by Jim Riesterer . . . . . Edited by Scott Hughes, Dan Narsavage & Diana Boyack



# UTM - Universal Transverse Mercator Geographic Coordinate System

The idea of the transverse mercator projection has its roots in the 18th century, but it did not come into common usage until after World War II. It has become the most used because it allows precise measurements in meters to within 1 meter.

A mercator projection is a 'pseudocylindrical' conformal projection (it preserves shape). What you often see on poster-size maps of the world is an equatorial mercator projection that has relatively little distortion along the equator, but quite a bit of distortion toward the poles.


What a transverse mercator projection does, in effect, is orient the 'equator' north-south (through the poles), thus providing a north-south oriented swath of little distortion. By changing slightly the orientation of the cylinder onto which the map is projected, successive swaths of relatively undistorted regions can be created.

This is exactly what the UTM system does. Each of these swaths is called a UTM zone and is six degrees of longitude wide. The first zone begins at the International Date Line (180°, using the geographic coordinate system). The zones are numbered from west to east, so zone 2 begins at 174°W and extends to 168°W. The last zone (zone 60) begins at 174°E and extends to the International Date Line.

[Find Self on a Map]

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**geostac@gmail.com**

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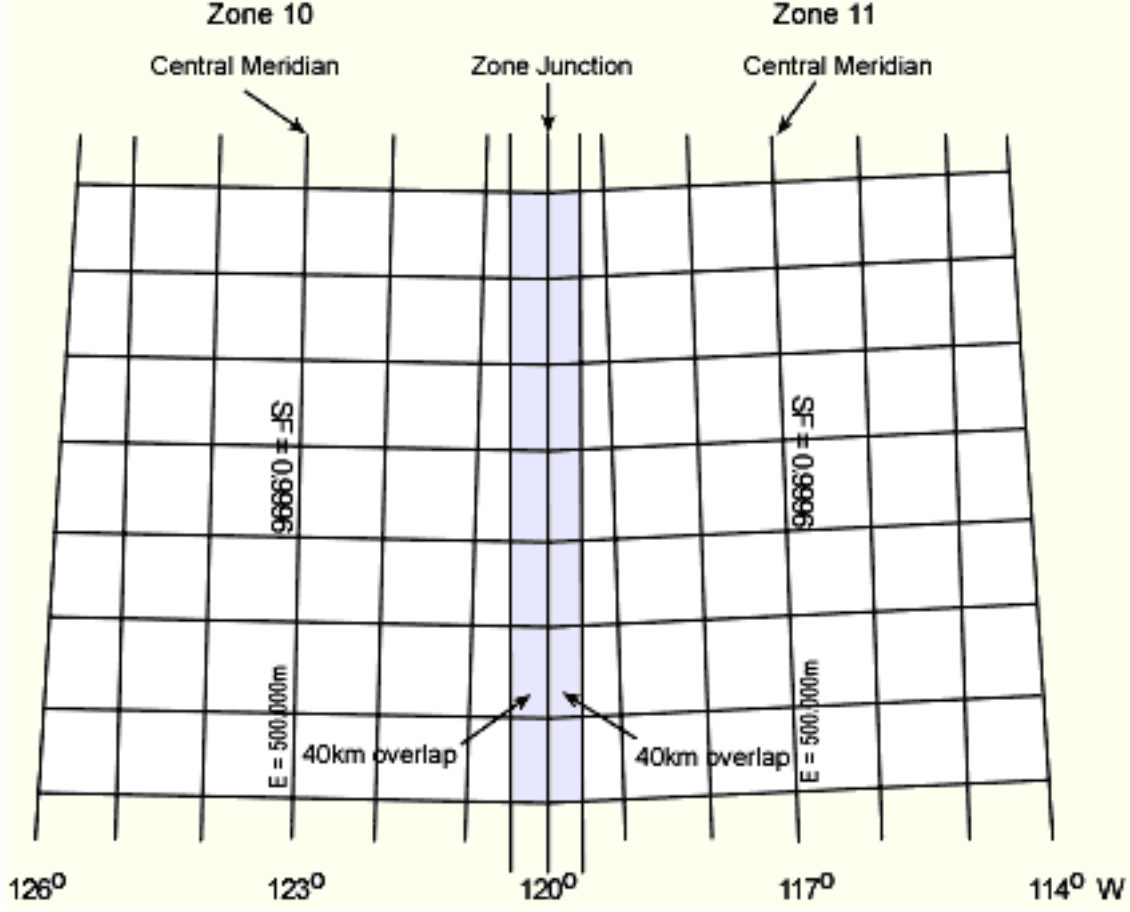
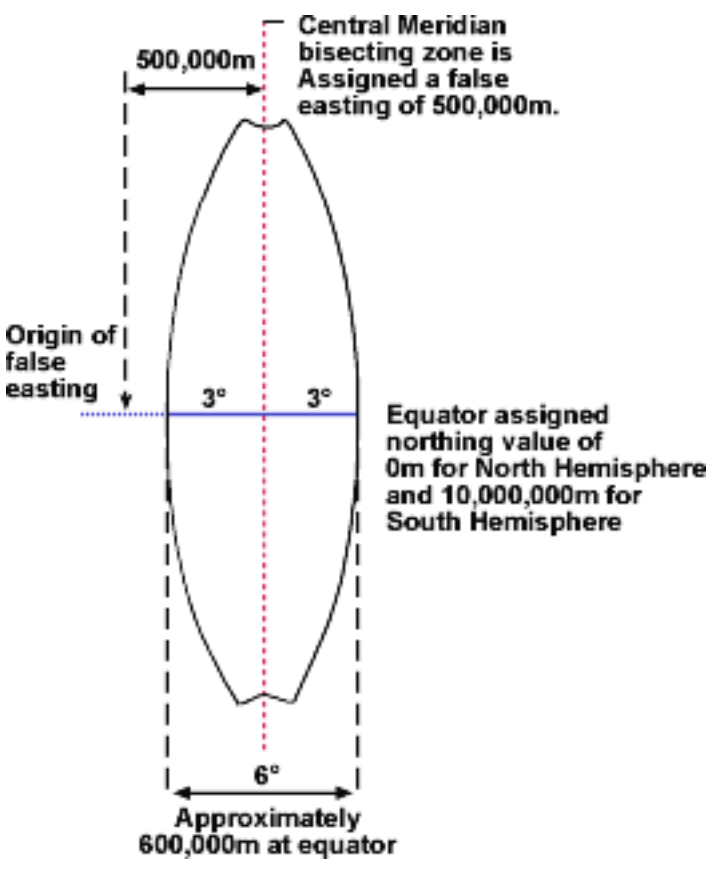



