U.S. Department of the Interior
U.S. Geological Survey
Earth Science
Information Center (ESIC)

Factsheet

The Universal Transverse Mercator (UTM) Grid

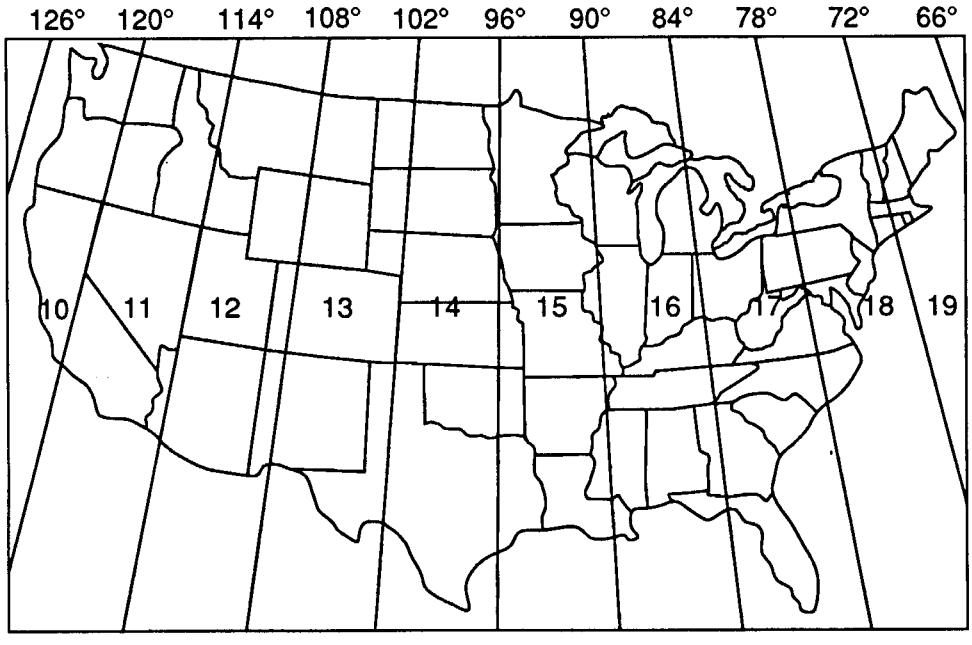

Figure 1. The Universal Transverse Mercator grid that covers the conterminous 48 United States comprises 10 zones—from zone 10 on the west coast through zone 19 in New England.

Map projections

The most convenient way to identify points on the curved surface of the Earth is with a system of reference lines called parallels of latitude and meridians of longitude. On some maps the meridians and parallels appear as straight lines. On most modern maps, however, the meridians and parallels may appear as curved lines. These differences are due to the mathematical treatment required to portray a curved surface on a flat surface so that important properties of the map (such as distance and areal accuracy) are shown with minimum distortion. The system used to portray a portion of the round Earth on a flat surface is called a map projection.

Grids

To simplify the use of maps, and to avoid the inconvenience of pinpointing locations on curved reference lines, a rectangular grid consisting of two sets of straight, parallel lines, uniformly spaced, each set perpendicular to the other, is superimposed on the map. This grid is designed so that any point on the map can be designated by its latitude and longitude or by its grid coordinates, and a reference in one system can be converted into a reference in another system. Such grids are usually identified by the name of the particular projection for which they are designed.

The Universal Transverse Mercator grid

The Defense Mapping Agency adopted a special grid for military use throughout the world called the Universal Transverse Mercator (UTM) grid. In this grid, the world is divided into 60 north-south zones, each covering a strip 6° wide in longitude. These zones are numbered consecutively beginning with zone 1, between 180° and 174° west longitude, and progressing eastward to zone 60, between 174° and 180° east longitude. Thus, the conterminous 48 States are covered by 10 zones, from zone 10 on the west coast through zone 19 in New England (fig. 1). In each zone, coordinates are measured north and east in meters. (One meter equals 39.37 inches, or slightly more than 1 yard.) The northing values are measured continuously from zero at the Equator, in a northerly direction. Southerly values are similarly measured from the Equator, south. A central meridian through the middle of each 6° zone is assigned an easting value of 500,000 meters. Grid values to the west of this central meridian are less than 500,000; to the east, more than 500,000.

