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INTRODUCTION TO GPSPLUS

The GPSPlus display unit processes the information from its accurate 12 channel GPS antenna/receiver unit or from an additional LORAN-C or DECCA receiver. The unit can select between either of the two input devices to display accurate positional information, along with waypoints, routes and information concerning GPS satellites, LORAN-C T.D.'s or DECCA L.O.P.'s.

GPSPLUS DISPLAY UNIT

The GPSPlus display unit's six keys and control knob have the following operating functions and features:

POS key - Positional Data

- Position as Latitude and Longitude to three decimal places.
- Course and Speed over the ground, (COG & SOG).
- Universal Time Co-ordinate (UTC), local time and date.
- Local sea current information, direction and speed.
- Satellite information, LORAN-C T.D's, DECCA L.O.P's.
- Use with the SETUP key for setting and adjusting parameters.

WPT/MOB/MARK key - Waypoint, Man Overboard & Mark

- Waypoint library for up to 250 waypoints.
- One-touch Man Overboard (MOB) alarm with range and bearing to MOB event.
- 20 One-touch instant entry "Mark" waypoints.
- Entry of waypoint latitude and longitude.
- Entry of present position as a waypoint.
- Name waypoints using up to 8 characters.
- Copying from one library waypoint to another.
- List and sort by waypoint name or number.
- Entry by range and bearing from present position.
- Erase waypoints from the library.
- "Download" waypoints via NMEA interface.
- "Uploading" waypoints from another NMEA position fixer.
- "Net download" waypoints to another GPSPlus display unit.
- Use with the SETUP key for setting and editing waypoints.

NAV key - Navigational Data

The NAV key only gives navigational data when a waypoint or route (sailplan) has been entered and selected.

- Bearing and distance to waypoint; Magnetic or True bearings, Nautical or Statute miles, Rhumb-line or Great Circle calculations.
- Course to steer (CTS).
- Cross track error (XTE) with off track and direction to steer indicator.
- Time to go (TTG) to waypoint.
- Velocity made good (VMG) to waypoint.
- Estimated time of arrival (ETA) at waypoint.
- Forward or reverse route selection.
- Use with the SETUP key for selecting target waypoint or route to be used for navigation.

ROUTE key - Route defining and editing

- Route library for up to 10 routes, with up to 40 waypoints per route.
- Route planning page gives range and bearing data between any two library waypoints.
- Edit existing routes; insert and delete waypoints from any selected route.
- "Download" route data via NMEA.
- Use with the SETUP key for defining and editing routes.

SETUP key - Used with other keys for setting and adjusting data. Refer to the SETUP section of the handbook for a full list of setups.

LIGHTS/ENTER key - Adjusts the illumination level, and when used with the SETUP key memorises any setting and adjustments that have been made.

▼ STEP ▲ knob - Selects and lists functions, waypoints, routes and is used to adjust values and data. When a number or name is flashing the **▼ STEP ▲** knob can be turned to alter the flashing display. Press the ENTER key to confirm your selection.

GPSPlus ALARMS

The GPSPlus display has alarms that can be set and adjusted to suit your requirements. When an alarm condition is met the internal alarm buzzer will sound and the display will indicate which alarm has been triggered. When the GPSPlus is part of a fully integrated Network Instrument system the alarm conditions will be displayed and sounded by all Network display units.

The following alarms can be set and adjusted:

- Waypoint arrival alarm with automatic waypoint advance.
- Anchor watch alarm.
- HDOP alarm (GPS use only).
- Cross track error alarm.
- Waypoint zone alarm.

The GPSPlus display will also repeat alarms from Network instruments when part of an integrated Network System.

Refer to the SETTING UP THE GPSPlus for details on setting and adjusting the alarms.

INTRODUCTION

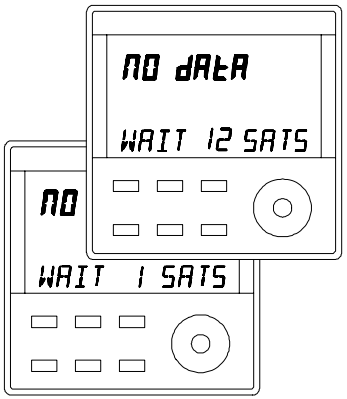
After installation the GPSPlus can be used immediately with minimal setting up for basic operation. To use the advanced features of the GPSPlus display it is necessary to program various parameters and enter waypoints and routes into the units library. These will be discussed in later sections of this handbook.

SWITCHING ON

The GPSPlus will power up and start receiving and processing the signals from the satellites when the switch or contact breaker for your instruments supply is turned on. The display unit does not have an ON/OFF switch.

INITIAL DISPLAYS

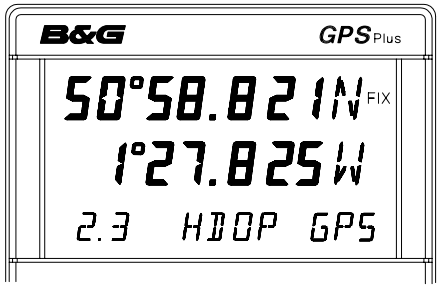
On power-up the unit will show its satellite receiving status:



When a brand new unit is powered up for the first time, or if the unit has moved more than 1500km since it was last powered up, it may take up to an hour to acquire enough satellites for a fix.

On subsequent power-ups the GPSPlus should quickly obtain enough satellites for a fix, and the WAIT message will only be displayed momentarily. If after a period of 15 minutes the display still shows NO DATA then check your installation. If everything seems to be in order consult your dealer.

The GPSPlus system requires only three satellites to obtain a `fix'. When the unit has obtained a fix (in GPS mode) the display will show the following:

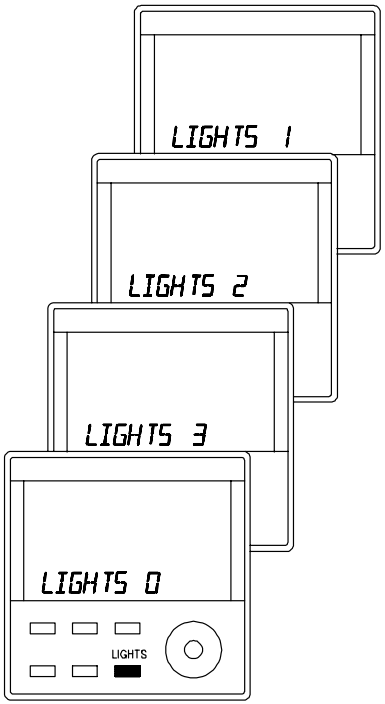


If the GPSPlus display has not been programmed with any navigational data (i.e. waypoints or routes) only the POS key gives useful information.

Your GPSPlus has the ability to be used with a secondary position fixing device, either a LORAN-C or a DECCA. The unit will initially power-up using its own GPS antenna/receiver unit. Selecting LORAN-C or DECCA receiver will be explained later in this manual. Once selected the GPSPlus will always power-up using the selected receiver.

USING THE LIGHTS KEY

The GPSPlus display unit has 3 levels of illumination and off, controlled by the LIGHTS key. It also changes the illumination level of the key legends. The LIGHTS key is always illuminated so even in complete darkness the key can be located.



- LIGHTS 0 OFF
- LIGHTS 3 High
- LIGHTS 2 Medium
- LIGHTS 1 Low

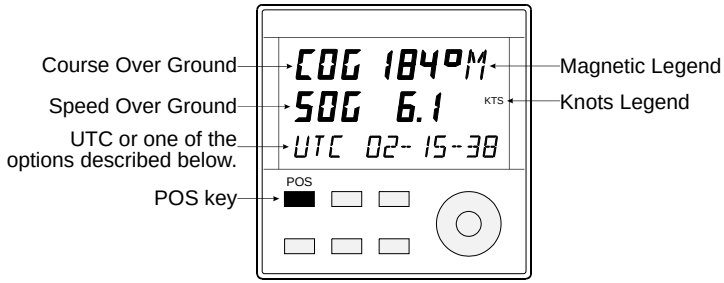
NOTES ABOUT ENTERING DATA

- When a number or name is flashing the ▼ **STEP** ▲ knob can be turned to alter the flashing display, without the need to press any other keys. To select the value that is currently flashing, press the ENTER key.
- When in a SETUP mode, if a key has not been pressed for a period of 30 seconds the SETUP sequence will be exited automatically.
- The ▼ **STEP** ▲ knob increases values when turned clockwise and decreases values when turned anti-clockwise.
- To end any SETUP sequence and return to normal operation, press any key except ENTER or the ▼ **STEP** ▲ knob.

USING THE POS KEY

Press the POS key to display the following pages:

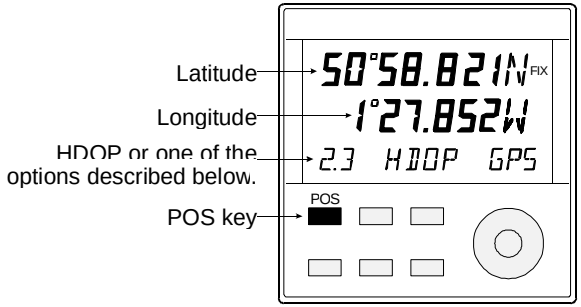
PAGE 1 PRESENT POSITION



The text line at the bottom of the display shows different information depending upon which type of position fixer is being used for positional data. Text display variations are as follows:

HDOP A figure of merit where the lower the number the better the accuracy of the fix (GPS only). This is the normal display when using the GPSPlus system.
GPS Some GPS receivers do not output HDOP data.
GPS DIF Differential GPS.
LORAN-C Present position from Loran-C chain.
DECCA Present position from Decca chain.
I I Integrated Instruments.
GPS DR The unit has not received valid data and is now using dead reckoning. A speed and heading input are required from the Network System.

PAGE 2 COG, SOG and UTC



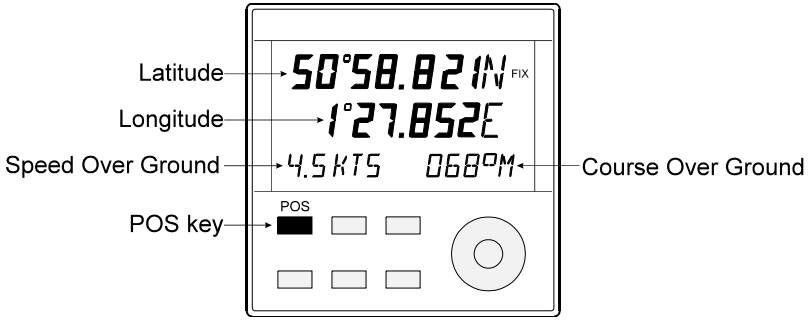
Course Over Ground, Speed Over Ground & Universal Time Co-ordinate (UTC has taken over from GMT as the World Standard Time).

The data is displayed (by default) in the following units:
COG in degrees Magnetic (***M***). User selectable to True (***T).***
SOG in Knots (***KTS***). User selectable to Miles per Hour (***MPH***) or Kilometres per Hour (***KH***). The text line can be configured to display different time and date information as follows:

LT Local Time, this can be set as required.
DATE This can be set as required.
UTC/DATE Alternating display of UTC and Date.
LT/DATE Alternating display of Local Time and Date.

For details about changed the default displays please refer to the Setup section of this manual.

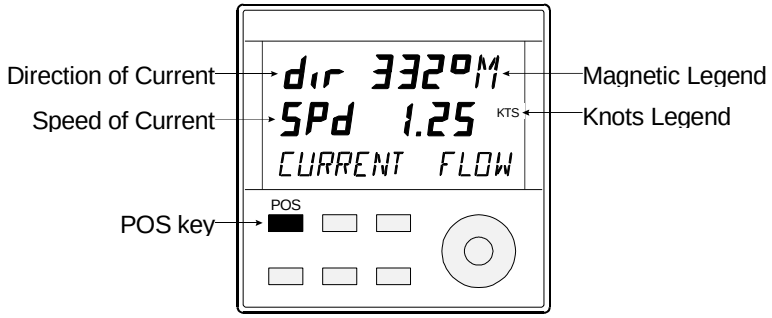
PAGE 3 PRESENT POSITION, COG AND SOG



Latitude and Longitude of present position on the main display and SOG and COG.

NOTE: The displayed values for SOG and COG will be in the same units as selected for the previous page

PAGE 4 CURRENT FLOW



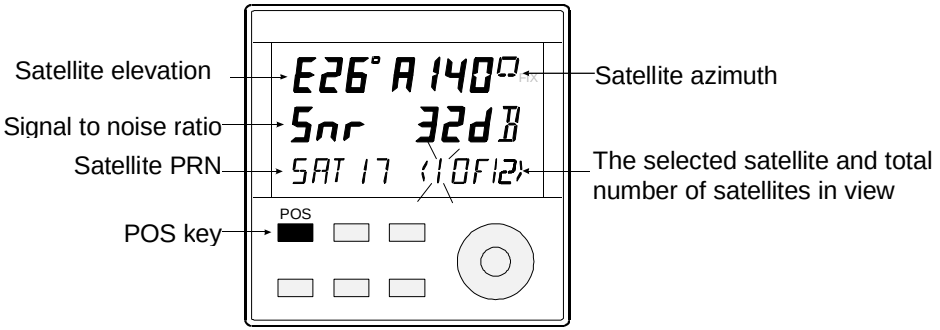
The local influences of sea current on the vessel.
Direction of sea current, in degrees Magnetic(*M*) or True(*T*).
Speed of sea current, in knots (*KTS*), kilometres/hour (*KPH*), or miles/hour (*MPH*).

NOTE: This information can only be displayed when the GPSPlus is receiving speed and heading data from an integrated Network System.

PAGE 5 RECEIVER INFORMATION PAGES

One of three different pages will be displayed depending upon the receiver selected.

GPS SATELLITE INFORMATION:



The fifth POS key page displays information about the receiver that has been selected to supply positional data (see SETUPS ON THE GPSPlus to select different receiver inputs).

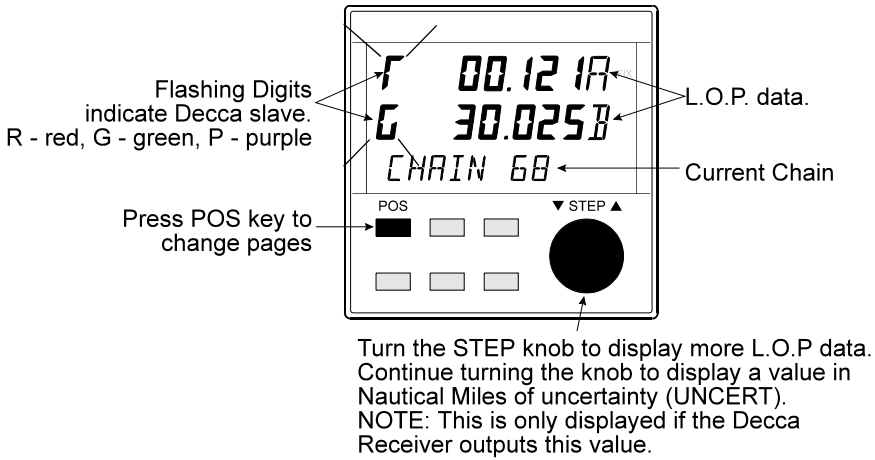
Data can be displayed about each satellite being tracked by the GPSPlus.

Satellite signal to noise ratio is displayed in dB: the higher the number the better the signal strength.

The satellite number is the satellite transmitted PRN.

When the SETUP control knob is turned, information is displayed about each satellite being tracked.

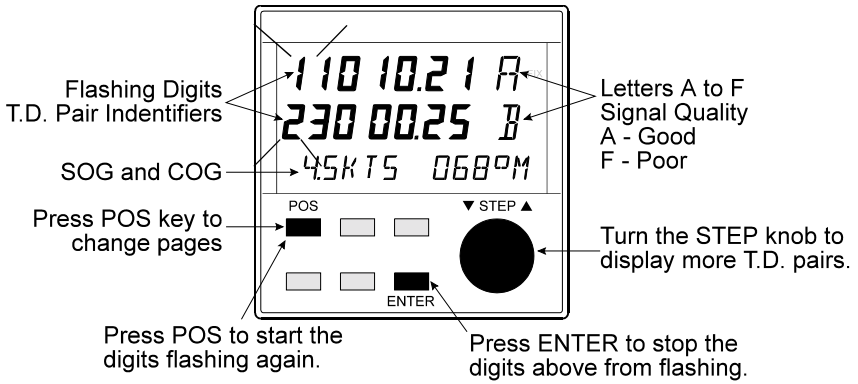
DECCA L.O.P. AND CHAIN INFORMATION:



Turn the ▼ **STEP** ▲ knob to display more L.O.P. data.

Continue turning the ▼ **STEP** ▲ knob to display the current chain or a value in Nautical Miles of uncertainty ***UNCERT*** (if output by the Decca receiver) on the LCD text line.

LORAN-C T.D. INFORMATION:



The text line displays ***SOG*** and ***COG***.

If the ENTER key is pressed the identifiers will stop flashing, press the **POS** key to make them flash again.
Turn the t **STEP** s knob to display more T.D. pairs.

INTRODUCTION TO WAYPOINTS

A "waypoint" is simply a point you wish to go to. It can be an anchorage, a point off a landmark, buoys, harbour entrances or any position at sea. Whatever the waypoint, it is necessary to know its position in latitude and longitude or determine its range and bearing from your present position. This can be taken directly from your chart.

The GPSPlus display can store 250 waypoints in its memory, this is commonly called a waypoint library. The waypoints are given unique numbers, and can also be named, so they can be recalled when required. After a time your waypoint library will contain all your most commonly used navigational points. The waypoints in the library can be edited if required, i.e. copied, named and deleted. This will be necessary if you have used all of the 250 waypoint library locations. Until at least one waypoint has been entered into the GPSPlus library defining a route the advanced navigational features obtained by pressing the NAV key are not available.

ENTERING WAYPOINT DATA

Waypoints can be entered into the waypoint library of the GPSPlus unit in many ways. The following is a list of these methods:

1. Mark facility, one-touch waypoint entry.
2. Entry of waypoint latitude and longitude.
3. Entry of present position as a waypoint.
4. Copying from a library waypoint to another.
5. Entry by range and bearing from another waypoint.
6. Copying or "uploading" from another position fixer.

