

RTK is PDQ

This process of using a base station to supply continuous correcting information is called RTK (which stands for Real-Time Kinematic, but the key words to remember are REAL TIME). RTK is required for any precise mobile application of GPS. That's because RTK provides precise positioning information at speeds up to 20 times per second. Now that's real-time information! That's twice as much information as a standard rotating laser operated machine control system receives!



*Topcon HiPer
RTK Rover*

*Topcon Legacy-E
Base Station*



Of course, to get the speed and precision of RTK, the rules change as compared to static GPS (which is a very slow method to get fairly accurate GPS results—if you have 15 minutes or more to give-away everytime you want to take a reading).

First, you need a minimum of six satellites, not four. Most scientists say you really need eight to give you reliable and robust real-time positions. In addition, you need some pretty smart software that can do all the calculations. After all, it must simultaneously track satellites, the earth's rotation, and your movement—all of which are not moving in the same direction! That's fun (and challenging) stuff for a scientist to figure out. (That's why Topcon has over 150 engineers and PhD's working exclusively on this!)

QUICK RECAP

Okay, let's quickly recap what we've learned so far. Then we'll move on to the great advantages Topcon GPS+ offers.

1. The Global Navigation Satellite System is composed of the GPS and GLONASS positioning satellite networks.
2. These satellites transmit radio signals at a known wavelength and time. (Actually, to get precise positioning, two sets of signals are transmitted from each satellite—one long wavelength and one short. Topcon GPS+ can receive both signals.)
3. These radio signals are received at a base station (known point) and a roving station (like your 3D-GPS+ equipped dozer).
4. The base station transmits corrections in real time to the roving receivers (could be several within a local area).
5. The result is continuously precise positioning information that can provide accuracy to within approximately $\pm 1/4$ inch (± 5 mm) in the horizontal position (X & Y).

A LITTLE MORE ABOUT ACCURACY

Did you notice in item 5 above and back on page two when accuracy is specified it's described as "horizontal" accuracy? The reason for that is because GPS supplies a higher degree of horizontal accuracy than it does vertical accuracy.

It can plot where you are latitude- and longitude-wise very precisely. But elevation, or vertical accuracy, is more difficult. That's because all the satellites are overhead, so there can be a wide range of horizontal bearings (virtually from one horizon to the other). But since no satellite signals are available from below the receiver, it's impossible to have a large range of vertical points.

So what is a typical vertical accuracy for RTK systems? From two to three times that of the horizontal accuracy, which should be anywhere from 1/2 to 3/4 inch (12 to 18mm). Of course, the more satellites you are receiving, the better your vertical accuracy will be.

TOPCON GPS+ TECHNOLOGY

Now, you have a basic understanding of how the system works, and while we have tried to keep it simple, it really is quite complicated. That's one reason why so few companies have the ability to build real-time, high accuracy receivers. Topcon is proud to be the leader in this field of technology. Along with leadership in optical surveying instruments, construction lasers and equipment automation systems, Topcon is the only company in the world that focuses exclusively on high-precision positioning products for all civil engineering applications.

Creating solutions for your positioning problems and increasing your productivity is what we do 24/7. It's our passion, and we think we do it better than anyone else. Just like our GPS+ technology is better than ordinary GPS.

So what is it exactly? It's everything ordinary GPS is plus!

- + Paradigm Chip**
- + Co-Op Tracking**
- + Fast Initial Acquisition and Re-Acquisition**
- + Multipath Reduction**
- + Antenna With High Phase Center Stability**
- + In-Band Interference Suppression***
- + GLONASS***

** Optional, activation fee required*

+ Paradigm Chip

At the heart of every Topcon GPS+ receiver is its advanced Paradigm chip—providing an amazing 40 channels of signal reception (compared to ordinary GPS manufacturers maximum of 24 channels). With its advanced design, the Paradigm chip also draws less power than any other designs, allowing our receivers to run longer so you can stay in the field without delays to recharge or replace batteries.



+ Co-Op Tracking

Topcon's patent-pending Co-op Tracking allows you to go places and work accurately where no other manufacturer's receiver can. So what is co-op tracking exactly? The best way to explain it is with an example. Have you ever tried to track a star at night using a pair of binoculars? Pretty easy, isn't it? Now, get in the bed of a truck and try to track that star as you're driven across a bumpy field at 20 mph while going under some trees! Still able to track the star? No way.

Well we have invented a unique way to use the satellites with their extremely precise and predictable orbit (position) to look back at the roving GPS+ receiver and keep it in its field of view at all times, and when it disappears under tree's or behind a building for a few seconds, to immediately pick it up when it reappears, hence the term co-op tracking. The receiver and satellites are co-operating to perform this advance tracking capability, something no one else has!

Ask your Topcon rep to demonstrate this feature—it's truly amazing, even more so if you know how limited ordinary GPS is in these situations. The more you know about GPS, the more you'll know you need Topcon GPS+!

+ Fast Initial Acquisition and Re-Acquisition

When you first turn on your GPS receiver it must acquire, or find, the satellites. Topcon's 40-channel Paradigm chip has four correlators per channel and, during the initial search, each correlator acts as a channel to help find the satellite signal. Compare this to ordinary GPS' normal 24-channel receiver with no additional correlators and it's easy to figure out GPS+ is 7 times faster at initial acquisition ($40 \times 4 = 160$, $24 \times 1 = 24$)!

This feature, along with co-op tracking, allows GPS+ to re-acquire satellites almost instantaneously (one second) should you ever lose acquisition. Consider how nice it would be if your personal computer powered up 7 times faster, and anytime it froze it would restart instantly. That's what Topcon GPS+ gives you compared to ordinary GPS, and that's more up time for you and your machines!