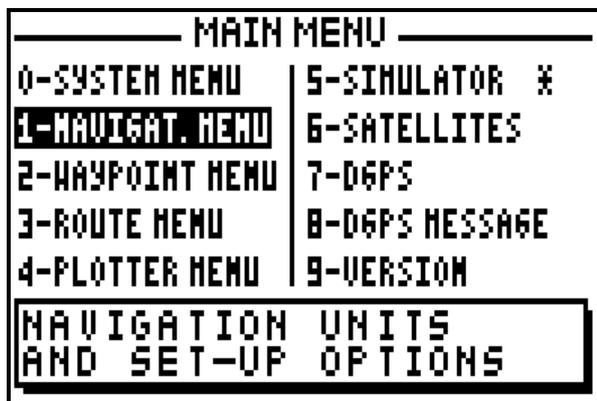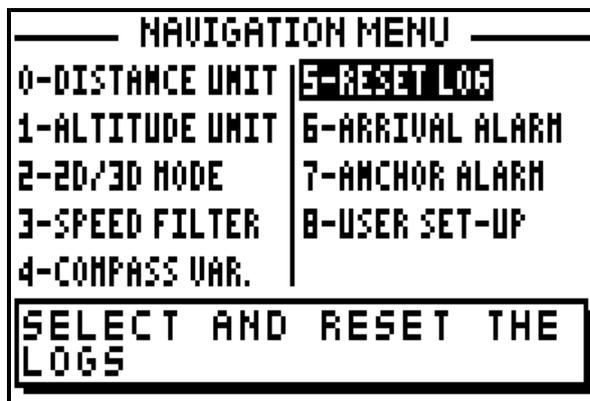
In the NAVIGATION MENU the options available are:
- 0 - select distance and speed unit
- 1 - select altitude unit
- 2 - select 2D/3D mode
- 3 - select speed filter rate
- 4 - set compass variation
- 5 - reset trip logs
- 6 - set up the arrival alarm
- 7 - set up the anchor alarm
- 8 - Display summary of navigation user options

Note: The window situated in the bottom of the screen explains the selected option.

7.2.1 – DISTANCE AND SPEED UNITS

From the NAVIGATION MENU, press the key **0** (0-DISTANCE UNIT). Select the distance unit and speed units using the ▲ ▼ arrow keys and press **Enter**.

```
————— NAVIGATION MENU —————   ➜    ┌─────────────────────┐
0-DISTANCE UNIT │ 5-RESET LOG        0-DIS│KM AND KMH    │S
1-ALTITUDE UNIT │ 6-ARRIVAL ALARM    1-ALT│NM AND KT     │ALARM
2-2D/3D MODE    │ 7-ANCHOR ALARM     2-2D/│MI AND MPH    │LARM
3-SPEED FILTER  │ 8-USER SET-UP      3-SPE│              │-UP
4-COMPASS VAR.                       4-COM│NOTE:         │
┌──────────────────────┐                 │1NM  =1.852 KM │
│SELECT  THE  DISTANCE │            SEL│1KT  =1.852 KMH│CE
│AND SPEED UNITS       │            AND│1MI  =1.609KM  │
└──────────────────────┘                 │1MPH =1.609 KMH│
                                         └─────────────────────┘
```
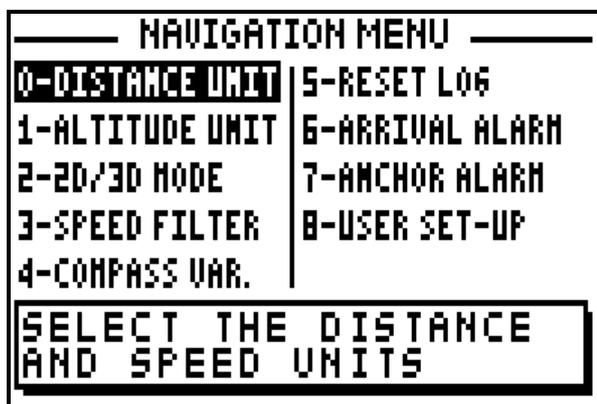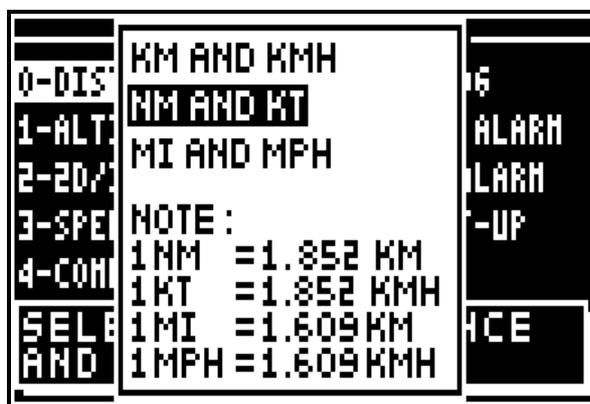
7.2.2 – ALTITUDE UNITS

From the NAVIGATION MENU, press key **1** (1-ALTITUDE). Select the unit using the ▲ ▼ arrow keys and press **Enter**.

```
 ——— NAVIGATION MENU ———          ——— NAVIGATION MENU ———
0-DISTANCE UNIT │5-RESET LOG      0-DIST┌─────────┐   LOG
1-ALTITUDE UNIT │6-ARRIVAL ALARM  1-ALTI│METRE    │AL ALARM
2-2D/3D MODE    │7-ANCHOR ALARM   2-2D/3D│FEET    │R ALARM
3-SPEED FILTER  │8-USER SET-UP    3-SPEED│        │ET-UP
4-COMPASS VAR.  │                 4-COMPA│NOTE:    │
┌──────────────────────┐         ┌──────│1 FOOT = │──────┐
│SELECT  THE  ALTITUDE │         │SELE└──│0.3048 METRE│TUDE│
│UNIT                  │         │UNIT              │
└──────────────────────┘         └──────────────────┘
```