NAMING WAYPOINTS

It is possible to give any waypoint a name. This could be the charted name of buoys, navigational markers, or any unique name you wish to use. The name must not exceed eight characters in length and can be any combination of letters, numbers, spaces and the symbols <, >, /. All spaces count as characters. For example:

BUOY, <BUOY>, 123/BUOY, B U O Y

The following words are reserved for use by the GPSPlus unit and can not be used as waypoint names:

INSERT DELETE START END

All waypoints can be named before or after their position has been entered. This allows you to generate a list of library names and then at a later date enter the latitude and longitude. The waypoint library can be sorted and listed either numerically (default) from WPT 1 to WPT 250 or alphabetically by name. Setting this feature is explained later.

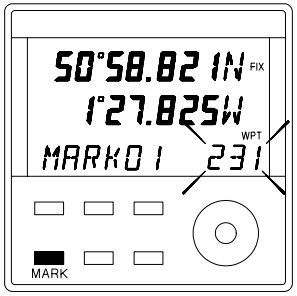
TRANSFER OF WAYPOINT DATA

It is possible to copy the waypoint library from the GPSPlus display to another or any NMEA device. This is called "downloading". There are two methods which will be explained later. The reverse process, when waypoints are copied from another GPSPlus display is called "uploading".

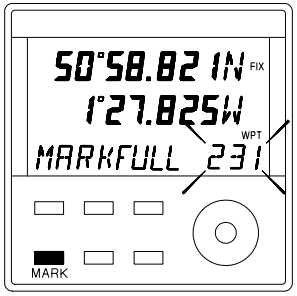
MARK FEATURE - INSTANT WAYPOINTS

The Mark feature allows 20 waypoints to be entered by using a single key, the **MARK** key. This enables pots, drift nets, and other points of interest along your present course to be instantly memorised. Pressing the **MARK** key enters your present position as a ***MARK*** into a reserved area of the waypoint library. These mark waypoints are automatically allocated the waypoint library names ***MARK01*** to ***MARK20*** and are waypoint numbers ***WPT 231*** to ***WPT 250***.

To enter a mark simply press the **MARK** key twice.



The first press will display the waypoint library, the second and further presses enter the MARKS. This can be carried out 20 times.



After all 20 mark library locations have been used the LCD will show ***MARKFULL***.

Mark waypoints can be used exactly like any other waypoint that you have entered using the methods described in the following pages.

If the Marks are of particular interest then it is good practice to copy them to other waypoint library locations, name them for easy identification, and then erase the original MARK. By erasing the original more MARKs can then be entered, because once the MARK library locations are full no more MARKs can be entered. These procedures are explained in this section of the handbook.

MARKs can be used to define a route. If on a passage you enter MARKs into the library, and then use them in the correct order to define a route, they can be used in reverse to lead the way home. These procedures are explained in USING ROUTES, later in this handbook.

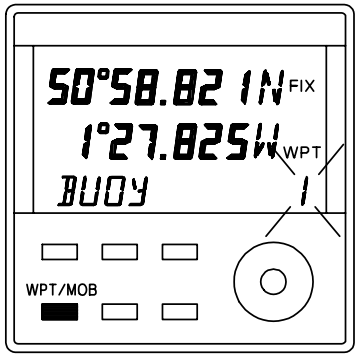
IMPORTANT NOTE: If MARK waypoints have been used to create a route ensure that the MARK latitude and longitude is as you expect. If the MARKs have been erased and then re-entered (by pressing the MARK key) the MARK latitude and longitude will have changed and the route could be entirely different. **THIS COULD ENDANGER YOU, YOUR CREW AND YOUR VESSEL. CHECK BEFORE YOU ENGAGE THE ROUTE.**

It is suggested that you use a table to record your MARK waypoints, it will help you identify and record them in the future. The following pages could be copied for this purpose or a table of your own design could be used.

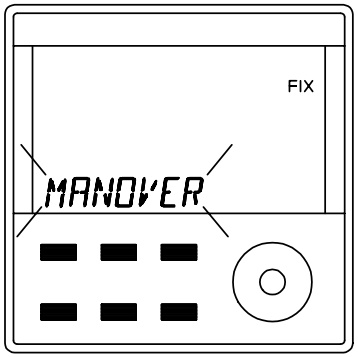
MARK NUMBER	MARK POSITION	MARK REFERENCE	MARK INFORMATION
MARK01 [WPT 231]	*LAT :* *LONG :*	*TIME :* *DATE:*	
MARK02 [WPT 232]	*LAT :* *LONG :*	*TIME :* *DATE:*	
MARK03 [WPT 233]	*LAT :* *LONG :*	*TIME :* *DATE:*	
MARK04 [WPT 234]	*LAT :* *LONG :*	*TIME :* *DATE:*	
MARK05 [WPT 235]	*LAT :* *LONG :*	*TIME :* *DATE:*	
MARK06 [WPT 236]	*LAT :* *LONG :*	*TIME :* *DATE:*	
MARK07 [WPT 237]	*LAT :* *LONG :*	*TIME :* *DATE:*	
MARK08 [WPT 238]	*LAT :* *LONG :*	*TIME :* *DATE:*	
MARK09 [WPT 239]	*LAT :* *LONG :*	*TIME :* *DATE:*	
MARK10 [WPT 240]	*LAT :* *LONG :*	*TIME :* *DATE:*	

MARK NUMBER	MARK POSITION	MARK REFERENCE	MARK INFORMATION
MARK11 [WPT 241]	*LAT :* *LONG :*	*TIME :* *DATE:*	
MARK12 [WPT 242]	*LAT :* *LONG :*	*TIME :* *DATE:*	
MARK13 [WPT 243]	*LAT :* *LONG :*	*TIME :* *DATE:*	
MARK14 [WPT 244]	*LAT :* *LONG :*	*TIME :* *DATE:*	
MARK15 [WPT 245]	*LAT :* *LONG :*	*TIME :* *DATE:*	
MARK16 [WPT 246]	*LAT :* *LONG :*	*TIME :* *DATE:*	
MARK17 [WPT 247]	*LAT :* *LONG :*	*TIME :* *DATE:*	
MARK18 [WPT 248]	*LAT :* *LONG :*	*TIME :* *DATE:*	
MARK19 [WPT 249]	*LAT :* *LONG :*	*TIME :* *DATE:*	
MARK20 [WPT 250]	*LAT :* *LONG :*	*TIME :* *DATE:*	

MAN OVERBOARD (MOB) FACILITY

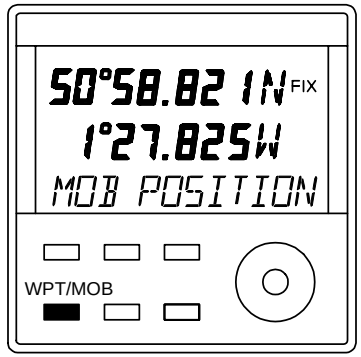


1. Press and Hold the **WPT/MOB** key for 3 seconds.

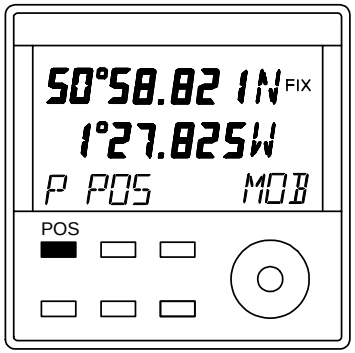


2. The display will flash ***MANOVER*** and the internal alarm will sound. Press any key to silence the alarm.

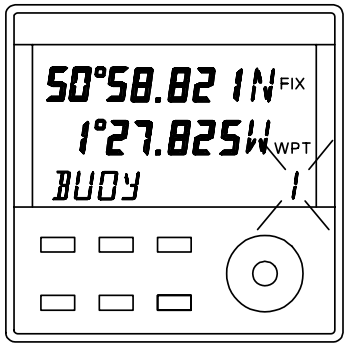
3. The display will now show the range and bearing to the MOB event. This display can also obtained by pressing the NAV key.



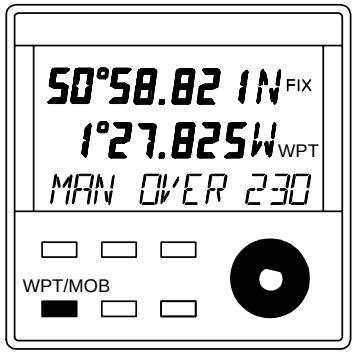
4. Press the WPT/MOB key to display the latitude and longitude of the MOB event.



5. Press the POS key to display current position in latitude and longitude.



6. Press and hold the **MOB/WPT** key for 3 seconds to return to normal operation.



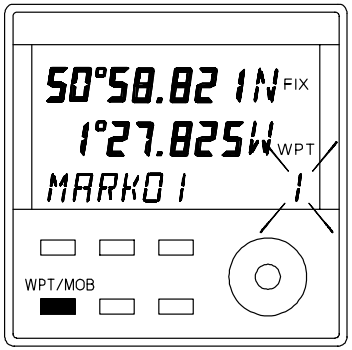
7. The MOB event is stored in the waypoint library as ***WPT 230***.
This waypoint will not be automatically overwritten by another MOB event, so it must be erased from the waypoint library using the waypoint erase facility.

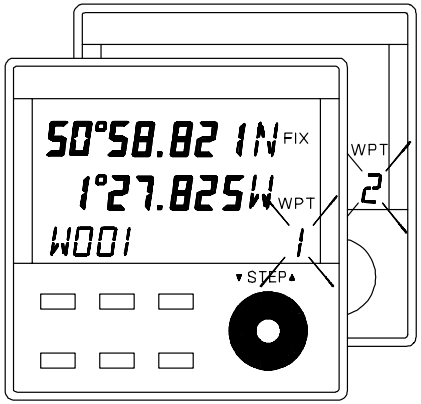
VIEWING THE WAYPOINT LIBRARY

Press the WPT/MOB key to the view the waypoint library. If the WPT/MOB key was the last key that was pressed, the display will show *MARK##* or *MARKFULL* for a few moments.

The flashing number below the *WPT* legend indicates which library location is being viewed (*1* to *250*). By turning the ▼ STEP ▲ knob the flashing number will change selecting each waypoint library location in turn.

If the library location is empty *nOt USEd* will be displayed. When a waypoint library location has been used the latitude and longitude of the waypoint in displayed in degrees and minutes. The waypoint "name" will be displayed to the left of the WPT number. If it has no name then a number with a leading "*W*" will be displayed e.g. *W001*.





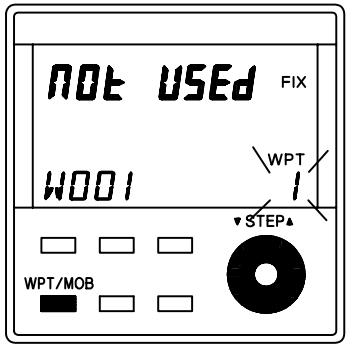
ENTERING AND USING WAYPOINTS

The following pages describe how to use the many waypoint functions in the order they are listed when the SETUP key is pressed. The method of entering and changing data is described in words and diagrams. These will give you an indication of what you might expect to see. B&G reserves the right to change the operation of the instrument without prior notice, so variation may occur.

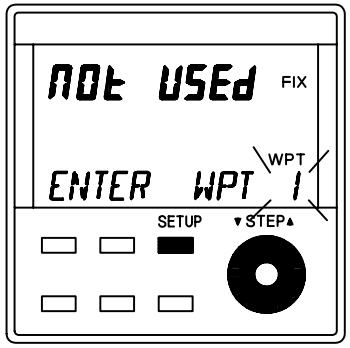
NOTES ABOUT ENTERING WAYPOINT DATA

- When a number or name is flashing the ▼ STEP ▲ knob can be turned to alter the flashing display, without the need to press any other keys.
- When in a SETUP mode, if a key has not been pressed for a period of 30 seconds the SETUP sequence will be exited automatically.
- The ▼ **STEP** ▲ knob increases values when turned clockwise and decreases values when turned anti-clockwise.
- To end any SETUP sequence and return to normal operation, press any key except ENTER or the ▼ **STEP** ▲ knob.

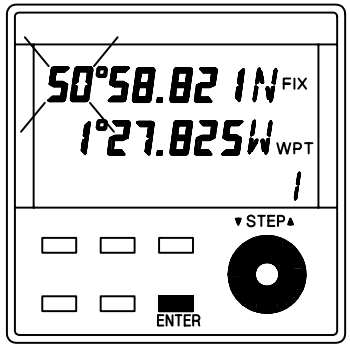
ENTERING WAYPOINTS BY LATITUDE AND LONGITUDE



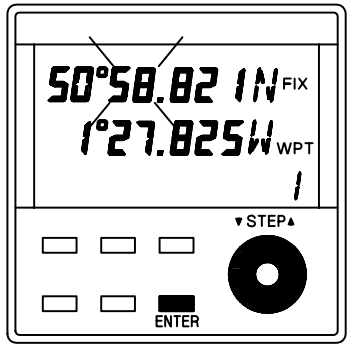
1. Select a point on a chart, determine the latitude and longitude. Press the **WPT/MOB** key.



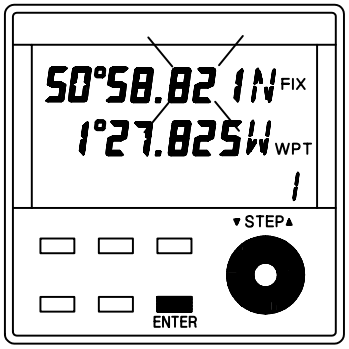
2. Press the **SETUP** key. Turn the ▼ **STEP** ▲ knob to select an empty ***WPT*** number.



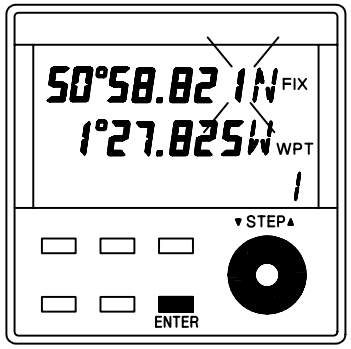
3. Press the **ENTER** key. The DEGREES of latitude will flash.
Use the ▼ **STEP** ▲ knob to change the degrees.



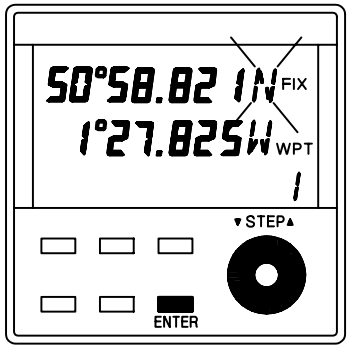
4. Press the **ENTER** key. The MINUTES of latitude will flash.
Use the ▼ **STEP** ▲ knob to change the minutes.



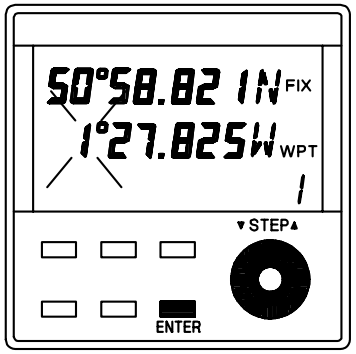
5. Press the **ENTER** key. The 10ths and 100ths of MINUTES will flash.
Use the ▼ **STEP** ▲ knob to change the value.



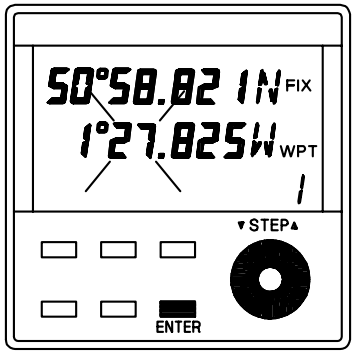
6. Press the **ENTER** key. The 1000ths of MINUTES will flash. Use the ▼ **STEP** ▲ knob to change the value.



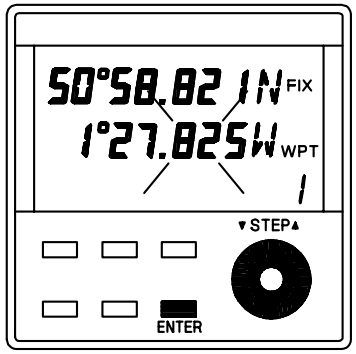
7. Press the **ENTER** key. The ***N*** or ***S*** will flash.
Use the ▼ **STEP** ▲ knob to select ***N*** or ***S***.



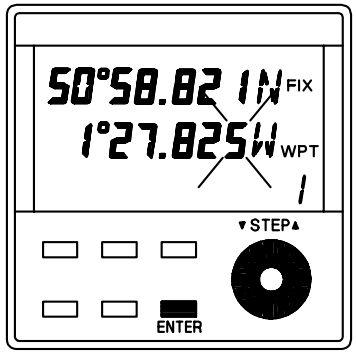
8. Press the **ENTER** key. The DEGREES of longitude will flash.
Use the ▼ **STEP** ▲ knob to change the degrees.



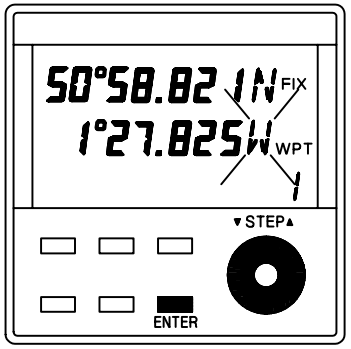
9. Press the **ENTER** key. The MINUTES of longitude will flash.
Use the ▼ **STEP** ▲ knob to change the minutes.



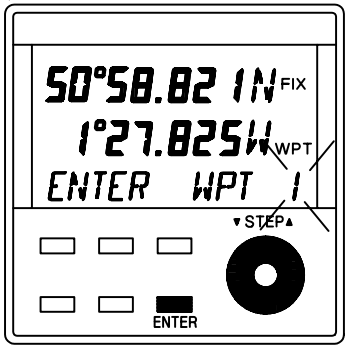
10. Press the **ENTER** key. The 10ths and 100ths of MINUTES will flash.
Use the ▼ **STEP** ▲ knob to change the value.



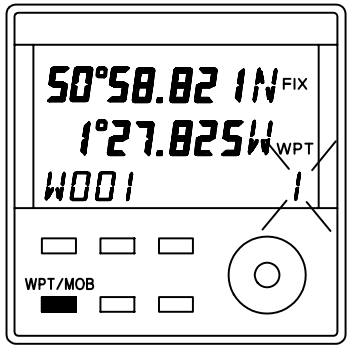
11. Press the **ENTER** key. The 1000ths of MINUTES will flash.
Use the ▼ **STEP** ▲ knob to change the value.



