

Re: Garmin Geko – Accuracy of conversion to British National Grid

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From: Michael Chare (*Michael_Chare_at_deletethis.btinternet.com*)

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> > *Since most people use the simple*
> > *(but slightly inaccurate) conversion used in the GPS, I think it*
> > *makes more sense to convert the coordinates to the datum and*
> > *position format that most people use. In other words, rather than*
> > *trying to get a more accurate datum, why not just convert the grid*
> > *refs in the datum that most people use?*
> >
> > *Well I was not aware that converting to grid references was a*
> > *significant source of error.*
> >
> > *It's not that significant. The greatest source of error is the detail*
> > *drawn on the map, not the map datum.*

What I am pointing out is that once EGNOS starts my (and many other) GPSs will not give accurate Grid References not because the GPS can not determine its true position, but because it can not calculate the Grid Reference accurately enough from a known position.

In the example I quote the calculation error is 7m which when added to the position error of 3m means that I can only be confident that the GPS is somewhere in a circle 20m in diameter. (Ignoring the fact that the Grid calculation error is constant rather than random in error).

> *For example, let's take my test trig point at Blackpill;*
>
> *SS 62168 90898 – This is the correct OS grid ref.*
> *SS 62171 90903 – This is the WGS84 grid ref converted to OS BNG using*
> *OziExplorer, which I think uses the same "simple" conversion as used in*
> *a GPS. There's an error of 3m in the easting and 5m in the northing.*
> *This is the grid ref I use for testing. On all but one visit my GPS has*
> *recorded a grid ref accurate to within 3m of this.*

Now that I have learnt about the BNG position calculation errors, I understand the significance of your use of OziExplorer to calculate the a Grid Reference which you use for your comparison!

My point would be that the GPS is not giving a true Grid reference for the reasons identified.

- >
- > *Now let's measure the grid ref of that trig point on an OS 1:25,000*
- > *scale map, using an accurately calibrated digital map (not scanned).*
- > *Each pixel on the map represents 2.5m. The "spot" in the centre of the*
- > *trig point symbol is pixels wide! It actually covers an area of 9*
- > *pixels, a 3x3 grid. This shows that the resolution of the map is not*
- > *high enough to give the kind of accuracy you desire, even assuming that*
- > *the "spot" is marked in the right place.*
- >
- > *Carefully marking a waypoint on the centre pixel of the trig point spot*
- > *(using the magnifying glass), I get a grid ref of SS 62160 90905.*
- >
- > *Compared to the OS GR there is an error of E-8m, N+7m, a distance of*
- > *12.8m.*
- > *Compared to the WGS84 GR there is an error of E-11, N+2, a distance of*
- > *11.2m.*
- >
- > *So even using the OS GR, the error in the placement of the spot on the*
- > *map is greater than the error in the datum conversion. Interestingly,*
- > *the error between the map and both grid refs is roughly the same, and*
- > *both errors are much greater than the 3m accuracy that the GPS is*
- > *capable of.*
- >
- > *Thus there's no practical advantage in going to the trouble of*
- > *specifying a more accurate user datum (which would only be more accurate*
- > *in one locale anyway), since the resolution of the map isn't high enough*
- > *to show the accuracy you desire, and the features on the map aren't*
- > *drawn that accurately anyway. So basically, your GPS is already more*
- > *accurate than the map. Fine tuning the datum won't give you any better*
- > *map accuracy.*
- >
- > *And this is a trig point we're talking about! If anything should be*
- > *positioned accurately on an OS map it should be the trig points, which*
- > *are the fundamental reference points from which the maps were originally*
- > *drawn. In practice, many map features are drawn far less accurately.*
- > *20-30m errors are not uncommon.*
- >
- > *For example, a road on this scale of map is typically drawn 15m wide,*
- > *for clarity. Actual roads are far less wide than this, so that's*
- > *inaccurate for a start. Because of these "enlarged" roads, adjacent*
- > *features tend to be moved aside to make room for them, thus these*
- > *features are even less accurately positioned. Where many important*
- > *features occur in close proximity, such as adjacent roads, railways,*
- > *rivers etc, each of these enlarged features has to be moved even more,*
- > *resulting in quite substantial position errors.*
- >
- > *The bottom line is that even the best maps used by the general public*
- > *(the 1:25,000 scale maps) are "symbolic" in design and use "relative"*

- > *position accuracy rather than "absolute" position accuracy. No one*
- > *noticed these errors until GPS came along. Now we're complaining about*
- > *them!*
- >
- > *So even if you define your highly accurate datum, the maps themselves*
- > *are not that accurate, so you'll never get perfect agreement between*
- > *them (unless you use extremely large scale survey grade mapping). The*
- > *fact is that the maps are just not as accurate as the GPS, so there's no*
- > *point in getting too hung up over the details. A more accurate datum*
- > *won't give you any real advantage.*
- >
- > *To get back to reality, what do you want to use your GPS for? If you*
- > *just want to go walking and use it for navigation, it's more than good*
- > *enough as it is.*
- >
- >> *My preference would be for absolute*
- >> *accuracy (i.e. adherence to the National Grid) rather than*
- >> *compatibility with other GPSs.*
- >
- > *Even if you can make the grid accurate, you can't make the features*
- > *drawn on the map accurate. You are never going to get the accuracy you*
- > *want from a typical map. What you are trying to do is correct a*
- > *relatively insignificant error. You'll just end up being frustrated by*
- > *the more significant errors in the maps themselves.*
- >
- > *In your original post you complained about a 7m discrepancy. Since the*
- > *spot heights on OS 25k maps are three pixels wide (2.5m x 3) you are*
- > *talking about an error which is only the size of the width of the spot.*
- > *Even a tiny error in the position of the spot would give you a larger*
- > *error than the datum conversion does. You said that the correct*
- > *conversion correlated better with the map. How could you tell? Were*
- > *you using an extremely large scale map?*

Yes, 1:2,500 (as I said). The Geko kept giving the wrong answer for a point in my garden and I now understand why.

I used the Excel Macros from the OS Web site to convert the WGS 84 position and this gave me a better answer.

Thanks to all the responses to my post I now understand why.

- >
- > *I mentioned earlier that I'm in the process of marking summit waypoints*
- > *(and averaging them) for publishing on my website. Given the positional*
- > *inaccuracies present in the maps, I feel that these "field" waypoints*
- > *will usually be more accurate than those measured from the map itself.*
- > *Since almost all GPS users use the standard OS datum provided by the*
- > *unit, it makes sense to provide these waypoints in the same datum, with*
- > *the same errors. If I were to use a more accurate datum conversion,*
- > *anyone using my waypoints would find them to be less accurate in actual*
- > *use. Thus there is a good reason for sticking with the supplied datum,*
- > *complete with errors.*

- >
- > *If you never intend to share waypoints then this may not be an issue for*
- > *you, but there are an awful lot of people using GPS these days, more*
- > *than you seem to be aware of, and sooner or later you are going to start*
- > *encountering them. Surely it makes sense for everyone to stick to the*
- > *same datum?*

I would suggest that any sharing of such data should include WGS 84 – can also make it easier for PC up load to GPS.

- >
- > *Whilst I sympathise with what you are trying to achieve, ultimately you*
- > *are just making life difficult for yourself. A more accurate datum in*
- > *one locale will be less accurate in another anyway, so you'll need to*
- > *use many different user datums when you visit different places.*

In principle I would like the Geko (and other GPSs) to do a better job of calculating BNG references, I don't know what the implication would be for manufacturing costs, or what can be done retrospectively by upgrading the firmware. The Geko supports quite a large number of other reference systems which may contain similar errors.

Michael Chare