➜
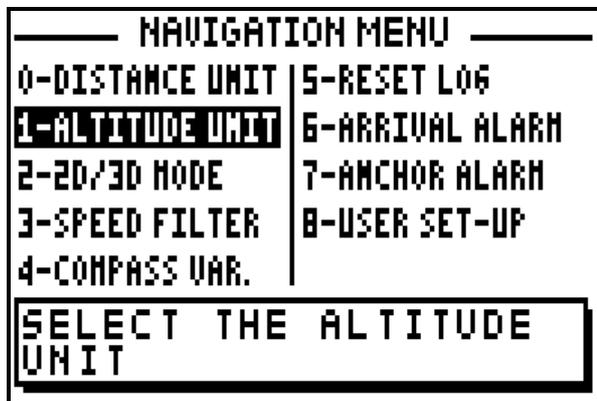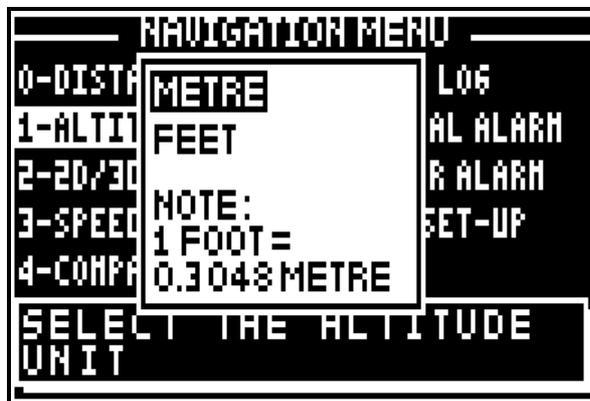
7.2.3 – 2D / 3D MODES

From the NAVIGATION MENU press key **2** (2-2D/3D MODE). Select the mode using the ▲ ▼ arrow keys and press **Enter**.

```
 ——— NAVIGATION MENU ———          ——— NAVIGATION MENU ———
0-DISTANCE UNIT │5-RESET LOG      0-DIS┌────────────────────┐
1-ALTITUDE UNIT │6-ARRIVAL ALARM  1-ALT│2 DIMENSIONS        │ARM
2-2D/3D MODE    │7-ANCHOR ALARM   2-2D/│3 DIMENSIONS        │RM
3-SPEED FILTER  │8-USER SET-UP    3-SPE│2D/3D AUTO          │P
4-COMPASS VAR.  │                 4-CON│NOTE :              │
┌──────────────────────┐         ┌─────│IN AUTO MODE, THE GPS│
│SELECT  2D,  3D,  AUTO│         │SEL  │NEEDS 5 SATELLITES OR│0
│MODES  FOR  ALTITUDE  │         │MOD  │MORE TO WORK IN 3D.  │
└──────────────────────┘         └──────────────────────────┘
```

➜
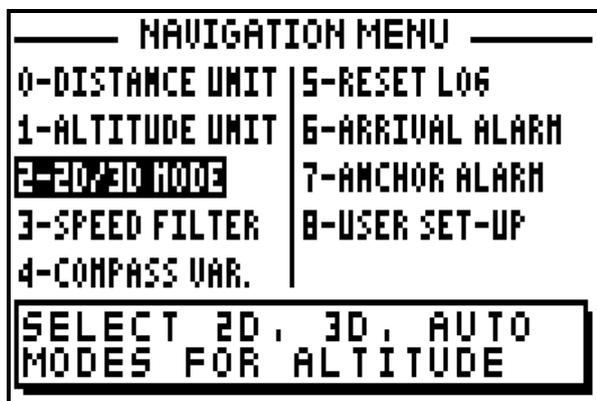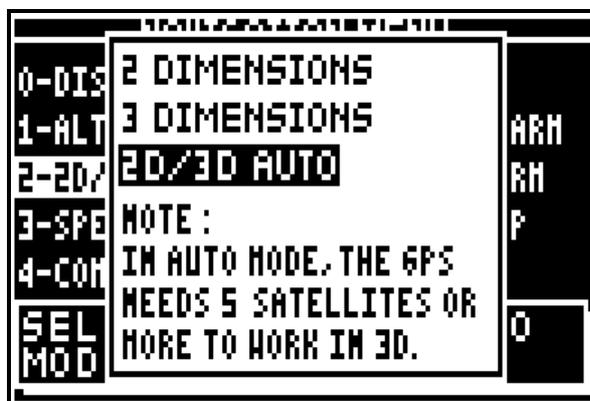
Tip: For marine use, select the 2D mode and enter your altitude, which is the height of the antenna above sea level.

7.2.4 – SPEED FILTER

Filtering or smoothing increases the accuracy of the speed readout.