12. Press the **ENTER** key. The ***W*** or ***E*** will flash. Use the ▼ **STEP** ▲ knob to select ***W*** or ***E***.

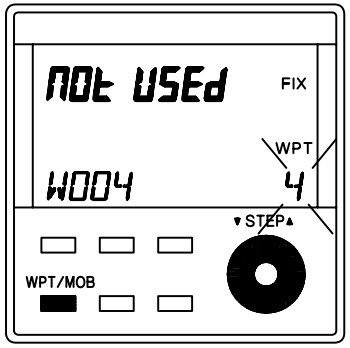


13. Press the **ENTER** key. The waypoint setting will be stored in the library.

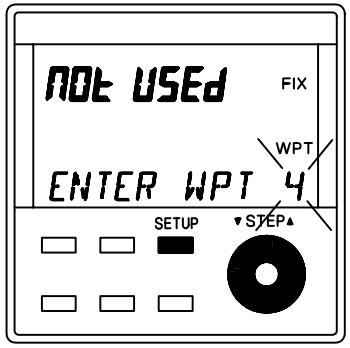


14. Press the **WPT/MOB** key to view the waypoint library.

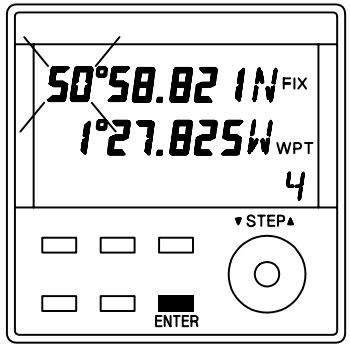
PRESENT POSITION AS A WAYPOINT



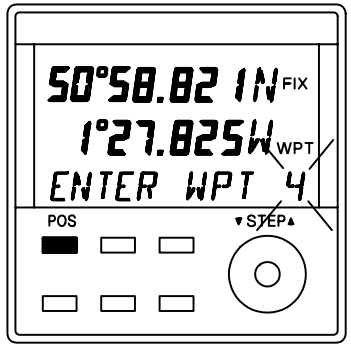
1. Press the **WPT/MOB** key.



2. Press the **SETUP** key. Use the ▲ **STEP** ▼ knob to select a ***WPT*** number.

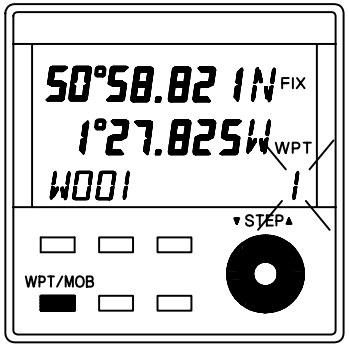


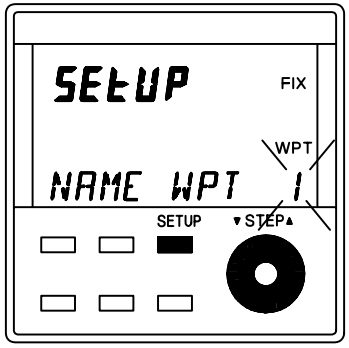
3. Press the **ENTER** key. The DEGREES of latitude will flash.



4. Press the **POS** key, the present position is now entered into the selected library location.

ENTERING A WAYPOINT NAME



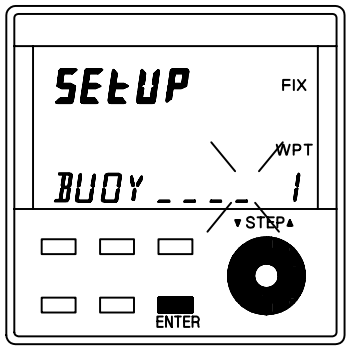


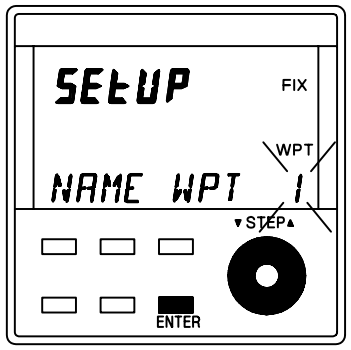
1. Press the **WPT/MOB** key. Use the ▼ **STEP** ▲ knob to view the waypoint library.

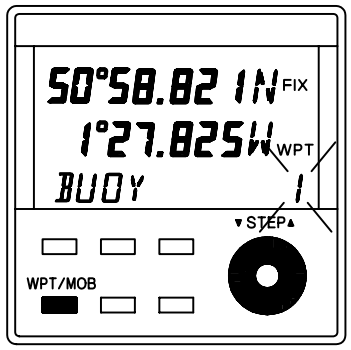
2. Press the **SETUP** key twice. The display will show ***NAME WPT*** ##. Use the ▼ **STEP** ▲ knob to select a ***WPT*** number.

3. Press the **ENTER** key. The first character will start flashing. Use the ▼ **STEP** ▲ knob to change the character.

4. Press the **ENTER** key to accept the displayed character and advance to the next.





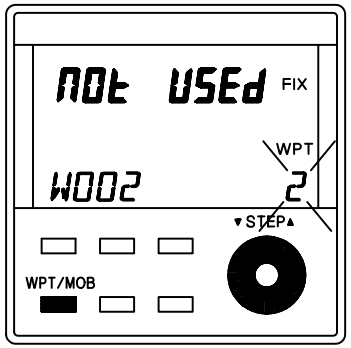


5. Repeat stages 3 and 4 until all characters have been entered, including blanks.

6. When the last character has been entered the display will return to ***NAME WPT*** ##.

7. Entry of waypoint latitude and longitude (if required) can be carried out as previously explained.

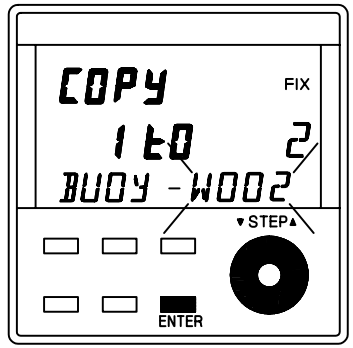
COPYING FROM WAYPOINT TO WAYPOINT



1. Press the **WPT/MOB** key. Use the ▼ **STEP** ▲ knob to select the target ***WPT*** number (or name).

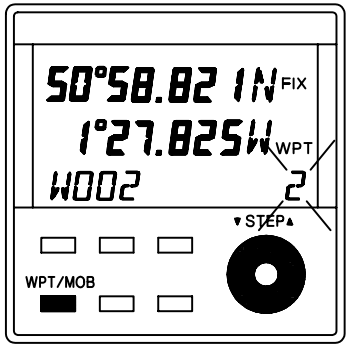
2. Press the **SETUP** key 3 times. The display will show ***COPY A WAYPT***.

3. Press the **ENTER** key. Use the ▼ **STEP** ▲ knob to select the waypoint to be copied. The waypoint number and name will be displayed.



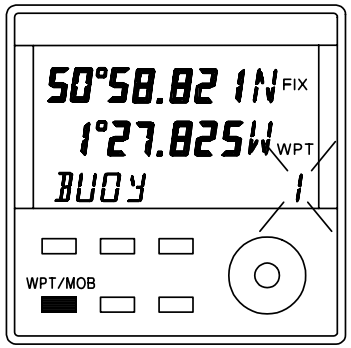
4. Press the **ENTER** key. Use the ▼ **STEP** ▲ knob to select the target waypoint. The waypoint number and name will be displayed.

5. Press the **ENTER** key to copy the waypoint to the library location. The display will show ***COPY A WAYPT***.



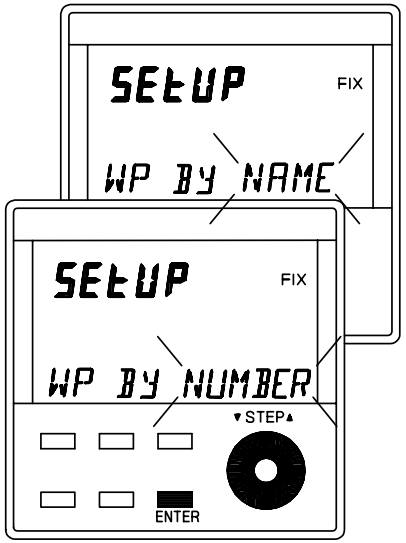
6. Press the **WPT/MOB** key. The display will show you the "new" waypoint.

SORTING THE WAYPOINT LIBRARY



1. Press the **WPT/MOB** key.

2. Press the **SETUP** key 4 times. The display will show ***WP BY NUMBER***.

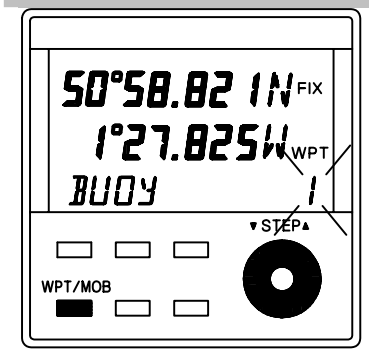


3. Press the **ENTER** key. The display will flash ***NUMBER***.

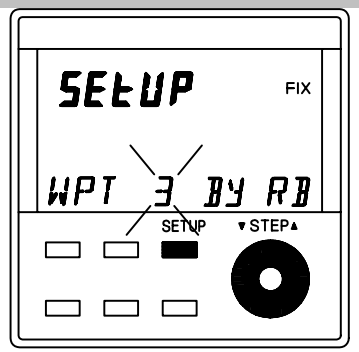
Use the ▼ **STEP** ▲ knob to select the sorting method.

4. Press the **ENTER** key to memorise the selection.

ENTERING WAYPOINT BY RANGE AND BEARING FROM PRESENT POSITION



1. Press the **WPT/MOB** key. Use the ▼ **STEP** ▲ knob to view the waypoint library.

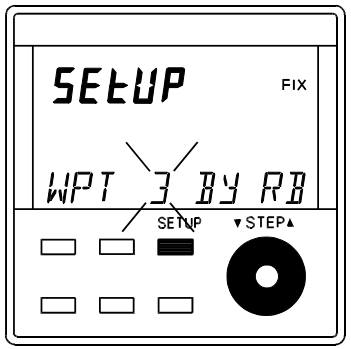


2. Press the **SETUP** key 5 times. The display will show ***WPT### BY RB***. Use the ▼ **STEP** ▲ knob to select a ***WPT*** number.

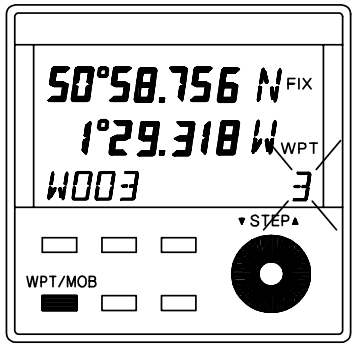
3. Press the **ENTER** key. The range in nautical miles will flash. Use the ▼**STEP**▲ knob to enter the range from 0.01 to 9.99nM.

4. Press the **ENTER** key. The bearing in degrees will flash. Use the ▼ **STEP** ▲ knob to enter the bearing from 000° to 359°.

5. Use the ▼ **STEP** ▲ knob to select a waypoint (from the library) to calculate the range and bearing from. For example ***BUOY WPT 1*** is used.

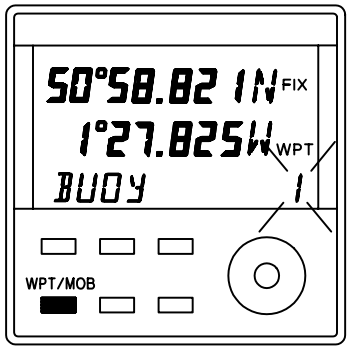


6. Use the ▼ **STEP** ▲ knob to select a waypoint library location for the new waypoint. Press the **ENTER** key to memorise the new range and bearing.



7. Press the **WPT/MOB** key twice to display the latitude and longitude of the waypoint. The waypoint can be named if required.

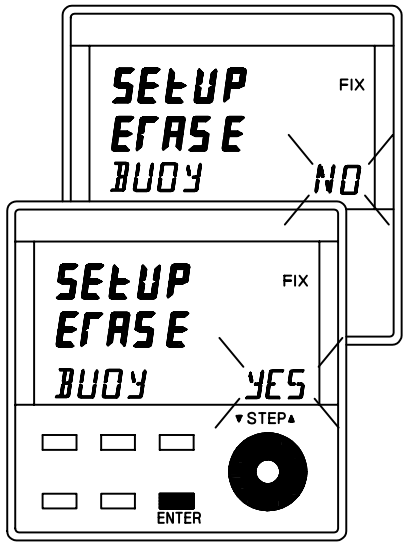
ERASING A WAYPOINT FROM THE LIBRARY



1. Press the **WPT/MOB** key.

2. Press the **SETUP** key six times, the display shows ***ERASE***.

Use the ▼ **STEP** ▲ knob to select the waypoint. If the waypoints have names these will be displayed.



3. Press the **ENTER** key. ***YES*** will flash.

Use the ▼ **STEP** ▲ knob to select ***YES*** to erase or ***NO*** to select another waypoint.

4. Press the **ENTER** key to erase the selected waypoint (when ***YES*** is displayed). If the knob is turned another waypoint can be selected for erasure, or press the **WPT/MOB** key to return to the library.

OTHER WAYPOINT SETUPS

The SETUP button has other waypoint facilities beyond the Waypoint Erase function. Three more waypoint functions are available as follows:

1. DOWNLOAD WPT
2. UPLOAD WPTS
3. NET DOWNLOAD

These functions are used when transferring waypoint data between other GPSPlus units and NMEA devices. They are described in the GPSPlus Interfacing section of this handbook.

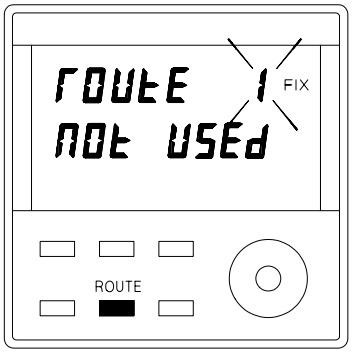
INTRODUCTION TO ROUTES

A "route" (sometimes called a sailplan) is simply a list of waypoints in the order that you intend to travel along them. It is made up of "legs", where a leg is the passage from one waypoint to another. You can have up to 10 routes stored in the GPSPlus and up to 40 waypoints in each route.

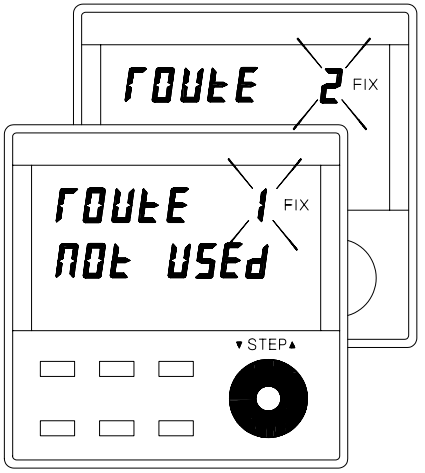
A route is defined leg by leg by recalling waypoints from the waypoint library and storing them in the route. It is important to remember that a leg is a straight line drawn between two waypoints, it does not recognise any obstruction in the way such as land, shallow water, wrecks, or other vessels. When planning your route take careful note of any navigational obstructions, including high and low water marks.

It is possible to select the direction of travel along your route, either forward or reverse and then miss out a complete leg if required. This will be explained later in the Navigation With GPSPlus section of this handbook.

VIEWING THE ROUTE LIBRARY



Press the **ROUTE** key.



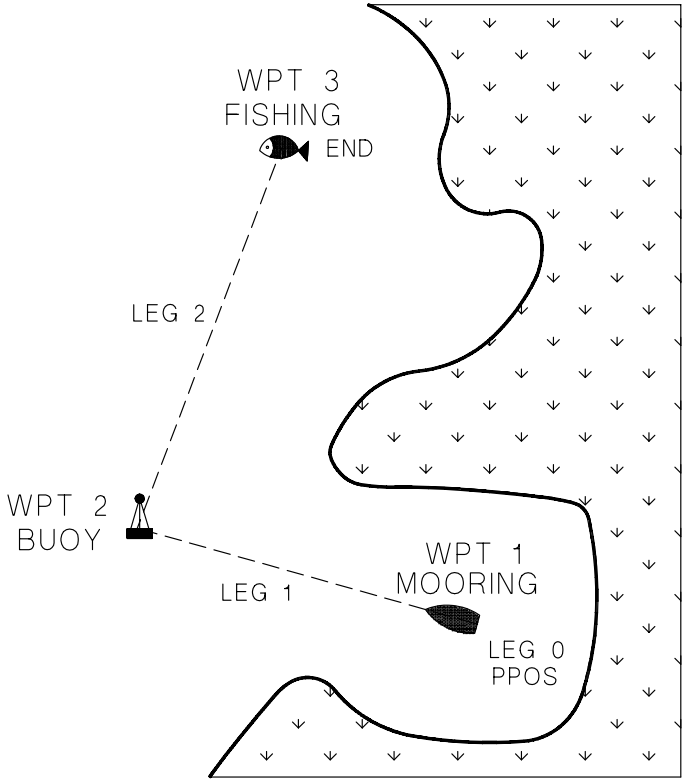
Turn the ▼ **STEP** ▲ knob.

When the ▼ **STEP** ▲ knob is turned the ten routes will be listed by number from 1 to 10 as ***USED*** or ***nOt USEd*** depending upon the current state.

If the text line of the LCD shows ***NULL WPT*** ###, (where ### is a number from ***1*** to ***250)***, it indicates that waypoint ### has been erased from the waypoint library and therefore the route is now invalid. To overcome this either redefine the route without the waypoint, or re-enter the erased waypoint.

Below is a diagram of a simple route that will be used in this section to demonstrate the use of the GPSPlus route facilities.

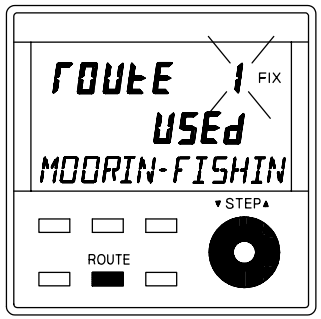
DIAGRAM SHOWING A SIMPLE ROUTE



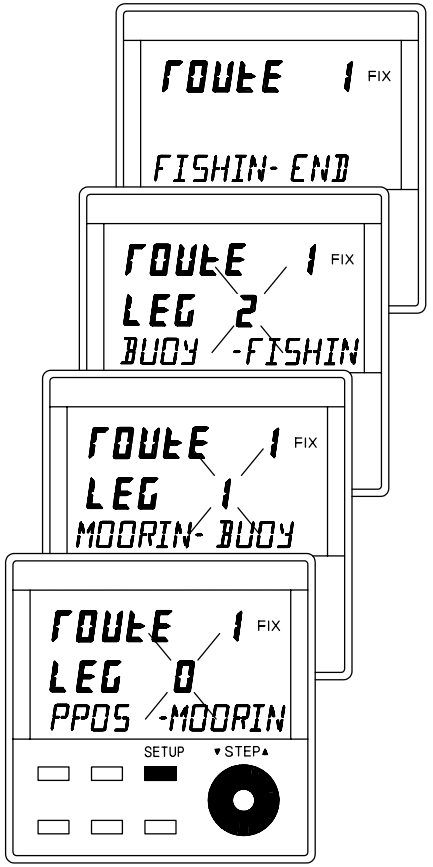
A simple table as shown below can be very helpful when planning a route. The latitude and longitude of each waypoint could be added if required.

