



## What is GPS



GPS (Global Positioning System) is a group of satellites orbiting approximately 11,000 miles above the earth. GPS was originally put in place as a navigation system for the U.S. military but because of the tremendous economic and security advantages, the decision was made to allow the satellite signals to be used for civilian purposes: Surveying has been one of the industries that has benefited from being allowed to use GPS. *Such applications as Baselines, RTK for stake-out, topo and locating property features and navigating can utilize GPS to maximize accuracy.* Each satellite sends out a radio signal at a known wavelength and time so precise that the distance to each satellite can be measured to less than 1/16th of an inch. If you can receive signals from at least four satellites at the same time, then GPS software can measure the distance to each one and accurately calculate the position of the receiving equipment.

A GPS receiver measures the incoming phase of the satellite signals to millimeter precision. However, as the satellite signals propagate through space to earth, they pass through and are affected by the atmosphere. Disturbances in the atmosphere cause a degradation in the accuracy of observations. GPS surveying is a differential method. A baseline is observed and computed between two receivers. When the two receivers observe the same set of satellites simultaneously, most of the atmospheric effects cancel out: The shorter the baseline, the greater potential for minimizing the atmospheric effects, as the atmosphere that the signals pass through while traveling to the receivers is nearly identical, there is less error introduced. Rapid Static surveys feature short observation times and it is sound practice, for all GPS surveying, and for Rapid Static in particular, to minimize baseline lengths. Depending on the area and number of points to be surveyed, you should consider establishing one or more temporary reference stations. Baselines radiating from a temporary reference station can be several kilometers in length. In terms of productivity and accuracy, it is much more advantageous to measure short baselines (e.g. 1,604 ft.) from several temporary reference stations rather than trying to measure long baselines (e.g. 49,212 ft.) from one central point.

When purchasing a GPS system, you need to ask how that system deals with some of the obstacles that are inherent to the GPS satellites: Satellite drift; Multipath (false signals that are generated when a true signal bounce off the ground or nearby structure); Refraction of the radio waves as they go through the earth's atmosphere; Radio and other interference. How your GPS equipment compensates for these obstacles has a bearing on the accuracy of the reading you get from your system.

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