

eTrexLegend GPS UNIT :

OVERVIEW (from GARMIN.COM)

What is GPS?

The Global Positioning System (GPS) is a satellite-based navigation system made up of a network of 24 satellites placed into orbit by the U.S. Department of Defense. GPS was originally intended for military applications, but in the 1980s, the government made the system available for civilian use. GPS works in any weather conditions, anywhere in the world, 24 hours a day.

How it works

GPS satellites circle the earth twice a day in a very precise orbit and transmit signal information to earth. GPS receivers take this information and use triangulation to calculate the user's exact location. Essentially, the GPS receiver compares the time a signal was transmitted by a satellite with the time it was received. The time difference tells the GPS receiver how far away the satellite is. Now, with distance measurements from a few more satellites, the receiver can determine the user's position and display it on the unit's electronic map.

A GPS receiver must be locked on to the signal of at least three satellites to calculate a 2D position (latitude and longitude) and track movement. With four or more satellites in view, the receiver can determine the user's 3D position (latitude, longitude and altitude). Once the user's position has been determined, the GPS unit can calculate other information, such as speed, bearing, track, trip distance, distance to destination, sunrise and sunset time and more.

The GPS satellite system

The 24 satellites that make up the GPS space segment are orbiting the earth about 12,000 miles above us. They are constantly moving, making two complete orbits in less than 24 hours. These satellites are traveling at speeds of roughly 7,000 miles an hour.

GPS satellites are powered by solar energy. They have backup batteries onboard to keep them running in the event of a solar eclipse, when there's no solar power. Small rocket boosters on each satellite keep them flying in the correct path.

- * The first GPS satellite was launched in 1978.
- * A full constellation of 24 satellites was achieved in 1994.
- * Each satellite is built to last about 10 years. Replacements are constantly being built and launched into orbit.
- * A GPS satellite weighs approximately 2,000 pounds and is about 17 feet across with the solar panels extended.
- * Transmitter power is only 50 watts or less.

What's the signal?

GPS satellites transmit two low power radio signals, designated L1 and L2. Civilian GPS uses the L1 frequency of 1575.42 MHz in the UHF band. The signals travel by line of sight, meaning they will pass through clouds, glass, and plastic but will not go through most solid objects such as buildings and mountains.

A GPS signal contains three different bits of information — a pseudorandom code, ephemeris data, and almanac data. The pseudorandom code is simply an I.D. code that identifies which satellite is transmitting information. You can view this number on your Garmin GPS unit's satellite page, as it identifies which satellites it's receiving. Ephemeris data, which is constantly transmitted by each satellite, contains important information about the status of the satellite (healthy or unhealthy), current date, and time. This part of the signal is essential for determining a position. The almanac data tells the GPS receiver where each GPS satellite should be at any time throughout the day. Each satellite transmits almanac data showing the orbital information for that satellite and for every other satellite in the system.

Sources of GPS signal errors

Factors that can degrade the GPS signal and thus affect accuracy include the following:

- **Ionosphere and troposphere delays** — The satellite signal slows as it passes through the atmosphere. The GPS system uses a built-in model that calculates an average amount of delay to partially correct for this type of error.
- **Signal multipath** — This occurs when the GPS signal is reflected off objects such as tall buildings or large rock surfaces before it reaches the receiver. This increases the travel time of the signal, thereby causing errors.
- **Receiver clock errors** — A receiver's built-in clock is not as accurate as the atomic clocks onboard the GPS satellites. Therefore, it may have very slight timing errors.
- **Orbital errors** — Also known as ephemeris errors, these are inaccuracies of the satellite's reported location.
- **Number of satellites visible** — The more satellites a GPS receiver can "see," the better the accuracy. Buildings, terrain, electronic interference, or sometimes even dense foliage can block signal reception, causing position errors or possibly no position reading at all. GPS units typically will not work indoors, underwater, or underground.
- **Satellite geometry/shading** — This refers to the relative position of the satellites at any given time. Ideal satellite geometry exists when the satellites are located at wide angles relative to each other. Poor geometry results when the satellites are located in a line or in a tight grouping.
- **Intentional degradation of the satellite signal** — Selective Availability (SA) is an intentional degradation of the signal once imposed by the U.S. Department of Defense. SA was intended to prevent military adversaries from using the highly accurate GPS signals. The government turned off SA in May 2000, which significantly improved the accuracy of civilian GPS receivers.

