

*USING G.P.S. IN THE FIELD*

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## What is a GPS?

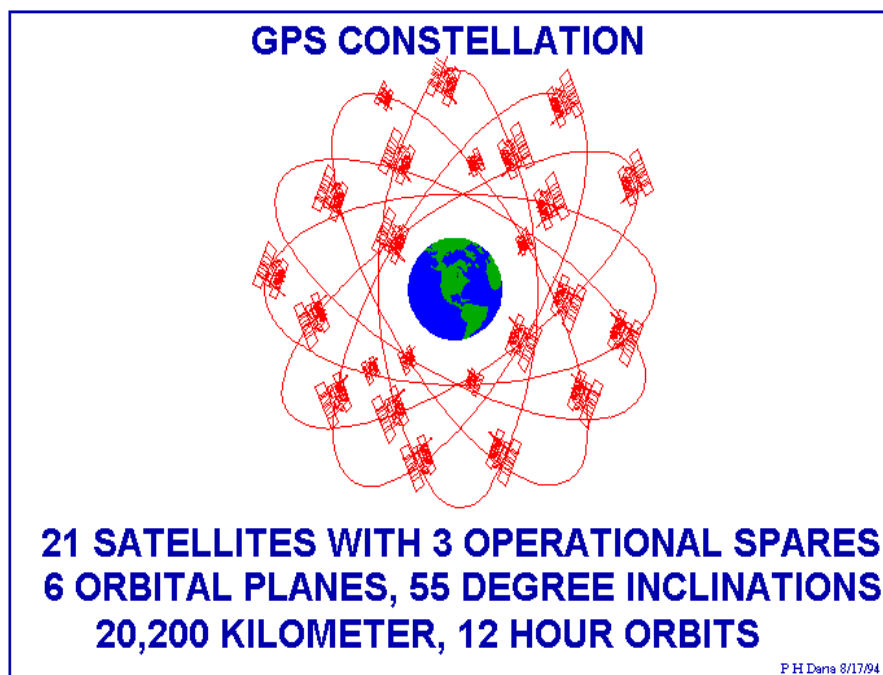
GPS (Global Positioning Systems) is a satellite-based navigation system developed by the US Department of Defence to provide a consistent, accurate method for simplifying navigation.

Unlike other accurate positioning systems, positions are given in real time. This means that the position of moving objects like cars and aeroplanes also can be determined instantly. Since 1978 the Global Positioning System has provided civil, commercial and recreational users with 24-hour, worldwide navigation coverage.

## How does GPS work?

GPS navigation uses satellite ranging to determine your position in relation to a set of satellites orbiting the earth. The GPS constellation consists of 24 satellites, which continuously send radio signals containing precise position and time information for each satellite back to earth.

By knowing the position of any 3 or 4 of these satellites and calculating the time differences between transmitted signals, your GPS receiver determines its present position and displays it in a coordinate system.

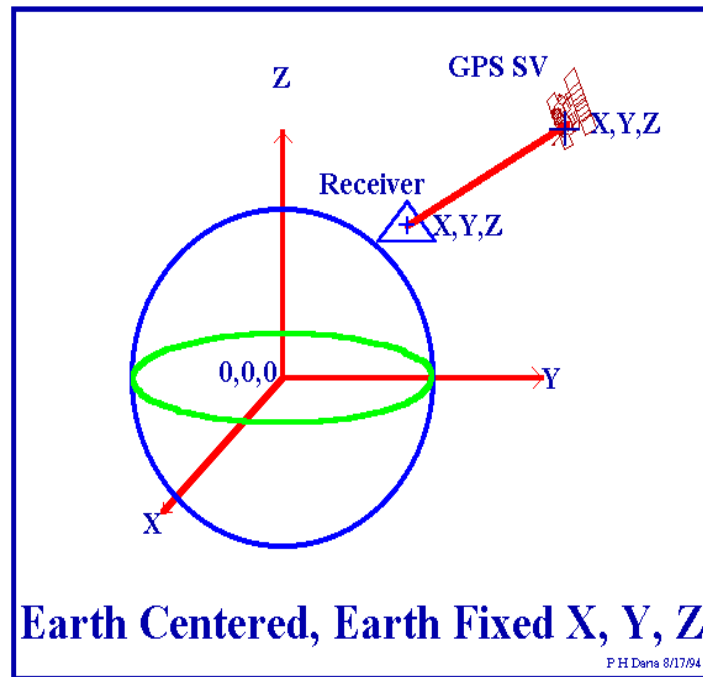


## What can GPS do?

As a positioning system, GPS can be used to determine:

