

Setting up a GPS Unit and Basic GPS Mapping Techniques Manual

1 Introduction

This manual is intended to provide users with a basic understanding of a Garmin eTrex GPS receiver and how it can help to support day to day operations. For detailed information about this receiver, refer to the owner's manual that is included with the receiver.

1.1 What is a Global Positioning System?

The Global Positioning System is a space-based global navigation satellite system. It provides reliable location and time information anywhere on Earth and at all times when there is an unobstructed line of site to at least four GPS satellites. It was created by the U.S. Department of Defense in 1973.

1.2 How it works?

The Global Positioning System consists of three segments:

1. Space Segment

The space segment is composed of orbiting satellites positioned in medium Earth orbit at an altitude of approximately 20 200 kilometers (12 550 miles). The satellites orbit around the Earth in six circular planes broadcasting the signal from space. Each satellite makes two complete orbits each day. About eight satellites are visible at any particular time from any point on the ground.

2. Control Segment

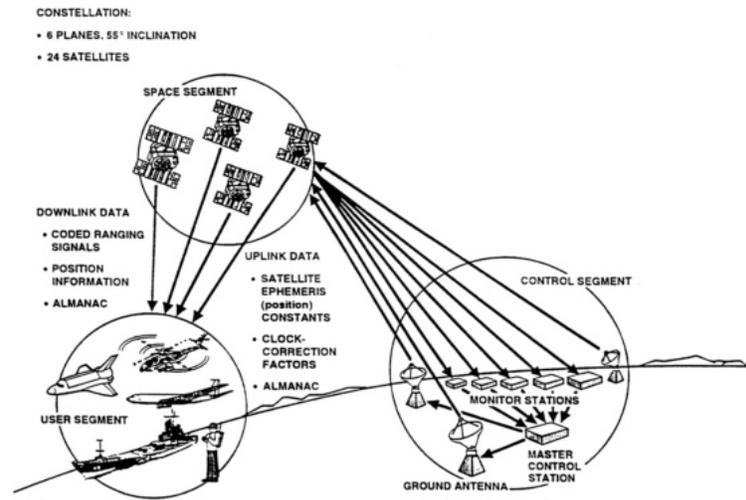
The Control Segment is composed of:

- Control Stations
- Dedicated Antennas
- Dedicated Monitor Stations

The control segment tracks the flight paths of the satellites and regularly contacts each satellite with a navigational updates.

3. User Segment

The user segment is composed of tens of millions of users on-the-ground, in-the-air, water etc.



GPS Segments

2 Setting up a Garmin e-Trex GPS unit

These are the basic steps on how to set up a Garmin eTrex GPS unit. These steps are specifically addressed for achieving best results when collecting track logs and waypoints for OpenStreetMap.

For a full description of the settings please consult the Owners Manual or check the site:

2.1 Getting Started

2.1.1 Installing batteries and a microSD card

The eTrex operates on two AA batteries which are not included.

To install the batteries:

- Remove the battery compartment cover from the back of the unit
- Insert the batteries, observing the proper polarity

The SD card should be included in the Garmin eTrex folder bundle. It should be installed in the slot on the left side of the batteries.

To install a microSD card:

- Remove the battery compartment cover from the back of the unit
- Locate the card slot at the upper-left edge of the battery tray, and slide the card into the slot