From the NAVIGATION MENU, press key **3** (3-SPEED FILTER). Select the speed filter required using the ▲ ▼ arrow keys and press **Enter**.
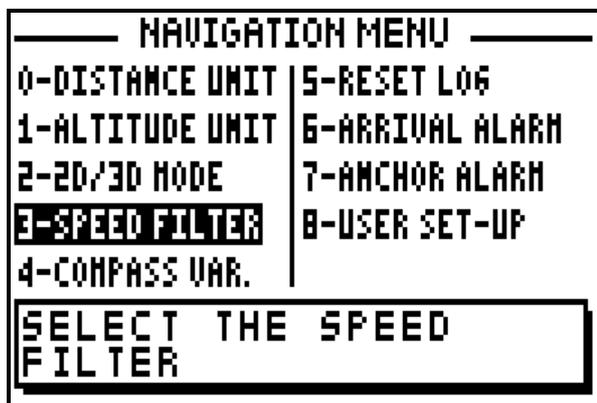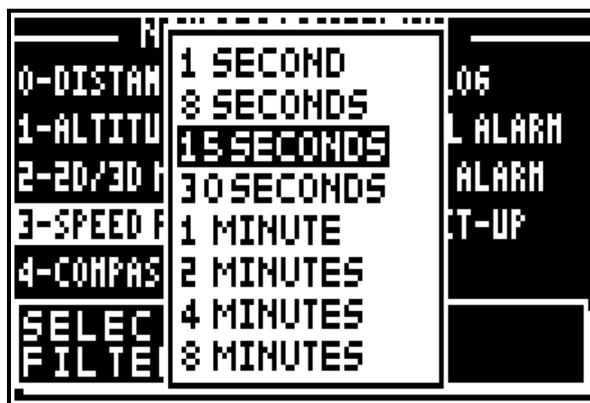
Tip: For a fast vehicle (e.g. car) use a short constant and for a slow vehicle (e.g. boat) use a longer constant.

7.2.5 – COMPASS VARIATION

The bearing and course are referenced to true north. To reference them to the magnetic north it is necessary to enter the compass variation. The magnetic variation is generally indicated on the navigation chart.

From the NAVIGATION MENU, press key **4** (4-COMPASS VAR.). If necessary use the **1** key to change the sign from + to -, then enter the compass variation using the numeric keys and press **Enter** to validate.
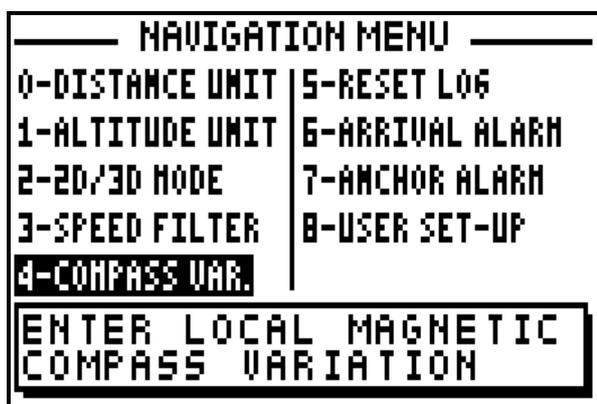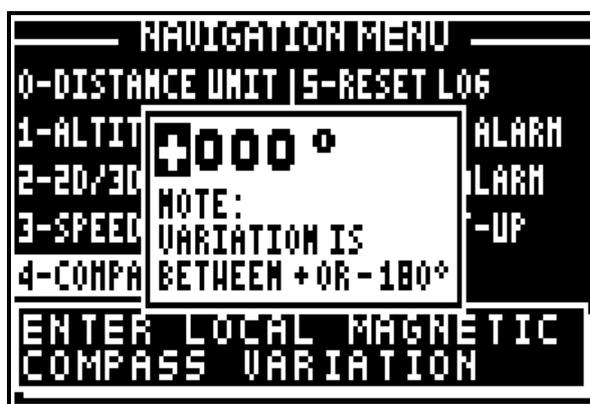
7.2.6 – RESET TRIP LOGS

From the NAVIGATION MENU, press key **5** (5-RESET LOG). Use the ▲ ▼ arrow keys to select the log to reset (LOG1 or LOG2) and press **Enter**.

```
┌─── NAVIGATION MENU ───┐          ┌─── NAVIGATION MENU ───┐
│0-DISTANCE UNIT │5-RESET LOG│   →  │0-DISTANCE UNIT│5-RESET LOG│
│1-ALTITUDE UNIT │6-ARRIVAL ALARM│  │1-ALT┌SELECT THE LOG TO┐ALARM│
│2-2D/3D MODE    │7-ANCHOR ALARM│   │2-2D/3│RESET:          │LARM│
│3-SPEED FILTER  │8-USER SET-UP│    │3-SPE │    LOG1 = 0     │-UP│
│4-COMPASS VAR.  │               │  │4-COMP│    LOG2 = 0     │   │
│SELECT AND RESET THE│            │  │SELECT AND RESET THE│
│LOGS                │            │  │LOGS                │
└───────────────────┘            └───────────────────┘
```
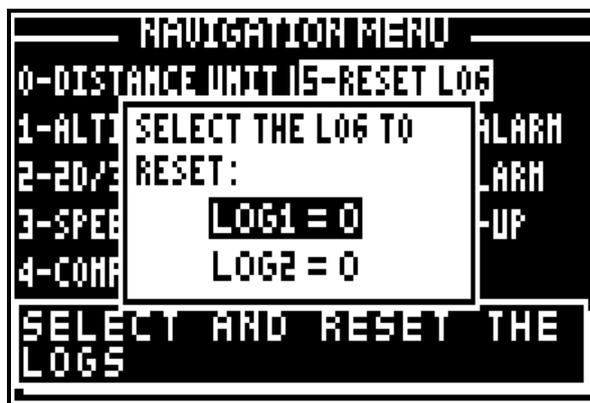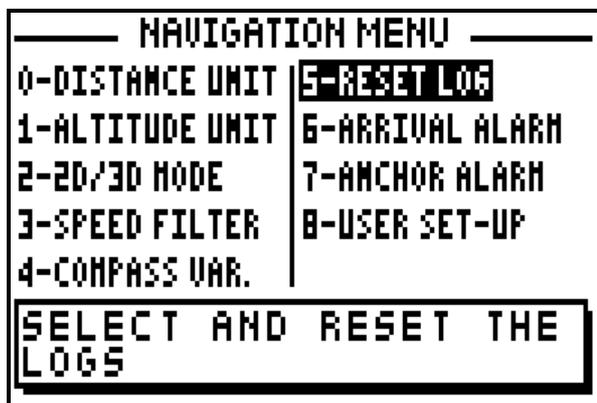
7.2.7 – WAYPOINT ARRIVAL ALARM