- The coordinates of point locations in three dimensions; longitude, latitude and altitude (x, y, and z respectively) with an accuracy of 30 to 100 metres
- The distance between two points
- The direction (azimuth) of linear features in the landscape.

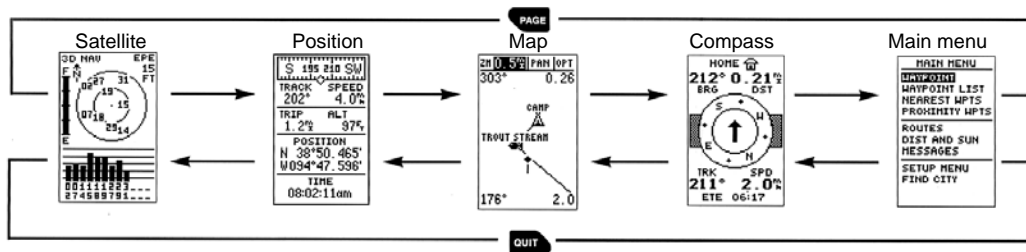
From these major applications, you can establish a steering guidance to go to a specific waypoint, or derive information such as surface area (with the assistance of a Geographic Information System).



# How to use your GPS

## Basics

- Use the arrow key to highlight or scroll through data options.
- Use Enter key to activate highlighted fields or confirm data entry.
- Use Page & Quit button to move scroll through the main data pages



## Navigation Setup

Mapping uses projection systems (Datum) to model the geometry of the earth surface (3D) on a plane (2D)

The navigation setup is used to select units of measurement for position format, map datum and distance.

The GPS device should record and display position data (3D) in a standardised format that can be used with paper maps (2D).

The format chosen by the Mapping Unit is a world-wide standard format that is suitable for use with most government charts.

Coordinate system units:

**hddd<sup>o</sup>mm'ss.s**

Latitude-Longitude in degrees, minutes and seconds

Map Datum:

**WGS84**

The WGS 84 datum covers world-wide navigation. However, if you are using a paper map or chart which uses a different map datum than WGS 84, then you may wish to switch to that datum to make your GPS position readout correspond to the chart.

If you record your location coordinates on a paper or in an Excel spreadsheet, it is important to report the datum details, so everyone can use your records accurately. See Annex 1.

**Note:** The GPS device is set up with the WGS84 datum by default, but can be changed to suit that of your map.

Distance Units:

**Metric**

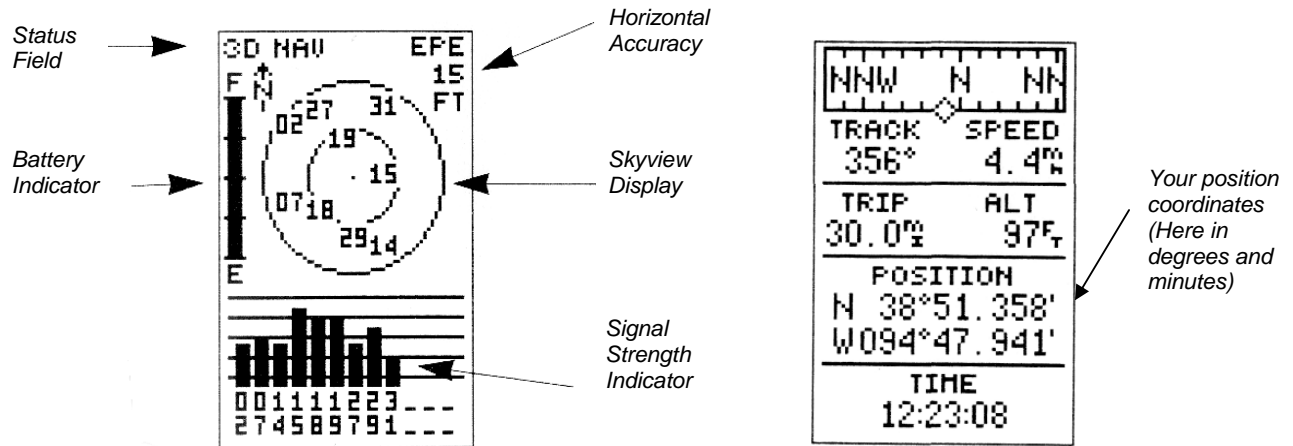
To configure your GPS unit, follow these steps:

- 1- Press Page button until the **MainMenu** page comes out.
- 2- Use the arrow key ▲▼ to highlight **Setup Menu** and press **Enter**
- 3- Highlight (▲▼) **Navigation Menu**, press **Enter**
- 4- Highlight (▲▼) the **POSITION FRMT** field, press **Enter**.
- 5- Select (▲▼) **hddd<sup>o</sup>mm'ss.s"**, press **Enter**.
- 6- Highlight (▲▼) the **MAP DATUM** field, press **Enter**.
- 7- Select (▲▼) **WGS84**, Press **Enter**.
- 8- Highlight (▲▼) the **UNITS** field, press **Enter**.
- 9- Select (▲▼) **METRIC**, Press **ENTER**.
- 10- Press Quit button twice to go back to the **Main Menu**.

***Status Position***

1. Take the GPS outdoor to a large, open area that has a clear view of the sky from horizon to horizon. The more open the area, the more precise the coordinates will be.
2. Switch the GPS on by pressing the red button / light bulb. The Welcome Page will be displayed while the unit is conducting a self-test.
3. When the self-test is completed the *Satellite Page* will appear. Press **ENTER** to initiate the GPS.

- From the "Choose Init Method" menu use the arrow key to highlight **Select country from list** and press **ENTER**. Use the arrow key to highlight the country you are currently in, and press **ENTER**.
- The Satellite Page will now reappear with the current satellite configuration for the country you selected, and your GPS is acquiring satellite data.



**The Satellite Page**

**The Position Page**

This process can take 5-10 minutes. The GPS Status Page provides a visual reference of satellite signal acquisition and position. A signal strength bar will appear for each satellite in view, with the appropriate satellite number indicated underneath each bar.

You have to wait until at least four satellites appear for your position to be calculated in 3 dimensions. The satellite sky view shows the position of each satellite relative to the unit's last position. Once sufficient signals have been received, the Status Page will be replaced by the *Position Page* indicating your position and providing you with a waypoint for future reference.

**If you have difficulties acquiring satellite signals, try facing another direction or move to a place with a clearer view of the horizon.**

## Marking a position

Press the MARK button to record your position. The *Mark Position Page* will appear, with a default three-digit name for the new waypoint in the upper-left portion of the page. You can now give your location a more meaningful name and a symbol:

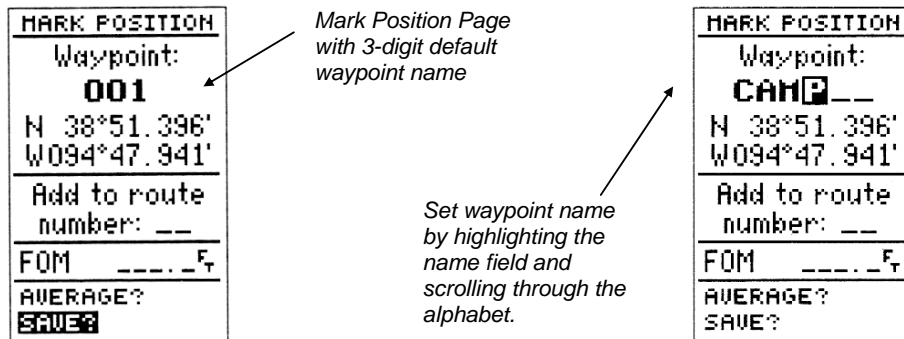
### To rename the waypoint:

1. Highlight the three-digit name field and press Enter.
2. Enter the new name by using the arrow keys ((▲▼) to scroll through the alphabet; (◀▶) to move between the character fields).
3. When the name is complete, press **ENTER**.
4. Highlight the **DONE?** prompt and press **ENTER** to save.