INSTRUMENTATION:

The Garmin GPS unit possesses an internal antenna that receives signals from the GPS satellites. With the information picked up from 3-4 satellites the unit can provide the user with information on position on the earth’s surface, altitude, and speed of travel. In addition, the unit allows the user to store current position (waypoint) in memory and allows for the storage of route of travel in memory (also seen on the display screen as a dotted line).

INSTRUCTIONS:

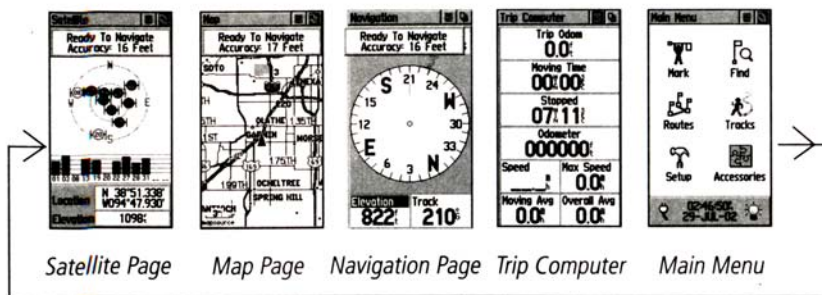
To use the eTrex unit:

1. Press and hold the lower black button on the right side of the unit down to turn the unit ON.
2. Press the PAGE BUTTON (upper black button on the right side) 3 times to view the SATELLITE PAGE on the display. This is the page that allows you to view the status of the unit as it locks onto the orbiting satellites.

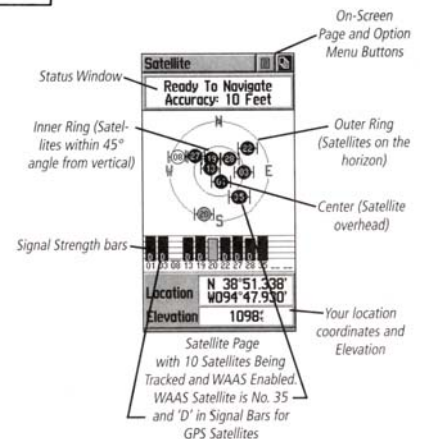


3. [To view other pages on the display screen:::Press the page button again to go to MAP PAGE; again to go to the NAVIGATION PAGE; again to go to the TRIP COMPUTER page; again to go to the MAIN MENU page and again to return to the SATELLITE PAGE. You can toggle to any of these pages in this manner at any time.]

