

A GPS System Will Take You Anywhere

The GPS (Global Positioning System) is a "constellation" of 24 well-spaced satellites that orbit the Earth and make it possible for people with ground receivers to pinpoint their geographic location. The location accuracy is anywhere from 1 to 100 meters depending on the type of equipment used. The GPS is owned and operated by the U.S. Department of Defense, but is available for general use around the world. Many people use it for many different reasons. Here are just a few of the more common ones.

Military

GPS allows accurate targeting of various military weapons including cruise missiles and precision-guided munitions, as well as improved command and control of forces through improved locational awareness. The satellites also carry nuclear detonation detectors, which form a major portion of the United States Nuclear Detonation Detection System. Civilian GPS receivers are required to have limits on the velocities and altitudes at which they will report coordinates; this is to prevent them from being used to create improvised missiles.

Navigation

GPS is used by people around the world as a navigation aid in cars, airplanes, and ships. Personal Navigation Devices (PND) such as hand-held GPS are used by mountain climbers and hikers. Glider pilots use the logged signal to verify their arrival at turn points in competitions. Low cost GPS receivers are often combined with PDAs, cell phones, car computers, or vehicle tracking systems. Examples of GPS-based services are MapQuest Mobile and TomTom digital maps. The system can be used to automate harvesters, mine trucks, and other vehicles. GPS equipment for the visually impaired is available.

Mobile Satellite Communications

Satellite communications systems permit "remotes" to communicate with "hubs" via satellites. A typical system uses satellites in geosynchronous orbit: this requires a directional antenna (usually a "dish") that is pointed at the satellite. When the "remote" is portable, as on a ship or a train, the antenna must be pointed based on its current location. Essentially all modern antenna controllers incorporate a GPS receiver to provide this location information.

The remote uses its location for two distinct purposes: first, to point the antenna at the satellite, and second, to compute the distance to the satellite. The distance to the satellite is crucial when deciding when to transmit a TDMA burst.

In this application, there are two distinct types of satellites and two distinct antennas: the GPS satellites are MEO and the GPS antenna is typically a 2cm sq. "patch antenna." The communications satellites are GEO and the communications antenna is typically 1m or larger. To a first approximation, the GPS system is less than 1% of the total cost of the remote system.

Location-based services

GPS functionality can be used by emergency services and location-based services to locate mobile phones. Assisted GPS is a GPS technology often used by the mobile phone because it reduces the power requirements of the mobile phone and increases the accuracy of the location obtained.

Location-based games

GPS receivers come in a variety of formats, from devices integrated into cars, phones, and watches, to dedicated devices such those shown here from manufacturers Trimble, Garmin and Leica (respectively, left to right). The availability of hand-held GPS receivers for a cost of about \$90.

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About the Author

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