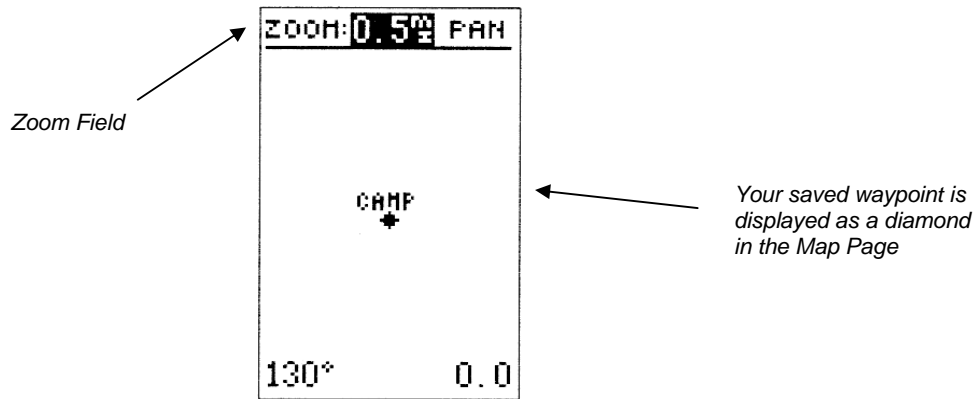
### To change the waypoint symbol:

1. Highlight the waypoint symbol field and press **ENTER**.
2. Select the symbol, press **ENTER**.
3. Move the cursor to the **DONE?** prompt, and press **ENTER** to save.

Your waypoint is now recorded in the GPS.

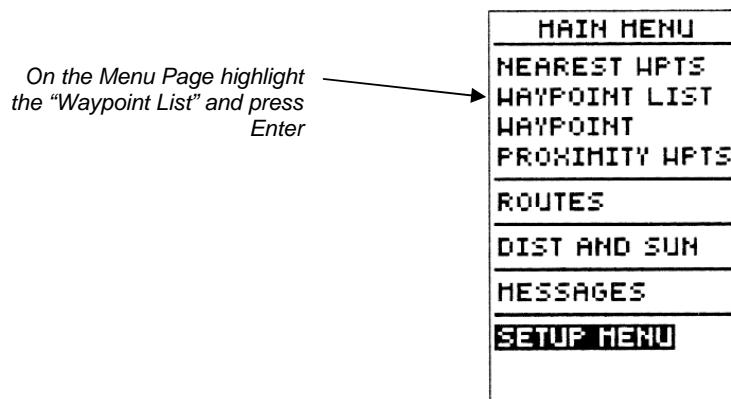


6. By pressing the PAGE button you can display the stored waypoint in the *Map Page*. You can zoom in and out by highlighting (◀▶) the zoom field (**ENTER**) and using the arrow keys (▲▼)



**To retrieve your waypoints:**

1. Press the PAGE button to go to the **Main Menu Page.22**
2. Highlight **WAYPOINT LIST** and press **ENTER**
3. Highlight the waypoint you are interested in and press **ENTER**. The information associated with the waypoint (name, coordinates and date) will appear on the screen.