2.1.2 Transferring data to and from the GPS unit

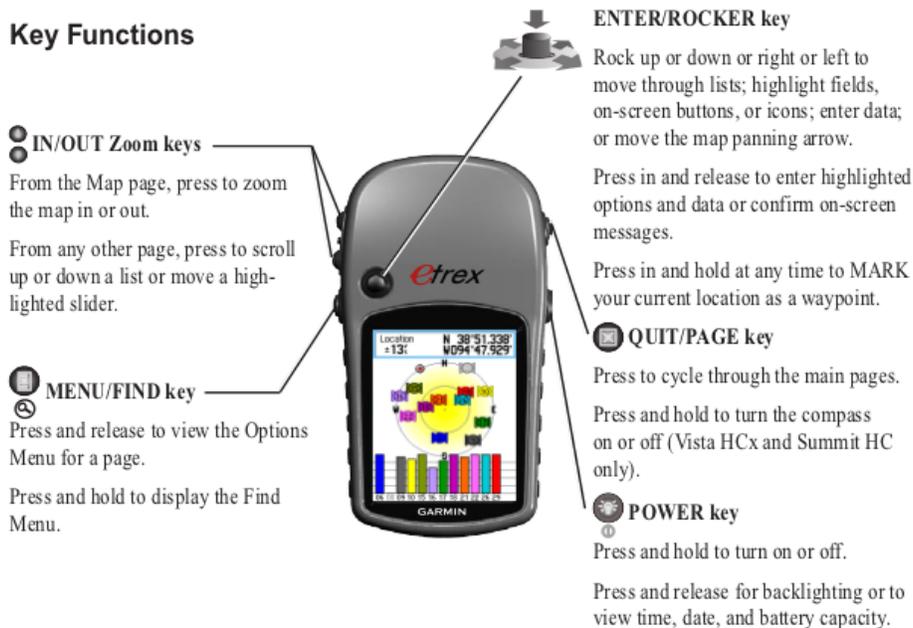
To transfer data to and from the device:

- Lift the weather cover from the USB unit on the back of the unit
- Connect the USB cable to the USB port on your computer and the USB port on the back of the unit
- Transfer the data



Installing the batteries and a microSD card

2.1.3 Key Functions

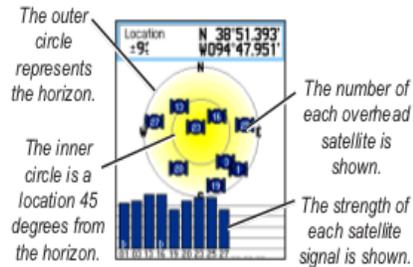


Key Functions

2.1.4 Initializing the GPS Receiver

When the satellite is turned on for the first time, the receiver must collect satellite data and establish its location. To receive the satellite signals you must:

- Be **outdoors** and have a clear view of the sky
- GPS is now searching for the satellite signals
- The *Locating Satellites* is replaced by *Acquiring Satellites* message
- Once the connection is established the *Location* and *Coordinates* appear in the *Acquiring Satellites Window*



Acquiring Satellites Window

2.2 Loading a Map

OpenStreetMap data is free to use however you like. Important! The changes need to be released under the OSM license. OSM data can be transformed into map files compatible with Garmin GPS devices. CloudMade (<http://cloudmade.com>) is one of the companies that produces free Garmin maps for a large number of countries.

Download a map:

- To find maps of the area, load <http://downloads.cloudmade.com> and browse the maps. The Garmin maps are in .img format.
- Once the area of interest is found, download the appropriate file to the computer.
- Unzip the file, this will extract the file called *gmapsupp.img*

Load the map onto the Garmin device by putting the device into USB Mass Storage mode, and copying over the file:

- Press *Menu* twice or *Page* key until arriving to *Main Menu*
- Select the *Setup* icon, press *Enter*, then select the *Interface* icon, and press *Enter*
- Connect the GPS to the Computer via USB cable, highlight the *USB Mass Storage* button and press *Enter*, the device shows up on a system as a drive
- If it doesn't exist create a folder called *Garmin* on the device
- Copy the downloaded *gmapsupp.img* file to the *Garmin folder*; if the file already exists you might want to archive the existing file
- Disconnect the GPS or press the *Power* button to restart the unit - the map should be available

2.3 Map Setup



Map Setup

Set up a map on the Map Page:

- Press Quit/Page key until arriving at the Map Page
- Press Menu/Find key, select Setup Map and press Enter/Rocker key

Use the Rocker key and move it left and right between different Map setups. Setup:

General Setup

- Use the *Rocker* key (left and right) to move from icon to icon on the top menu and select the *General Setup*
- Move the *Rocker* key down to highlight *Orientation*, press *Enter*, select *North Up* and press *Enter* again
- Then highlight *Lock On Road*, press *Enter*, select *Off* and press *Enter* again.

Turning *Lock On Road ON* would automatically align the tracklog with the nearest road present on the map loaded into the GPS unit. By turning the *Lock On Road OFF* will record new data even in the presence of existing roads.

