

The CQ Value and SKI-Pro

In Newsletter No. 16, it was discussed how the CQ value on a System 500 is computed.

It was explained that on the sensor, the CQ is based on the rms value (an estimate of the measurement noise and environmental conditions) and the co-factor matrix (the influence of the different constellations of the satellites on the co-ordinate components). Then additionally, empirical assumptions are also taken into account to provide a realistic measure of the quality.

So what quality indicators can be seen in SKI-Pro?

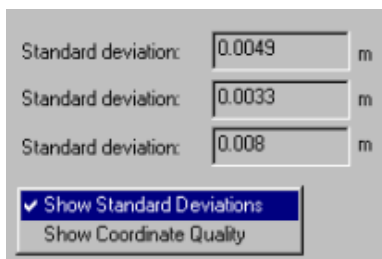
Viewing Co-ordinate Quality Information in SKI-Pro

When the surveyed GPS data is imported into SKI-Pro, the rms and the co-factor matrix elements are also imported. As on the sensor, these values are used to compute all quality information seen in SKI-Pro. However, in SKI-Pro, it is also possible to see some additional quality information.

Access the Point Properties dialog box (right click on a point and choose Properties) for any measured point.

In the Stochastic tab view of the Point Properties dialog box, the rms value (shown as M0) and the elements of the co-factor matrix can be seen. Note that the co-factor matrix values are correctly adjusted to reflect if the point is viewed as Geodetic or Cartesian.

Now click on the General tab view. Here both the Co-ordinate Quality values and the Standard Deviations for that point can be seen. To toggle between the two, right click anywhere on the Point Properties dialog box.



As with the Co-ordinate Quality, the Standard Deviation values are computed using the rms and elements of the co-factor matrix, but as shown below, using different elements of the matrix.

$$Std_{(Lat, East)} = M_0 \cdot \sqrt{Q_{11}}$$

$$PosnQty = M_0 \cdot \sqrt{Q_{11} + Q_{22}}$$

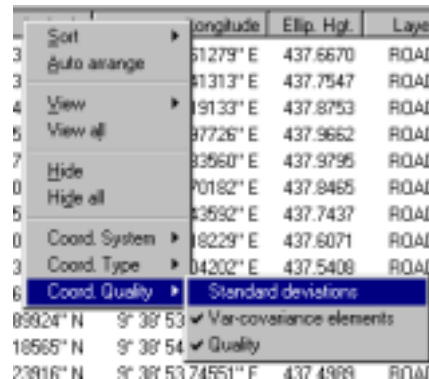
Why does SKI-Pro offer the option of seeing both the Quality values and Standard Deviations? The reason is that some clients simply prefer one or the other.

Click back on the Stochastic tab view to view the error ellipse information. Again, the error ellipse values are computed from the rms and the co-factor matrix elements. These are 1 sigma error ellipse values and this means there is a 39.3% probability that the least squares estimate of that points position (i.e. the computed position) lies within the error ellipse centred at its true position. (Of course, the point's true position is not known, so the error ellipses are drawn with their centre at the computed point's position).

The error ellipses can also be graphically viewed in the View / Edit tab view of a project.

It is also possible to view all this quality information in the Points tab view of a project. Right-click on a column heading and choose to View the appropriate columns as shown here.

Remember you can quickly see which points have the worst quality by sorting in the Points tab view (click on the appropriate column heading).



Using Co-ordinate Quality Information

What can the co-ordinate quality information be used for? Obviously, the main use is to give an estimate as to how precisely a point has been measured (either in RTK or post processing) and can subsequently be used to assess the quality of a survey in general.

Co-ordinate quality information is also used in the computation of an averaged point (the same point that has been measured twice) and also used as the input into the subsequent network adjustment....

Remember...

- All co-ordinate quality information can be viewed both in the Points tab view and in the Point Properties dialog box.
- Points can be easily sorted by their quality in the Points tab view.
- Try not to get confused with co-ordinate quality information. All quality information is simply based on well-defined and commonly used statistical techniques.