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Apelco

GPS11 Handheld GPS

Instruction Manual

Handheld GPS

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

Package Contents

Checking your GPS11 Package

The GPS11 package contains the following standard items:

1. Display unit with an internal antenna

2. Lanyard

3. Velcro fixing

4. Mounting bracket   (GPS11 plus only)

5. Power and Data connector   (GPS11 plus only)

6. Installation & Operation Guide
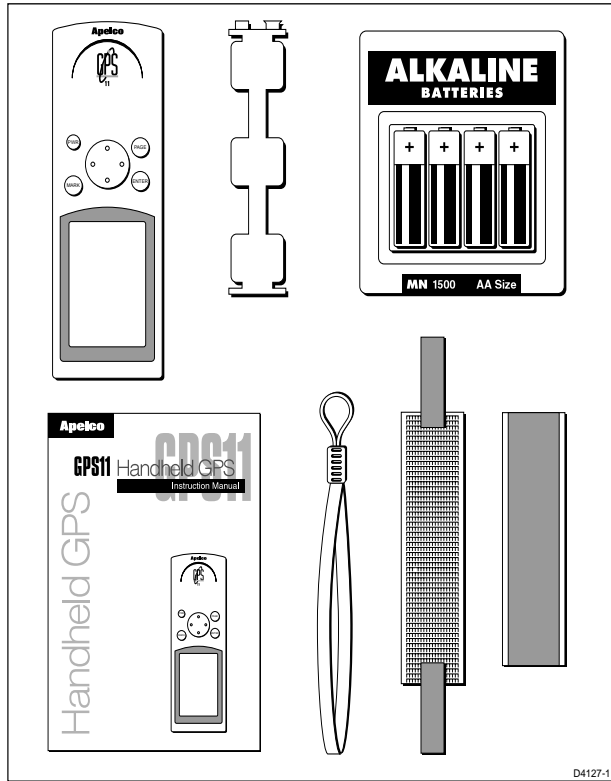
7. Warranty document

Items Missing?

If any of the above items are missing or damaged, please contact your Apelco dealer or our Product Support Department to obtain replacement parts. **Please note that missing or damaged items cannot be replaced without proof of purchase.**
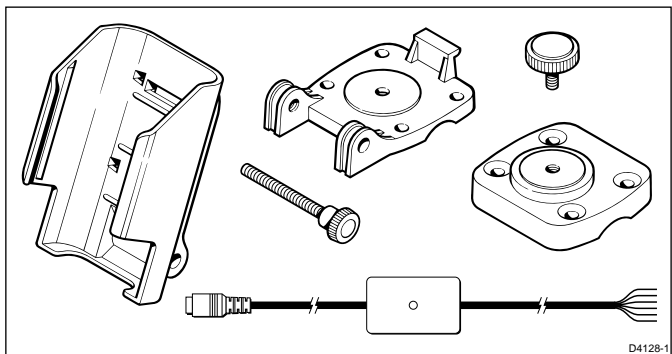
Registering this Product

Once you have checked that you have all of the listed components, please take the time to complete the warranty document and return it to your national distributor.

By returning this document you will receive prompt and expert attention should you ever experience any difficulties with this product. Also, your details are added to our customer database so that you automatically receive new product brochures as and when they are released.

Package Contents

Standard GPS11 package

GPS plus package (see page 12 for accessory pat numbers)

Contents

Chapter 1: Introduction

Congratulations on the purchase of your Apelco GPS11.

This unit is a navigational system consisting of a radio-positioning receiver making use of signals from the NAVSTAR GPS (Global Positioning System). The system offers simultaneously, high accuracy, continuous cover and worldwide availability.

This unit may be operated as a purely standalone system supplied by its own internal batteries or may be connected to an external 12v supply and integrated with further instumentation via a NMEA data link.

For fixed installation a bracket is provided to allow secure fixing in a wide variaty of positions.

Important Information

All Raytheon equipment and accessories are designed to the highest standard for use in the leisure marine environment.

Their design and manufacture conforms to the latest Electromagnetic Compatibility (EMC) standards, but good installation is required to ensure that performance is not compromised. Although every effort has been taken to ensure that they will perform under all conditions, it is important to understand what factors could affect the operation of the product. To avoid the risk of EMC problems, all Raytheon equipment and cables connected to it should be;

❑ At least 1m (3 feet) from any equipment transmitting or cables carrying radio signals e.g. VHF radios, cables and antennas. In the case of SSB radios, the distance should be increased to 2m (7ft).

❑ At least 20m (66 feet) from large vessels equipped with radar.

❑ More than 2m (7 feet) from the direct path of a radar beam.

The following points should also be noted;

❑ Genuine Raytheon cables should be used at all times. Cutting and rejoining these cables can compromise EMC performance and so should be avoided unless doing so is detailed in the installation manual.

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

❑ Voltage drops below 10v in the power supply to our products can cause the equipment to reset. This will not damage the equipment but will cause the loss of some information and can change the operating mode. This most frequently happens during engine starting, and so to reduce the risk of this occurring, it is recommended that the equipment is supplied from a different battery than the one used for engine start.

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

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

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

Please keep these notes for future reference.

Chapter 2: Installation

This chapter covers installation of the support bracket and external cable of the GPS11. If the unit is to be used purely as a standalone handheld GPS then this chapter may be ignored.

2.1 "Velcro" Strap mounting

The unit is supplied with a "Velcro" strip which may be attached to the rear case using the lanyard slots. Ensure that the strap is pulled tight and the end tabs turned back and secured to the main strap.

Attach the fixing strip to the desired surface using glue or double sided tape or sew the strip onto clothing.

2.2 Bracket Mounting (GPS11 plus only)

The unit is supplied with a universal mounting bracket (selected models only) which will allow your GPS to be slotted into a permanent storage/operating position.

2.2.1 Fixed to a vertical bulkhead

Select your desired position and screw the backplate (1) to the vertical bulkhead. Slot the main bracket (2) onto the top tab of the backplate and then push the bottom of the main bracket back, to allow the supplied finger bolt (3) to secure the base of the bracket.
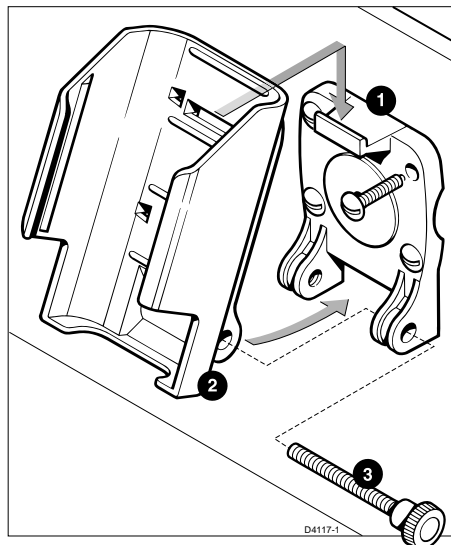
2.2.2 Fixed to a horizontal surface

The bracket may be fixed such that it may be adjusted vertically only or such that it may be rotated and adjusted vertically.

For vertical adjustment only screw the backplate (1) to the desired horizontal surface and then secure the main bracket (2) at the desired angle using the finger bolt (3).
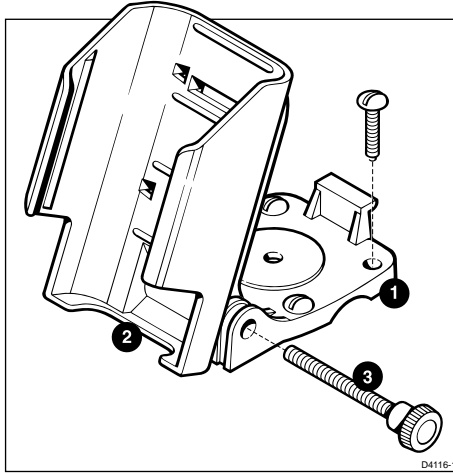
To allow the bracket to be rotated assemble the backplate (1) to the main bracket (2) using the finger bolt (3). The angle may be adjusted later if required. Select your desired position and screw the base plate (4) to the horizontal surface, then attach the backplate to the baseplate using the finger bolt (5).
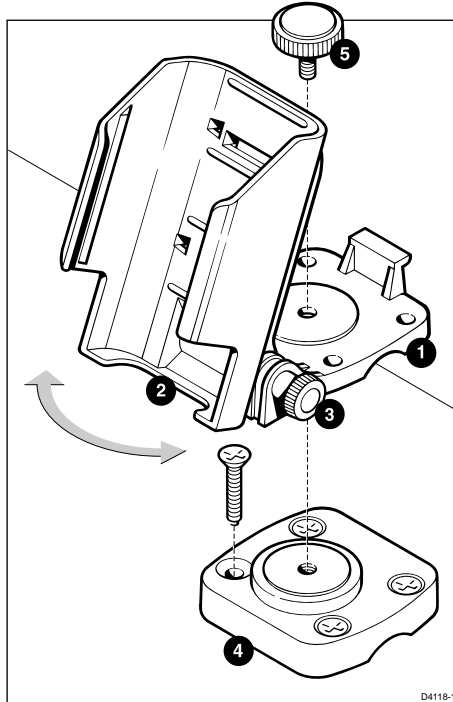
D4118-1

2.2.3 Fixed to a rail

The bracket may be mounted to a rail using the same method as for mounting to a horizontal surface but by reversing the base plate and using stainless steel nuts and bolts (not supplied) to clamp the base plate to the back plate around the rail.
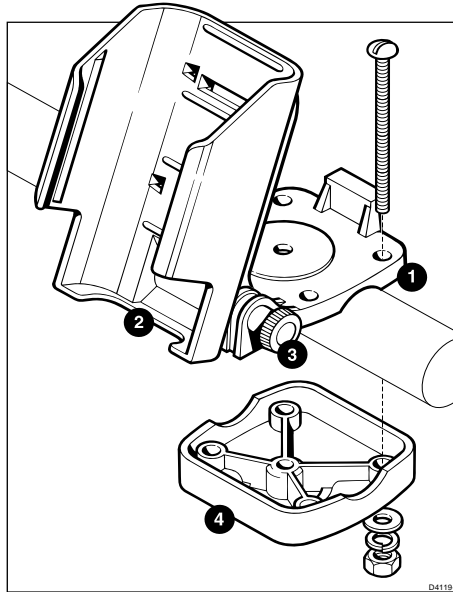
2.3 Accessories

Carry Case

Part No. P36003

A soft carry case is available to protect your GPS11 unit.