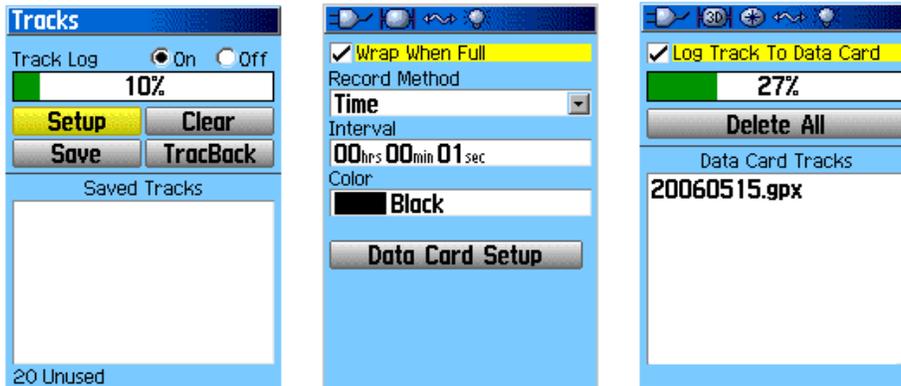
Tracks Setup

- Use the *Rocker* to move back to the *Icon Menu* on top
- Select *Track Setup*
- Move the *Rocker* down to highlight *Track Points* and press *Enter*
- Use the *Numeric Keypad* to enter 10000 and press *Enter*

10000 is the maximum number of track points that can be recorded in the GPS units internal memory. The limit of the track points recorded to the microSD card is only limited by the size of the card.

2.4 Track Log Setup

These steps make sure that the Garmin eTrex is recording track logs with a sample rate once per second and recording the track logs to the data card. Setting the frequency of the track log recording to the highest possible (one second) will ensure the most complete track recording.



Track Log Setup

First make sure the Track Log is being recorded:

- Press *Menu* twice or *Page* key until arriving to *Main Menu*
- Select *Tracks* icon and press *Enter*
- If *Track Log* is set to *Off*, move the *Rocker* to highlight *On*, and press *Enter*

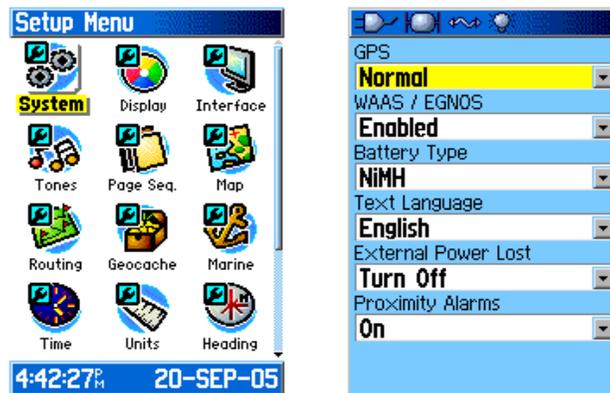
Next, configure the Track Log recording:

- Highlight the *Setup* button, and press *Enter* to open the *Tracklog Setup Page*
- Highlight *Wrap When Full*, and press *Enter* so that it is *Checked*
- Highlight *Record Method*, press *Enter*, select *Time*, and press *Enter*
- Highlight *Interval*, use the *Numeric Keypad* to set interval to *00 hrs 00 min 01 sec*, and select *OK*
- Highlight *Color*, press *Enter*, select your choice, and press *Enter*

Finally. Configure the Data Card:

- Highlight the *Data Card Setup* button, and press *Enter* to enter the *Data Card Setup Page*
- Highlight *Log Track To Data Card*, and press *Enter* so that it is *Checked*

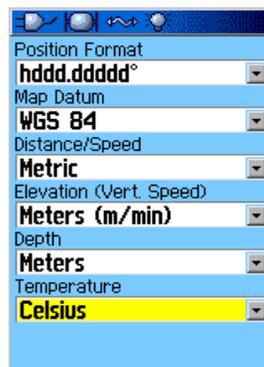
2.5 System setup



System Setup

- Press *Menu* twice or *Page* key until you arrive to the *Main Menu*
- Select the *Setup* icon, and press *Enter*, then select the *System* icon, and press *Enter*
- Highlight *GPS*, press *Enter*, select *Normal*, and press *Enter* again
- Highlight *WASS/EGNOS*, press *Enter*, select *Enabled*, and press *Enter* again
- Highlight *Battery Type*, press *Enter*, select depending on your battery type (most rechargeable batteries are usually *NiMH*, while the normal ones are *Alkaline*)

