**How GPS Works**



So, you want to know how GPS works? GPS, short for Global Positioning System, is a means for locating any point on the earth. It has many uses; navigation, surveying, vehicle tracking, hiking and outdoor recreation just to name a few.

In the 1970s the Department of Defense (DoD) conceived the idea of GPS. It was born from a need to accurately determine the position of ballistic missile submarines prior to launching missiles. All the old methods of determining position had their flaws. Those methods were affected by atmospheric conditions, limited in range, subject to enemy jamming, or degraded by interference.

The GPS system is made of 24 NAVSTAR satellites and five ground stations. The ground stations are responsible for keeping the satellites in precise orbit. The DoD placed each of the 24 satellites in a precise orbit at an altitude of 10,900 miles. Each satellite weighs two tons, is 18.5 feet long, and orbits the earth in a little less than 12 hours.

**The Trick: Measuring Distance With Time**

Each of the 24 satellites transmits its own unique signal. The GPS unit has stored in it those 24 separate "signatures" and therefor knows the position of each satellite. By measuring the distance to at least four satellites, each in its distinct orbit, location of the GPS receiver can be pinpointed down to as little as 3 meters. Distance to each satellite is measured simply by the time it takes for a radio wave to reach the GPS unit.

To be able to lock onto four signals, a GPS unit needs to have at least four channels. Most units have 12 channels. Calculations were made for the orbits necessary for each of the 24 satellites so that at least five are "visible" to any one point on the earth at one time.

GPS can be used in any type of weather, and is used on land, in the air, and for marine applications. Some conditions limit its usefulness. Heavy tree cover and cliffs, steep hills, or tall buildings can interfere, but often in those situations one can move to a better location and still not be too far off the intended route.

[Click here for an excellent in-depth tutorial on how GPS works](http://www.trimble.com/gps/index.shtml) (Macromedia Shockwave Player is required to view the tutorial - it's free).
Basic understanding of how GPS works ensures that you can make the most of this very useful tool.