Bracket Assembly

Part No. P36004 (included in GPS11 plus)

To allow the standard GPS11 unit to be bracket mounted the bracket assembly that is included in the GPS11 plus kit is available separately.

External Connection

There are three external cable accessories available which may be used to connect your GPS11 to external power and data sources.

Part No. P36001 Power and Data Cable (included in GPS11 plus)

D4124-1
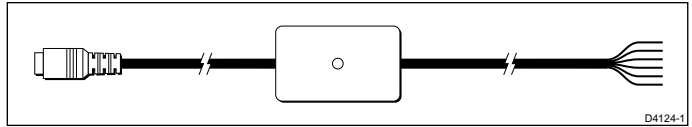
Part No. P36005 Power and Data Cable + PC Connector

D4126-1
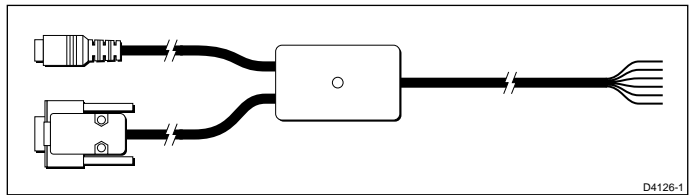
Note: Ensure that any unused cores are isolated to prevent data loss

Part No. P36002 Power Cable with Cigar Lighter Adapter

D4125-1
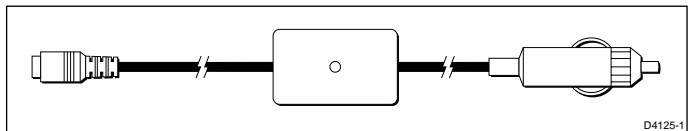
2.4 External Power connection

The GPS11 may be connected to an external power supply between 10V and 24V d.c..

Connection is made via any of the Power/Data cables shown on page 13 and should be protected by a 5 Amp fuse or circuit breaker.
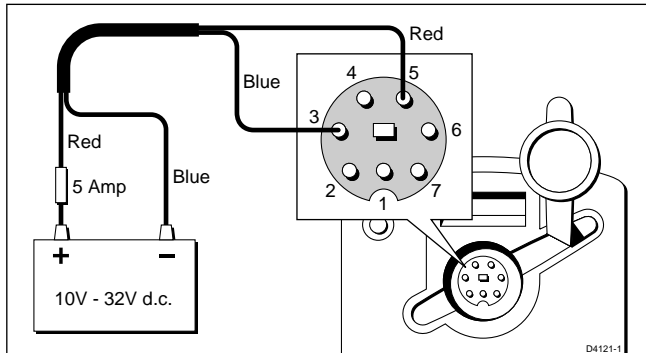
2.5 External Data Connection

The GPS11 is capable of outputing data to other navigational instrumentation or accepting waypoint information from an external source (P.C.).

Connection is made via the supplied Power/Data cable.

1. GREEN   - Not used
2. YELLOW - NMEA output +ve
3. BLUE   - Data common
                    - External power supply -ve
4.   - Not connected
5. RED   - External power supply
6. ORANGE - Input 1 (DGPS/P.C.)
7. BROWN - Not used
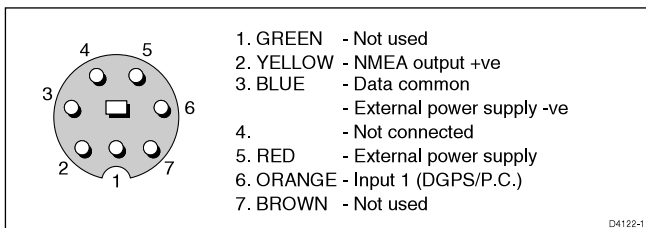
Note: Data communications protocols must be set up correctly in the "SET-UP PORT" section, see page xx.

Chapter 3: Getting Started

3.1 Inserting the batteries

Open the battery cover on the base of the unit by pulling the compartment latch (1) towards the side of the unit. The battery cover will spring open revealing the black battery carrier within.

Remove the carrier and insert the four AA size batteries following the + and - marks.

Insert the loaded carrier back into the unit taking care to line up the stud (2) on the carrier with the mark on the cover seal (3).

Close the battery cover and pull the latch toward the side of the unit. The cover will click into position sealing the battery compartment.

Note: The cover will not close if the battery carrier has been inserted incorrectly.

D4120-1
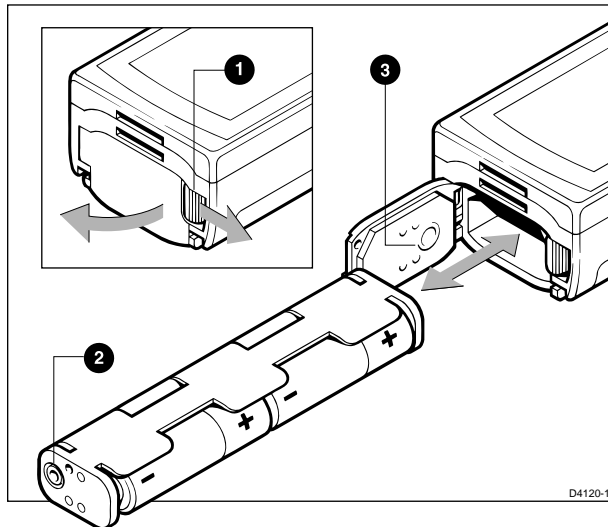
3.2 Switching the unit ON and OFF

Press the PWR button to switch on your GPS11. The Startup screen
will be displayed for 5 seconds.
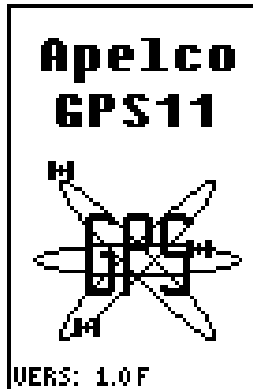
startup

After 5 seconds the GPS satellite information page will be displayed
showing the number and identification of the satellites being
received.
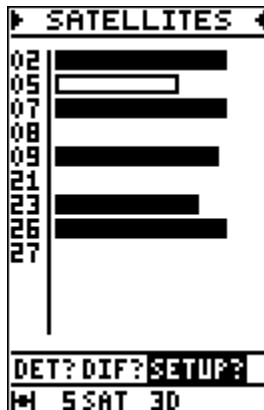
satstat

To switch off your GPS11 press and hold down the PWR button.
After a one second delay a countdown display will appear. Keep the
PWR button held down for a further three seconds until the display
switches off.

3.3 Light and Contrast

After startup the illumination and contrast may be adjusted by pressing the PWR button momentarily.

```
┌─►   POSITION   ◄─┐
│    50°.49 542    │
│ ┌──────────────┐ │
│ │BACKLIGHT:    │ │
│ │ON            │ │
│ │              │ │
│ │CONTRAST:     │ │
│ │ ▐████▌░░░░░  │ │
│ │              │ │
│ │BACKLIGHT TIME:│ │
│ │CONTINUOUS    │ │
│ └──────────────┘ │
│ 02/03/98 09:59:33│
├──────────────────┤
│ ►◄  8 SAT  3D    │
└──────────────────┘
```
lgtcon

Use the trackpad up/down arrows to highlight "BACKLIGHT", "CONTRAST" or "BACKLIGHT TIME" and press ENTER to select.

BACKLIGHT: Use the up/down arrows to select ON or OFF then ENTER to store.

CONTRAST: Use the left/right arrows to increase or decrease the contrast to the desired level then ENTER to store.

BACKLIGHT TIME: Use the up/down arrows to select the option required then ENTER to store.
Options are:
15 or 30 seconds
1, 2 or 4 minutes
Continuous

Press PAGE to return to the last screen.

Note: The backlight will reduce the battery life. The continuous setting is not recommended unless the unit is connected to an external power supply.

3.4 Selecting different pages

Use of the PAGE button allows the unit to move through the
sequence of main operating pages:

> **> SATELLITES <**
>
> **> POSITION <**
>
> **> WAYPOINT DATA <**
>
> **> ROUTE DATA <**
>
> **> PLOTTER <**

Each page has a menu bar near the bottom of the display. To access a
menu use the left/right arrows on the trackpad to highlight the
appropriate title and then press ENTER to activate the menu.

3.5 Status indicator

The bottom line of the screen shows the units current status and
cycles though three sets of information:

Battery Status:

Full
Half
Low
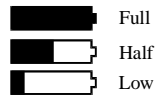
Number of Satellites being tracked: ∃ SAT

Chart Datum selected: WGS 84

Position Fix: H

Illumination: LIGHT

Operating Mode: ∃D

Differential Fix: D
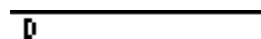
3.6 Setup

Basic Setup of the GPS11 unit is accessed by highlighting SETUP? on the menu bar on the SATELLITES page.

The Setup section is then divided into four sub-menus:

SET-UP SYSTEM

SET-UP PLOTTER

SET-UP NAVIGAT

SET-UP PORT

Sub menus are accessed by highlighting the appropriate line and pressing ENTER.