2.6 Units Setup

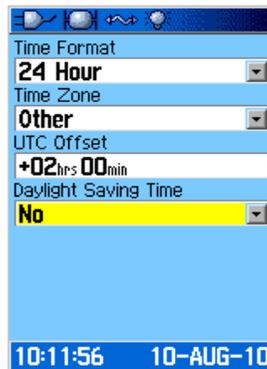


Units Setup

To set up Measuring Units:

- Press *Menu* twice or *Page* key until you arrive to the *Main Menu*
- Select *Setup* icon, press *Enter*, then select the *Units* icon, and press *Enter*
- Highlight *Position Format*, press *Enter*, select *hddd.dddd°*, and press *Enter*
- Select *Map Datum*, press *Enter*, select *WGS 84*, and press *Enter*
- Select *Distance/Speed*, press *Enter*, select *Metric*, and press *Enter*
- Select *Elevation*, press *Enter*, select *Meters (m/min)*, and press *Enter*
- Select *Depth*, press *Enter*, select *Meters*, and press *Enter*
- Select *Temperature*, press *Enter*, select *Celsius*, and press *Enter*

2.7 Time Setup



Time Setup

- Press *Menu* twice or *Page* key until you arrive to the *Main Menu*
- Select *Setup* icon, press *Enter*, then select the *Time* icon, and press *Enter*
- Highlight *Time Format*, press *Enter*, and select *24 Hour*
- Highlight *Time Zone*, press *Enter*, and select a city in your time zone. If no obvious choice is listed, select *Other*, and press *Enter*
- Highlight *UTC Offset*, press *enter*, and use the *Numeric Keypad* to manually set your timezones offset. When finished, select *OK*.

2.8 Welcome screen setup



Welcome Setup

- Press *Menu* twice or *Page* key until you arrive to the *Main Menu*
- Select *Setup* icon, and press *Enter*, then select *Welcome* icon, and press *Enter*
- Use the *Alphanumeric Keypad* to enter a message

3 Basic GPS mapping techniques

The basic mapping techniques described are specifically addressed for achieving the best results when collecting points of interest, ways and areas, using a hand-held GPS units, such as the Garmin eTrex device.

3.1 Collect satellite data and establish location

The steps to initialize the GPS receiver are already described above (Initializing the GSP receiver).

Before you set out to map, you need to initialize the GPS receiver, meaning, the receiver must collect satellite data and establish its location. To receive the satellite signals:

- Be **outdoors** and have a clear view of the sky!
- Turn the GPS device on by pressing the *Power* button
- GPS is now searching for the satellite signals
- The *Locating Satellites* is replaced by *Acquiring Satellites* message
- Once the connection is established the *Location* and *Coordinates* appear in the *Acquiring Satellites Window*

You are ready to map!



Collecting satellite data and establishing location

3.2 Collecting Points of Interest

Points of Interest (POI) are points/locations which are of special interest and usually the reason for conducting a mapping exercise. They are either physical points or events, placed somewhere in space and time. Some examples of Points of Interest are hospitals, schools, water points, toilets, shops, religious institutions, and even events, such as, demonstrations, clashes, rallies, etc. By mapping we determine the exact location of Points of Interest in space and time.

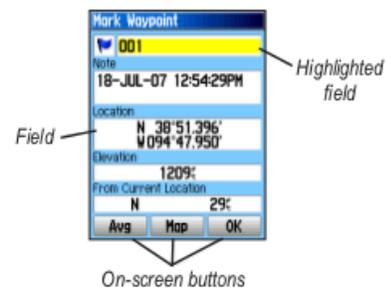
There are many different ways to collect Points of Interest. This step explains how to collect these points, also known as waypoints, using a hand-held GPS unit.