The zones are then further subdivided into an eastern and western half by drawing a line, representing a transverse mercator projection, down the middle of the zone. This line is known as the 'central meridian' and is the only line within the zone that can be drawn between the poles and be perpendicular to the equator (in other words, it is the new 'equator' for the projection and suffers the least amount of distortion). For this reason, vertical grid lines in the UTM system are oriented parallel to the central meridian. The central meridian is also used in setting up the origin for the grid system.




Any point can then be described by its distance east of the origin (its 'easting' value). By definition the Central Meridian is assigned a false easting of 500,000 meters. Any easting value greater than 500,000 meters indicates a point east of the central meridian. Any easting value less than 500,000 meters indicates a point west of the central meridian. Distances (and locations) in the UTM system are measured in meters, and each UTM zone has its own origin for east-west measurements.

To eliminate the necessity for using negative numbers to describe a location, the east-west origin is placed 500,000 meters west of the central meridian. This is referred to as the zone's 'false origin'. The zone doesn't extend all the way to the false origin.
The origin for north-south values depends on whether you are in the northern or southern hemisphere. In the northern hemisphere, the origin is the equator and all distances north (or 'northings') are measured from the equator. In the southern hemisphere the origin is the south pole and all northings are measured from there. Once again, having separate origins for

the northern and southern hemispheres eliminates the need for any negative values. The average circumference of the earth is 40,030,173 meters, meaning that there are 10,007,543 meters of northing in each hemisphere.

UTM coordinates are typically given with the zone first, then the easting, then the northing. So, in UTM coordinates, Red Hill is located in zone twelve at 328204 E (easting), 4746040 N (northing). Based on this, you know that you are west of the central meridian in zone twelve and just under halfway between the equator and the north pole. The UTM system may seem a bit confusing at first, mostly because many people have never heard of it, let alone used it. Once you've used it for a little while, however, it becomes an extremely fast and efficient means of finding exact locations and approximating locations on a map.

Many topographic maps published in recent years use the UTM coordinate system as the primary grids on the map. On older topographic maps published in the United States, UTM grids are shown along the edges of the map as small blue ticks.

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