After switching on select "SETUP?" on the menu bar using the trackpad. Press ENTER to display the main menu.

```
┌─────────────────┐
│   MAIN MENU     │
│ SELECT SUB-MENU:│
│                 │
│ ▐SET-UP SYSTEM▌ │
│ SET-UP PLOTTER  │
│ SET-UP NAVIGAT  │
│ SET-UP PORT     │
│                 │
│                 │
│ EXIT?           │
│ ►┤ LIGHT W6S B4 │
└─────────────────┘
```
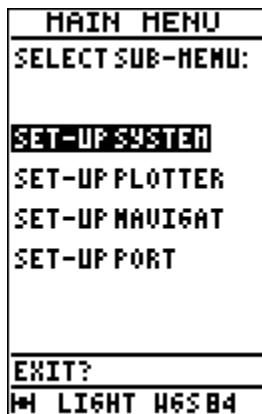
Mainmen1

Set-up System

Use the trackpad to select "SET-UP SYSTEM" and press ENTER.

```
SET-UP SYSTEM
D/S UNIT:  NM-KT
ALT.UNITS: FEET
ALTITUDE: ON
WARM START
U.K.
LOCAL TIME
+00H 00MIN
ECONOMY MODE
NOT ACTIVE
MAIN MENU?
►I  7 SAT  3D
```
Setsys

Use the trackpad to highlight the desired option:

D/S UNIT:

Press ENTER to select the desired units for Speed and Distance.

Highlight the desired option and press ENTER to select.

Options are: KM - KPH, NM - KT, MI - MPH.

ALT. UNITS:

Press ENTER to select the desired units for altitude.

Highlight the desired option and press ENTER to select.

Options are: METRE, FEET,

ALTITUDE:

Press ENTER to select whether to display or not the altitude information on the Position page..

Options are: ON -display altitude / OFF - not display altitude

WARM START

Press ENTER to select a start area:

> AUTO - The unit will search for all satellites and will initiate a cold start if the unit has moved location while switched off. "Selection" - A local area may be selected instructing the unit to search for selected satellites first.

Note: When the unit is first switched on the setting of the correct Warm Start region will greatly reduce the time to first fix. The auto setting could result in a time to first fix in excess of 30 minutes.

LOCAL TIME

Press ENTER to select a time offset from UTC.

Use the trackpad to input the correct local time difference for the area you are in and press ENTER to select.

ECONOMY MODE

Stops GPS reception to increase the battery life of the unit. Use this setting for entering waypoint and route information whilst the unit is not being used for navigation.

Options are: ACTIVE - reception disabled
                 NOT ACTIVE - reception enabled

Note: Setting is returned to NOT ACTIVE on power up.

MAIN MENU?

Highlight this option and press ENTER to return to the main menu.

Set-up Plotter

Use the trackpad to select "SET-UP PLOTTER" and press ENTER.

```
SET-UP PLOTTER
CLEAR TRACK

RESET TRIP LOG

TRACK INTERVAL
1 MINUTE

RANGE RINGS
OFF

WPT DISPLAY
SYMBOL (O)
MAIN MENU?
```

Setplot

Use the trackpad to highlight the desired option:

CLEAR TRACK:

Press ENTER to clear the displays track. A confirmation page will appear . Press ENTER once more to clear the stored track information from the memory.

RESET TRIP LOG:

Press ENTER to reset the displayed Trip Log. A confirmation page will appear . Press ENTER once more to reset the trip log or use the trackpad to highlight NO? and then press ENTER to cancel.

TRACK INTERVAL:

Press ENTER to select the time between track data saves.

Options are: 5 seconds
                30 seconds
                1 minute
                2 minutes
                5 minutes

Note: The longer the time interval the larger is the track that can be stored although the resolution of the final plot may be poor if the distances travelled are small.

RANGE RINGS:

Press ENTER to switch the range rings ON or OFF.

WPT DISPLAY:

The symbol which displays a waypoint on the plotter screen may be set either to (O) or to the first letter of the waypoint name. Press ENTER to select the desired option.

Set-up Navigation

Use the trackpad to select "SET-UP NAVIGAT" and press ENTER.

```
SET-UP NAVIGAT
MAP DATUM
WGS 84 DEFAULT
ANTENNA MODE
AUTO
ALTITUDE
-0085 ft
COORDINATES
00°00.000'
COMPAS VARIAT.
000°
MAIN MENU?
|◄| LIGHT WGS 84
```

Setnav

Use the trackpad to highlight the desired option:

MAP DATUM:

The default map datum is WGS84, however it is possible to select from a list of alternative datums as specified in Appendix A of this manual. Highlight the required datum using the trackpad and press ENTER to select.

Note: It is important to ensure the correct datum is selected to prevent position errors being introduced.

ANTENNA MODE:

For Marine use select the 2 DIMENSIONAL mode and enter the antenna height above sea level to obtain the most accurate position. For land use select 3 DIMENSIONAL mode and allow the GPS unit to calculate height above sea level. Setting the mode to AUTO will cause the GPS to use 3 dimensional mode when it is tracking 4 or more satellites.

ALTITUDE

If the antenna mode is set to 2 dimensional operation the unit must be told at what height above sea level it is. This will ensure the positional accuracy is maintained. If 3 dimensional operation is selected then altitude need not be entered.

COORDINATES

Position and waypoint information may be displayed in any one of several systems.

Options are: $000^0 00.00'$, OSGB, UTM, Swedish Grid

COMPASS VARIAT (Variation)

Compass bearings may be displayed in Magnetic or True form. If set to 000^0 then all bearings displayed will be displayed as True bearing. This unit does not apply variation automatically.

Set-up Communications Port

Use the trackpad to select "SET-UP PORT" and press ENTER.
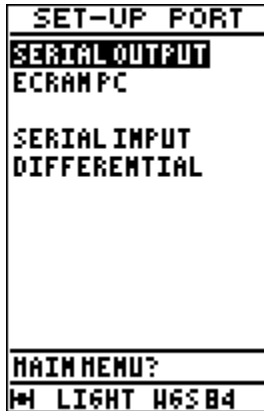
```
┌─────────────────────┐
│    SET-UP PORT      │
│ ▌SERIAL OUTPUT▐     │
│ ECRAN PC            │
│                     │
│ SERIAL INPUT        │
│ DIFFERENTIAL        │
│                     │
│                     │
│                     │
│                     │
│                     │
│                     │
│ MAIN MENU?          │
│ ◄► LIGHT WGS 84     │
└─────────────────────┘
```
Setport

Use the trackpad to highlight the desired option:

SERIAL OUTPUT:

Options are: NMEA182, NMEA183,
                       WAYPOINT (for PC waypoint communication)

SERIAL INPUT:

Options are: DIFFERENTIAL (for differential receiver input),
                       WAYPOINT (for PC waypoint communication)

Note: Specifications of the NMEA sentences are given in
Appendix B of this manual.

3.7 Marking Events

Pressing the EVENT button on the GPS11 enters the current position
into the memory as a waypoint.

The display will show the position information.

```
┌─────────────────────┐
│    EVENT/MOB         │
│ EVENT:              │
│                     │
│ WPT:WPT 003         │
│                     │
│ LAT:   50°49.134N   │
│                     │
│ LON:  001°03.160W   │
│                     │
│                     │
│ COMMENT:            │
│ 12H36-0044M         │
│ 02-03-98---         │
│ SAVE?               │
│ ┣┫  3SAT  3D        │
└─────────────────────┘
```
Event01

*Time and date of
—— EVENT automatically
entered as a comment*

The event is automatically given the name 'WPT XXX' where XXX
is the next available number. Highlighting SAVE on the menu bar
will save the Event as a waypoint which will appear in the waypoint
list (see page 34).

It is possible to edit any of the Event data by using the trackpad to
highlight the relevant piece of information and pressing the
ENTER button. It is also possible to save the information as shown
and edit later using the Modify Waypoint facility described on
page 34).

3.8 Man Over Board (MOB)

Should a crewmember fall overboard press and hold the EVENT
button for 2 seconds. The GPS11 will immediately enter the Plotter
screen set to the minimum range. The range will automatically alter
to ensure that the MOB position and your current position remain on
the display at all times.
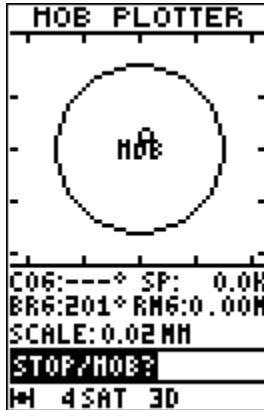
Mob

Use the Bearing and Range figures to steer the vessel back to the
original position to recover the casualty.

Pressing ENTER will cancel the MOB mode and return to the normal
plotter page. Use the PAGE button to continue using the GPS unit
normally.

Chapter 4: Operation

4.1 Satellites Page

The satellites page shows the status and numbers of satellites being tracked by the GPS11.

The main page shows the satellite numbers and the signal strength.

satel01

By highlighting DET? on the menu bar and pressing the ENTER button details of azimuth and elevation of the satellites may be viewed.

satel02

By highlighting DIF? on the menu bar and pressing the ENTER button details regarding a differential fix may be viewed.
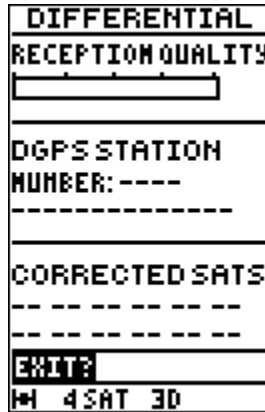
```
┌─────────────────┐
│  DIFFERENTIAL   │
│RECEPTION QUALITY│
│ ┌─┬─┬─┬─┬─┬─┐   │
│ └─┴─┴─┴─┴─┴─┘   │
│                 │
│ DGPS STATION    │
│ NUMBER: ----    │
│ ──────────────  │
│                 │
│ CORRECTED SATS  │
│ -- -- -- -- -- --│
│ -- -- -- -- -- --│
│ EXIT?           │
│ ⊮   4 SAT  3D   │
└─────────────────┘
```
difinfo

RECEPTION QUALITY

The bargraph shows the reception quality with a full bar indicating 100% reception

DGPS STATION

The identification number of the differential station being received will appear automatically.