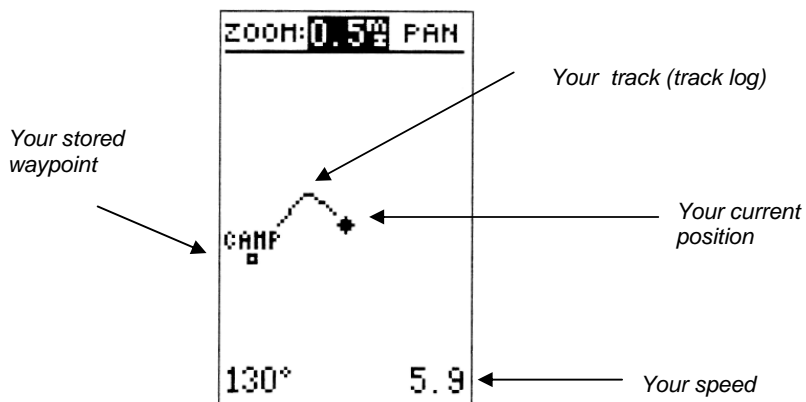


## ***Moving Map Basics***

The map page acts as a window. It allows you to view your position, the “path” you have traveled over, and nearby waypoints.

A diamond icon in the center of the screen represents your current position. As you move, you will see a thin line – called a track log -- appear along the path you have just covered.

Names of stored waypoints can also be show on the map.



## ***Routes***

The route navigation feature lets you plan and navigate a course from one place to another using a set of pre defined waypoints.

Routes are often used when it's not practical or possible to navigate a direct course to a particular destination. (Impassable terrain)

A route is a sequence of waypoints you have to cross if you want to navigate from the first waypoint (*starting point*) of the route to the latest waypoint (*destination point*) of the same route.

Whenever you activate a route with the GPS it will automatically select the closest waypoint in the route as the “active to” waypoint and will show you the direction and distance to this point as you move.

As you pass each waypoint in the route, the receiver will sequence and select the next waypoint as the new “active to” waypoint.

**TracBack function** (GPS 12XI Software 4.0 only)

The tracback feature allows you to quickly retrace your path using the track log automatically stored in the receiver.

Before starting your trip, you must clear the existing track log.

In the Map page select option **OPT** (ENTER) and highlight **TRACK SETUP** (ENTER)



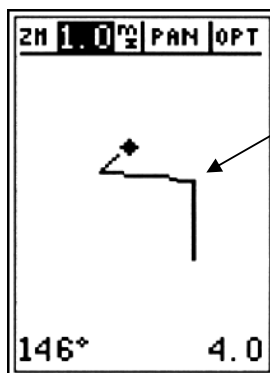
Set

**RECORD: Wrap** (ENTER)

**METHOD: Auto** (ENTER)

Highlight **CLEAR LOG** (ENTER) and select **Yes** (ENTER)

**Note:** Always clear your log at the exact point you want to go back to.



The GPS will now keep your track in its memory and draw your track on the map page.

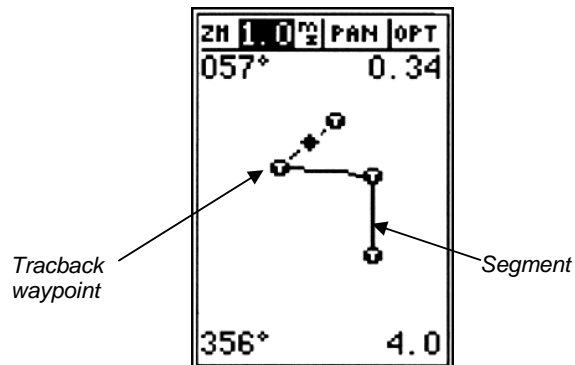
Once you want to retrace your way back, Press **Goto** and highlight **Tracback** to begin tracback navigation

Once the tracback function has been activated the GPS will take the track log currently stored in memory and divide it into segments.

Up to 30 waypoints will be created to mark most significant features of the track log.

A message will appear while the GPS analyses the data and creates a Tracback route.

The **Route** page will appear showing a route from your present position (*starting point*) to the oldest track log point in memory (*destination point*) (i.e. when you cleared the track log).



### Data Collection

The GPS units utilized by UNHCR are designed mainly for navigation purposes. However, due to the increased accuracy and quality of GPS units and the removal of errors previously introduced into the satellite network, the GPS units can now be used for data collection that will not require high precision accuracy. Depending on the GPS unit and environmental conditions there will be a horizontal error of approximately 1-30 meters. If accuracies of less than 5 meters are needed then alternative survey or differentially corrected (error corrected) data collection techniques should be used.

