

485 - UTM Instructions

For UTM maps, see the ILLUSTRATIONS section.

UTM MAP LOCATIONS

The Universal Transverse Mercator (UTM) Grid System provides a simple and accurate method of recording locations. Its greatest advantages over other systems are its speed and precision, and the use of simple metric units of measure.

In the UTM system, the Earth is divided into numbered zones (Fig. 1) to determine the correct zone for your area, refer to the lower lefthand corner of your USGS map.

A site's UTM location can be easily calculated if it is plotted on a USGS map that has UTM tick marks along its edge (Fig. 2). Most USGS quadrangles published since 1950, and all published since 1959, have these ticks. Any position can be determined to within 1,000 meters merely by referring to the UTM ticks along the edge of 7.5 or 15 minute maps. More precise locations are determined by using a UTM calculator (Fig. 3).

Any point may be identified by referring to three items: its zone number, its distance in meters north from the Equator ("northing"), and its distance in meters from an imaginary point to the west of the zone ("easting").

Equipment Needed

1. A USGS topographic map, 7.5 minute series (1:24,000) if possible.
2. A flat working surface on which to lay the map.
3. A straightedge long enough to reach completely across the map (30-36 inches). Ordinary rulers may not be straight enough

Figure 3. UTM calculator (fascimile). Arrows indicate the two most commonly used scales.

4. A very sharp pencil.
5. A plastic UTM calculator (enclosed).

Procedure for Calculating UTM's

1. Find your point on the map.
2. With the straightedge, carefully draw a line from the top of the map to the bottom, connecting the two blue UTM ticks immediately west of the point. Make sure the ticks are a correct pair (have the same value).
3. Do the same for the pair of ticks immediately south of the point; draw a line from the left to the right side of the map. This will intersect your first line somewhere to the southwest of the point (Fig. 4).
4. Record the UTM zone number.

Figure 4. USGS map with lines drawn to connect UTM ticks. The lines intersect southwest of the point.

5. Record the easting and northing values of the drawn lines. In our example (Fig. 4), this would be 640___ m. E. and 4987___ m. N. (If this is unclear, see the Notes below.) These are the first digits of your complete UTM location; the last three digits will be measured with the plastic UTM calculator.
6. Find the scale on the UTM calculator which matches the scale on the bottom of your map. The two most common scales are 1:24,000 (7.5 minutes) and 1:62,500 (15 minute).
7. Using the UTM calculator, measure how far east the point is from the north-south line you drew. Record this as the last three digits of the easting value. The point in Figure 5 is 560 meters east of the line. Thus, the complete easting value is 64056 m E.
8. Repeat the process, measuring from the point to the east-west line to obtain the complete northing value.

Figure 5. The UTM calculator shows that this point is 560 meters east of the line, or UTM 640560m E.

Other Methods for Calculating UTM

When a point is located near the lefthand edge of the map, reverse the process. Subtract the values obtained with the UTM calculator from the closest intersecting ticks to the northeast of the point.

Although the basic method will work, other approaches are faster. Refer to the USDI publication "Using the UTM Grid System to Record Historic Sites", HCRS Publication No. 40, by Wilford Cole (1980).

Notes

1. The light blue UTM ticks on the edge of maps may show only their first three or four digits. Easting values are abbreviated as three digit numbers along the top and bottom edges of the map, and the first digit is shorter than the other two. Northing values are abbreviated as four digit numbers along the left and righthand edges of the map, and the first two digits are shorter. These abbreviations are clarified near the northwest and southeast corners of the map, where a tick will be written out in full (Fig. 2). For example, an easting shown as 523 would be printed in full as 523000m E., or 23,000 meters east of the zone's central meridian. (An arbitrary value of 50,000 meters is assigned to the meridian, as a convenience to avoid negative values.)
2. If the value of a UTM tick is not printed on the map, you can easily calculate it by counting from nearby ticks. Just remember that ticks are spaced every 1,000 meters on 7.5 and 15 minute maps, and that you add when counting north or east and subtract when counting south or west.
3. Northing is the number of meters north of the Equator, and has 7 digits. Easting is the distance from an imaginary point 50,000 meters west of the central meridian. Northing values are larger than easting (6 digits) because it is farther to the Equator.
4. Lines connecting UTM grid ticks of equal value are seldom parallel with the edges of the map. Therefore, when drawing lines across your map, be careful to locate the appropriate pair of UTM ticks regardless of how the lines may look.
5. The divisions numbered 1-9 on the 1:24,000 scale of the UTM calculator represent thousands of meters, and the smallest are 20 meters. Thus, the smallest measurable value at this scale is 10 meters, or a point falling between two of the smallest lines.

6. The divisions numbered 1-4 on the 1:62,5000 scale of the UTM calculator represent thousands of meters, and the smallest are measurements may only be made to the nearest 50 meters. Thus, the measurements may only be made to the nearest 25 meters at this scale. (We are not sure why this scale goes beyond 1,000 meters, because you should never need anything more.)

UTM EXERCISE #1

Using the scale for a 7,5 minute map, calculate the UTM Easting and Northing for sites A, B, C, and D. Assume Zone 11. Record your answers in the spaces provided below. The correct UTM values are shown upside-down. (Variation of 10 meters is acceptable.)

UTM EXERCISE #2

Using the scale for a 15 minute map, calculate the UTM Easting and Northing for sites A, B, C, and D. Assume Zone 11. Record your answers in the spaces provided below. The correct UTM values are shown upside-down. (Variation of 25 meters is acceptable.)