CORRECTED SATS

The satellites which are being corrected by the differential station will be indicated by their identification numbers.

4.2 Position Page

This page gives your primary position information along with speed and course over the ground.
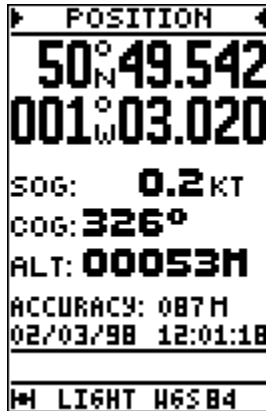
```
►    POSITION    ◄
  50°N49.542
001°W03.020
SOG:    0.2KT
COG: 326°
ALT: 00053M
ACCURACY: 087M
02/03/98  12:01:18

►◄ LIGHT W6S B4
```
pos01

There are no menu options on this page.

4.3 Waypoint Data Page

This page gives your primary waypoint information. Use this page for entering, deleting or editing waypoint information and activating a waypoint.
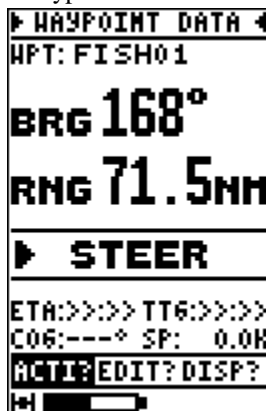
```
► WAYPOINT DATA ◄
WPT: FISH01
BRG 168°
RNG 71.5NM
► STEER
ETA:>>:>> TTG:>>:>>
COG:---° SP:  0.0K
ACTI? EDIT? DISP?
►◄ ▮▮▮▯▯
```
wayp01

There are three menu options "ACTI?", "EDIT?" and "DISP?"

Highlighting "DISP?" on the menu bar will allow the choice of Data, CDI or BDI display.

Waypoint Display Page

From the main waypoint page highlight the "DISP?" option and
press "ENTER" you will be presented with three options:

Data   Shows the main waypoint information page

CDI   Shows the Course Direction Indicator Page
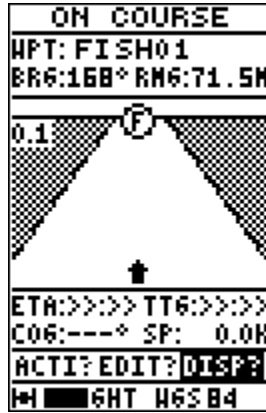
*Active waypoint
information*

CDI01

BDI   Shows the Bearing Direction Indicator Page
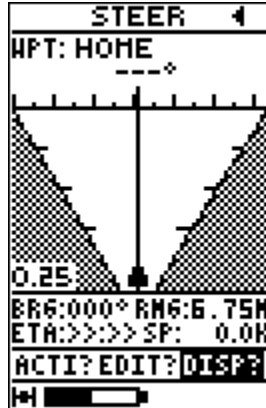
BDI01

Entering, Modifying and Deleting Waypoints

From the main Waypoint information page select the menu option "EDIT?" and press the ENTER button. The menu changes to allow three options ENTER?, MODIFY? and DELETE?

```
        EDIT WPT

PLEASE SELECT
YOUR WAYPOINT
OPERATION



WPT MEMORY USED:


ENTER? MODIFY?
DELETE?
┣┫  LIGHT  W6S B4
```
edit01

Entering a Waypoint

Select ENTER? on the menu bar and press the ENTER button.

A blank waypoint data page will appear.

```
ENTER WAYPOINT
WPT:------
LATITUDE:
     °
  --  --.---
     N    .
LONGITUDE:
     °
---  --.---
     W    .
COMMENT:
----------
----------
VALID? CLEAR?
┣┫  4 SAT  3D
```
editwp

The highlighted setting is WPT:, press ENTER to select the waypoint name option.

wptname

Use the trackpad up and down arrows to select the first letter or number of your waypoint name then use the right arrow to move on to the next digit. Continue until the waypoint name is complete (max. 6 digits) and press "ENTER".

Use the down arrow to highlight LATITUDE: and press ENTER.
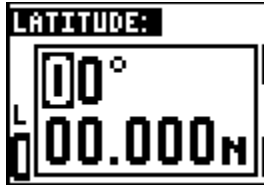
lat

Use the up and down arrows to select the digits and the right and left arrows to move around until the correct waypoint latitude has been entered. Press the ENTER button.

Use the down arrow to highlight LONGITUDE? and press ENTER.
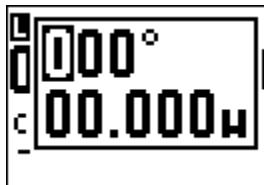
lon

Repeat the above procedure to enter the correct waypoint longitude.

Use the down arrow to highlight COMMENT: and press ENTER.
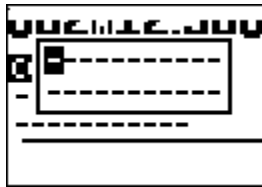
comment

If desired a 20 digit comment may be added to assist later in identifying the waypoint, select letters and numbers as before and press ENTER to complete the waypoint information.
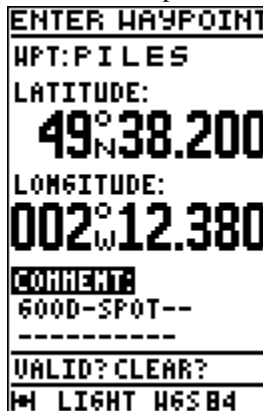
wptcompl

Check the data entered carefully and, with the VALID? setting highlight on the menu press ENTER to save the information.

Note: Failure to highlight VALID? in the menu bar and press the ENTER button will cause the waypoint information to be lost.

If the information is incorrect you may use the trackpad arrows to go back and highlight the setting to be changed or highlight CLEAR? on the menu bar to clear the form and start again.

Modifying a Waypoint

Select MODIFY? on the menu bar and press the ENTER button.

A list of stored waypoints will appear.

```
      WPT  LIST
 SELECT THE WPT
 TO BE MODIFIED

 BAR01
 BAR02
 FISH01 | 50N56.29
 FISH02 | 001W03.00
 FUEL   | --------
 HOME   | --------
 PILES
 RAY01            ▼

 ⊶ LIGHT  W6SB4
```
wptlst01

Use the trackpad down arrow to highlight the required waypoint.
Latitude, Longitude and comments will appear for each waypoint as
the list is advanced. Press ENTER when the desired waypoint is
located.

```
     MODIFY   WPT
 WPT:PILES
 LATITUDE:
  49°N38.200
 LONGITUDE:
  002°W12.380
 COMMENT:
 GOOD-SPOT--
 ----------
 VALID? CLEAR?
 ⊶ LIGHT  W6SB4
```
wptcompl

Use the trackpad to navigate around the screen and enter the modifi-
cations required. Highlight "VALID?" and press ENTER to store the
changes or highlight "ERASE?" and press ENTER to clear the
waypoint data and start again.

Deleting a Waypoint

Select DELETE? on the menu bar and press the ENTER button.

A list of stored waypoints will appear.
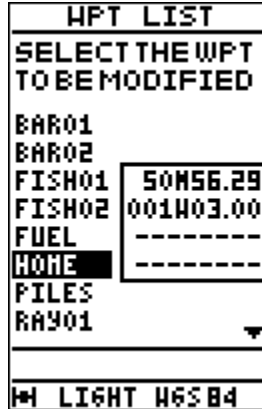
wptlst01

Use the trackpad down arrow to highlight the required waypoint. Lat/
Lon and comments will appear for each waypoint as the list is
advanced. Press ENTER when the desired waypoint is located.

delwrn1

Press ENTER once more to confirm waypoint deletion or press
PAGE to return to the main Waypoint information page.

Note: If the waypoint is used in a route then an error message will appear
          giving the name of the route in which the waypoint is used. The route
          must be edited to remove the waypoint before the waypoint can be
          deleted from the waypoint list.

Activating a Waypoint

To start the GPS11 tracking to a waypoint highlight "ACTI?" on the menu bar and press ENTER.
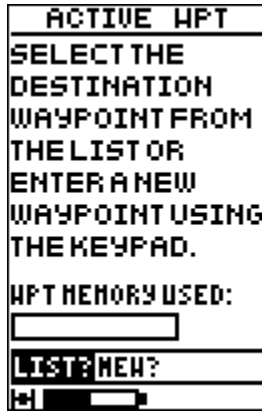
```
┌─────────────────────┐
│     ACTIVE WPT      │
├─────────────────────┤
│ SELECT THE          │
│ DESTINATION         │
│ WAYPOINT FROM       │
│ THE LIST OR         │
│ ENTER A NEW         │
│ WAYPOINT USING      │
│ THE KEYPAD.         │
│                     │
│ WPT MEMORY USED:    │
│ ┌─────────────────┐ │
│ └─────────────────┘ │
├─────────────────────┤
│ LIST? NEW?          │
│ ▶◀ ███████▶         │
└─────────────────────┘
```
actwpt01

You now have the option to select a waypoint from the stored list or to enter a new waypoint.

Activating a Waypoint from the list

Highlight "LIST?" on the menu bar and press ENTER.