The arrival alarm sounds to warn you of your arrival at your destination waypoint or to inform you that you have completed the leg of a route.

The adjustable options are:

ON/OFF = On off of the audible alarm (the visual alarm and the passage to the following waypoint in the ROUTE function are always active).
MODE = the audible alarm gives out BEEPS for a duration of 10 seconds or for an unlimited time until the user presses a key on the keyboard.
DISTANCE = it is the radius from a waypoint that you wish the alarm to sound. The visual alarm and the audible alarm are activated when the vessel enters the circle, (this circle is determined by the alarm radius selected).

From the NAVIGATION MENU, press key **6** (6-ARRIVAL ALARM). Use the ▲ ▼ arrow keys to move the cursor in the option window. Use the ◄ ► arrow keys to select alarm ON/OFF and the mode required. Use the numeric keys to enter the distance. Once all parameters are configured, press **Enter** to validate.

```
┌─── NAVIGATION MENU ───┐          ┌─── NAVIGATION MENU ───┐
│0-DISTANCE UNIT │5-RESET LOG│   →  │0-DISTANCE UNIT│5-RESET LOG│
│1-ALTITUDE UNIT │6-ARRIVAL ALARM│  │1-┌SET-UP THE WPT ARRIVAL ALARM┐│
│2-2D/3D MODE    │7-ANCHOR ALARM│   │2-│FOR YOUR GPS:              │
│3-SPEED FILTER  │8-USER SET-UP│    │3-│ON/OFF   :ON│
│4-COMPASS VAR.  │               │  │4-│MODE     :10 SECONDS│
│SET-UP THE WPT      │            │  │  │DISTANCE :0.30 NM│
│ARRIVAL ALARM       │            │  │ARRIVAL ALARM│
└───────────────────┘            └───────────────────┘
```
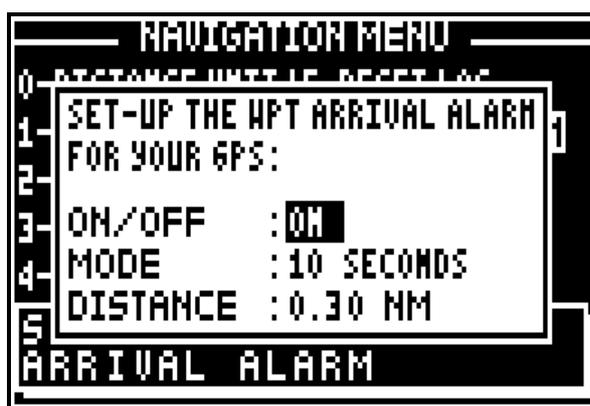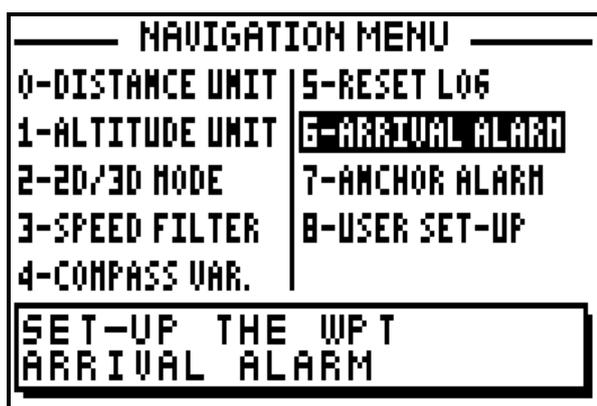
7.2.8 – ANCHOR ALARM

The anchor alarm is used to warn you of your drift in relation to a reference waypoint. The reference waypoint is the active waypoint of the GOTO WAYPOINT function.

The adjustable options are:

ON/OFF = On off of the audible alarm (the visual alarm and the passage to the following waypoint in the ROUTE function are always active).
MODE = the audible alarm gives out BEEPS for a duration of 10 seconds or for an unlimited time until the user presses a key on the keyboard.
DISTANCE = it is the radius from a waypoint that you wish the alarm to sound. The visual alarm and the resonant alarm are released when the vessel enters the circle, (this circle is determined by the alarm radius selected).

