Re: Choosing a GPS Receiver

Source: http://sci.tech−archive.net/Archive/sci.geo.satellite−nav/2004−09/0965.html

---

From: Peter (*prathman_at_comcast.net*)
Date: 09/15/04

```
Date: Wed, 15 Sep 2004 14:45:44 −0700
```

Susan Ramsey wrote:

> I am considering purchasing my first GPS receiver. Because I live in a
> mountainous region, being able to know my elevation is of primary importance
> to me. Instead of spending about $100 on a digital altimeter, I would like
> to buy a GPS receiver for around $300. I have spent several hours on the
> gpsinformation.net site trying to figure out what receiver I need and what
> elevation accuracy I can expect, and I am still confused, partly because I
> am not sure which information is obsolete and which is still accurate.
>
> According to an article written in Feb. 01, an elevation error of up to 75
> feet can be expected with GPS

Depends on the reception quality. I find that when I have decent reception with 5 or more satellites having a reasonable geometry then my altitude readings are within 40' over 95% of the time. This is without any WAAS or other DGPS corrections and without any barometric altimeter.

, but DGPS dramatically improves accuracy where
> available. I found Coast Guard information which seems to indicate that my
> location in Jackson Co, NC is not currently in a DGPS−covered area, but that
> a new receiver is planned for Dandridge, TN (about 70 miles away). The site
> says that construction of the Dandridge site will start in 2004 if funding
> is available, so I am hoping it will be built soon. But I am unsure whether
> I will be within its range−−although other sites seem to have a range of
> about 150 miles, I wonder if being on the other side of the peaks of the
> Appalachians will keep me out of range.

In any event, using regular DGPS will require purchase and use of a separate beacon receiver that connects to your GPS unit. Since it's not clear that you'd even have reception of the DGPS radio signals throughout the area it's probably best not to plan on this option. Most current receivers do provide for the optional addition of DGPS beacon receivers if you later want to add one. But in most cases WAAS will be the easier option for improved GPS accuracy.
>
> I assume that someone interested in accurate elevation readings would want a
> receiver with a barometric altimeter. I read about models in which the GPS

> altitude can be used to calibrate the barometric altitude, but again the
> question of accuracy of the GPS altitude arises.

But the GPS errors tend to be pretty random, so what the receiver does is to average the observed discrepancy between the barometric sensor and the GPS over a long period of time (time constant of about 30 minutes) to decide by how much to adjust the barometric reading. Both methods (barometric and GPS) have errors but the barometric sensor is stable over short time periods but subject to drift over periods of hours as weather systems move in. In contrast the GPS measurements fluctuate considerably over short periods of time (seconds to a few minutes) but give very accurate results when averaged over long periods. The auto−calibration routines in the GPS receiver can use these characteristics to give a measurement that is far more accurate than you get with either method by itself.
AFAIK at the moment the only consumer GPS units with this feature are from Garmin and the models are the eTrex Summit, Geko 310, eTrex Vista and VistaC, 76S, 60CS, and 76CS. Assuming you want a detailed map display eliminates the Summit and Geko. An external antenna jack isn't absolutely required since you can always use a re−radiating type of external antenna, but it is convenient to have. This would limit the choice to the 76S, 60CS, or 76CS (in order of increasing price). The latter two have easier to read color screens and auto−routing capability − very handy for driving, especially if looking at houses in unfamiliar neighborhoods.
>
> I am also concerned about getting a receiver that will operate as accurately
> as possible in moderate tree cover in a mountainous region. I would usually
> have access to open sky when beginning a hike, and/or at intermittent times
> later, but given my geographical location, I probably won't have access to
> the SE horizon because of the mountains. I have read that WAAS probably won
> 't work in tree cover and/or mountainous terrain, so my assumption is that I
> can't count on that accuracy until more satellites go up. Do I need a unit
> that has a quad helix antenna and/or accepts an external antenna? I am
> impressed by the reviews of the new eTrex Vista Color, but it doesn't have
> either of these features. One review said all the eTrex models have more
> reception problems than other Garmin receivers, but another part of the
> review said "Antenna is slightly smaller than on larger Garmin units, but
> gives sensitivity almost equal to the larger Garmin receivers."

Garmin technical support says that the eTrex antenna size and design is identical to the other units, but it is true that there seem to be more complaints about reception with the regular eTrex series − that does *not* seem to be the case with the new color versions which are based on quite a different hardware platform.
>
> In general, my situation is as follows:
>
> I live in the mountains of western North Carolina. I am interested in
> hiking and driving around the region while keeping track of my position and
> elevation as I explore new areas. I may be shopping for a new house soon,

> and some of the houses will be on private or homeowners' association roads
> that may not be on software maps. I want to know the precise location,
> especially elevation, or each house I visit. (My experience is that both
> sellers and agents tend to be vague and imprecise about the elevation). I
> hike, but I am not a "serious" hiker−−the longest hikes I take are several
> hours to half a day−but I take short hikes frequently. These hikes are
> usually in moderate−to−heavy tree cover. I also like to keep track of my
> elevation on car trips in the eastern US. I would want to be able to use
> topo maps for my region, but I am concerned about the prospect of having to
> pay $100 for proprietary software for the entire US, especially since I
> would never use 95% of the maps.

I've found the Garmin street maps, such as City Select−NA, to be very useful to have loaded in the GPS receiver and well worth the expenditure. But the topo maps have not been nearly as useful. For me to effectively use topo maps usually requires a view of a larger area than I can see in detail at one time on the small GPS screen. So I generally just use paper topo maps in conjunction with the GPS.

I feel comfortable working with some of
> the more technical aspects of mapping, but I don't think I would use
> sophisticated features very often. I could live with either serial or USB
> connection to my PC, although of course USB would be more convenient.

The main issue is the time required to load new maps. Loading a full 24 MB into the 76S over an RS−232 serial port takes about an hour vs. just a few minutes over a serial USB connection. Other operations such as up/downloading waypoints/tracks/routes are generally fast enough with either type of interface.

> I have absolutely no interest in marine or aviation features. Of course, like
> everyone else, I don't want to pay more than I have to, and I would like to
> find a vendor that both has a good reputation and offers a reasonable
> discount.
>
> In summary, my questions are:
>
> 1. What is my status regarding WAAS and DGPS, and how does this influence
> the type of antenna I need?

I wouldn't count on getting consistent reception of either, but even without these the combination of GPS and barometric altimeter should give you good quality elevation (and position) data. Being able to connect an external antenna easily is certainly a plus point since it lets you put the antenna a bit higher and in an optimal orientation while still holding the receiver in a convenient spot. Just eliminating the obstruction caused by your body can be very useful in letting the receiver get a few more satellite signals.
>
> 2. Given the answer to #1, what receiver is best for me?

Given your concerns about altitude accuracy I think you're limited to
the Garmin units I mentioned above. If you also want to use it for
driving then the two auto−routing units (60CS and 76CS) would be the
first to look at. Note that Magellan has one unit, the Meridian
Platinum which does include a barometric sensor. However, the firmware
does *not* use data from this to determine altitude so its elevation
data is not improved the way it is with the Garmin units that have
pressure sensors. Magellan is coming out with a new eXplorist series
and later versions of that are reported to have enhanced altitude
accuracy using pressure sensors like Garmin, but the ones announced so
far have severe limitations − no computer connection, no detailed maps,
etc.
>
> 3. What is the best way to find a reputable discount vendor?

tvnav.com has a good reputation and the prices are generally quite
competitive. The owner is an active participant in this group.
If you find a vendor with a good price you might want to ask again here
and see if anyone has had good or bad experiences.