ROUTE LEG	FROM	TO
LEG 0	PPOS, present position	MOORING
LEG 1	MOORING	BUOY
LEG 2	BUOY	FISHING

LISTING THE WAYPOINTS OF A STORED ROUTE



Press the **ROUTE** key and turn the ▼ **STEP** ▲ knob to view the route library. The first and last waypoint name or numbers are displayed on the text line.



Press the **SETUP** key and turn the ▼ **STEP** ▲ knob to list the route LEG by LEG.

ROUTE PLANNING PAGE

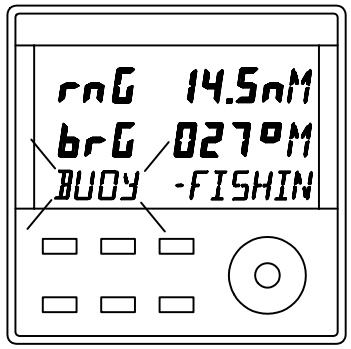
WAYPOINT TO WAYPOINT RANGE AND BEARING

The GPSPlus display ***PLANNING PAGE*** allows the range and bearing to be calculated between any two, library waypoints. This facility is very useful when planning a route.

1. Press the **ROUTE** key until the display shows ***PLANNING PAGE***, ***FROM*** and ***TO*** will be showing on the text display. ***FROM*** will flash.

2. Turn the ▼ **STEP** ▲ knob to cycle through the waypoints in the library until the desired waypoint is displayed e.g. ***BUOY***. Press the **ENTER** key to select the displayed waypoint. ***TO*** will now flash.

3. Turn the ▼ **STEP** ▲ knob to select the other waypoint from the library e.g. ***FISHIN***. Press the **ENTER** key to select the displayed waypoint.

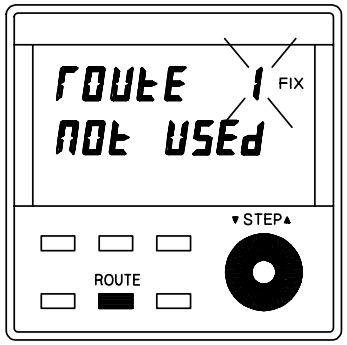


4. The display will now show the inter-waypoint range and bearing. The waypoint name or number will continue to flash so that other selections can be made.

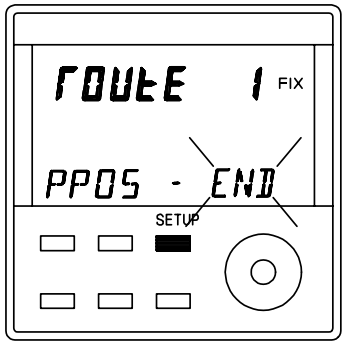
DEFINING A ROUTE

The route in the diagram on the previous page is used in the following example.

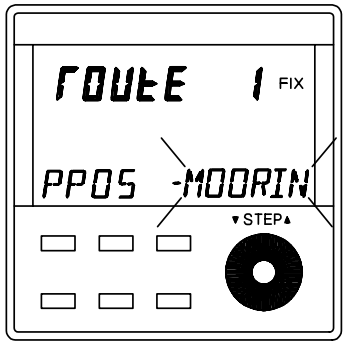
When the waypoint library has been set to sort by name, the display will only show the first six characters of any named waypoint. If the waypoints in your library have not been named then the waypoint number will be shown e.g. ***W001***. When sort by number is selected then the WP number is displayed.



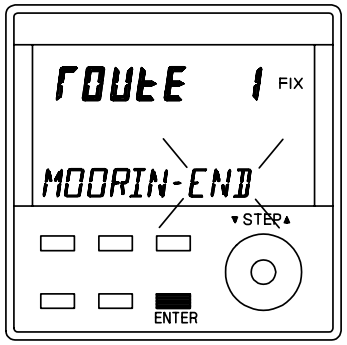
1. Press the **ROUTE** key. Select a route to define using the ▼ **STEP** ▲ knob.



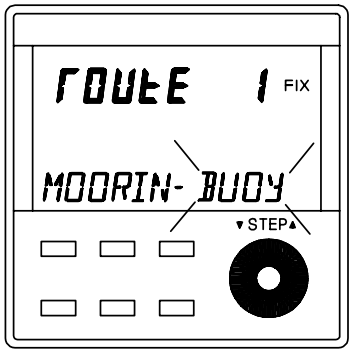
2. Press the **SETUP** key to begin route entry. ***END*** will flash. When the right side of the text display is flashing, waypoints can be selected from the library. The start of a route is always from your present position ***PPOS***.



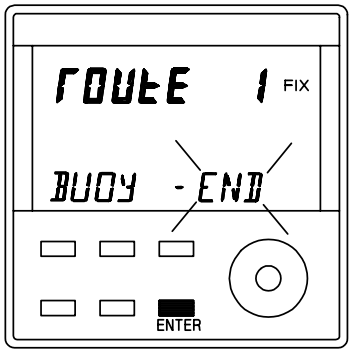
3. Turn the ▼ **STEP** ▲ knob to cycle through the waypoints in the library until the desired waypoint is displayed e.g. ***MOORIN***.



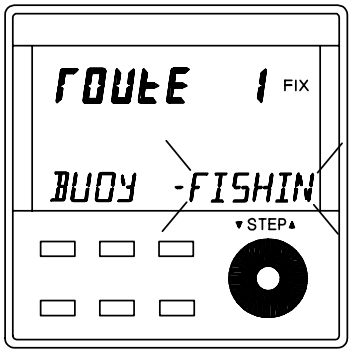
4. Press the **ENTER** key to select the displayed waypoint. The selected waypoint will now appear on the left of the display.



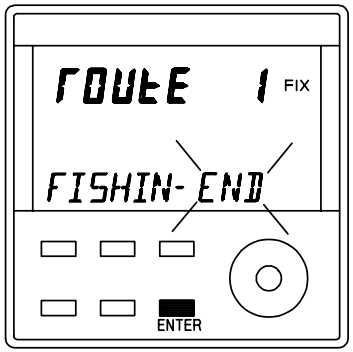
5. Turn the ▼ **STEP** ▲ to select the next waypoint, ***BUOY***.



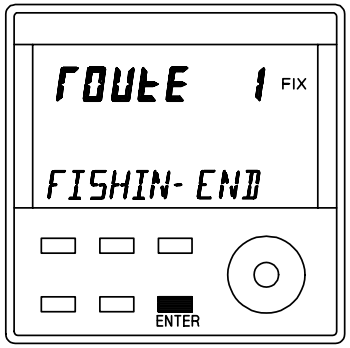
6. Press the **ENTER** key to accept waypoint ***BUOY*** into the route.



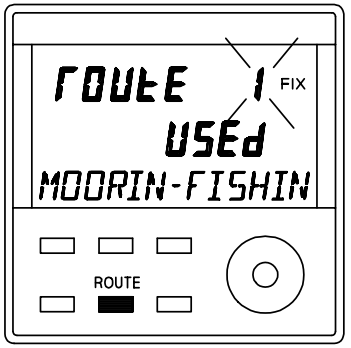
7. Turn the ▼ **STEP** ▲ to select the next waypoint, ***FISHIN***. This waypoint is the last waypoint in this route.



8. Press the **ENTER** to select ***FISHIN*** into the route. ***END*** will flash.



9. Press the **ENTER** key again to complete the route definition.



10. Press the **ROUTE** key, the display will now show ***ROUTE 1***, ***USED***, and the start and end waypoints.

EDITING A STORED ROUTE

Any stored route in the route library can be edited. Waypoints can be inserted into or deleted from any leg of your defined route, or simply added on to the end. There is also facility to delete the entire route from the route library. If all the waypoints are deleted the route will be listed as ***nOt USEd*** when the route library is viewed.

To edit a leg of a route proceed as follows:

INSERTING AND DELETING WAYPOINTS IN A ROUTE

1. Press the **ROUTE** key until ***ROUTE*** # is displayed. Select the route to be edited from the route library with the ▼ **STEP** ▲ knob.
2. Press the **SETUP** key and turn the▼ **STEP** ▲ knob to list the route leg by leg.
3. When the leg to be edited is displayed press the **ENTER** key.
4. The waypoint name or number will now flash.
5. Turn the ▼ **STEP** ▲ knob until the word ***INSERT*** or ***DELETE*** is displayed.
6. Press the enter key to ***INSERT*** or ***DELETE*** a waypoint.
7. If ***DELETE*** has been selected the displayed waypoint is immediately deleted, so you must be sure! The number of legs will now have decreased by one.
8. If ***INSERT*** has been selected the ▼ **STEP** ▲ knob allows the waypoint library to be listed (see DEFINING A ROUTE). Press the **ENTER** key to select the waypoint to be inserted. The number of legs will now have increased by one.

ADDING WAYPOINTS TO THE END OF A ROUTE

1. Press the **ROUTE** key until ***ROUTE*** # is displayed. Select the route to be edited from the route library with the ▼ **STEP** ▲ knob. Press the **SETUP** key.
2. Turn the ▼ **STEP** ▲ knob until ***END*** is shown on the right of the text display.
3. Press the **ENTER** key, ***END*** will now flash.
4. Turn the ▼ **STEP** ▲ knob to cycle through the waypoint library until the desired waypoint is displayed.
5. Press the **ENTER** key to select the displayed waypoint. ***END*** will continue to flash, allowing more waypoints to be added if required.
6. Press the **ENTER** key again to end route editing.

DELETING ROUTES FROM THE ROUTE LIBRARY

1. Press the **ROUTE** key until ***ROUTE*** # is displayed.
2. Press the **SETUP** key twice. The display will show ***ERASE***, and ***ROUTE*** #. The route number will flash.
3. Turn the ▼ **STEP** ▲ knob to cycle through the route library until the desired route is displayed.
4. Press the **ENTER** key, the display will flash ***YES***.
5. Turn the ▼ **STEP** ▲ knob to change the display to ***NO*** if you change your mind.
6. Press the **ENTER** key when ***YES*** is displayed to delete the route. **A DELETED ROUTE CANNOT BE UN-DELETED**.

OTHER ROUTE SETUPS

The SETUP key has another function beyond the Route Erase function. This function, ***ROUTE DOWNLOAD***, is described in the GPSPlus Interfacing section of this handbook.

NAVIGATION WITH GPSPLUS

The **NAV** key is used to give navigational information from your present position to a specific waypoint, the "target" waypoint. The target waypoint could be any waypoint in the waypoint library or a waypoint that makes up one the legs of a pre-defined route.

It is necessary to select a waypoint or a route before the GPSPlus unit can calculate the data. The target waypoint can be changed at any time so NAV information is available about any waypoint in the library.

The following navigational information is available when a target waypoint has been selected:

- Location of waypoint
- Waypoint identity (ID)
- Bearing and distance from present position to waypoint
- Course to steer (CTS)
- Cross track error (XTE)
- Course over ground (COG)
- Speed over ground (SOG)
- Time to go (TTG)
- Velocity made good (VMG)
- Estimated time of arrival (ETA)

Bearings can be displayed in degrees with reference to True or Magnetic North and distances can be displayed in Nautical Miles, Statute Miles or Kilometres. The calculated values can be Rhumb Line or Great Circle.

The **NAV** key is also used to select the direction of the route, either forwards or reverse. This is the order in which the waypoints are used.

NOTES: If when a route is selected or when following a route the display shows the message ***NAV FAULT***, it means that the target waypoints of the route have been deleted from the GPSPlus waypoint library. To overcome this problem either redefine the route or re-enter the deleted waypoint(s).

When following a route the GPSPlus will continue to display navigational data after the vessel has passed the final waypoint. The information will be based on the last waypoint until another waypoint or route is selected. The displayed value for cross track error (XTE) is based on an extended line of the previous track.

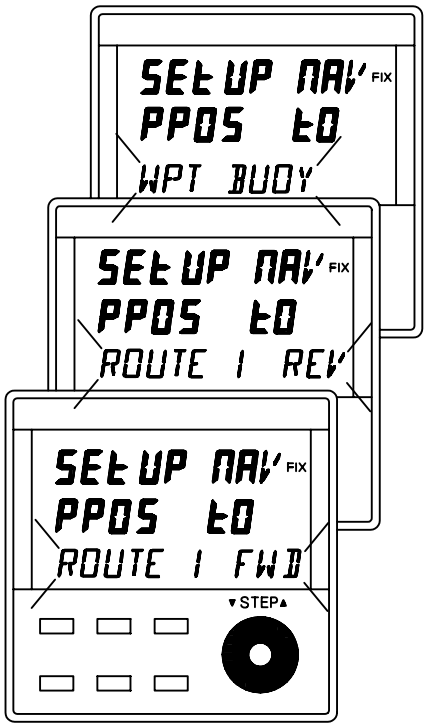
When the GPSPlus is used in combination with a Network PILOT that has NMEA data being supplied to the PILOT Display via its NMEA interface, the NAV key allows the GPSPlus to select the PILOT NMEA data for calculation of the displayed navigational data.

IMPORTANT NOTE: If MARK waypoints have been used to create a route ensure that the MARK latitude and longitude is as you expect. If the MARKs have been erased and then re-entered (by pressing the MARK key) the MARK latitude and longitude will have changed and the route could be entirely different. **THIS COULD ENDANGER YOU, YOUR CREW AND YOUR VESSEL. CHECK BEFORE YOU ENGAGE THE ROUTE.**

SELECTING OR CHANGING THE TARGET WAYPOINT OR ROUTE

1. Press the **NAV** key. If the unit is not already NAVing, ***nO PLAn*** will be displayed. The text display will invite you to press ***SETUP***.

2. Press the **SETUP** key, the display will flash either ***NO PLAN***, or one of the displays shown in 3.



3. Use the ▼ **STEP** ▲ knob to select the waypoint or the route to be used for navigation. The direction of the route is also selected by choosing ***ROUTE # FWD*** or ***ROUTE # REV*** (when NMEA data is available via the Network PILOT, PILOT NMEA is also displayed).

4. Press the **ENTER** key to memorise the selection.
Pressing the **NAV** key will now display navigational information.

DISPLAYING THE NAV PAGES

Press the NAV key to display the following pages of navigational data:

PAGE 1 SELECTED NAV DATA

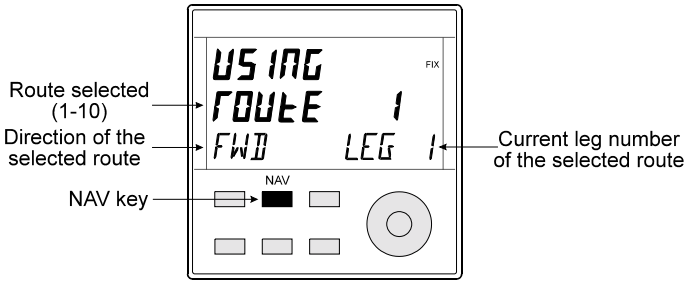
One of three different pages will be displayed depending upon whether a waypoint, route or Pilot NMEA data is being used for NAV functions.

WAYPOINT SELECTED - POINt SELECtEd

This is the name or number of the target waypoint selected for NAV functions.

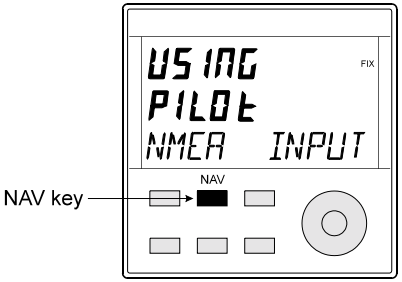
ROUTE SELECTED - USING ROUTE #

When a route has been selected from the route library the display will show which route is selected, the direction of travel along the route and the current leg.



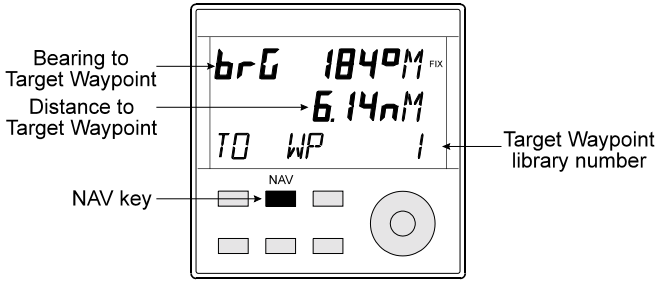
PILOT NMEA INPUT - USING PILOT NMEA INPUT

When NMEA data is being supplied via the NMEA interface of the Network PILOT display unit from a Chart Plotter the GPSPlus display will let you know.



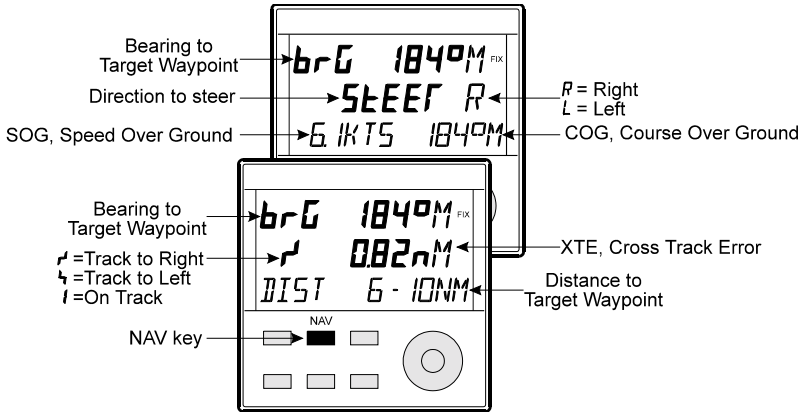
PAGE 2 BEARING AND DISTANCE

Bearing (***brG***) and Distance from present position to the target waypoint. Bearing is displayed in degrees Magnetic (***M***) and distance is displayed in nautical miles (***nM***) by default.