### Suggested GPS Unit Configuration for Data Collection

It is highly recommended that users modify the position format to collect points in decimal degrees. To configure your GPS unit for point and line data collection, follow these steps:

- 1- Press Page button until the **MainMenu** page comes out.
- 2- Use the arrow key ▲▼ to highlight **Setup Menu** and press **Enter**
- 3- Highlight (▲▼) **Navigation Menu**, press **Enter**
- 4- Highlight (▲▼) the **POSITION FRMT** field, press **Enter**.
- 5- Select (▲▼) **hddd.ddddd°**, press **Enter**.
- 6- Highlight (▲▼) the **MAP DATUM** field, press **Enter**.
- 7- Select (▲▼) **WGS84**, Press **Enter**.
- 8- Highlight (▲▼) the **UNITS** field, press **Enter**.
- 9- Select (▲▼) **METRIC**, Press **ENTER**.
- 10- Press Quit button twice to go back to the **Main Menu**.

## Waypoint Data (points)

The process to collect point data is the same as the “**Mark Position**” section elaborated on earlier in this document. Follow these procedures to collect waypoints for features such as wells, towns or any other point of interest.

## Track Data (lines)

To collect lines with your GPS unit you will need to do some additional configuration and understand the way the GPS collects lines. The GPS unit in fact will not collect lines but a series of points that can be connected later to form polygons or lines. This process is much like dropping breadcrumbs as you move across the landscape. You must specify how often the GPS will collect points. This is important because the unit can only collect 1050 points and when it has reached its capacity it will then automatically start deleting the first points to make room for new ones. To configure the unit use the same process as highlighted in the “Track Back” section earlier and explained again below. The only difference will be in setting the **METHOD**: to **Auto** or **Time Interval**. The **Auto** setting calculates the rate of point collection as a function of time and distance travelled and is good for collection of, for example, road data. The **Time Interval** setting is used for the collection of more detailed data such as the parameter of a UNHCR office. The decision of which to use is based on what type of data you are collecting.

For example, if you are collecting data for a relatively straight road over a large distance then you do not need to collect a many point to define that road and the Auto setting would be best. If you are collecting data for the outline of a river that has many curves over a short distance then you may set a **Time Interval** of 00.00.30, which is every half-second. As a general rule visualize the feature that you are trying to collect and the speed at which you are travelling (by foot, in a car) and estimate what that feature would look like if you picked up points at your specified time interval and then connected all of those points.

In the Map page select option **OPT (ENTER)** and highlight **TRACK SETUP (ENTER)**



Set

**RECORD: Wrap or Off (ENTER)**

**METHOD: Auto or Time Interval (ENTER)**

If **Time Interval** set time.

Highlight **CLEAR LOG (ENTER)** and select

**Yes (ENTER)**

Another important process in line data collection is to remember to turn the track function off when you are finished with the collection of a feature. For example, if you collect an access road to a refugee camp and then drive to another refugee camp where you want to collect a boundary of an agricultural area with the unit turn on, you will continue to collect point on you drive between the two sites and fill up the GPS memory. You can either turn the unit off until you get to the new site or set the **RECORD**: setting to the **Off** position. After you have downloaded the tracks (The process is highlighted in separate software specific instructions) you should always perform the **CLEAR LOG** function to free up memory space on the unit.

### **Documentation**

As many of UNHCR's offices are not equipped with the facilities to process the data collected by the GPS unit into maps it is important to carefully document all points and tracks collected so it will be processed correctly by the GIMU or RSAL offices. Annex 1 & 2 provide forms for GPS data documentation in the field. It is highly recommended to use the Annex 2 sheet for collection in Decimal Degrees after you have configured your unit following the instruction in the Data Collection section of this document.

### **Data Download from GPS Unit**

Separate documentation will be provided for data download procedures and it is highly recommended that these procedures are used. This will reduce error introduced during the filling out of forms and save time in data processing. **This does not however mean that you do not need to fill out collection form.**

**Turn off the GPS by pressing the red button / light bulb for 3 seco**