To collect a point:

- Stand in front of an object you wish to collect
- Press *Enter* key and hold it for one second until you arrive to *Mark Waypoint* screen
- Write down on a piece of paper (or into Waypoint Log Sheet) the number and the name of the point you are collecting (You can move up to the waypoint number field by using the Rocker key, and press Enter. Alphanumeric and Numeric Keypads appear. You can use these keypads to type in the name of the location you are mapping but for the sake of saving time it is better to use a sheet of paper and a pencil)
- *OK* should be highlighted, press *Enter* to save the location



Collecting Points of Interest



Example of a GPS Waypoint Log Sheet:

GPS Waypoint Log Sheet

Waypoint	Description
001	
002	
003	
004	
005	
006	
007	
008	

Waypoint Log Sheet

3.3 Collecting Ways

Ways are lines connecting different locations. Ways can be highways, roads, paths, railway lines, bus lines, ship lines, bicycle routes, hiking trails etc.

Before you start collecting ways, you need to set the Track Log as described above in the Track Log Setup. Once the device is set to record track, all you need to do is walk along the way you wish to map, and the device does the rest. For maximum efficiency try walking in the middle of the way you are collecting, but **DO NOT PUT YOURSELF IN DANGER!**



Collecting ways

3.4 Collecting Areas

An area is an enclosed space usually of the same attribute/land use. Areas can be forests, lakes, seas, parks, fields, buildings, parking lots, squares, playgrounds, etc.

There is a couple of ways to collect an area with a GPS unit but the fastest and the easiest are:

Collect a point **in the middle**:

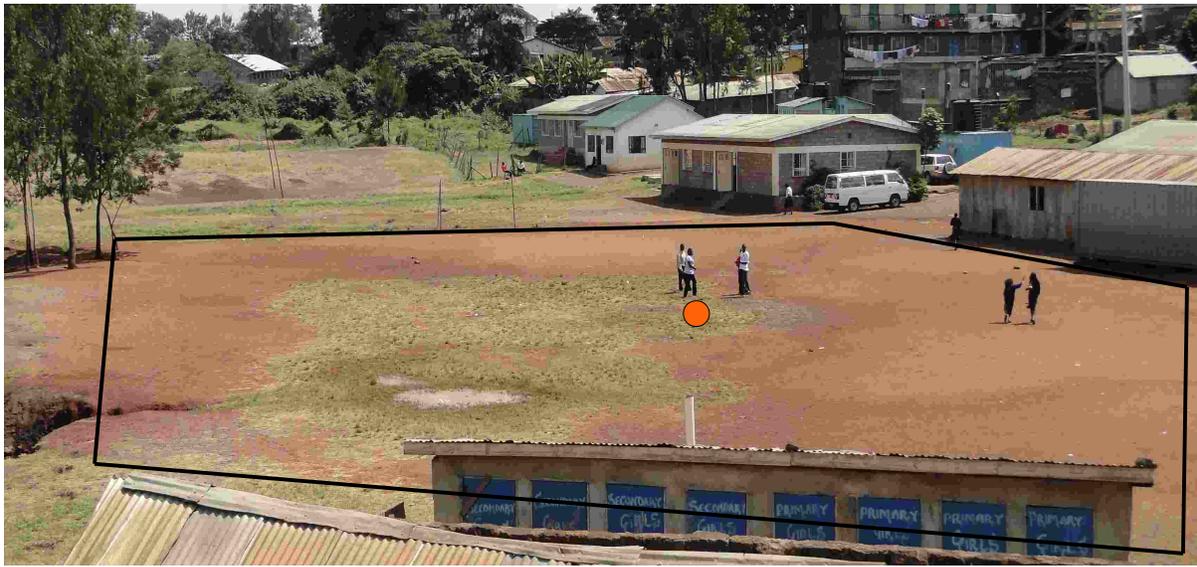
- Collect a point in the middle of an area you want to map, estimate the dimensions and draw an approximate sketch of an area on a piece of paper

This method is good for smaller areas like playgrounds but it's not very precise.

Collect points **on the perimeter of the area**:

- Walk around the perimeter of an area and collect points at the edges of an area
- Write the waypoints of the edges of an area on a piece of paper

Collecting a point in the middle of an area and sketching out an area:



Collecting a point in the middle and sketching out an area

Collecting points on the perimeter of the area:



Walking the perimeter of an area and collecting points at the edges