

Interpolating UTM coordinates from a USGS 7.5 minute quadrangle

USGS 7.5 minute quads display three coordinate systems:

- Latitude / Longitude (degrees, minutes and seconds)
- State plane or California coordinate system (feet)
- UTM (Universal Transverse Mercator) (meters)

The easiest way to interpolate coordinates on a map is to use the UTM values and create a grid. The UTM grid is based on meters and the grid lines are 1km (1000 meters) apart.

You can estimate distance on a map using the UTM grid due to the known distance between each line.

The UTM values displayed on the top and bottom of the map are called eastings, providing an east-west position. UTM values increase from west to east. The UTM values displayed on the left and right of the map are called northings, providing a north-south position. UTM values increase from south to north.

Easting values:

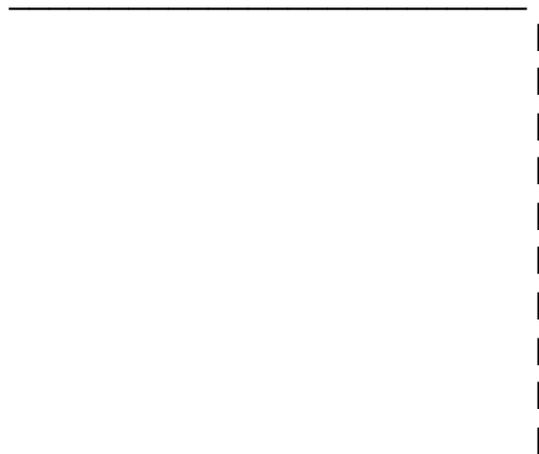
- The full easting coordinate value = 635000m.E. This represents the west start point for a grid.
- The distance between 635000m.E and 636000m.E = 1000 meters.
- The last 3 numbers represent meters. The distance between 635180m.E and 635721m.E = 541 meters.

Northing values:

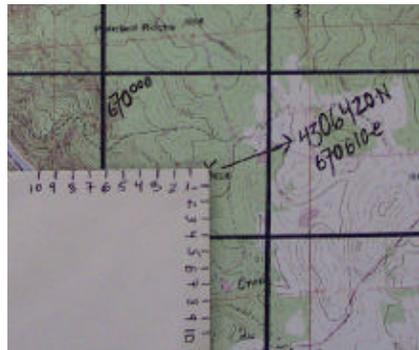
- The full northing coordinate value = 4268000m.N. This represents the southern start point for a grid.
- The distance between 4268000m.N and 4269000m.N = 1000 meters.
- The last 3 numbers represent meters. The distance between 4268325m.N and 4268575m.N = 250 meters.

To interpolate the coordinates for a specific point, you need to create a UTM grid on the map. Some USGS 7.5 minute quads have the UTM grid drawn directly on the map, but most do not. Create a grid by drawing a line between identical UTM values on the top and bottom of the map, or left and right of the map. You should draw a minimum of 4 lines, using the full coordinate values surrounding the point you wish to interpolate. The box you create surrounding the point of interest will have 100 meters on each side. If you had to, you could mark off the north and east side into 10 equal increments (100 meters each) just by 'eye-balling' it. It would be more accurate to create a 100 meter ruler using the kilometer scale located at the bottom of the map.

Creating the 100 meter ruler is easy. Find a piece of paper that has a right angle. Place the right angle corner of the paper on the '0' on the 1 kilometer bar scale (with the rest of the paper to the left). Use the increments on the barscale to mark off 10 increments on the paper. Number the increments on the paper from left to right starting with 10, decreasing to 0 at the corner. Now rotate the paper so the corner is at the start of the barscale (at the start of the small increments). Use the increments on the barscale to mark off 10 increments on the paper. Number the increments on the paper from right to left starting with 10, decreasing to 0 at the corner. Your ruler should look like this:



Place right angle of the rule on the point of interest. Now count off the increments where the ruler crosses the gridlines. Add the meter value to the full coordinate value to calculate the northing and easting coordinate.



In the above example, the full easting coordinate value = 670000m.E, and the full northing coordinate = 4306000m.N. The ruler indicates that the 670000m.E. grid line intersects the horizontal scale at 61, making the easting coordinate 670610m.E. The 4306000m.N grid line crosses the vertical scale at 420 resulting in a northing coordinate of 4306420m.N.

Once you have interpolated the desired coordinate, you can manually enter it into your GPS unit. Make sure the position format is set to UTM/UPS on the GPS unit before you enter the coordinate values. Once you have entered the coordinates, you can change the position format to any other desired format (such as decimal degrees or degrees minutes seconds). The GPS unit will automatically perform the format conversion.