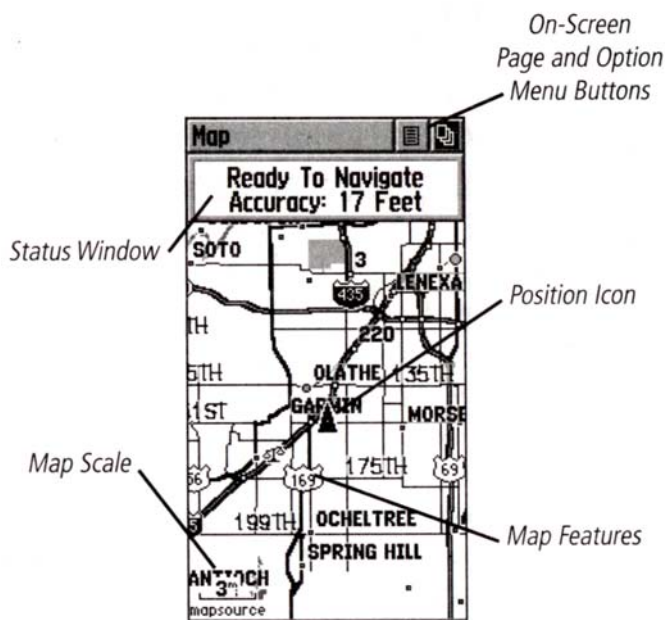
Main Page Basics



4. After the unit locks onto 3-4 satellites (from 15sec – 5 min) you will see location and elevation data at the bottom of the screen and a statement on the accuracy of the unit in the upper top of the screen. [The number of satellites the GPS has locked onto and signal strength are seen in the middle section of the screen. The bars indicate signal strength from each satellite and if the bars are black-the signal from the satellite has been locked onto and the height of the bar indicates signal strength. Each satellite has its own unique ID number.]

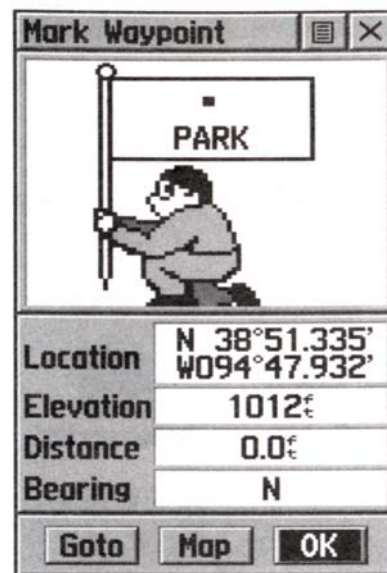


- Press the PAGE button to toggle to the MAP PAGE on the screen (this page will be the main one used when visualizing position). Your position is displayed on the MAP page using a triangular POSITION ICON that is centered on the map. As you move, the Position Icon remains in the middle of the screen and as the map moves, your movement (TRACK LOG) is displayed as a trail of dots on the screen. The map also displays geographical details such as rivers, lakes, roads and towns.
- You can zoom in or zoom out of the map page by pressing the upper 2 buttons on the left side of the unit [scale can be changed from 20 ft to 500 miles]. The upper button zooms out and provides less map detail, while the 2nd button zooms in and provides more map detail. The bottom left corner of the screen provides you with a distance bar to gauge the area you are observing.



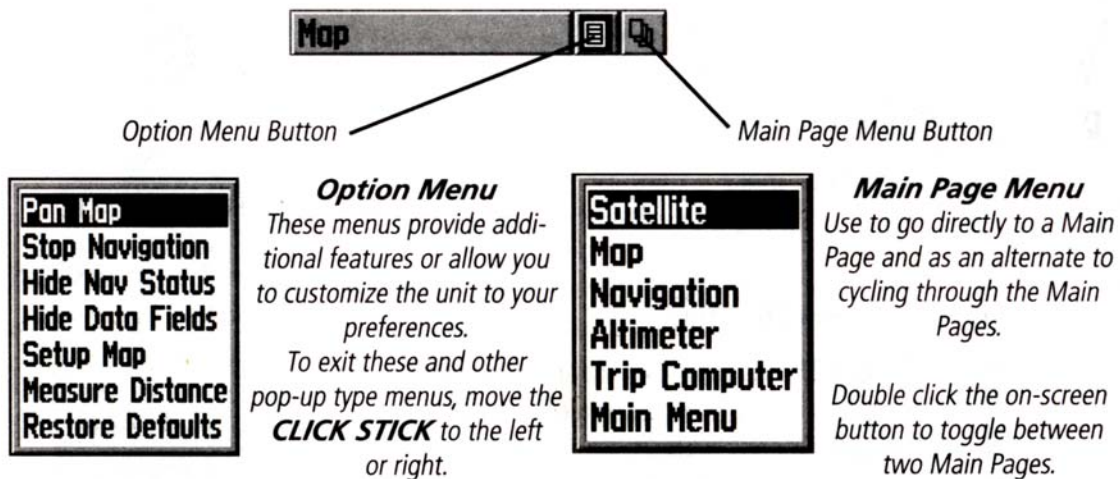
Mark

- You can store your current position in memory by creating a WAYPOINT on the screen. Press and hold the CLICK STICK (located in the upper left corner of the front panel above the screen) down for 2 seconds. The MARK WAYPOINT PAGE appears. A little man holds a flag with the number that will be assigned to your current position. This WAYPOINT number can then be used to locate the position in the future since the point is saved in memory. Press the CLICK STICK down for 2 seconds once to save the WAYPOINT in memory and to display the WAYPOINT on the screen.