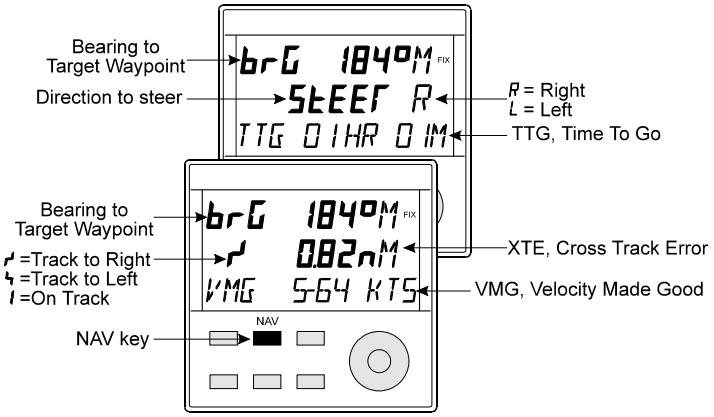
PAGE 3 BEARING, DISTANCE, XTE, SOG AND COG

Bearing to target waypoint. Cross track error, alternating with direction to steer. Speed Over Ground and Course Over Ground, alternating with Distance to target waypoint.



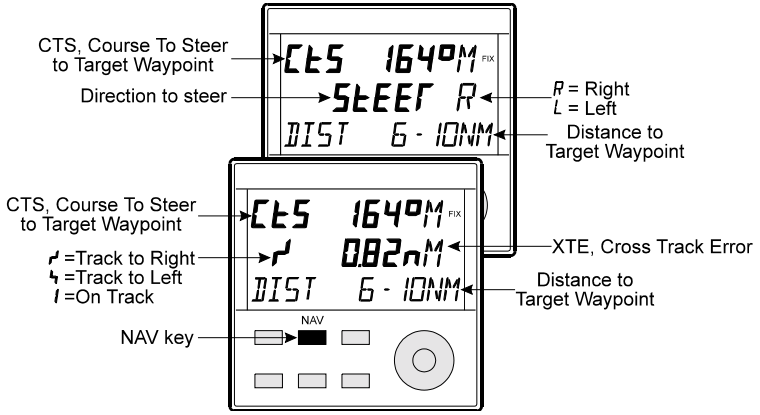
PAGE 4 BEARING, XTE, TTG AND VMG

Bearing to target waypoint. Cross track error, alternating with direction to steer. Time To Go (TTG) in hours and minutes, alternating with Velocity Made Good (VMG) to target waypoint.



PAGE 5 CTS, XTE AND DISTANCE

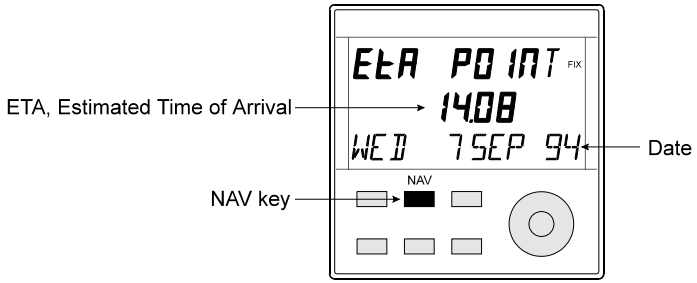
CTS Course to steer to target waypoint. Cross track error, alternating with direction to steer. ***DIST*** Distance to the target waypoint in nautical miles.



PAGE 6 ESTIMATED TIME OF ARRIVAL

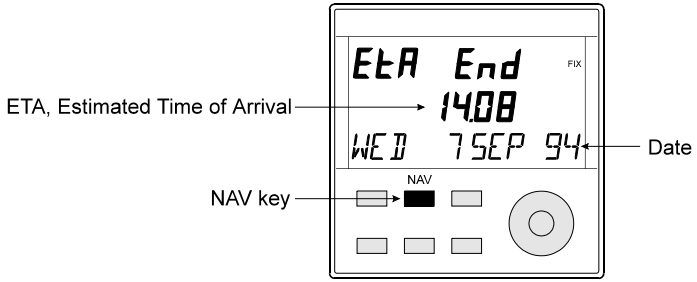
WAYPOINT SELECTED

EtA POINT Estimated time of arrival at the target waypoint in hours and minutes. The date, month and year are displayed on the bottom line.



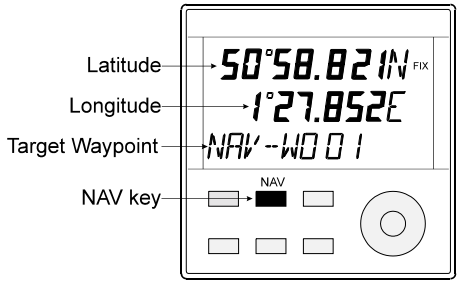
ROUTE SELECTED

EtA END Estimated time of arrival at the last waypoint of the route in hours and minutes. The date, month and year are displayed on the bottom line.



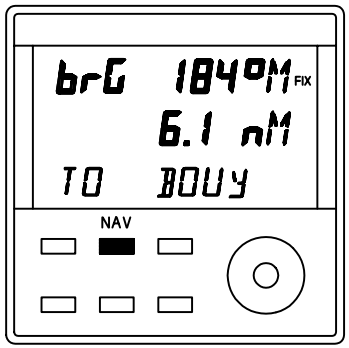
PAGE 7 LATITUDE AND LONGITUDE OF TARGET

Latitude and Longitude of target waypoint. The target waypoint name or number is shown on the text display.

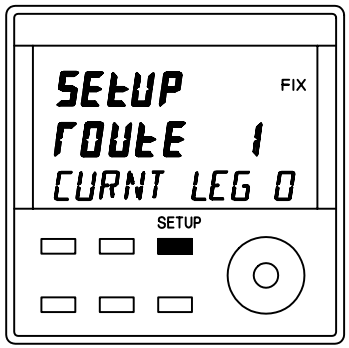


CHANGING THE CURRENT LEG OF A ROUTE

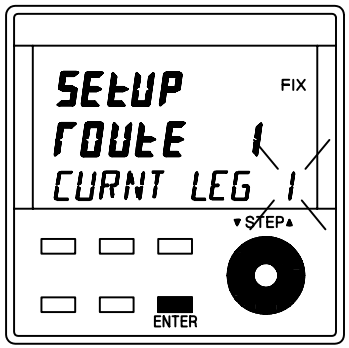
The GPSPlus allows any leg of the selected route to be missed or skipped over so that the route can be changed without inserting or deleting any waypoints. Once a route has been selected proceed as follows:



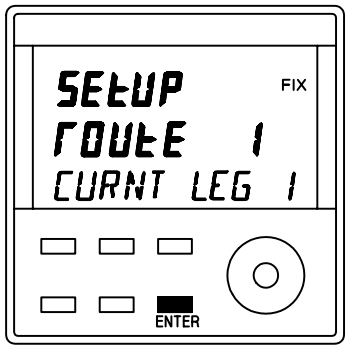
1. Press the **NAV** key. The display will show the last NAV page displayed.



2. Press the **SETUP** key three times. The display will show the current leg number of the selected route, e.g. ***CURNT LEG 0***.



3. Press the **ENTER** key, the leg number will flash. Use the ▼ **STEP** ▲ knob to select a different leg number.



4. Press the **ENTER** key to memorise the selection. The **NAV** key will now display information about the new leg

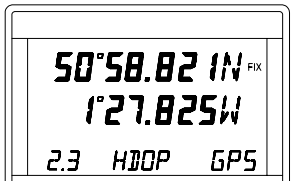
INTRODUCTION TO SETUPS ON THE GPSPLUS

The GPSPlus has many parameters that can be set if the user wishes, some of these are alarms. The sequence for adjusting or setting these parameters and alarms is similar in every case, only the displayed information is different.

The SETUPs are arranged in a continuous list that you can cycle through using the **SETUP** key. For a full description of each SETUP with its selectable parameters please refer to the table at the end of this section.

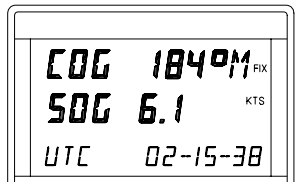
A short cut method allows you to start cycling through the list from a different entry point determined by the **POS** display. The following list illustrates this principle.

With this **POS** page displayed the **SETUP** list starts from ***INPUT***



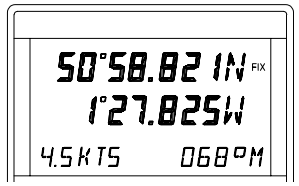
INPUT
AUTO ADV
RADIUS
ANCHOR AL
HDOP ALRM
CROSS TRK
ZONE # AL
DATUM
USER DATUM

With this **POS** page displayed the **SETUP** list starts from ***DISPLAY***



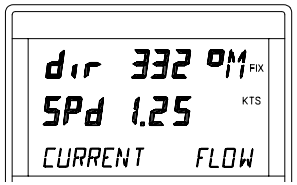
DISPLAY
LOCAL TIM
DATE

With this **POS** page displayed the **SETUP** list starts from ***BEARINGS***



BEARINGS
AUTO MAG VAR
DISTANCE
COG SOG
BEARINGS
LANGUAGE

With this **POS** page displayed the **SETUP** list starts from ***OUTPUT***



OUTPUT
C / SUMS
TYPE
PRESENT POSITION
CONTRAST

SELECTING THE RECEIVER INPUT TYPE

If your GPSPlus system has a LORAN-C or DECCA receiver, connected to the second receiver socket on the rear of the unit, this can be selected to give positional information. All of the features and functions of the GPSPlus can be used with any of the receivers. This allows you to select a different position fixer if one becomes unreliable, or to compare accuracy of position.

1. Press the **POS** key so ***HDOP*** is displayed on the text line.

2. Press the **SETUP** key. The display will show the current ***INPUT*** device.

SEtUP
InPUt
GPS

3. Press the **ENTER** key ***GPS*** will now flash. Use the **▼ STEP ▲** knob to change the ***INPUT*** device, ***LORAN-C***, ***DECCA***.

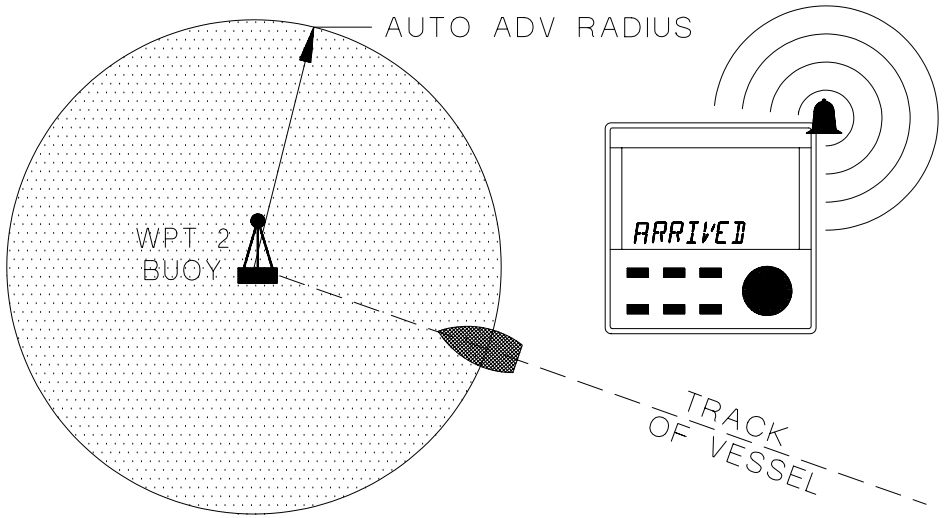
4. Press the **ENTER** key to memorise the new setting.

5. After 30 seconds the display will return to present position or press the **POS** key to return instantly.

WAYPOINT ARRIVAL ALARM

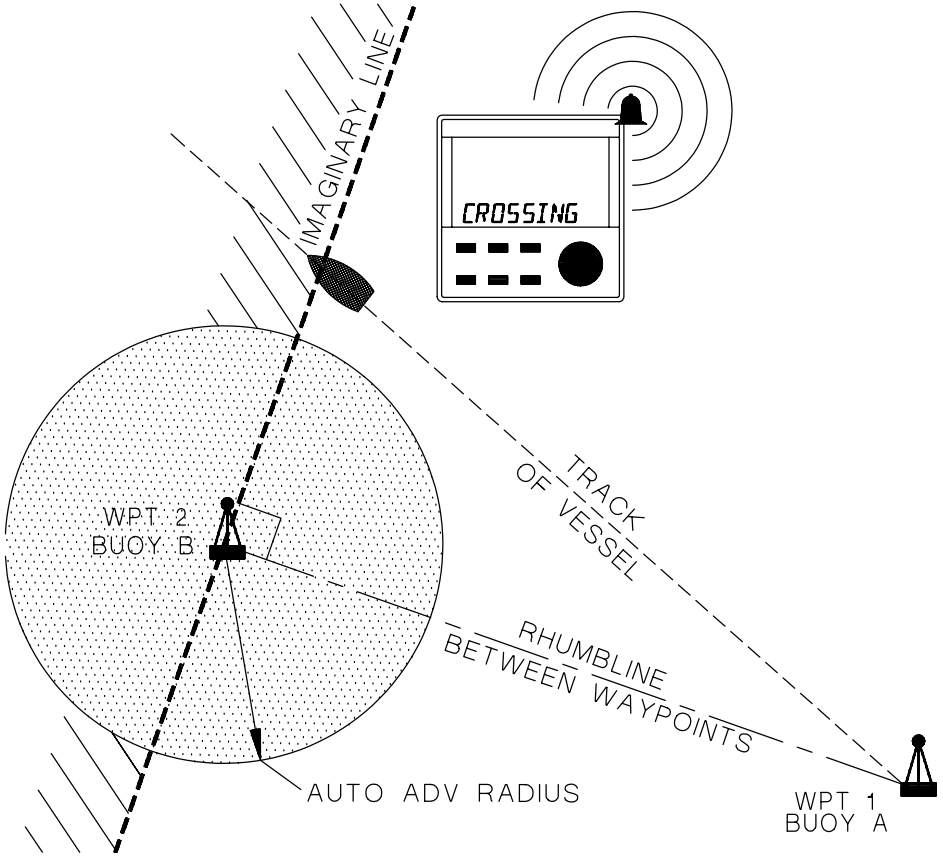
The waypoint arrival alarm is always active, i.e. it CANNOT be disabled. It is used in conjunction with the auto advance function. The auto advance function is used to automatically select the next waypoint in a route or sailplan. The waypoint arrival alarm is triggered when the vessel is within a preset radius around the target waypoint. The alarm is triggered in two ways.

1. When the vessel arrives at the target waypoint within the radius set for the auto advance function the display will sound its alarm and flash ***ARRIVED***. Other Network units will also sound their alarms.



WAYPOINT ARRIVAL CONT...

2. When the vessel DOES NOT arrive at the target waypoint within the set radius for auto advance, BUT crosses an imaginary line drawn through the waypoint perpendicular to the rhumb-line between waypoints, the display will sound its alarm and flash ***CROSSING***. Other Network units will also sound their alarms.



The action taken when the alarm is activated depends on the ***AUTO ADV***ance status:

If ***AUTO ADV***ance is ***ON***, the next waypoint in the route is used when the vessel arrives or crosses the waypoint as described above. When this occurs the alarm will sound and the display flashes for five seconds, then the next waypoint in the route will be automatically selected.

If ***AUTO ADV***ance is ***OFF***, the next waypoint in the route is used only when a key is pressed to silence the waypoint arrival or crossing alarm. The alarm will sound and the display flash until a key is pressed, then the next waypoint in the route will be selected.

NOTE: When steering the boat with a Network PILOT, the autopilot will not steer to the next waypoint until instructed to do so by the helmsman. This is a safety feature. Refer to the Steering to NMEA section of the PILOT owners manual.

SETTING *AUTO ADV*ance FEATURE

1. Press the **POS** key.

2. Press the **SETUP** key until ***AUTO ADV*** is displayed.

SEtUP
AUtO ADV
OFF

WAYPOINT ARRIVAL CONT...

3. Press the **ENTER** key, ***OFF*** will now flash.

4. Use the ▼ **STEP** ▲ knob to select ***ON*** or ***OFF***. NOTE: The ***AUTO ADV*** feature is factory set to ***OFF***.

5. Press the **ENTER** key to memorise your setting.

SETTING *AUTO ADV*ance *rADIUS*

(If you have not previously done so, press the **POS** key.)

1. Press the **SETUP** key until ***rADIUS*** is displayed.

SEtUP
rADIUS
0.10NM

2. Press the **ENTER** key, the value will now flash.

3. Use the ▼ **STEP** ▲ knob to alter the value in the range 0.01 to 9.99NM. NOTES: The ***rAdIUS*** value is factory set to 0.10NM. If Statute Miles or Kilometres have been selected the value will be displayed in the appropriate units.

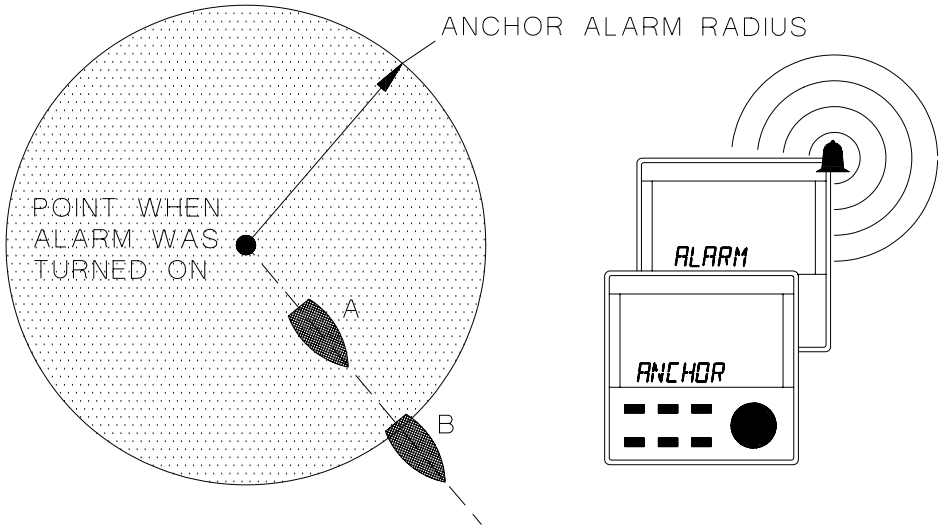
4. Press the **ENTER** key to memorise your setting.

ANCHOR ALARM

Although the name of this alarm implies use when at anchor it can be used to alert when drifting away from any specific point or waypoint.

The anchor alarm sets a circle of a specific radius around a point. The latitude and longitude of the point is determined by your position when the alarm is selected to ***ON***. If the boat should drift OUTSIDE the predetermined radius the alarm will sound.

Press any key to silence the alarm.



In the example above, the vessel can drift anywhere in the shaded area determined by the alarm radius. When the vessel moves from point A to point B the alarm will sound.