From the NAVIGATION MENU, press key **7** (ANCHOR ALARM) and press **Enter** Use the ▲ ▼ arrow keys to move the cursor in the options window. Use the ◄ ► arrow keys to select alarm ON/OFF and mode required. Use the numeric keys to enter the distance. Once all parameters are configured press **Enter** to validate.

```
——— NAVIGATION MENU ———         ➔    ═══ NAVIGATION MENU ═══
0-DISTANCE UNIT │5-RESET LOG
1-ALTITUDE UNIT │6-ARRIVAL ALARM        SET-UP THE WPT ANCHOR ALARM
2-2D/3D MODE    │7-ANCHOR ALARM         FOR YOUR GPS:
3-SPEED FILTER  │8-USER SET-UP
4-COMPASS VAR.  │                       ON/OFF    : ON
                                        MODE      : 10 SECONDS
SET-UP  THE  WPT                        DISTANCE  : 0.30 NM
ANCHOR  ALARM                           ANCHOR  ALARM
```
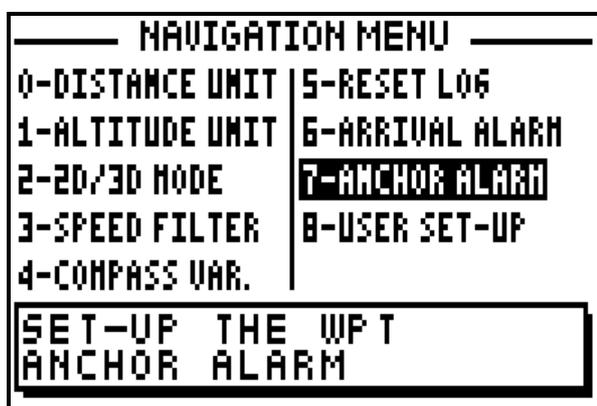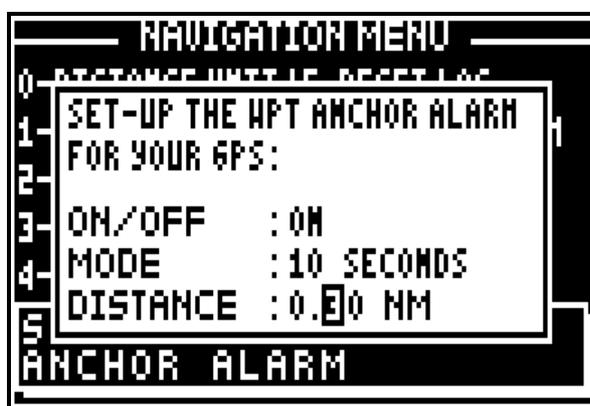
7.2.9 – USER SET-UP SUMMARY

From the NAVIGATION MENU press key **8** (8-USER SET-UP).

```
——— NAVIGATION MENU ———         ➔    ─────────────────────
0-DISTANCE UNIT │5-RESET LOG                USER SET-UP
1-ALTITUDE UNIT │6-ARRIVAL ALARM      DISTANCE UNIT   : NM
2-2D/3D MODE    │7-ANCHOR ALARM       ALTITUDE UNIT   : M
3-SPEED FILTER  │8-USER SET-UP        MODE 2D/3D/AUTO : 2D/3D AUTO
4-COMPASS VAR.  │                     SPEED FILTER    : 15 SECONDS
                                      COMPASS VAR.    : +000°
DISPLAY USER  SET-UP                  ARRIVAL ALARM   : ON    D:0.30
FOR NAVIGATION  MENU                  ANCHOR ALARM    : ON    D:0.30
```
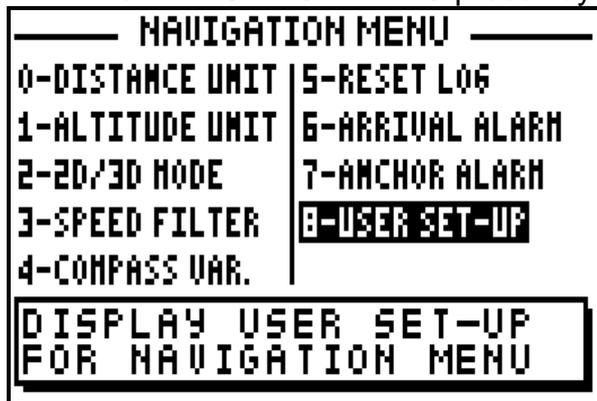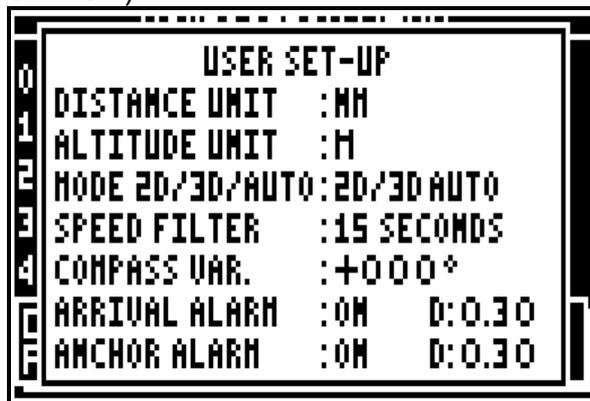
D – DESCRIPTION OF THE EQUIPMENT AND SPECIFICATIONS

1 – CONTENTS

- 1 receiver case.
- 1 GPS/DGPS antenna with 10 metres of coaxial cable and TNC plug.
- 1 0.85 metre whip.
- 1 power supply cable with fuse and data input/output.
- 1 1 metre white cable for antenna reference.
- 1 1 metre yellow/green cable for connection of the receiver case with the ground.
- 2 screws, 2 washers and 2 fan washers.
- 1 pair of support brackets with 2 trunnion knobs and 2 rubber washers.
- 4 fixing screws.
- 1 spare fuse.
- 1 User's Manual.
- 1 guarantee card.
- 1 Quick Reference Card.