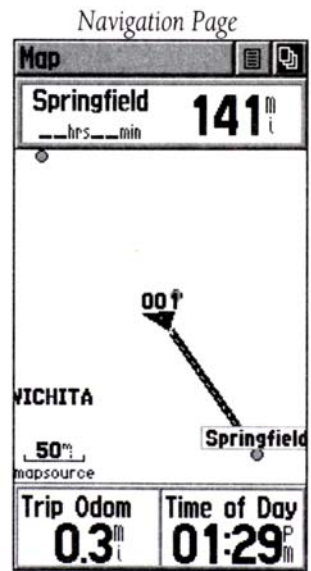
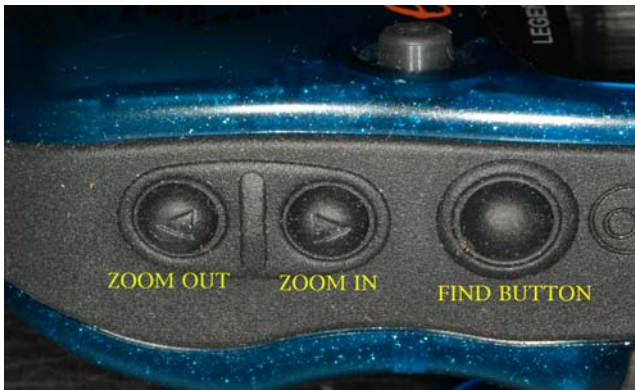
Mark Waypoint Page

8. Additional features are available while in the MAP PAGE using the CLICK STICK. At the top of the MAP page are 2 icons. The left icon is the OPTIONS MENU. Access this menu by pushing the CLICK STICK to the left (DO NOT PRESS DOWN AT THIS POINT). You will note that this menu is highlighted. Press the CLICK STICK down and the menu appears. [At any time you can exit this menu by pressing the PAGE BUTTON.] The PAN MAP and the MEASURE DISTANCE are the 2 options that you will use. Press the CLICK STICK downward or up to access the various options. Then press the CLICK STICK down to turn on these options:::

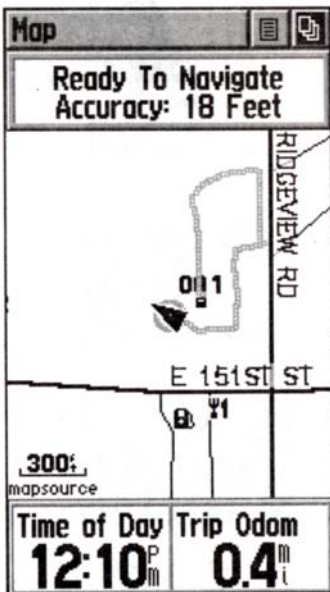


- a) **PAN MAP OPTION:** After you press the CLICK STICK down to turn on the Pan Map option, you will note the presence of a white arrow. Move the arrow to the right or left or up or down by using the CLICK STICK like a joy stick. You will note that in the upper section of the screen the words Map Pointer appear and below these words are the position of the pointer. The pointer can be brought to the extreme borders of the screen and will cause the map to move so that additional map details are brought into view. You can store the position of the pointer into memory by pressing the CLICK STICK down once for 2 seconds. You will see the MARK WAYPOINT PAGE. A little man holds a flag with the number that will be assigned to your current position. This WAYPOINT number can then be used to locate the position in the future since the point is saved in memory. Press the CLICK STICK down for 2 seconds once to save the WAYPOINT in memory and to display the WAYPOINT on the screen.
- b) **MEASURE DISTANCE OPTION:** After you press the CLICK STICK down to turn on the Measure Distance option, you will note the presence of a white arrow. The arrow is at your current location-you will note the letter N (North) and 0.0 (distance from current location) displayed in small type in the upper right section of the second upper screen info panel. Move the arrow to the right or left or up or down by using the CLICK STICK like a joy stick. You will note that a dotted arrow is drawn as you move away from the current location and the letter and the 0.0 distance measure changes to give you the direction and distance that the pointer has moved from the original (current) position. Press the PAGE BUTTON to return to the MAP PAGE after you have obtained the info you need.