A list of stored waypoints will appear.
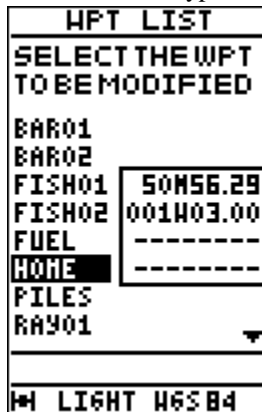
```
┌─────────────────────┐
│     WPT LIST        │
├─────────────────────┤
│ SELECT THE WPT      │
│ TO BE MODIFIED      │
│                     │
│ BAR01               │
│ BAR02               │
│ FISH01  ┌─────────┐ │
│ FISH02  │50N56.29 │ │
│ FUEL    │001W03.00│ │
│ HOME    │──────── │ │
│ PILES   │──────── │ │
│ RAY01            ▼  │
│                     │
├─────────────────────┤
│ ▶◀ LIGHT W6S B4     │
└─────────────────────┘
```
wptlst01

Use the trackpad down arrow to highlight the required waypoint. Lat/Lon and comments will appear for each waypoint as the list is advanced. Press ENTER when the desired waypoint is located.

Activating a new Waypoint

Highlight NEW? on the menu bar and press the ENTER button.

A blank waypoint data page will appear.

```
ENTER WAYPOINT
WPT:------
LATITUDE:
      o
  --  --.---
     N    .
LONGITUDE:
       o
 --- --.---
     W    .
COMMENT:
----------
----------
VALID? CLEAR?
|◄►|  4 SAT  3D
```
editwp

Follow the procedure on page 31 Entering a Waypoint to complete the form.

Check the data entered carefully and, with the VALID? setting highlighted on the menu press ENTER to save the information..
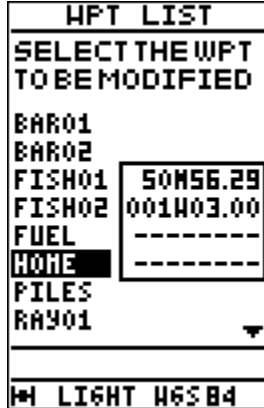
Note: The new waypoint will be stored in memory and added to the waypoint list.

If the information is incorrect you may use the trackpad arrows to go back and highlight the setting to be changed or highlight CLEAR? on the menu bar to clear the form and start again

To stop tracking to a waypoint highlight "ACTI?" on the menu bar and press ENTER. "DEACTIVATE?" will be highlight on the menu bar. Press ENTER, a warning page will be displayed.

```
L  CAUTION!
   PRESS ENTER
   TO STOP
L  'WAYPOINT'
[  FUNCTION OR
L  PRESS PAGE
C  TO ESCAPE
```
stopwarn

Press ENTER to stop tracking to that waypoint.

4.4 Route Data Page

This page gives your primary route information. Use this page for
entering, deleting or editing route information and activating a
stored route.

```
▶ ROUTE  DATA ◀
FISH01 ➡ HOME
ROUTE:01 ▶ FISH01

BRG 168°

RNG 71.5NM

▶ STEER

ETA:>>:>> TTG:>>:>>
COG:---° SP:   0.0K
ACTI?EDIT?DISP?
▶◀  6 SAT  3D
```
route01

There are three menu options "ACTI?", "EDIT?" and "DISP?"

Highlighting "DISP?" on the menu bar will allow the choice of Data,
CDI or BDI displays as indicated on page 30 Waypoint Display
Page.

Editing a route

Highlight "EDIT?" from the menu bar and press ENTER.

Three options are given: "ENTER?", "MODIFY?" and
"DELETE?"

Entering a Route

Select ENTER? on the menu bar and press the ENTER button.

A blank Route data page will appear.

```
  ENTER  ROUTE
RTE:-- L6:----MM
------    |  ------
------    |  ------
------    |  ------
------    |  ------
------    |  ------
------    |  ------
------    |  ------
------    |  ------
------    |  ------
------    |  ------
VALID? ERASE?
◄► LIGHT W6S B4
```
edit02

The highlighted setting is RTE:, press ENTER to select the Route
number option.

```
  ENTER  ROUTE
RTE:--  L6:----MM
---  | █ ─ |----
---  |       |----
------    |  ------
------    |  ------
```
rtename

Use the trackpad arrows to select the number (00 to 19) of the new
route and press "ENTER". If the route number has already been used,
the previously entered route information will be displayed whereas if
the route is new the data sheet will be empty.

Use the down arrow to highlight the first waypoint line and press
ENTER.

rtewpt01

Use the trackpad to enter the desired waypoint name. As you enter the individual numbers or letters the first matching entry in the waypoint library will be displayed. This allows you to select a waypoint without having to enter the complete name. Press ENTER when the correct waypoint is being displayed to enter the waypoint into the route.
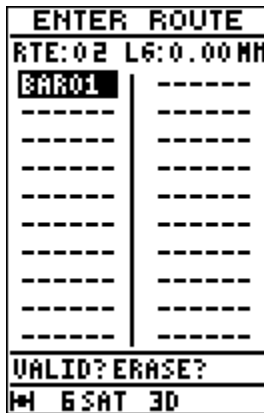
rtewp02

Press the down arrow to highlight the next waypoint data line and repeat the above procedure. Continue until the route is complete (maximum 20 waypoints).

Check carefully to ensure the route information is correct and highlight "VALID?" on the menu bar and press ENTER.

Note: Failure to highlight VALID? in the menu bar and press the ENTER button will cause the waypoint information to be lost.

Modifying a Route

Select MODIFY? on the menu bar and press the ENTER button.

The Route list page will appear.

```
     ROUTE LIST
MODIFY:

01:FISH01▸HOME
02:PILES ▸HOME
03:FISH01▸PILES




_____
╟┥  6 SAT  3D
```
rtelst

Highlight the route to be modified and press ENTER.

The route data page will be displayed.

```
   MODIFY ROUTE
RTE:02 L6:6185 MM
 PILES   | ------
 FUEL    | ------
 RAY01   | ------
 FISH01  | ------
 BAR01   | ------
 HOME    | ------
 ------  | ------
 ------  | ------
 ------  | ------
 ------  | ------
VALID?ERASE?
╟┥  6 SAT  3D
```
modrte

Use the trackpad arrows to highlight the waypoint line that requires changing and press ENTER. Select the correct waypoint from the list and press ENTER to update the route.

Check the changes carefully, highlight "VALID?" on the menu bar and press ENTER to store the modified route.

Deleting a Route

Select DELETE? on the menu bar and press the ENTER button.

The Route list page will appear.

```
   ROUTE  LIST
MODIFY:

01:FISH01►HOME
02:PILES ►HOME
03:FISH01►PILES




━━━━━━━━━━━━━━
►┤  6 SAT  3D
```
rtelst

Highlight the route to be deleted and press ENTER.

A warning message will be displayed asking for confirmation that the route should be deleted.

```
   ROUTE  LIST
DELETE:

0
0  CAUTION!
0  PRESS ENTER
   TO DELETE THE
   ROUTE OR
   PRESS PAGE
   TO ESCAPE!


OK?
►┤  6 SAT  3D
```
rtedelcn

Press ENTER to confirm deletion or PAGE to return to the main Route Data page.

Activating a Route

From the main Route Data page highlight "ACTI?" on the menu bar and press ENTER.

```
 ACTIVE ROUTE
SELECT AN
EXISTING ROUTE
FROM THE LIST
OR ENTER A NEW
ROUTE USING
THE KEYPAD.


ROUTE MEMORY USED:
█
LIST? NEW?
H-H  6 SAT  3D
```
actrte01

You now have the option to select a waypoint from the stored list or to enter a new waypoint.

Activating a Route from the list

Highlight "LIST?" on the menu bar and press ENTER.

A list of stored routes will appear.

```
    ROUTE LIST


01:FISH01▶HOME
02:PILES ▶HOME
03:FISH01▶PILES






H-H  6 SAT  3D
```
rtelst1

Use the trackpad down arrow to highlight the required route and press ENTER.

You will be asked to select the direction in which you wish to follow the selected route.

rtedir

Select Forward or Reverse and press ENTER. You will now be asked to select your start waypoint. The first waypoint of the stored route will be displayed.

rtestart

If you wish to commence the route from an alternative waypoint use the trackpad up and down arrows to select the desired starting point. Press ENTER when the desired start point is displayed.

The selected Route's data page will be displayed.

rtedata1

The GPS11 will start tracking through the selected route.

Activating a new Route

Highlight NEW? on the menu bar and press the ENTER button.

A blank route data page will appear.

```
┌──────────────────┐
│   ENTER  ROUTE   │
├──────────────────┤
│RTE:-- L6:---- MM │
│------  │ ------  │
│------  │ ------  │
│------  │ ------  │
│------  │ ------  │
│------  │ ------  │
│------  │ ------  │
│------  │ ------  │
│------  │ ------  │
│------  │ ------  │
│------  │ ------  │
├──────────────────┤
│VALID? ERASE?     │
├──────────────────┤
│ LIGHT  W6S B4   │
└──────────────────┘
```
Edit02

Follow the procedure on page 38 Entering a Route to complete the form.

Check the data entered carefully and, with the VALID? setting highlight on the menu press ENTER to save the information.

Note: The new route will be stored in memory and added to the route list.

If the information is incorrect you may use the trackpad arrows to go back and highlight the setting to be changed or highlight CLEAR? on the menu bar to clear the form and start again.

Advancing through a Route

When you reach a waypoint there are two options:

1. The GPS position will enter the arrival circle which is preset at 0.1nm and will display the arrival message.

wptadv1

Press ENTER to display the Route Data for the next leg and start tracking to the next waypoint.

2. You physically arrive at the waypoint but the GPS position is greater than 0.1nm from the waypoint position (possibly due to poor reception). In this case it will be necessary to manually advance to the next waypoint as shown below.

From the Route Data page highlight ACTI? on the menubar and press ENTER.

wptadv

Use the trackpad to highlight NEXT LEG? and press ENTER.