SETTING THE ANCHOR ALARM

1. Press the **POS** key.

2. Press the **SETUP** key until ***AnCHOr AL*** is displayed.

3. Press the **ENTER** key, the display will flash the current anchor alarm radius.

4. Use the ▼ **STEP** ▲ knob to alter the value in the range 0.01 to 9.99NM.
   NOTE: The value is factory set to 1.00NM. Due to external factors this alarm may not be reliable below 0.05NM. The value will be displayed in Statute Miles or Kilometres if those units have been selected.

5. Press the **ENTER** key to memorise your setting. The display will now flash the current alarm state.

6. Use the ▼ **STEP** ▲ knob to select ***ON*** or ***OFF***.
   NOTE: The anchor alarm is factory set to ***OFF***.

7. Press the **ENTER** key to memorise your setting.

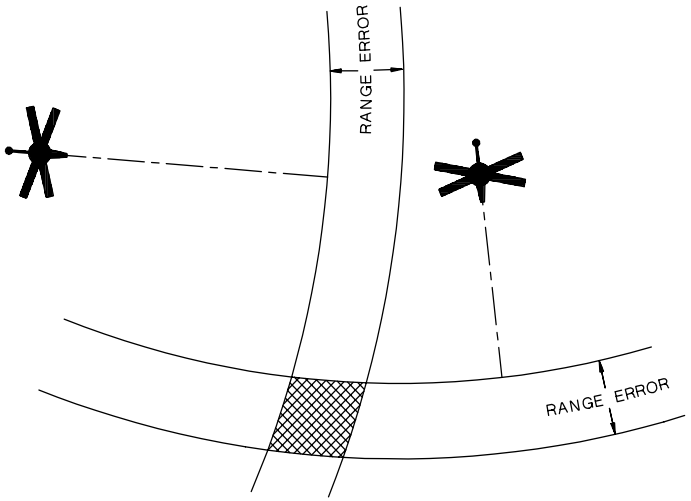
To change the alarm state without adjusting the radius, miss out step 4.

HDOP ALARM

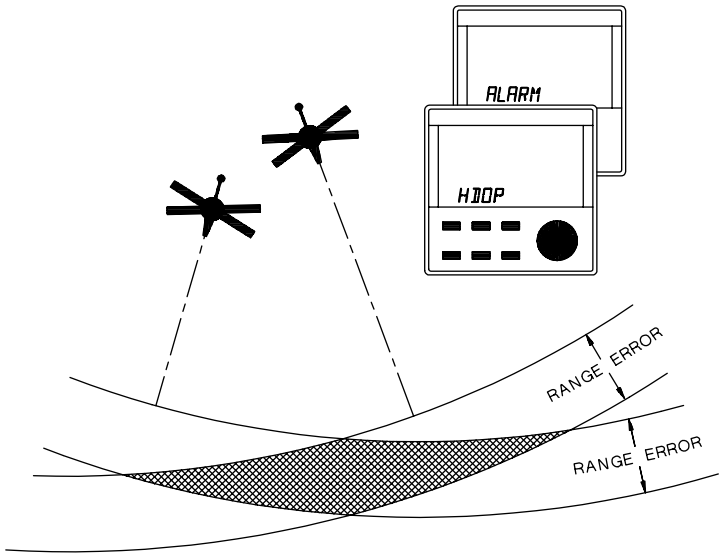
As in all radio navigation systems, the accuracy is affected by the geometry of the situation. Probably the most familiar examples of this today is the practice of avoiding "small crossing angles" in Loran-C or Decca lines of position (LOP). These hyperbolic systems operate with fixed site transmitters so the angles are constant at any particular location. GPS uses moving transmitters (satellites) and therefore the geometry or crossing angles are constantly changing. In 2-dimensional GPS navigation, the lines of position are moving circles on the Earth's surface that are, at all points, equidistant from a satellite. The effects of geometry on accuracy can be summarized in a single number, called the Horizontal Dilution of Precision (HDOP).

The accuracy obtainable from a particular set of satellites is equal to the pseudo-range measurements multiplied by the HDOP. In order to avoid extra-ordinary errors due to short periods of very poor geometry the GPSPlus software will not use satellite constellations with an HDOP higher than twelve. The HDOP alarm allows you to be alerted when the HDOP value becomes larger than a preset value (up to 12).

GOOD SATELLITE GEOMETRY - LOW HDOP (<12)



BAD SATELLITE GEOMETRY - HIGH HDOP (>12)



SETTING THE HDOP ALARM

1. Press the **POS** key.

2. Press the **SETUP** key until ***HDOP ALrM*** is displayed.

3. Press the ENTER key, the display will flash the current HDOP alarm limit.

4. Use the ▼ **STEP** ▲ knob to alter the limit in the range 0.1 to 12.0. NOTE: The value is factory set to 4.0.

5. Press the **ENTER** key to memorise your setting. The display will now flash the current alarm state.

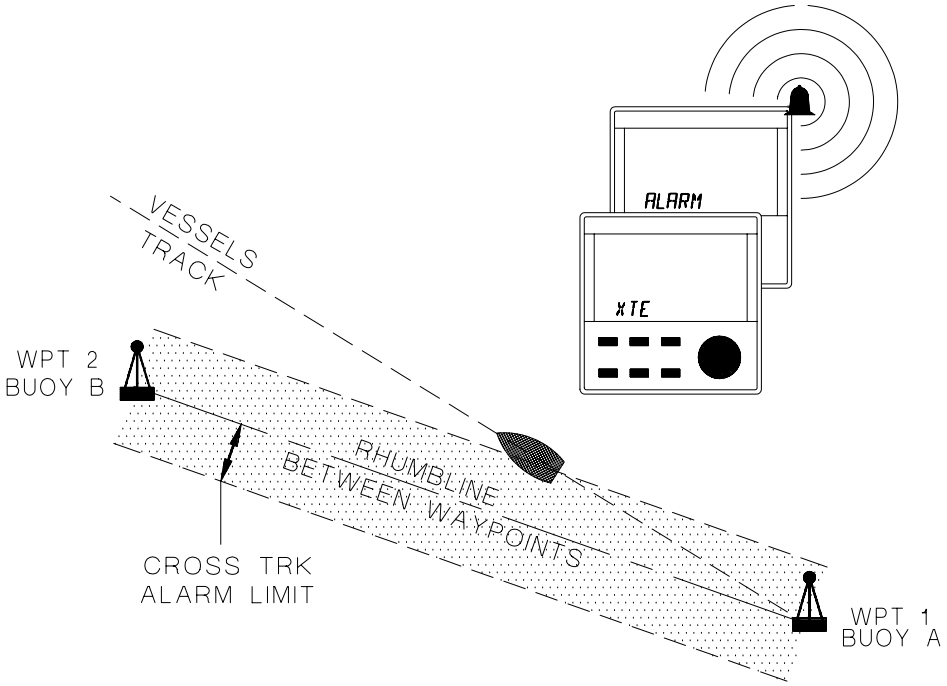
6. Use the ▼ **STEP** ▲ knob to select ***ON*** or ***OFF***.
   NOTE: The HDOP alarm is factory set to ***OFF***.

7. Press the **ENTER** key to memorise your setting.

To change the alarm state without adjusting the limit, miss out step 4.

CROSS TRACK ALARM

The Cross Track Error Alarm is triggered when the vessel strays to the left or right of the course line drawn between the last waypoint and the next waypoint in a route by more than a preset distance, in other words, if the Cross Track Error (XTE) value is larger than the value set.



SETTING THE CROSS TRACK ERROR (XTE) ALARM

1. Press the **POS** key.
2. Press the **SETUP** key until ***CrOSS trK*** is displayed.

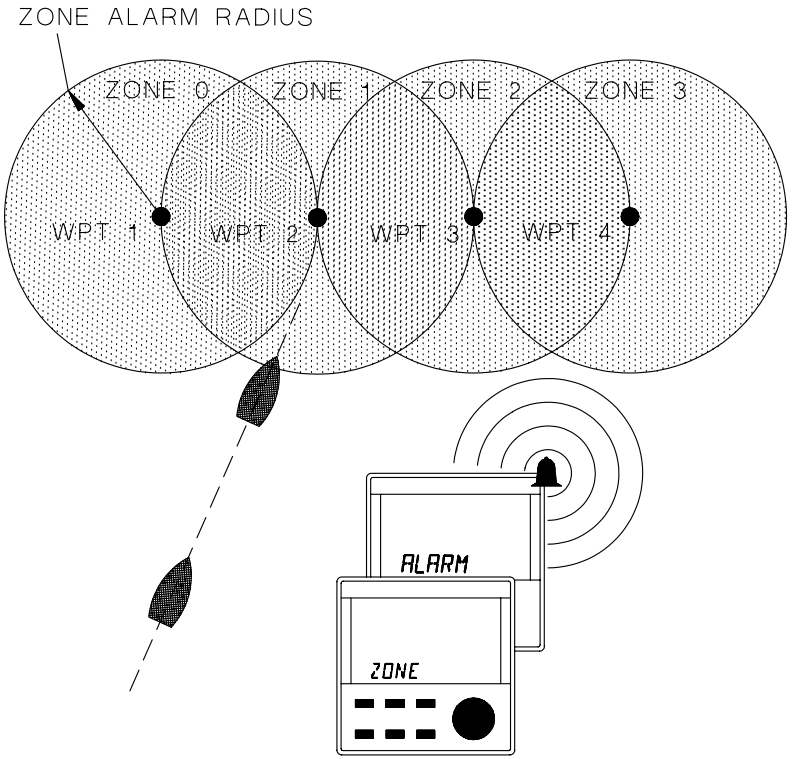
SEtUP
CrOSS trK
OFF

3. Press the **ENTER** key, the display will flash the current cross track error alarm limits.
4. Use the ▼ **STEP** ▲ knob to alter the value in the range 0.01 to 9.99NM.
   NOTE: The value is factory set to 1.00NM. The value will be displayed in Statute Miles or Kilometres if those units have been selected.
5. Press the **ENTER** key to memorise your setting. The display will now flash the current alarm state.
6. Use the ▼ **STEP** ▲ knob to select ***ON*** or ***OFF***.
   NOTE: The waypoint zone alarm is factory set to ***OFF***.
7. Press the **ENTER** key to memorise your setting.

To change the alarm state without adjusting the limits, miss out step 4.

WAYPOINT ZONE ALARM

The zone alarm sets a circle of a specific radius around any waypoint. If the boat should drift INTO the predetermined radius the alarm will sound. This is very useful when attempting to remain near to a specific waypoint but without getting too close, for example, a wreck particularly good for fish. The GPSPlus display allows ten zone alarms to be set. These could be used to create a barrier or exclusion zone as shown in the example below. Press any key to silence the alarm.



SETTING THE ZONE ALARM

1. Press the **POS** key.
2. Press the **SETUP** key until ***ZONE 0 AL*** is displayed. Use the ▼ **STEP** ▲ knob to select the ZONE to be set up.

   SEtUP
   ZONE 0 AL
   OFF

3. Press the **ENTER** key, the display will flash the **WPT** number. Select any waypoint from the waypoint library with the ▼ **STEP** ▲ knob. Marks can be used.
4. Press the **ENTER** key, the display will flash the zone alarm radius. Use the ▼ **STEP** ▲ knob to alter the value in the range 0.01 to 9.99NM. **NOTE**: The value is factory set to 1.00NM. The value will be displayed in Statute Miles or Kilometres if those units have been selected.
5. Press the **ENTER** key to memorise your setting. The display will now flash the current alarm state.
6. Use the ▼ **STEP** ▲ knob to select ***ON*** or ***OFF***.
   NOTE: The zone alarm is factory set to ***OFF***.
7. Press the **ENTER** key to memorise your setting.

Repeat the above stages for each waypoint zone.

NETWORK SYSTEM ALARMS

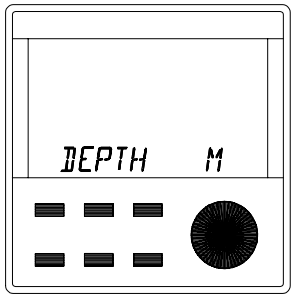
The GPSPlus display has an internal buzzer that will sound when an alarm condition is met on a Network unit that has alarm functions: Network DEPTH and Network QUAD for depth alarms and Network PILOT for Watch Alarm and Off Course alarms. The unit will also display which alarm is activated.

To silence the internal alarm and return the display to normal operation press any of the keys.

DEPTH ALARM DISPLAY

Depth alarms can be set for the following depth conditions:

- Shallow water
- Deep water
- Anchor Watch

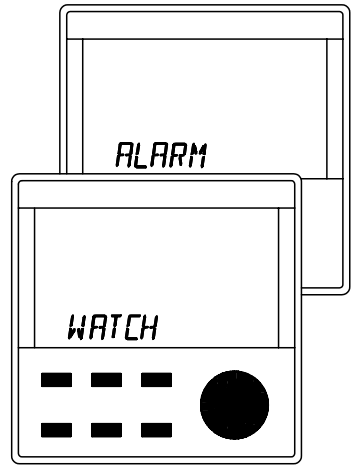


Check your Network DEPTH or QUAD unit to see which alarm is activated.

NETWORK PILOT ALARM DISPLAYS

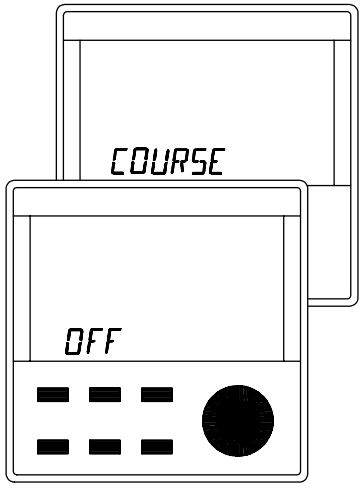
WATCH ALARM

The Watch Alarm is a count-down timer with is activated at the end of the preset count-down period. The display alternates between the messages above.



OFF COURSE ALARM

The Off Course alarm is activated when the boat deviates off course by a preset amount. The display alternates between the messages above.



SETTING THE CHART DATUM

The chart datum can be obtained from the navigational chart you are using.

1. Press the **POS** key.

2. Press the **SETUP** key until ***dAtUM*** is displayed.

3. Press the **ENTER** key, the displayed chart datum will now flash.

4. Use the ▼ **STEP** ▲ knob to select the required chart datum. Refer to the datum list at the end of this manual.

   NOTE: For user defined chart offsets select ***USER ENTERED***.

5. Press the **ENTER** key to memorise your setting.

SETTING A USER DATUM

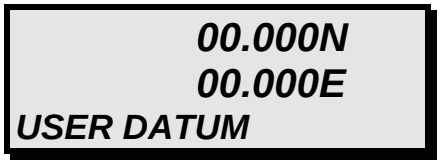
This is a user entered latitude and longitude offset obtained from some charts.

NOTE: Before USER DATUM can be used USER ENTERED must be selected as DATUM, see previous section.

1. Press the **POS** key.

2. Press the **SETUP** key until ***USER DATUM*** is displayed.

3. Press the **ENTER** key, the display will now flash.



4. Use the ▼ **STEP** ▲ knob and the ENTER key to enter the required offset.

5. Press the **ENTER** key to memorise your setting.

SELECTING NMEA OUTPUT SENTENCES

The setting allows the NMEA output sentences to be selected as ***ON*** (transmitted) or ***OFF*** (not transmitted). It is important that when interfacing with other NMEA devices that the correct sentences are selected to ON. Initially all sentences are ***OFF*** except ***RMB*** and ***RMC***. Refer to GPSPlus Interfacing for more information.

1. Press the **POS** key.

2. Press the **SETUP** key until ***OUtPUt*** is displayed. The NMEA sentence mnemonic will flash.

3. Use the ▼ **STEP** ▲ knob to view the list of NMEA sentences and the current status (***ON*** or ***OFF***).

4. Press the **ENTER** key when the display shows the required NMEA sentence mnemonic, ***ON*** or ***OFF*** will now flash.

5. Use the ▼ **STEP** ▲ knob to change the status.

6. Press the **ENTER** key to memorise your setting.

NMEA CHECKSUMS

NMEA Output checksum: some older systems (e.g. Hercules 390) do not accept this checksum data, so this setup may need to be turned off.

1. Press the **POS** key.

2. Press the **SETUP** key until ***C / SUMS*** is displayed. The current status is displayed. The checksum is ***ON*** by default.

3. Press the **ENTER** key, the ***C / SUMS*** status ***ON/OFF*** will now flash.

4. Use the ▼ **STEP** ▲ knob to select the required status.

5. Press the **ENTER** key to memorise your setting.

DISPLAY TYPE

The unit can be set to run an internal demonstration program, useful for learning to operate the instrument.

1. Press the **POS** key.

2. Press the **SETUP** key until ***tYPE*** is displayed.

3. Press the **ENTER** key, the display will now flash.

4. Use the ▼ **STEP** ▲ knob to select ***NORMAL*** or ***DEMO***.

5. Press the **ENTER** key to memorise your setting.

PRESENT POSITION

This allows the user to input present position in degrees of latitude and longitude. It is only required for some LORAN-C and DECCA receivers or when using the unit in DR mode.

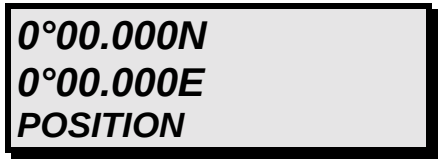
Enter degrees of latitude and longitude

1. Press the **POS** key.

2. Press the **SETUP** key until ***PRESENT POSITION*** is displayed.

3. Press the **ENTER** key, the display will now flash.

4. Use the ▼ **STEP** ▲ knob and the **ENTER** key to enter the present position in degrees of Latitude and Longitude.



5. Press the **ENTER** key to memorise your setting.

DISPLAY CONTRAST

The contrast control can improve the display clarity. Experiment to obtain the clearest display. The default setting is ***2***.

1. Press the **POS** key.

2. Press the **SETUP** key until ***CONTRAST*** is displayed.

3. Press the **ENTER** key, the display contrast value will now flash.

4. Use the ▼ **STEP** ▲ knob to select the required contrast level in the range ***0*** to ***3***.

5. Press the **ENTER** key to memorise your setting.

TIME/DATE INFORMATION

The text line of the LCD can display different combinations of time and date information:

UTC	- Universal time coordinate
LT	- Local time, user set
DATE	- Day, date, month and year
UTC/DATE	- Alternating display
LT/DATE	- Alternating display

1. Press the **POS** key.
2. Press the **SETUP** key until ***dISPLAY*** is displayed.

3. Press the **ENTER** key, the display time and date line will now flash.
4. Use the ▼ **STEP** ▲ knob to select the required time and date format.
5. Press the **ENTER** key to memorise your setting.