Determining a UTM grid value for a map point

The UTM grid is shown on all quadrangle maps prepared by the U.S. Geological Survey. On 7.5-minute quadrangle maps (1:24,000 scale) and 15-minute quadrangle

maps (1:50,000, 1:62,500 and standard-edition 1:63,360 scales) the UTM grid lines are indicated at intervals of 1,000 meters, either by blue ticks in the margins of the map or with full grid lines. The 1,000-meter value of the ticks is shown for every tick or grid line. In addition, the actual meter value is shown for ticks nearest the southeast and northwest corners of the map. Provisional maps at 1:63,360 scale show full UTM grids at 5,000-meter intervals.

To use the UTM grid, a transparent grid overlay can be used that subdivides the grid, or lines can be drawn on the map connecting corresponding ticks on opposite edges. The distances can be measured in meters at the map scale between any map point and the nearest grid lines to the south and west. The northing of the point is the value of the nearest grid line south of it plus its distance north of that line; its easting is the value of the nearest grid line west of it plus its distance east of that line (see fig. 2).

On maps at 1:100,000 and 1:250,000 scale, a full UTM grid is shown at intervals of 10,000 meters and is numbered and used in the same way.

Information

For further information contact any Earth Science Information Center (ESIC) or call 1-800-USA-MAPS.

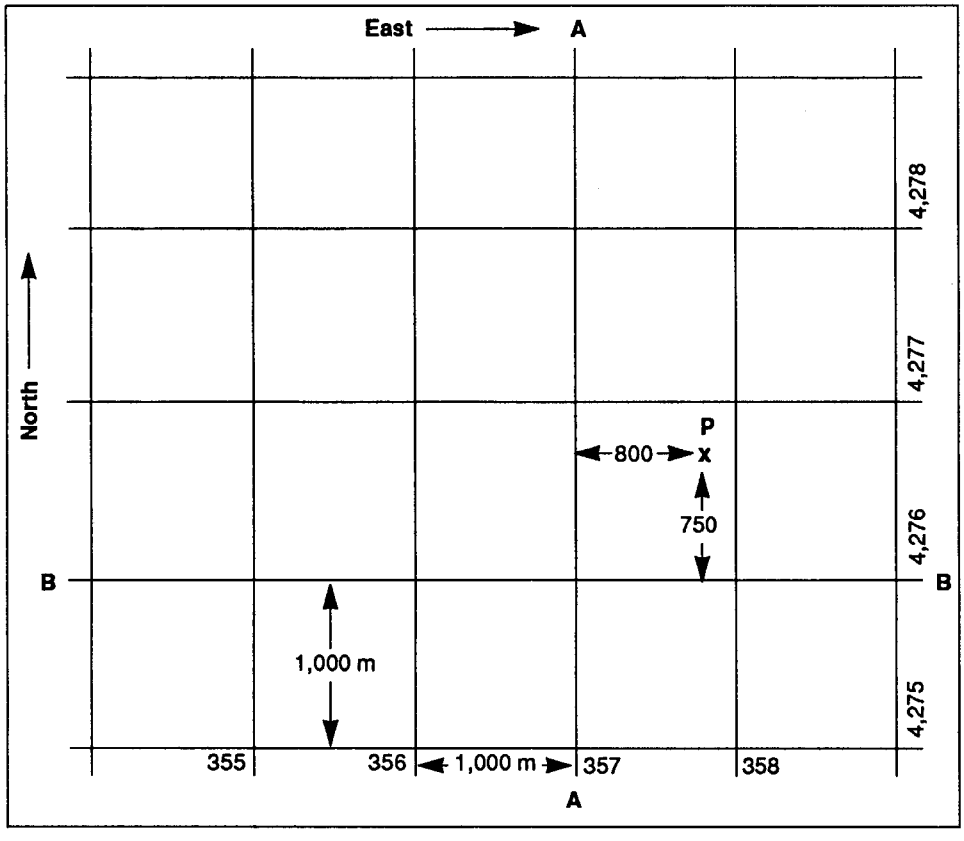

Figure 2. The grid value of line A-A is 357,000 meters east. The grid value of line B-B is 4,276,000 meters north. Point P is 800 meters east and 750 meters north of the grid lines; therefore, the grid coordinates of point P are north 4,276,750 and east 357,800.