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2 – FX412 SPECIFICATIONS

Main functions:

. Direct Access™ (direct access to POS, NAV, GOTO, PLOT, MARK/MOB and MENU functions)
. Latitude, longitude in DGPS mode with definition of the 1/10000 of minute (18cm).
. Altitude, accuracy, date and time.
. 14 types of co-ordinates, UTM, Lambert, Switzerland Grid, UK Grid.
. 115 map datum's Europe 50, WGS 84, WGS72.
. Speed and course over the ground.
. Velocity to destination.
. Two logs.
. 500 waypoints with name by 6 alphanumeric characters, comment of 22 characters and icon
   representation for the plotter function.
. 20 reversible routes of 20 waypoints with total length of route and waypoint advance
. Direct Access™ to the list of waypoints or routes with the List key
. Range and bearing to the destination waypoint.
. Time to go.
. Cross track error.
. Distance to the end of the route.
. Direct Access™ to the MOB (Man Over Board) function
. Direct Access™ to the MARK (Event / Waypoint) function.
. 3 graphic representations of the GOTO function: Compass, 3D road and Radar.
. Graphic display of satellite constellation with signal strength bargraph .

. Enter a waypoint by its range and bearing in relation to another waypoint or vessels current position
. Simulator mode.

Plotter Functions:

. Full screen or multi-windows display.
. Personalisation of navigation information in multi windows mode
. 250 track and chart outline points
. Track interval selectable from 10 metres to 100 kilometres.
. Zoom with Direct Access™ (by the Zoom key scales from 25m to 1000 Km).
. Home function.
. Display of the 500 waypoints with their icons.
. Display of the direct track to the destination waypoint.
. Display of the active route.
. PMS function to enter a chart outline using Yeoman Plotter

General features:

. Receiver L1 (1575.42 MHz) receiver 12 satellites with parallel technology
. Horizontal position and speed accuracy
- 25 metres RMS (2D), 1Km/hour RMS with SA code.
- 2 to 5 metres, 0.1Km/hour in differential RTCM 104 mode.
. Acceleration: 3g.
. Update rate: 1 second.
. Time to fix:
- Reacquisition 4 seconds.
- Up to 3 hours off: 30 seconds.
- Up to 24 hours off: 90 seconds.
- World-wide cold start: 3 minutes.
. Screen: FSTN screen with backlight 91 x 59 mm.
. Keypad: complete illuminated keypad with 19 tactile keys with 4 arrow keys.
. Memory: FlashRom technology guaranteeing the safeguard of navigation information, waypoints, routes etc., backup lasts up to 100 years no lithium battery
. Dimensions of the receiver: 198 x 101 x 63 mm.
. Dimensions of antenna: 113 x 75 mm + 0.85 metre whip.
. Weight: 450 grams.
. Operating temperature: -10°C to +60°C.
. Storage temperature: -20°C to + 70°C.
. Power supply: 10 to 36 volts DC.
. Consumption: 3.5 watts with backlight on
. Waterproof: IPX6 IEC 529 norm
. Electromagnetic compatibility: According to the IEC norm 945 second and third publication.

DGPS FX412 specifications

. RTCM SC 104 V2.1 receiver.
. Frequencies : 281.5 to 325 KHz by step of 500 Hz,
Europe, Asian, Oceania and US range.
. Baud rate : 100 Bps and 200 Bps.

. Manual selection of the stations.
. Type : dual super heterodyne with MSK coherent detection.
. Adjacent channel rejection +/- 500 Hz = 30 dB.
. central channel rejection +/- 10 Hz = -3 dB.

* * ATTENTION: Do not expose to direct sunlight.

E – ADVICE ON INSTALLATION

1 – RECEIVER CASE

The FX412 multi position mounting bracket allows the receiver to be bulkhead or chart table mounted, The case design allows the unit to be flush mounted if desired.

Power Supply

The FX412 requires a 10 Volts to 32 Volt DC supply. The FX412 is reverse polarity protected and is fused in the positive line of the connector lead. Connect the power cable to the receiver. The **red wire to the positive (+)** and the **blue wire to the negative (-)** connections of the power supply.

Earthing the FX412

Advice: To obtain optimum reception, it is recommended that where a earth (ground) connection exists on a vessel it be connected to screw terminal on the rear of the equipment via the green/yellow wire provided, taking the shortest route possible. Do not hesitate to cut the earth wire to obtain the shortest length. See diagram.
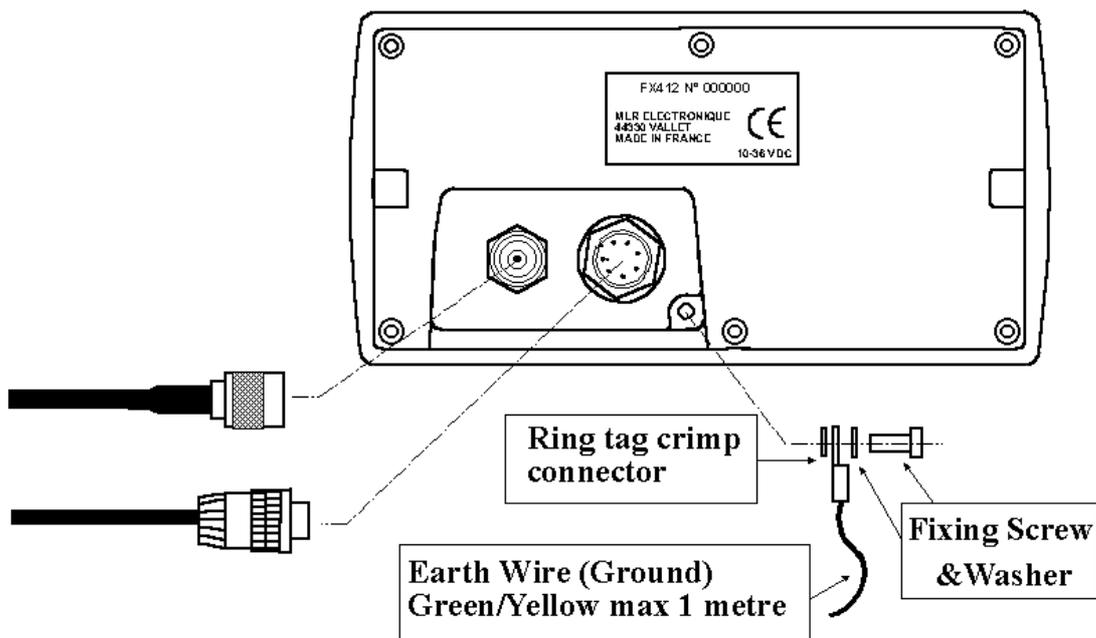
DATA OUTPUT