SETTING LOCAL TIME

The local time display can be corrected for the current time zone.

1. Press the **POS** key.
2. Press the **SETUP** key until ***LOCAL tIM*** is displayed.

3. Press the **ENTER** key, the time in hours will now flash.
4. Use the ▼ **STEP** ▲ knob to adjust the hours.
5. Press the **ENTER** key. The time in minutes will now flash.
6. Use the ▼ **STEP** ▲ knob to adjust the minutes.
7. Press the **ENTER** key to memorise your setting.

SETTING THE DATE

This setting allows the correct Day, Date, Month and Year to be entered into the memory.

1. Press the **POS** key.
2. Press the **SETUP** key until ***dAte*** is displayed.

3. Press the **ENTER** key. The displayed date will now flash.
4. Use the ▼ **STEP** ▲ knob to select the required date.
5. Press the **ENTER** key. The month will now flash.
6. Use the ▼ **STEP** ▲ knob to select the required month.
7. Press the **ENTER** key. The year will now flash.
8. Use the ▼ **STEP** ▲ knob to select the required year.
9. Press the **ENTER** key to memorise the settings.

NOTE: The GPSPlus will work out the day automatically.

SETTING MAGNETIC OR TRUE BEARINGS

All bearings are displayed in degrees selected, Magnetic (***M***) or True (***T***).

1. Press the **POS** key.
2. Press the **SETUP** key until ***bEArInGS*** is displayed.

3. Press the **ENTER** key, magnetic or true will now flash.
4. Use the ▼ **STEP** ▲ knob to adjust the setting.
5. Press the **ENTER** key to memorise your setting.

MAGNETIC VARIATION

The magnetic variation is calculated by the unit when in ***AUTO***, however the value can be ***EntErEd*** if required.

1. Press the **POS** key.

2. Press the **SETUP** key until ***MAG VAR*** is displayed. The current mode will also be displayed. By default this is ***AUTO,*** the calculated magnetic variation is displayed on the bottom line

3. Press the **ENTER** key, the ***AUTO*** display will now flash.

4. Use the ▼ **STEP** ▲ knob change from ***AUTO*** to ***EnTEREd***. Press the **ENTER** key.

5. Use the ▼ **STEP** ▲ knob to enter the magnetic variation in degrees from 0° to 180°. Press the **ENTER** key.

6. Use the t **STEP** s knob to enter ***W*** for West or ***E*** for East.

7. Press the **ENTER** key to memorise the setting.

DISTANCE UNITS

All distances are displayed in the units selected, either ***NM*** - Nautical Miles, ***M*** - Statute Miles or ***K*** - Kilometres. The default setting is ***NM*** - Nautical Miles.

1. Press the **POS** key.

2. Press the **SETUP** key until ***dIStAnCE*** is displayed. The current units will also be displayed.

3. Press the **ENTER** key, the display will now flash.

4. Use the ▼ **STEP** ▲ knob change the distance units.

5. Press the **ENTER** key to memorise the setting.

COG AND SOG DAMPING

This is the damping factor applied to Speed and Course Over the Ground. When set to ***AUTO*** more damping is applied when ***SOG*** is low, to prevent display jitter.

1. Press the **POS** key.

2. Press the **SETUP** key until ***COG SOG*** is displayed. The setting for damping will also be displayed.

3. Press the **ENTER** key, the display will now flash.

4. Use the ▼ **STEP** ▲ knob change the damping.

5. Press the **ENTER** key to memorise the setting.

CALCULATION METHOD FOR BEARINGS

This setup is the method used by the unit to calculate bearing and distance in NAV mode. The unit can be set to use either Rhumb Line or Great Circle. Select the one most suitable for your navigational needs.

1. Press the **POS** key.

2. Press the **SETUP** key until ***bEArInGS*** is displayed. The current setting will also be displayed.

3. Press the **ENTER** key, the display will now flash.

4. Use the ▲ **STEP** ▼ knob change the setting.

5. Press the **ENTER** key to memorise the setting.

CHANGING THE DISPLAY LANGUAGE

Changes the display language format from English to French. All displays will be in the language selected. By default the setting is English.

1. Press the **POS** key.

2. Press the **SETUP** key until ***LANGUAGE*** is displayed. The current setting will also be displayed.

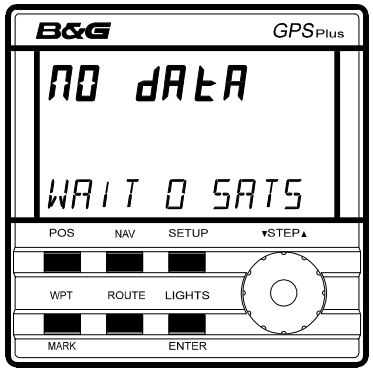
3. Press the **ENTER** key, the display will now flash.

4. Use the ▼ **STEP** ▲ knob to change the setting.

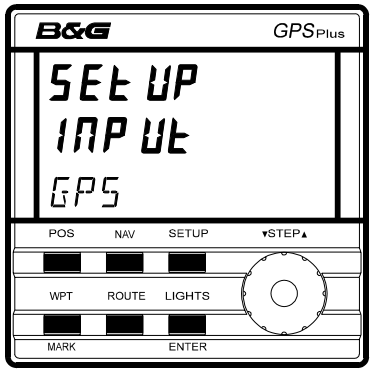
5. Press the **ENTER** key to memorise the setting.

MULTIPLE GPS^{PLUS} DISPLAY INSTALLATIONS

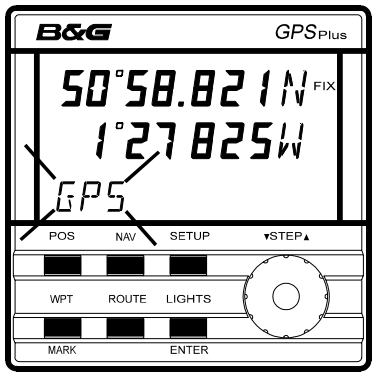
Installations with two or more GPS^{plus} displays fitted must select which GPS^{plus} display will receive the data. When the GPS^{plus} displays and GPS antenna are powered up the display should show the following:



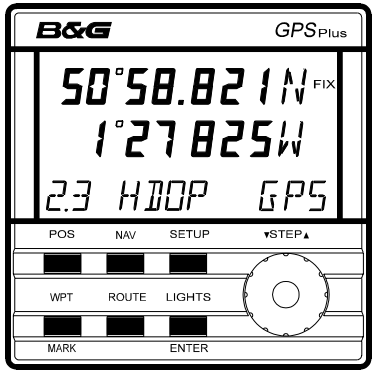
If the above is not shown then press the **SETUP** key until the following is displayed:



Press the **ENTER** key, the display will now show **nOt USEd.** Turn the ▼ **STEP** ▲ knob. If the GPS has not yet locked onto the position then **nOt USEd** will remain. If the GPS has locked then **nOt USEd** will be replaced with the Latitude and Longitude.



Press the **ENTER** key to memorise the selection. Press the **POS** key to return to the position page.



TRANSFERRING WAYPOINT DATA

Up to four GPSPlus displays can be connected into a Network System. This allows multiple NMEA receivers to be used (remember that a single GPSPlus display allows two NMEA receivers to be connected). To enable GPSPlus displays to co-exist on the same network most of the setups are common and the waypoint and route libraries must be identical.

When another GPSPlus display is added the data is usually transferred automatically via the system network cables. Occasionally automatic data transfer is unsuccessful and it is necessary to manually initiate the transfer of waypoint and route library data from one unit to the other. Data transferred to other NMEA devices (not GPSPlus displays) is always initiated manually.

The copying of data, whether between GPSPlus displays or other NMEA devices, is called Uploading or Downloading depending on the direction of the data transfer.

DOWNLOADING

There are two methods of Downloading:

1. **Downloading Via B&G Network**
   This is when data is copied between GPSPlus displays via the B&G Network.

2. **Downloading Via NMEA Interface**
   Waypoint data can also be transferred to other NMEA devices. This is accomplished via the GPSPlus display NMEA interface cable. The waypoints to be downloaded are selected one by one, and then transferred as a complete block of data in an NMEA sentence $IIWPL.

UPLOADING

Uploading of waypoints is accomplished via the secondary NMEA device socket (on the rear case of the GPSPlus display) and cable directly from the position fixer selected. All waypoints are transferred until the **ENTER** key is pressed to terminate uploading.

The following procedures accomplish data transfer.

DOWNLOADING VIA B&G NETWORK

When downloading in this manner the waypoints are transferred via the B&G Network interconnecting cables as Network data. The waypoints are downloaded as one complete block of data.

1. Press the **WPT/MOB** key.
2. Press the **SETUP** key nine times. The display will show:

3. Press the **ENTER** key. The display will show:

The number of waypoints downloading will be displayed counting down from 250.

NOTE: This method of transfer will automatically terminate when all waypoint data has been copied or when a waypoint with the same name as another already in the waypoint library is received. It is possible that the GPSPlus will display ***DATABASE FAULT*** and ***WAYPOINT <name/number>***. This indicates that there are two different waypoints with the same number. Erase or copy one of the waypoints to another (unused) library location if this occurs.
DOWNLOADING VIA NMEA INTERFACE

When downloading in this manner it is necessary to use a special NMEA output cable (part number 610-OA-038) available from your dealer. This cable is connected to the secondary NMEA device socket of the GPSPlus display unit. The waypoints to be downloaded are selected one by one.

1. Press the **WPT/MOB** key.
2. Press the **SETUP** key seven times. The display will show:

3. Press the **ENTER** key. The display will show:

The name of a waypoint for downloading will be displayed and the ***WPT*** number will be flashing.

4. Use the ▼ **STEP** ▲ knob to select a waypoint.
5. Press the **ENTER** key to download the displayed waypoint.
6. Repeat 4 and 5 until all the waypoints are transferred.

UPLOADING WAYPOINTS

Uploading of waypoints is accomplished via the secondary NMEA device socket and cable directly from the position fixer selected. All waypoints are transferred until the **ENTER** key is pressed to terminate uploading.

1. Press the **WPT/MOB** key.

2. Press the **SETUP** key eight times. The display will show:

SEtUP
UPLOAD WPTS

3. Press the **ENTER** key. The display will show:

SEtUP
UPLOADING 1

The number will increase indicating the total number of waypoints transferred so far.

4. Press the **ENTER** key to terminate uploading.

NOTE: Uploading will stop automatically if a waypoint having the same name as one already in the GPSPlus library is uploaded.

DOWNLOADING ROUTE DATA

When multiple GPSPlus displays are used it may be necessary to copy the route data (that is, all the waypoint data stored in a route), between displays. This procedure is similar to copying the waypoint library as previously explained and is also called downloading.

1. Press the **ROUTE** key until ***ROUTE #*** is displayed.

2. Press the **SETUP** key three times. The display will show ***DOWNLOAD***.

ROUtE 1
USEd
DOWNLOAD

3. Press the **ENTER** key to download the route data.

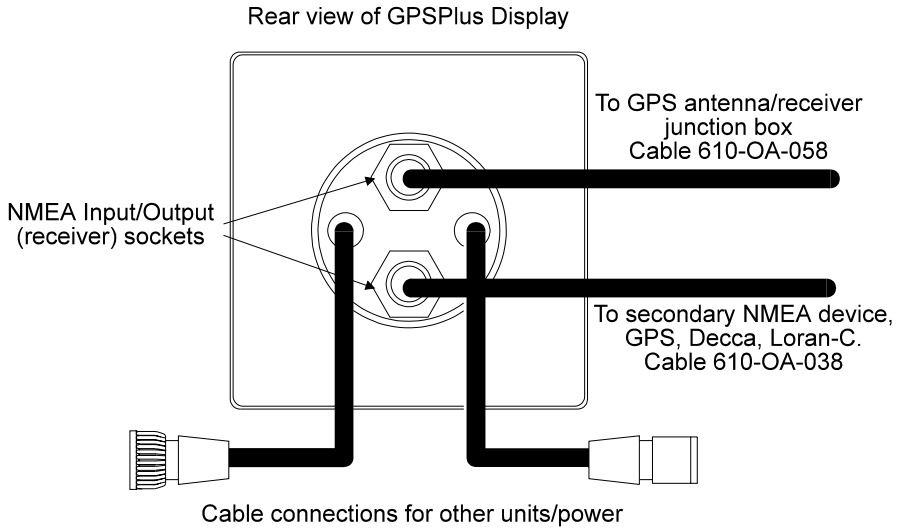
NOTE: It is possible for the GPSPlus to display an error message ***DATA FAULT*** when downloading routes. This indicates two routes with the same route number exist. If this occurs erase one of the routes, or redefine another route using the same waypoint data.

NMEA INTERFACING WITH GPSPLUS

The two sockets on the rear case of the GPSPlus display are NMEA input/output connectors for position fixing instruments, radar sets, autopilots and other devices requiring NMEA interfacing. The connectors allow bi-directional data communication using the NMEA 0183 v1.5 protocol. This allows input of positional data (latitude and longitude) and other position fixer information (e.g. satellite data) into the GPSPlus display unit for displaying, and output of control sentences (including waypoint data) to a position fixer.

In a standard GPSPlus system the GPSPlus antenna/receiver unit uses the top connector, leaving the other for connection to a secondary NMEA device (e.g. a GPS, Loran-C or Decca receiver).

GPS*Plus *RECEIVER SOCKETS



NMEA input/output to the position fixer receiver has hardware connections for version 1.5 NMEA. The receiver connection cables supplied have the following colour coded connections:

GPS ANTENNA CONNECTION USING CABLE 610-OA-058

WIRE COLOUR	FUNCTION	PIN
GREY	NMEA IN +	3
BLACK	NMEA IN -	4
SCREEN	CABLE SHIELD	6

SECONDARY NMEA 0183 DEVICE CONNECTION USING CABLE 610-OA-038

WIRE COLOUR	FUNCTION	PIN
BLACK	NMEA OUT +	1
WHITE	NMEA OUT -	5
GREEN	NMEA IN +	3
YELLOW	NMEA IN -	4
SCREEN	CABLE SHIELD	6

NMEA OUTPUT

The GPSPlus display software provides NMEA output from both of the receiver connection sockets.

It is necessary to select the required NMEA output sentences as ON (transmitted) or OFF (not transmitted). To determine which sentences are required refer to the NMEA device handbook.

To turn a sentence from OFF to ON or vice versa:

1. Press the **POS** key to display the ***CURRENT FLOW*** page.
2. Press the **SETUP** key once, the display will show ***OUTPUT***.
3. Turn the ▼ **STEP** ▲ knob to list all the GPSPlus output sentence mnemonics. By default all are OFF except RMB and RMC.
4. Press the **ENTER** key when the desired sentence is displayed, ***ON*** (or ***OFF***) will flash.
5. Use the ▼ **STEP** ▲ knob to change the flashing display.
6. Press the **ENTER** key to memorise the setting.
7. Repeat until all the required sentences are set.

NMEA OUTPUT SENTENCE LIST

The following is a list of all the NMEA output sentences available from the GPSPlus display unit including the initial setting. The SETUP key allows selection of each sentence as ***ON*** or ***OFF***, allowing custom interfacing as required by the end user.

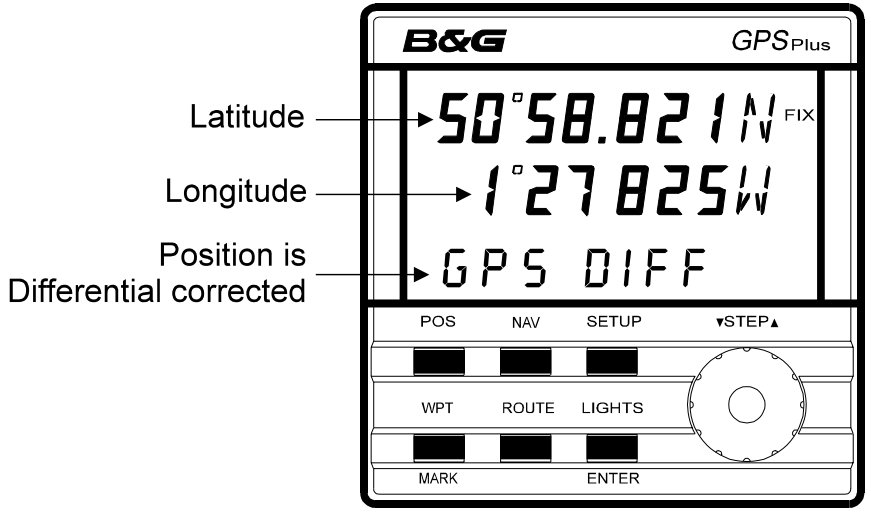
APB	Autopilot sentence 'B'	OFF
BOD	Bearing, Origin to destination	OFF
BWC	Bearing and distance to waypoint (great circle)	OFF
BWR	Bearing and distance to waypoint (rhumb line)	OFF
DBT	Depth Below Transducer	OFF
DTM	Chart datum	OFF
GL2	Geographic Latitude and Longitude (NMEA V2.0)	OFF
GL1	Geographic Latitude and Longitude (NMEA V1.5)	OFF
RMA	Recommended minimum specific - Loran C	OFF
RMB	Recommended minimum navigation information	ON
RMC	Recommended minimum navigation - GPS	ON
VDR	Tidal Set and Drift	OFF
VHW	Heading and water speed	OFF
VLW	Distance Travelled through the Water	OFF
VTG	Actual track and ground speed	OFF
VWR	Wind bearing (relative) and speed	OFF
VWT	True Wind speed and Angle	OFF
WCV	Waypoint closure velocity	OFF
XTE	Cross track error	OFF
ZDA	UTC time and date	OFF
ZTG	Time of arrival at waypoint	OFF
WPL	Waypoint location	OFF

GPSPLUS DIFFERENTIAL INFORMATION

The GPSPLUS system is capable of accepting a Differential GPS input conforming to the RTCM SC 104 V2.0 format.

Refer to the installation sheets for wiring details.