After a short pause the arrival message will be displayed.

```
 B | ARRIVAL AT
   | WPT: HOME
   | ENTER TO
 R | ADVANCE.      NM
        STEER    ◀
```
wptadv1

Press ENTER to display the Route Data for the next leg and start
tracking to the next waypoint.

Note: The manual advance may be used at any stage if you wish to bypass a
            waypoint and track to an alternative later in the Route.

De-activating a route

To stop tracking through a route highlight "ACTI?" on the menu bar
and press ENTER. Use the trackpad to highlight "STOP?" on the
menu bar and press ENTER, a warning page will be displayed.

```
 P          -              -
 F | CAUTION!          |  -
 R | PRESS ENTER       |  -
 F | TO STOP           |  -
 B | 'ROUTE'           |  -
 H | FUNCTION OR       |  -
 - | PRESS PAGE        |  -
 - | TO ESCAPE!        |  -
```
stoptrack

Press ENTER to stop tracking through the route.

4.5 Plotter Page

The plotter page gives a graphical display of the route history and displays any waypoints that may be in view.

```
┌──────────────────────┐
│►    PLOTTER      ◄│
│0.25          4.55│
│NM            NM│
│-      ☻WPT002        -│
│                      │
│                      │
│-                    -│
│                      │
│-                    -│
│                      │
│-    ·    ·    ·     -│
│COG:--- SOG:   0.0 K│
│BRG:000 RNG:7.21NM│
│WPT:HOME              │
│▐ZOOM IN?▌ZOOM OUT?│
│►◄ LIGHT W6S 84│
└──────────────────────┘
```
plot01
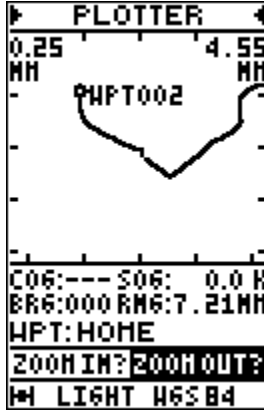
____ *Plotter scale and trip log reading*

Menu options are ZOOM IN? or ZOOM OUT?

Highlight the appropriate instruction and press ENTER to change the plotter scale. The range is from 0.02 to 250 of the units selected.

Note: Plotter functions, including clearing the track memory can be accessed via the SET-UP menu

Chapter 5: Fault Finding & Maintenance

5.1 Fault Finding

If your GPS11 fails to operate check the battery condition and ensure that the contacts are clean. If an external power source is being used check the voltage and ensure that the Power/Data plug is clean and secure.

If the unit powers up but fails to obtain a fix ensure that the unit has a clear view of the sky. Reception will be affected by buildings, trees and other objects that restrict the signal from the satellites, it is wise to check with another GPS operator locally to ensure that the satellite system is fully operational

In the unlikely event that a fault develops within the unit there are no user serviceable parts and the complete GPS11 should be returned to a registered Apelco Service Agent for attention.

5.2 How to Contact Apelco

In the USA.

For technical Support

Please call 1-800-539-5539, extension 2445 or (603) 647-7530, extension 2445. Our Fax number is 1-603-634-4756.

You may reach our Technical Service Department Monday through Friday, 8:15 A.M. to 5:00 P.M. EasternStandard Time or Daylight Saving Time. Our Technical Support Specialists are available to answer questions about installing, operating, and troubleshooting about your Apelco unit. You may also reach our Technical Support Department via the Internet.

Questions may be addressed directly to:

rmc_tech_apelco@raymarine.com

Or, you may visit Apelco at the World Wide Web site for Raytheon Electronics:

www.raymarine.com

For accessories and parts

Please call 1-800-539-5539, extension 2120 or (603) 647-7530, extension 2120.

Our Customer Service Department is available Monday through Friday 8:15 A.M.to 5:00 P.M. Eastern Time. Please have the Apelco part number ready when placing an order. (See the optional Accessory List in this manual on page 12.) If you are not sure which item you need for your Apelco unit, please contact our Technical Support Department before placing your order. Apelco accessory items and parts are also available through your authorised Apelco dealer.

For product repair and service

When you first receive your unit, please be sure to complete and mail the warranty card included in the package. In the unlikely event your Apelco unit should develop a problem, please return the unit to our Product Repair Centre. If you need service help, and you have not mailed your warranty card, please include a copy of your original purchase receipt to verify your warranty status.

Please return your unit to this address:
Apelco Product Repair Center
676 Island Pond Road
Manchester, NH. 03109-5420

In Europe

Contact your Apelco main distributor for assistance for the supply of accessories and technical assistance. Faulty units may also be returned to the distributor or returned directly to:

Raytheon Marine Europe Ltd.
Robinson Way
Anchorage Park
Portsmouth, PO3 5TD
England

The telephone number for Raytheon Marine Europe is (44) 1705 693611. The Fax number is (44) 1705 694642

Contact via the Internet:

Questions may be addressed directly to:

techsupap@rmeltd.co.uk

Or, you may visit Apelco at the World Wide Web site for Raytheon Electronics:

www.raymarine.com.

5.3 Maintenance

Chemical and abrasive materials must not be used to clean the GPS11 housing; if it is dirty, clean it with a soft, damp cloth.

Examine all cables for chafing or damage to the outer shield and, where necessary, replace with genuine Apelco cables and resecure.

Ensure that any external plugs and sockets are kept clean and dry. Use small amounts of a silicon based grease to prevent corrosion on exposed connectors.

Chapter 6: Specification

Dimensions

Size:	51 x 150 x 33 mm
	2.01" x 5.90" x 1.30"
Weight:	255g (9 oz.) with batteries

LCD Display: 100 x 64 FSTN with EL back light.

Receiver

Frequency:	1.575 GHz, C/A code.
Type:	8 genuine parallel channels with phase tracking (predicts the next 4 in view).
Antenna:	Patch internal / integrated antenna
Maximum Speed:	2000km/hour
3 Dimensions:	Latitude, Longitude and Altitude; requires 4 or more satellates
Pos. Rate Update:	1 second

Automatic Selection of Satellites

Automatic Almanac update

Autolocalization

Accuracy

Horizontal Position:	with SA code : 100m RMS (2D) in RTCM 104 differential mode : 2 to 5 m RMS.
Velocity:	with SA code : 1.0km/hour RMS in differential mode : 0.1 km/hour
Acceleration:	3g

Time to First Fix (typical)

Reaquisition:	4 seconds
Up to 1 hour off:	30 seconds
Up to 24 hours off:	90 seconds
Worldwide cold start:	3 minutes

Power Supply

Batteries:	4 AA alkaline batteries
External Supply:	10-32v dc
Battery Life:	8 hrs in continuous permanent mode. 10 hrs in economy permanent mode. 16 hrs in discontiouous mode with a use equivalent to one hour per day.

Temperature

Operating:	-10^0 to $+60^0$C (14^0 to 140^0F)
Storage:	-20^0C to $+70^0$C (-4^0 to 158^0F)

Data

Output:	NMEA0182, and 0183.
Input:	NMEA 0183, RTCM 104. Waypoint loading and unloading with P.C.

Plotter Functions

Plotter Capacity:	300 points
Plotter time scale:	25 hours max.
Plotter scales:	0.02 to 250 in the units selected

Display of waypoints and active route plan.

Main Functions

Chart Datums:	As shown in Appendix A of this manual.
Coordinates:	latitude, longitude, UTM, OSGB, Swedish Grid
Navigation:	Speed and Course over the Ground.
Waypoints:	600 waypoints each with 6 alphanumerical character display and automatic classification.
Other features:	Event mark including
	20 reversible routes of 20 wayponts maximum.
	Range and bearing to a selected waypoint.
	Total distance covered log.

Appendix A : Chart Datums

Code	Name	Abbrev' 11	Abbrev' 23
0	WGS 84	WGS84	WGS84DEFAULT
1	Adinan - MEAN FOR Ethiopia, Sudan	ADINES	ADINANMEANS
2	Adinan - Burkina Faso	ADINBUR	ADINANBURKIN
3	Adindan - Cameroon	ADINCAM	ADINANCAMER
4	Adindan - Etiopia	ADINETH	ADINANETHIOP
5	Adindan - Mali	ADINMAL	ADINANMALI
6	Adindan - Senegal	ADINSEN	ADINANSENEG
7	Adindan - Sudan	ADINSUD	ADINANSUDAN
8	Afgooye - Somalia	AFGOSOM	AFGOOVESOMALI
9	Ain el Abd 1970 - Bahrain	AINBAH	AIN1970BAHR
10	Ain el Abd 1970 - Saudi Arabia	AINSAUD	AIN1970SAUDI
11	Anna 1 Astro 1965 - Cocos Islands	ANNCOCO	ANNA1COCOSIS
12	Antiguaa Island Astro 1943 Antigua (Leeward Islands)	ANT1943	ANTIGUAIS1943
13	Arc 1950 MEAN FOR Botswana, Lethoso, Malawi, Swaziland, Zaire, Zambia, Zimbabwe	ARC1950	ARC1950MEAN
14	Arc 1950 - Botswana	ARC9501	ARC1950BOTSWA
15	Arc 1950 - Burundi	ARC9502	ARC1950BURUND
16	Arc 1950 - Lethoso	ARC9503	ARC1950LETHOS
17	Arc 1950 - Malawi	ARC9504	ARC1950MALAWI
18	Arc 1950 - Swaziland	ARC9505	ARC1950SWAZIL
19	Arc 1950 - Zaire	ARC9506	ARC1950ZAIRE
20	Arc 1950 - Zambia	ARC9507	ARC1950ZAMBIA
21	Arc 1950 - Zimbabwe	ARC9508	ARC1950ZIMBAB
22	Arc 1960 - MEAN FOR Kenya, Tanzania	ARC1960	ARC1960MEAN
23	Ascension Island 1958	ASC1958	ASCENSIS1958