The FX412 has two data outputs: RS232 output for direct connection with a P.C. and an RS422 (NMEA) output for navigation devices.

DATA INPUT

The FX412 has data input for loading waypoints from a P.C. or for the connection with a differential beacon receiver (DGPS) to increase the accuracy of the GPS.

CONNECTION WITH A P.C. AND WITH THE MLR DF300 DGPS RECEIVER

FX412 Wiring	Designation	DF300 Wiring	P.C. pins
Blue	(-) Negative	Blue	
Red	Positive (+)10 to 36 Volts DC	Red	
Brown or orange	Reference RS422 (NMEA OUT)	Yellow	
Yellow	Output RS422 (NMEA OUT)	Green	
Green	Reference RS232	Black	5
Black	Input RS232	White	3
White	Output RS232		2

The pin numbers for the P.C. SUBD connector (9 pin) are in the above table.
To interface the FX412 to an autopilot, plotter, sounder or radar, connect the brown (or orange) wire and the yellow wire to the NMEA input of the external device.

CONNECTION WITH a YEOMAN TYPE PLOTTER

To construct your electronic chart from a YEOMAN plotter connect it to your FX412 as detailed below:

FX412 Wiring	Designation	Yeoman Wiring
Blue	(-) Negative	Blue
Red	Positive (+)10 to 36 Volts DC	Red
Brown or orange	Reference RS422 (NMEA OUT)	
Yellow	Output RS422 (NMEA OUT)	
Green	Reference RS232	Black
Black	Input RS232	Green
White	Output RS232	White

Connect the 2 black wires of YEOMAN with the two blue wires.

2 – ANTENNA MOUNTING

The antenna is best sited well above the main structure of the vessel, clear of all surrounding objects, especially all transmitting aerials.

Fix the counterpoise of the antenna (white cable) to the antenna with the use of the screw and washers provided. The counterpoise cable must be vertical for 80% of its length. Secure the cable using cable ties or insulation tape to stop movement. The counterpoise cable of the antenna must not be placed inside a metallic tube or mast and <u>not connected to any earth or metallic part of the vessel</u>.

Whip antenna 850mm

Antenna counterpoise 1 metre

Extension pole ACC912

Cable tie fixing counterpoise to pole
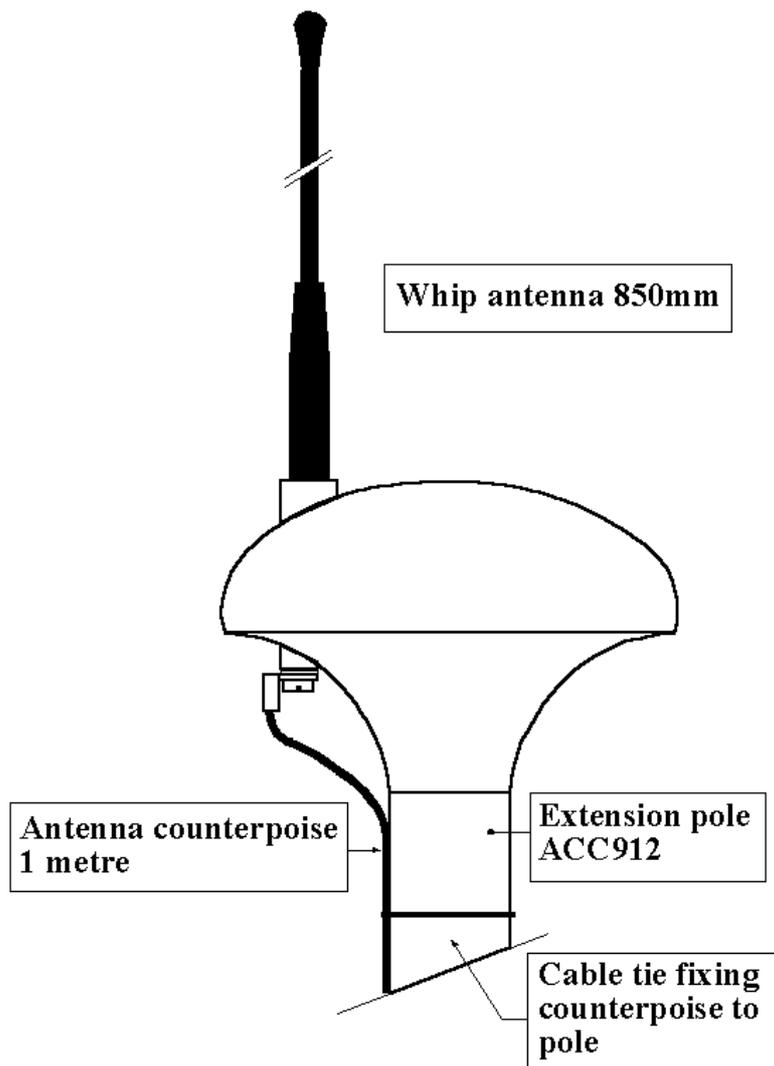
Note. Where radar is fitted aboard the vessel the antenna must be sited above the scanner and well clear of the radar beam.