9. An additional feature that is available while in the MAP PAGE is the FINDING A WAYPOINT option. This is accomplished by using both the FIND BUTTON and the CLICK STICK. The FIND BUTTON is the lowest button on the left side of the GPS unit. Press the FIND BUTTON and a menu appears. WAYPOINTS is highlighted. Press the CLICK STICK down and a menu with 2 choices (NEAREST and BY NAME) appears. Use the Click stick as a joystick to highlight BY NAME. Press the CLICK STICK down an a menu of all WAYPOINTS appears. Use the CLICK STICK as a joy stick and select and highlight the WAYPOINT you are interested in. Press the click STICK down once to see info on the WAYPOINT. Press the click STICK down a second time to see the NAVIGATION PAGE. Press the CLICK STICK down again and a menu appears in the upper right corner. MAP is highlighted. Press the CLICK STICK down and the MAP PAGE appears with a line extending from the current location to the WAYPOINT of interest.



A Map Page Goto

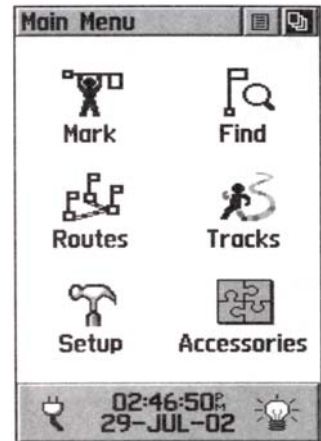


Track on Main Map Page

10. As discussed above-when you have the MAP PAGE on the screen, your current position is displayed on the MAP page using a triangular POSITION ICON that is centered on the map. As you move, the Position Icon remains in the middle of the screen and the map moves and your movement (TRACK LOG) is displayed as a trail of dots on the screen.

Effectively this is an electronic breadcrumb trail on the MAP PAGE. The breadcrumb trail is the TRACK LOG. You can save 10 track logs in the GPS memory. To save the current TRACK LOG you need to switch the screen display to the MAIN MENU PAGE. Use the CLICK STICK to highlight the TRACKS icon.

The Main Menu Page



Main Menu with Feature Icons and Power, Date/Time, and Backlight Status Window

Tracks



Tracks Page

Press down on the CLICK STICK and the TRACKS PAGE appears.

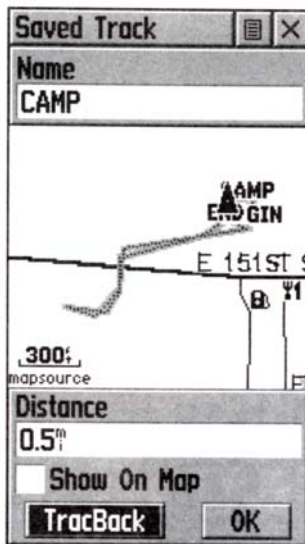
The TRACKS PAGE allows you to see currently saved tracks and allows you to save an additional track (the current track that is on the MAP PAGE). All saved Tracks are listed on this page.

Use the Click Stick to SAVE the current TRACK LOG by highlighting the SAVE BUTTON and by pressing down on the CLICK STICK after the SAVE button is highlighted. A small menu appears-use the CLICK STICK to highlight the Entire Log and then press down on the Click Stick.



Save Track Options

Tracks Options



Saved Track Page

The next page that appears is the TRACK LOG that will be saved. Press the CLICK STICK down again (if the OK BUTTON is highlighted) and the TRACK LOG will be saved and added to the list of SAVED TRACK LOGS.

11. The GPS unit can be attached to a computer via the serial cable supplied. Slide the connector onto the GPS as illustrated below.