24	Astro Beacon E 1945 - Iwo Jima	IWOJIMA	ASTROIWOJIMQA
25	Astro DOS 71/4 - St. Helena Island	STHELEN	ASTROSTHELISL
26	Astro Tern Island (FRIG) 1961 Tern Island	TERNISL	ASTROTERN1961
27	Astranomical Station 1952 Marcus Island	MARCUIS	ASTO1952MARIS
28	Australian Geodetic 1966 Autralia & Tasmania	AUSTR66	AUSTRALAIN1966
29	Autralian Geodetic 1984 Autralia & Tasmania	AUSTR84	AUSTRALIAN1984
30	Ayabelle Lighthouse - Djibouti	DJIBOUT	AYABELLEDJIBO
31	Bellevue (IGN) Efate & Erromango Islands	BELLVUE	BELLEVEFATE
32	Bermuda 1957 - Bermuda	BERMUDA	BERMUDA1957
33	Bissau - Guniea - Bissau	BISSAU	BISSAUGUINEA
34	Bogota Observatory - Colombia	BOGOTA	BOGOTACOLOMBI
35	Bukit Rimpah Indonesia (Bangka & Belitung Islands	BUKITRI	BUKITRIMPAH
36	Camp Area Astro Antarctica (McMurdo Camp Area)	ANTARCT	CAMANTARCTICA
37	Campo Inchauspe - Argentina	ARGENTI	CAMPARGENTIA
38	Canton Astro 1966 - Phoenix Islands	PHEONIX	CANTON66
39	Cape - South Africa	SAFRICA	CAPESAFRICA
40	Cape Canaveral - Bahamas, Florida	CANAVEL	CAPEBAHAMFLO
41	Carthage - Tunisia	TUNISIA	CARTHAGETUNIS
42	Chaham Island Astro 1971 New Zealand (Chatham Island)	CHATHIS	CHATHAMIS1971
43	Chua Astro - Paraguay	PARAGUY	CHUAPARAGUAY
44	Corrego Alegre - Brazil	BRAZIL	CORREGOBRAZIL
45	Dabola - Guinea	GUINEA	DABOLAGUNEA
46	Djakarta (Batavia) Indonesia (Sumatra)	DJAKARTA	DJAKARTAINDON

47	DOS 1968 New Georgia Islands (Gizo Islands)	GIZOISL	DOS1968GIZOIS
48	Easter Island 1967 - Easter Island	EASTISL	EASTERISL1967
49	European 1950 MEAN FOR Austria, Belgium, Denmark, Finland, France, West Germany, Gibralter, Greece, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland	EU19501	EUROPE19501
50	European 1950 MEAN FOR Austria, Denmark, France, West Germany, Netherlands, Switzerland	EU19502	EUROPE19502
51	European 1950 MEAN FOR Iraq, Isreal, Jordan, Lebanon, Kuwait, Saudi, Arabia, Syria.	EU19503	EUROPE19503
52	European 1950 - Cyprus	EU19504	EUROPE19504
53	European 1950 - Egypt	EU19505	EUROPE19505
54	European 1950 England, Channel Islands, Ireland, Scotland, Shetland Islands	EU19506	EUROPE19506
55	Eropean 1950 - Finland, Norway	EU19507	EUROPE19507
56	European 1950 - Greece	EU19508	EUROPE19508
57	European 1950 - Iran	EU19509	EUROPE19509
58	European 1950 - Italy (Sardinia)	EU195010	EUROPE195010
59	European 1950 - Italy (Sicily)	EU195011	EUROPE195011
60	European 1950 - Malta	EU195012	EUROPE195012
61	European 1950 - Portugal, Spain	EU195013	EUROPE195013
62	European 1979 MEAN FOR Austria, Finland, Netherlands, Norway, Spain, Sweden, Switzerland	EUR1979	EUROPE1979
63	Fort Thomas 1955 Nevis, St. Kitts (Leeward Islands)	FTTHOM	FTTHOMAS
64	Gan 1970 - Republic of Maldives	GAN1970	GAN1970MALDI
65	Geodetic Datum 1949 - New Zealand	NEWZEAL	GEOD49NEWZEAL

66	Graciosa Base SW 1948 Azores (Faial, Graciosa, Pico, Sao Jorge, Terciera)	AZORES	GRACIOSAZORES
67	Guam 1963 - Guam	GUAM	GUAM1963
68	Gunung Segara - Indonesia (Kalimantan)	INDONES	GUNUNGSEGARA
69	GUX 1 Astro - Guadalcanal Island	GUADISL	GUX1ASTRO
70	Herat North - Afganistan	AFGHAN	HERATNORTH
71	Hjorsey 1955 - Iceland	ICELAND	HJORSEY1955
72	Hong Kong 1963 - Hong Kong	HONGKNG	HONGKONG1963
73	Hu-Tzu-Shan - Taiwan	TAIWAN	HUTZUSHAN
74	Indian - Bangladesh	BANGLAD	INDIANBANGLAD
75	Indian - India, Nepal	NEPAL	INDIANINDIANEP
76	Indian 1954 - Thailand, Vietnam	54THAIL	INDIAN1975THA
77	Indian 1975 - Thailand	75THAIL	INDIAN1975THA
78	Ireland 1965 - Ireland	IRELAND	IRELAND1965
79	ISTS 073 Astro 1968 South Georgia Islands	SGEORGA	ISTS061AS1968S
80	ISTS 073 Astro 1969 - Diego Garcia	DIEGOGA	ISTS073AS1969
81	Johnston Island 1961 - Johnston Island	JOHNSTN	JOHNSTON1961
82	Kandawala - Sri Lanka	SRILANK	KANDAWALASRIL
83	Kerguelen Island 1949	KERGUIS	KERGUELEN1949
84	Kertau 1948 - West Malaysia & Singapore	WESTMAL	KERTAU1948
85	Kusaie Astro 1961 - Cayman Brac Island	CAYBRAC	KUSAIEAST1951
86	L. C. 5 Astro 1961 - Cayman Brac Island	CAYBRAC	LC5ASTRO1961
87	Leigon - Ghana	GHANA	LEIGONGHANA
88	Liberia 1964 - Liberia	LIBERIA	LIBERIA1964
89	Luzon - Philippines (Excluding Mindanao)	LUZON1	LUZONPHILIPP1
90	Luzon - Philippines (Mindanao)	LUZON2	LUZONPHILLIPP2
91	Maha 1971 - Mahe Island	MAHAISL	MAHA1971
92	Massawa - Ethio[ia (Eritrea)	ETHIOPI	MASSAWAETHIOP
93	Merchich - Morocco	MOROCCO	MERCHICHMOROC
94	Midway Astro 1961 - Midway Islands	MIDWYIS	MIDWAYAS1961

95	Minna - Cameroon	CAMERN	MINNACAMEROON
96	Minna - Nigeria	NIGERIA	MINNACAMEROON
97	Montserrat Island Astro 1958 Montserrat (Leeward Islands)	MONSERT	MONTSERIS1958
98	M'Poraloko - Gabon	GABON	MPORALOKOGAB
99	Nahrwan - Oman (Masirah Island)	OMAN	NAHRWANOMAN1
100	Nahrwan - Saudi Arabia	SAUDIAR	NAHRWANSAUDI2
101	Nahrwan - United Arab Emirates	UAE	NAHRWANUEA3
102	Naparima BWI - Trinidad & Tobago	TR&TOB	NAPARIMABWI
103	North American 1927 MEAN FOR Antigua, Barbados, Barbuda, Caicos Islands, Cuba, Dominican Republic, Grand Cayman, Jamaica, Turks Islands	NAMER1	NAMER19271
104	North American 1927 MEAN FOR Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua	NAMER2	NAMER19272
105	North American 1927 - MEAN FOR Canada	NAMER3	NAMER19273
106	North American 1927 MEAN FOR CONUS	NAMER4	NAMER19274
107	North American 1927 MEAN FOR CONUS (East Mississippi River) including Louisiana, Missouri, Minesota	NAMER5	NAMER19275
108	North American 1927 MEAN FOR CONUS (West of Mississippi River)	NAMER6	NAMER19276
109	North American 1927 - Alaska	NAMER7	NAMER19277
110	North Amerian 1927 Bahamas (Acdept San Salvador Island)	NAMER8	NAMER19278
111	North American 1927 Bahamas (San Salvador Island)	NAMIR9	NAMER19279
112	North American 1927 Canada (Alberta, British Columbia)	NAMIR10	NAMER192710
113	North Ameria 1927 Canada (Manitoba, Ontario)	NAMIR11	NAMER192711

114	North America 1927 Canada (New Brunswick, Newfoundland, Nova Scotia, Quebec)	NAMER12	NAMER192712
115	North America 1927 Canada (Northwest Territories, Saskatchewan)	NAMER13	NAMER192713
116	North America 1927 - Canada (Yukon)	NAMER14	NAMER192714
117	North American 1927 - Canal Zone	NAMER15	NAMER192715
118	North American 1927 - Cuba	NAMER16	NAMER192716
119	North American 1927 Greenland (Hayes Peninsula)	NAMER17	NAMER192717
120	North American 1927 - Mexico	NAMER18	NAMER192718
121	North American 1983 Alaska, Canada, CONUS	NAMER19	NAMER192719
122	North American 1983 Central America, Mexico	NAMER20	NAMER192720
123	Observatorio Metereo 1939 Azores (Corvo & Flores Islands)	AZORES	OBSERVMET1939
124	Old Egyptian 1907 - Egypt	EGYPT	OLDEGYPT1907
125	Old Hawaiian MEAN FOR Hawaii, Kauai, Maui, Oahu	OHAWN1	OLDHAWN1
126	Old Hawaiian - Hawaii	OHAWN2	OLDHAWN2
127	Old Hawaiian - Kauai	OHAWN3	OLDHAWN3
128	Old Hawaiian - Maui	OHAWN4	OLDHAWN4
129	Old Hawaiian - Oahu	OHAWN5	OLDHAWN5
130	Oman - Oman	OMAN	OMAN
131	Ord. Survey G. Britain 1936 MEAN FOR England, Isle of Man, Scotland, Shetland Islands, Wales	OSGB1	OSGB19361
132	Ord. Survey G. Britain 1936 - England	OSGB2	OSGB19362
133	Ord. Survey G. Britain 1936 England, Isle of Man, Wales	OSGB3	OSGB19363
134	Ord. Survey G. Britain 1936 Scotland, Shetland Islands	OSGB4	OSGB19364