Advice: The antenna can be installed on any 1 inch 14 TPI bracket.

N.B. Suitable non-metallic 14TPI extension poles and a variety of brackets are available from your local dealer.

.

The coaxial cable must take the shortest route from the antenna to the display unit, whilst avoiding any other power or signal cables The TNC antenna plug is connected to the cable at the time of manufacture to ensure a good quality connection

The antenna coaxial cable must not exceed 10 meters in length. It may however be shortened to suit the installation.

Contrary to previous MLR antennas it is now possible to cut the cable and shorten it. The minimum length is 1 metre, in this event a new TNC connector must be obtained and correctly fitted. (It is not possible to re-use the factory fitted one.)

Note: Only the whip antenna provided with the FX412 part no. ACC026 must be used with the antenna assembly.

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3 – PROCEDURE FOR ELIMINATION OF INTERFERENCE

Frequencies used to transmit the differential corrections are situated in the 300 kHz band (long waves). This frequency band is very sensitive to interference that can be generated by the electric or mechanical devices on board the vessel. To obtain the best results from your FX412, we advise that you verify the good reception of the differential signal.

Where interference or electrical noise interferes with DGPS reception, we advise that you carry out the procedures given below to try to eliminate the problem.

3.1. – VERIFICATION OF DIFFERENTIAL SIGNAL RECEPTION

For this operation only <u>All</u> equipment on board must be switched off with the exception of the FX412 which must be switched on.

From the GENERAL MENU, press key 7 (or select 7–DGPS and to press on to Enter). Choose and program the frequency and the Baud rate of the station nearest to your position (see paragraph B.9.1). Read on the left of the screen the reception level of the differential signal (a good signal = ¾ of the black bar graph) and the error rate of received information (it should be zero = white bar graph). In bottom of the screen read the identification number of the DGPS station together with its status and the list of satellites corrected.

Note the level of reception of the differential signal as well as the success rate, and proceed to the following paragraphs.

3.2. – DETECTION OF THE INTERFERENCE PRESENT

To see if any equipment causes DGPS interference you need to switch on all electric devices on board, then start the engines. You must start by switching on one item, waiting for 2 minutes then checking the DGPS SIGNAL LEVEL & % ERROR received. If there is no change to the SIGNAL LEVEL & % ERROR, repeat the procedure with the next item. Finally start the engine(s) and once again check the levels. If there is no variation then interference is not present and your FX412 installation is perfect. If the SIGNAL LEVEL decreases substantially or the % ERROR increases substantially, go to paragraph 3.

3.3. – DETECTION OF THE NATURE OF INTERFERENCE

The best tool is an isolated 12 Volts battery, it permits the detection of the type of interference, conducted interference, (conducted via the power supply), or radiated interference, (received by the antenna). Connect the FX412 to the isolated 12 Volt battery (ensure that the ground, the data output and input are completely disconnected) and repeat the procedure in paragraph 2.
If the interference ceases it is on the power supply, go to the next paragraph 4, if the interference continue go directly to the paragraph 5.

3.4. – SOLUTION TO INTERFERENCE ON THE POWER SUPPLY.

IF IN DOUBT CONTACT A LOCAL QUALIFIED MARINE ELECTRICAL ENGINEER BEFORE PROCEEDING. For each device interfering with DGPS reception, put a 2 or 3 microfarad suppression capacitor from the positive connection to the metal case of the device causing the problem. Note: It may be necessary to put additional capacitors between positive and negative and from negative to the case, which must be earthed (grounded)
N.B.: For engines equipped with alternators it is necessary to wire the 3 capacitors as shown in the following diagram:
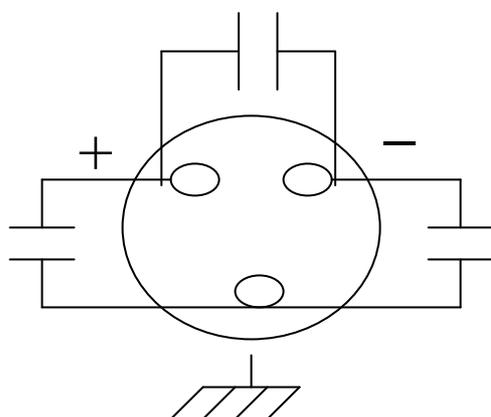
In difficult cases an isolated battery power supply may be the only solution.

3.5. – SOLUTION OF INTERFERENCE BY RADIATION

For every device interfering with the FX412, check the earth bonding of the device to the ships ground connection.

If the engine is the source of interference, the construction of a low resistance, fine mesh cage inside the engine compartment, bonded to the engine block should be considered. (Faraday cage principle)

Try various sites for the antenna of the FX412.

3.6. – SOLUTION TO MECHANICAL INTERFERENCE

If the interference is caused only when the propeller is engaged in gear, it may be necessary to earth (ground) the propeller shaft, utilising a set of shaft brushes.