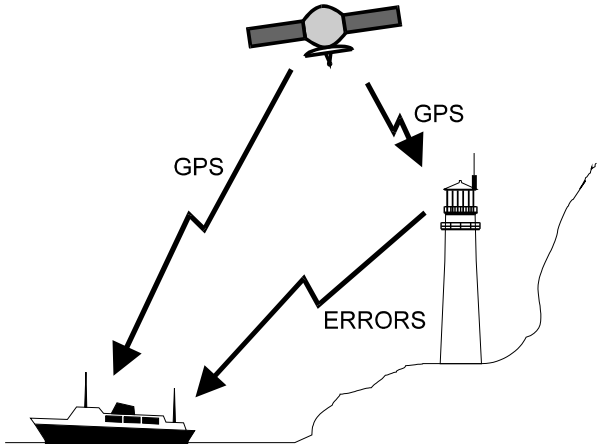
Once the GPS has obtained a fix, and the Differential receiver has locked onto the beacon, the GPSPLUS display will show the following:



NOTE: The above is not a new page. The value of ***HDOP*** is replaced with ***GPS DIFF .***

The basic GPS system available to the normal user contains a deliberate inaccuracy, called Selective Availability (SA). This limits the accuracy of the GPS position to an average of 100 metres. To improve the accuracy a system called Differential GPS (DGPS) was designed to run with the normal GPS system.

The basic principle of DGPS is that a known position (Lighthouse, Coastguard Station, etc.) has a normal GPS receiver installed. A computer monitors the position from the GPS and compares this to its known position. The error between the GPS position and the known position is calculated then transmitted over a conventional radio link to the vessel. The GPS on board the vessel recalculates the position taking into account the errors. A separate receiver and antenna are needed to receive the Differential beacon signal.



INSTALLATION OF THE DISPLAY UNIT

The display unit is supplied with a clip-in mounting bracket which allows for easy installation. Access from behind is not necessary to secure the unit in place. However, to prevent theft and permanently fix the unit in position, locking studs and thumb nuts are supplied.

SITING THE UNIT

The instrument is designed for mounting on or below deck. A mounting position should be selected where it is:

- Easy to read by the helmsman
- On a smooth, flat surface
- At least 100mm (4") from a compass
- Protected from direct splashes of water to the rear of the display case
- Accessible from behind for fitting locking studs if required.

TOOLS REQUIRED

- 70mm (2¾") hole cutter
- 2.9mm, 5mm drills
- Screwdrivers
- Measuring tape or rule
- Cable clips or ty-wraps.

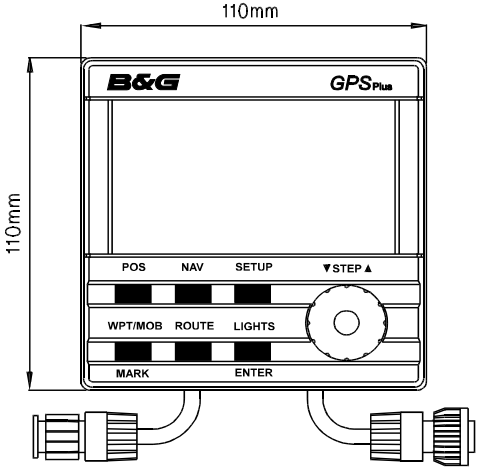
MOUNTING THE UNIT

Use the cutting template supplied to mark the centres of the holes for the self-tapping screws, the fixing stud holes and the mounting bracket.

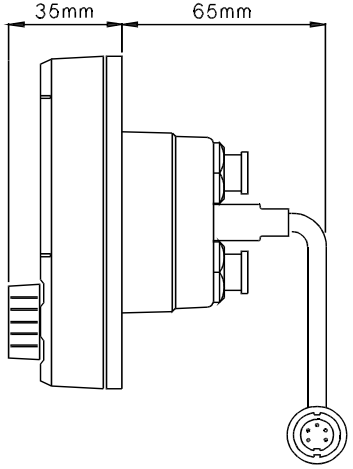
- The template allows 4mm (5/32") between adjacent units for the suncover. Increase this distance if required to a maximum of 60mm (2 3/8") between units or 180mm (3 1/8") between centres. For greater distances between units extension cables are available.
- Use a 70mm (2 3/4") diameter hole cutter for the mounting bracket hole.
- Use a 2.9mm drill for the self-tapping holes.
- Use a 5mm drill for the locking stud holes.
- Secure the mounting bracket to the bulkhead with the self-tapping screws supplied.
- Fit the rubber-sealing gasket around the mounting bracket.
- Screw the locking studs into the back of the display head (if required for security locking).
- Carefully pass the cable tails through the mounting bracket hole, connect the plugs and sockets to sensor cables, power cable and other Network display units as required.
- Clip the display head into the mounting bracket (it is a snug fit).
- Secure the instrument with the thumb nuts supplied (if required).

INSTALLATION DATA

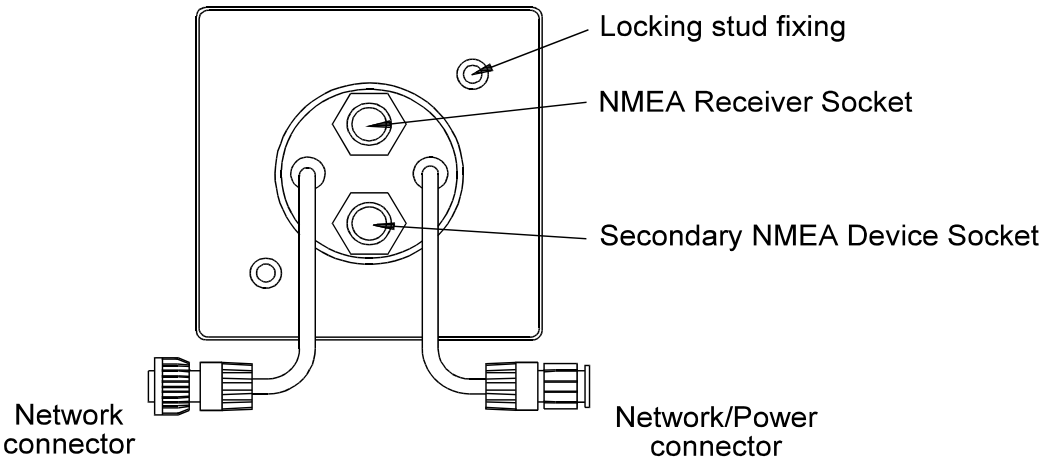
GPSPLUS Display Unit



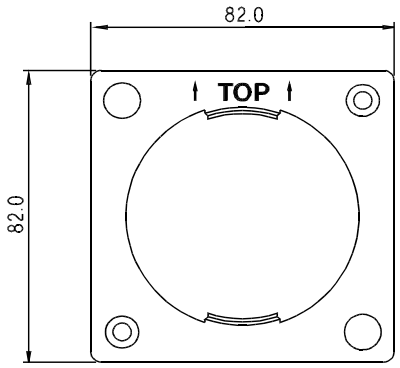
Side view of unit



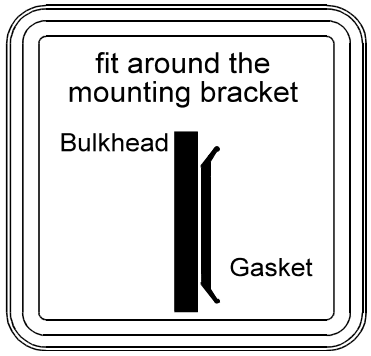
Rear view of unit

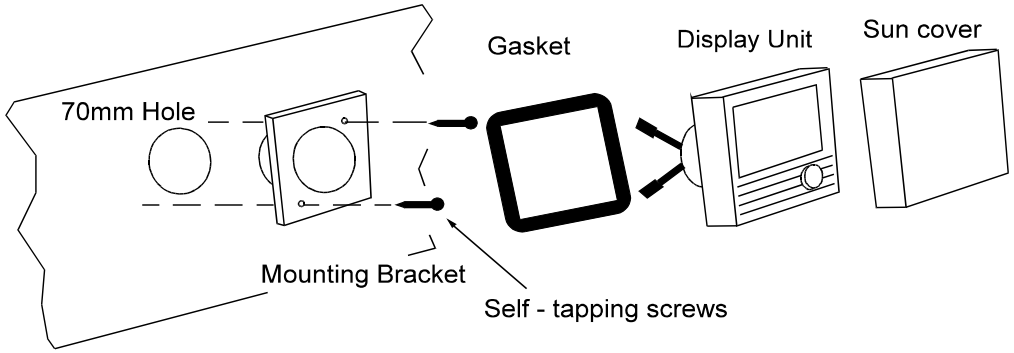


Mounting Bracket



Rubber Gasket





INSTALLATION OF ANTENNA UNIT

CHOOSING A LOCATION

Select a suitable site for the antenna unit with reasonable consideration of the following points:

- As close as possible to the vessel's deck, which has a relatively unobstructed view of the horizon
- Avoid areas where the unit could become damaged, e.g. where ropes or wires could become entangled
- Avoid installing unit at the mast top: this location accentuates the boat’s motion
- Avoid areas of high vibration, e.g. engine housings and radar installations
- Not within 60cm (2ft) of other antennas, e.g. VHF, SSB
- Above or below a radar's cone of transmission
- Below and at least 3m (10ft) away from satellite communications equipment

Dense wood or metal structures will shield the unit from satellite signals. However, stays, masts and relatively dry sails will not interfere with reception. The unit can receive signals through glass, canvas and thin fibreglass (for example, a wheelhouse or saloon area), however it would be advisable to try such a location before permanent fixture.

MOUNTING THE ANTENNA UNIT

The GPS antenna unit may be pole mounted. The threaded socket at the base of the unit will accept a 1¼" straight thread. The GPS antenna unit only requires hand tightening on to the pole mount. Over tightening with a tool could damage the threaded socket at the base of the unit.

The pole mounting arrangement of the GPS antenna unit makes it easy for you to remove and store it in a safe and secure place when not in use. For permanent installation it is advisable to drill and pin the GPS antenna unit. This will discourage theft and prevent accidental loosening.

Alternatively the GPS antenna can be split into two parts by removing the four screws in the underside. The lower part can be discarded, leaving the GPS antenna with a flat base, which can be mounted on a cabin top or “A” frame.

If you choose this mounting option secure the GPS antenna from underneath using 4 x M3 machine screws. Care should be taken to trim overlong screws so no more than 7 turns of the thread are inside the GPS antenna.

ROUTING THE GPS ANTENNA CABLE

The GPS antenna unit is supplied with a 9 metre (30ft), shielded multicore cable. The cable should be routed to the GPSPlus Display unit junction box and then cut to length. For connection details refer to the installation sheet supplied with your system.

When routing the antenna cable consideration should be given to the following guidelines:

AVOID:

- Sharp bends or kinks in the cable
- Hot surfaces e.g. exhaust manifolds or stacks
- Rotating or reciprocating equipment
- Sharp or abrasive surfaces
- Door, hatch and window jambs
- Corrosive fluids or gases

LIST OF CHART DATUMS

GPSPlus NAME	CHART DATUM	COUNTRIES
ADINDAN	ADINDAN	Ethiopia Mali Senegal Sudan
AFGOOYE	AFGOOYE	Somalia
AIN EL ABD	AIN EL ABD 1970	Bahrain Island
ANNA 1 ASTRO	ANNA 1 ASTRO 1965	Cocos Islands
ARC 1950	ARC 1950	Botswana Lesotho Malawi Swaziland Zaire Zambia Zimbabwe
ARC 1960	ARC 1960	Kenya Tanzania
ASCENSION 58	ASCENSION ISLAND 1958	Ascension Island
AST BECON E	ASTRO BEACON "E"	Iwo Jima Island
AST B4 SATO	ASTRO B4 SOROL ATOLL	Tern Island
AST DOS 71/4	ASTRO DOS 71/4	St. Helena Island
ASTRONOMIC S	ASTRONOMIC STATION 1952	Marcus Island
AUSTRALIA 66	AUSTRALIA GEODETIC 1966	Australia Tasmania
AUSTRALIA 84	AUSTRALIA GEODETIC 1984	As above
BELLEVUE	BELLEVUE (IGN)	Efate Islands Erromango Islands
BERMUDA 1957	BERMUDA 1957	Bermuda Islands
BOGOT OBSERV	BOGOTA OBSERVATORY	Colombia
CAMPO INCHAU	CAMPO INCHAUSPE	Argentina
CANTON ASTRO	CANTON ASTRO 1966	Phoenix Islands
CAPE	CAPE	South Africa
CAPE CANAVER	CAPE CANAVERAL	Florida Bahama Islands
CARTHAGE	CARTHAGE	Tunisia
CHATHAM 1971	CHATHAM 1971	Chatham Island (New Zealand)
CHAU ASTRO	CHAU ASTRO	Paraguay

CORREGO ALEG	CORREGO ALEGRE	Brazil
DJAKARTA	DJAKARTA (BATAVIA)	Sumatra Island (Indonesia)
DOS 1968	DOS 1968	Gizo Island (New Georgia Islands)
EASTER IS 67	EASTER ISLAND 1967	Easter Island
EUROPEAN 50	EUROPEAN 1950	Austria Belgium Denmark Finland France Germany Gibraltar Greece Italy Luxembourg Netherlands Norway Portugal Spain Sweden Switzerland
EUROPEAN 79	EUROPEAN 1979	Austria Finland Netherlands Norway Spain Sweden Switzerland
FINLAND	FINLAND HAYFORD 1910	Finland
GANDAJIKA	GANDAJIKA BASE	Republic of Maldives
GEODETIC 49	GEODETIC DATUM 1949	New Zealand
GUAM 1963	GUAM 1963	Guam Island
GUX 1 ASTRO	GUX 1 ASTRO	Guadalcanal Island
HJORSEY 1955	HJORSEY 1955	Iceland
HONG KONG 63	HONG KONG 1963	Hong Kong
INDIAN VIETN	INDIAN	Thailand Vietnam

LIST OF CHART DATUMS

INDIAN	INDIAN	Bangladesh India Nepal
IRELAND 1965	IRELAND 1965	Ireland
ISTS 073 AST	ISTS 073 ASTRO 1969	Diego Garcia
JOHNSTON IS	JOHNSTON ISLAND 1961	Johnston Island
KANDAWALA	KANDAWALA	Sri Lanka
KERGUELEN IS	KERGUELEN ISLAND	Kerguelen Island
KERTAU 1948	KERTAU 1948	West Malaysia Singapore
LC 5 ASTRO	L.C.5 ASTRO	Cayman Brac Island
LIBERIA 1964	LIBERIA 1964	Liberia
LUZON MINDAN	LUZON	Mindanao Island
LUZON PHILLIP	LUZON	Phillippines (excluding Mindanao Island)
MAHE 1971	MAHE 1971	Mahe Island
MARCO ASTRO	MARCO ASTRO	Salvage Islands
MASSAWA	MASSAWA	Eritrea (Ethiopea)
MERCHICH	MERCHICH	Morocco
MIDWAY ASTRO	MIDWAY ASTRO 1961	Midway Island
MINNA	MINNA	Nigeria
NAHRWAN OMAN	NAHRWAN	Masirah Island (Oman)
NAHRWAN UAE	NAHRWAN	United Arab Emirates
NAHRWAN SAUD	NAHRWAN	Saudi Arabia
NAPARIMA BWI	NAPARIMA, BWI	Trinidad and Tobago
NA CONUS	NORTH AMERICAN 1927	Mean value (CONUS)
NA ALASKA	NORTH AMERICAN 1927	Alaska
NA BAHAMA	NORTH AMERICAN 1927	Bahamas Island
NA SAN SALVA	NORTH AMERICAN 1927	San Salvador Island
NA CANADA	NORTH AMERICAN 1927	Canada (Newfoundland Island)
NA CANAL ZON	NORTH AMERICAN 1927	Canal Zone

NA CARIBBEAN	NORTH AMERICAN 1927	Caribbean - Barbados Caicos Islands Cuba Dominican Republic, Grand Cayman, Jamaica Leeward Islands Turks Islands
NA CENTRAL	NORTH AMERICAN 1927	Central America - Belize Costa Rica El Salvador Guatemala Honduras Nicaragua
NA CUBA	NORTH AMERICAN 1927	Cuba
NA GREENLAND	NORTH AMERICAN 1927	Greenland (Hayes Peninsula)
NA MEXICO	NORTH AMERICAN 1927	Mexico
N AMERICA 83	NORTH AMERICAN 1983	Alaska Canada Central America CONUS Mexico
OBSERVATORIO	OBSERVATORIO 1966	Corvo Flores Islands (Azores)
OLD EGYPTIAN	OLD EGYPTIAN	Egypt
OLD HAWAIIAN	OLD HAWAIIAN	Mean Value
OMAN	OMAN	Oman
OS OF GB 36	ORDNANCE SURVEY OF GB 1936	England Isle of Man Scotland Shetland Islands Wales
PICO LAS NIE	PICO DE LAS NIEVES	Canary Islands
PITCAIRN AST	PITCAIRN ASTRO 1967	Pitcairn Island
PROV S CHILE	PROVISIONAL S.CHILEAN 1963	South Chile

LIST OF CHART DATUMS

PROV S AMER	PROVISIONAL S.AMERICAN 1956	Bolivia Chile Colombia Equador Guyana Peru Venezuela
PUERTO RICO	PUERTO RICO	Puerto Rico Virgin Islands
QATAR NATION	QATAR NATIONAL	Qatar
QORNOQ	QORNOQ	South Greenland
REUNION	REUNION	Mascarene Island
ROME 1940	ROME 1940	Sardinia Island
SANTO DOS	SANTO (DOS)	Espirito Santo Island
SAO BRAZ	SAO BRAZ	Sao Miguel Santa Maria Islands (Azores)
SAPPER HILL	SAPPER HILL 1943	East Falkland Island
SCHWARZECK	SCHWARZECK	Namibia
S AMERICA 69	SOUTH AMERICAN 1969	Argentina Bolivia Brazil Chile Colombia Ecuador Guyana Paraguay Peru Venezuela Trinidad and Tobago
S ASIA	SOUTH ASIA	Singapore
SE BASE	SOUTHEAST BASE	Porto Santo Madeira Islands
SW BASE	SOUTHWEST BASE	Faial Graciosa Pico Sao Jorge Terceira Islands (Azores)
SWEDEN	RT90 (RT38) SWEDEN	Sweden
TIMBALAI 48	TIMBALAI 1948	Brunei East Malaysia (Sarawak, Sabah)

TOKYO	TOKYO	Japan Korea Okinawa
TRISTAN AST	TRISTAN ASTRO 1968	Tristan da Cunha
VITI LEVU	VITI LEVU 1916	Viti Levu Island (Fiji Islands)
WAKE-ENIWETK	WAKE ENIWETOK 1960	Marshall Islands
ZANDERIJ	ZANDERIJ	Surinam
WGS 72	WORLD GEODETIC SYSTEM 1972	
WGS 84	WORLD GEODETIC SYSTEM 1984	
USER ENTERED	User entered Lat. and Long. offset	