135	Ord. Survey G. Britain 1936 - Wales	OSGB5	OSGB19365
136	Pico de las Nieves - Canary Islands	CANISL	PICONIEVES
137	Pitcairn Astro 1967 - Pitcairn Islands	PITISL	PITCAIRN1967
138	Point 58 MEAN FOR Burkina Faso & Niger	POINT58	POINT58
139	Pointe Noire 1948 - Congo	CONGO	POINTEN1948
140	Porto Santo 1936 Porto Santo, Madeira Islands	PSANTO	POSANTO1936
141	Provisional S. American 1956 MEAN FOR Bolivia, Chile, Colombia, Ecuador, Guyana, Peru, Venezuela	SAMER1	SAMER19561
142	Provisonal S. American 1956 - Bolivia	SAMER2	SAMER19562
143	Provisional S. American 1956 Chile (Southern, Near 43^{0}S)	SAMER3	SAMER19563
144	Provisional S. American 1956 Chile (Southern, Near 43^{0}S)	SAMAR4	SAMER19564
145	Provisonal S. American 1956 - Columbia	SAMAR5	SAMER19565
146	Provisonal S. American 1956 - Ecuador	SAMAR6	SAMER19566
147	Provisonal S. American 1956 - Guyana	SAMER7	SAMER19567
148	Provisonal S. American 1956 - Peru	SAMER8	SAMER19568
149	Provisonal S. American 1956 - Venezuela	SAMER9	SAMER19569
150	Provisional S. Chilean 1963 Chile (South , Near 53^{0}S) (Hito XVIII)	CHILE	SCHILE1963
151	Puerto Rico - Puerto Rico, Virgin Islands	PUERTOR	PUERTORICO
152	Qatar National - Qatar	QATAR	QATARNATIONAL
153	Qornoq - Greenlan (South)	GREENDS	QORNOQGREENLD
154	Reunion - Mascarene Islands	MASCISL	REUNIONMASCA
155	Rome 1940 - Italy (Sardinia)	SARDINI	ROME 1940ITALY
156	Santo (DOS) 1965 Espirito Santo Islands	ESPIRIT	SANTODOS1965
157	Sau Braz Azores (Sao Miguel, Santa Maria Islands	SAOBRAZ	SAOBRAZAZORES

158	Sapper Hill 1943 - East Falkland Islands	EFALKLD	SAPPERHILL43
159	Schwareck - Namibia	NAMIBIA	SCHWARZECK
160	Selvagem Grande - Salvage Islands	SALVAGI	SELVAGEMGRAND
161	SGS 85 - Soviet Geodetic System 1985	SGS85	SGS85SOVIET85
162	South American 1969 MEAN FOR Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Trinidad & Tobago, Venezuela	SAMER10	SAMER196910
163	South American 1969 - Argentina	SAMER11	SAMER196911
164	South American 1969 - Bolivia	SAMER12	SAMER196912
165	South American 1969 - Brazil	SAMER13	SAMER196913
166	South American 1969 - Chile	SAMER14	SAMER196914
167	South American 1969 - Colombia	SAMER15	SAMER196915
168	South American 1969 - Equador	SAMER16	SAMER196916
169	South American 1969 Ecuador (Baltra, Galapagos)	SAMER17	SAMER196917
170	South American 1969 - Guyana	SAMER18	SAMER196918
171	South American 1969 - Paraguay	SAMER19	SAMER196919
172	South American 1969 - Peru	SAMER20	SAMER196920
173	South American 1969 - Trinidad & Tobago	SAMER21	SAMER196921
174	South American 1969 - Venezuala	SAMER22	SAMER196922
175	South Asia - Singapore	SINGAPR	SOUTHASIASING
176	Tananarive Observatory 1925 Madagascar	MADAG	TANANARIV1925
177	Timbalai 1948 Brunei, East MAlaysia (Sabah, Sarawak)	BRUNEI	TIMBALI1948
178	Tokyo - MEAN FOR Japan, Korea, Okinawa	TOKYO1	TOKYO1
179	Tokyo - Japan	TOKYO2	TOKYO2
180	Tokyo - Korea	TOKYO3	TOKYO3
181	Tokyo - Okinawa	TOKYO4	TOKYO4
182	Tristan Astro 1968 - Tristan da Cunha	TRISTAN	TRISTANAST1968
183	Viti Levu 1916 - Fiji (Viti Levu Island)	VITLEVU	VITILEVU1916

184	Wake-Eniwetok 1960 - Marchall Islands	WAKEENI	WAKEENIWE1960
185	Wake Island Astro 1952- Wake Atoll	WAKEATO	WAKEASTRO1952
186	WGS 1972 - Global Definition	WGS1972	WGS1972
187	Yacare - Uruguay	YACARE	YACARE
188	Zanderij - Suriname	ZANDERI	ZANDERIJ

Appendix B : NMEA Output Specifications

1 - NMEA 0182 or NMEA 0180 COMPLEX

8 DATA bits, D7 bit = 1, 1 STOP bit, 1200 BAUD, even parity, rate 4 s.

2 - NMEA 0183 Version 2.1

8 DATA bits, D7 bit = 0, 1 STOP bit, 4800 BAUD, no parity

Sentences transmitted:

-APB Automatic pilot format B

-BWC Waypoint, Range and bearing

-GLL Geographic Position - Latitude/Longitude

-GGA Global Positioning System Fix Data

-RMB Recommended Min. Navigation Information

-RMC Recommended Min. Specific GPS/TRANSIT Data

-VTG Speed and Course

-ZTG UTC and Time to Destination Waypoint

Sentence information is shown on the following pages.

-APB Automatic pilot format B

$APB, A, A, x.x, a, N, A, A, x.x, a, c--c, x.x, a, x.x, a, x.x, a *hh<CR><LF>

- Heading to steer to destination waypoint magnetic or true
- Bearing, Present position to destination magnetic or true
- Destination waypoint ID
- Bearing origin to waypoint magnetic or true
- Status: A = perpendicular passed at waypoint
- Status: A = arrival circle entered
- XTE units, nautical miles
- Direction to steer L/R
- Magnitude of XTE (cross track error)
- Status: A = Data valid or not used, V = Loran-C cycle lock warning flag
- Status: A = Data Valid
  V = Loran-C blink or SNR warning
  V = General warning flag for other navigation systems when a reliable fix is not available

-BWC Bearing and Distance to Waypoint

$BWC, hhmmss, llll.lll, a, yyyyy.yyy, a, x.x, T, x.x, M, x.x, N, c--c *hh<CR><LF>

- Waypoint ID
- Distance, nautical miles
- Bearing, degrees magnetic
- Bearing, degrees true
- Waypoint longitude, E/W
- Waypoint latitude, N/S
- UTC of observation

-RMB Recommended Minimum Navigation Information

$RMB, A, x.x, a, c--c, c--c, llll.lll, a, yyyyy.yyy, a, x.x, x.x, x.x, A *hh<CR><LF>

- Data status: A = Data valid, V = Navigation receiver warning
- Cross track error, nautical miles
- Direction to steer, L/R
- Origin waypoint ID
- Destination waypoint ID
- Destination waypoint latitude, N/S
- Destination waypoint longitude, E/W
- Range to destination waypoint, nautical miles
- Bearing to destination, degrees true
- Destination closing velocity, knots
- Arrivial Status: A = arrival circle entered or perpendicular passed
  V = not entered / passed

-RMC Recommended Minimum Specific GPS?TRANSIT Data

$RMC, hhmmss, A, llll.lll, a, yyyyy.yyy, a, x.x, x.x, xxxxxx, x.x, a *hh<CR><LF>

- UTC of position
- Status: A = valid data, V = Navigation receiver warning
- Latitude, N/S
- Longitude, E/W
- Speed over ground, knots
- Course over ground, degrees true
- Date: dd|mm|yy
- Magnetic variation, E/W

-GGA Global Positioning System Fix Data

$GGA, hhmmss,llll.lll,a, yyyyy.yyy, a, x, xx, x.x, x.x, M, x.x, M, x.x, xxxx *hh<CR><LF>

- UTC of position
- Latitude, N/S
- Longitude, E/W
- GPS quality indicator
- Number of satellites in use
- Horizontal dilution of position
- Antenna altitude re: mean-sea level (geoid)
- Units of antenna altitude, meters
- Geoidal separation
- Units of geoidal separation, meters
- Age of Differential GPS data
- Differential reference station ID

-GLL Geographic Position - Latitude/Lingitude

$GLL, llll.lll, a, yyyyy.yyy, a, hhmmss, A *hh<CR><LF>

- Latitude, N/S
- Longitude, E/W
- UTC of position
- Status: A= valid, V = not valid

-VTG Speed and Course

$VTG, x.x, T, x.x, M, x.x, N, x.x, K *hh<CR><LF>

Speed over ground, km/hr
Speed over ground, knots
Course, degrees magnetic
Course, degrees true

-ZTG UTC and Time to Destination Waypoint

$ZTG, hhmmss, hhmmss, c--c *hh<CR><LF>

Destination waypoint ID
Time to go, hh = 00 to 99
UTC of observation

Document Number: 81145-1

Raytheon Electronics

Apelco

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