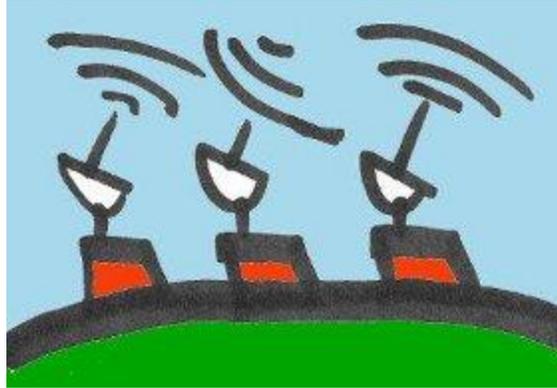


HOW DOES GPS WORK

The data sent down to earth from each satellite contains a few different pieces of information that allows your GPS receiver to accurately calculate its position and time. An important piece of equipment on each GPS satellite is an extremely accurate atomic clock. The time on the atomic clock is sent down to earth along with the satellite's orbital position and arrival times at different points in the sky. In other words, the GPS module receives a timestamp from each of the visible satellites, along with data on where in the sky each one is located (among other pieces of data). From this information, the GPS receiver now knows the distance to each satellite in view. **If the GPS receiver's antenna can see at least 4 satellites, it can accurately calculate its position and time.** This is also called a lock or a fix.

Did you catch all of that? If not or if you want more, check out a much more detailed explanation, in volume 1 of *GPS Fundamentals* by Dan Doberstein. Volume 1 has been released for free, but you must support the author to read volume 2.



An artist's rendition of the control segment.

There is another piece of the global positioning system we haven't talked about. Along with satellites and GPS receivers, there are ground based stations that can communicate with the satellite network and some GPS receivers. This system is formally called the control segment and increases the accuracy of your GPS receiver. Common systems that use the control segment to improve accuracy are WAAS and DGPS. WAAS is common on most GPS receivers and improves accuracy to about 5 meters. DGPS requires a specific type of GPS receiver and gets centimeter accuracy. DGPS units are also expensive and tend to be larger because they require an additional antenna.

Source: <https://learn.sparkfun.com/tutorials/gps-basics>