

## Topo Maps, GPS and UTM Grid Readers

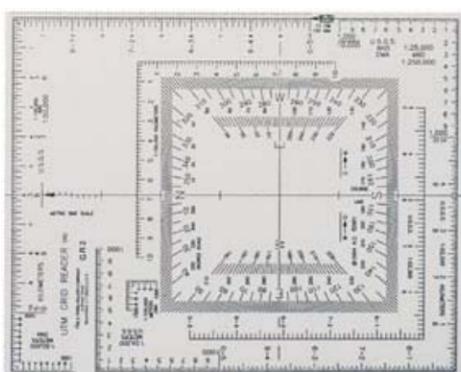
Supplemental information for [Kayak Navigation by Tom Holtey](#)

### UTM Grid Reader & Map - A Backup When Electronic Positioning Systems Fail

Many folks are using GPS, a new electronic navigation tool (Global Positioning System), for their backcountry navigation. Electronic devices can and do fail. For this reason if you do depend on using a GPS consider also carrying a topo map, **compass** and a **UTM Grid Reader**.

In addition to using a paper map as back up to a GPS there are situations where you may wish to share an exact location with others. You may have a cache of supplies or a campsite marked on your topo map and wish to give that location to a GPS using buddy.

Or you may have logged those camp and cache sites as waypoints in your GPS and wish to pin point that place on a paper map for your map-and-compass using buddy. You may even get into a situation where you need to inform emergency responders where a victim is for evacuation.



### The Universal Transverse Mercator Grid Reader

A UTM Grid Reader is a clear plastic sheet with "rulers" printed on it. Those rulers kind of look like little carpenter's framing squares. There will be several of them, all with a scale printed next to them. A scale will look like this: **1:24,000**. It will also feature a 360-degree protractor to help you plot compass courses on you map.

**UTM** (Universal Transverse Mercator) is a system of communicating coordinates in a grid, not unlike the X & Y graphs back in high school geometry. UTM is Metric and based on Meters. One meter = 39.4 inches, or 1.09 yards. It is an alternative system to latitude and longitude that is based on Degrees, Minutes & Seconds.

### TOPO NAD SYSTEMS, ZONES AND SCALES

There are two systems within UTM, NAD 27, the older one, & **NAD 83** the one replacing **NAD 27**. Most USGS maps currently in print are in the NAD 27 system. All USGS maps have this information printed on them. A GPS electronic device should be able to switch from one to the other.

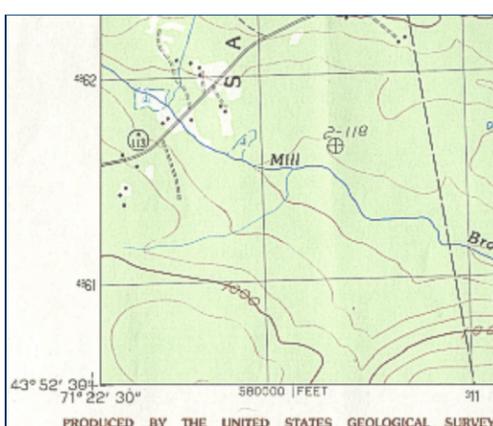
Make sure you are using all the same data - on your map, on your GPS, and in your notes. Be aware also that you may at times need to know what UTM Zone you are working with, also printed on the maps. There are ten zones in North America. Zone 10 covers much of the west coast. Zones 11 through 18 progress from west to east. Zone 19 covers much of New England.

A common topo map used for backcountry navigation will have a scale of **1:24,000**. It is called a **7.5-minute series** topographic map. We will use this for our first example. Look in the lower left corner of your map and you will see "**1927 NORTH AMERICAN DATUM**". That is the **NAD27** mentioned above. There may even be instructions on how to convert to NAD 83 printed on the map. You will also see the UTM zone.

### LOCATING A POSITION ON A PAPER MAP

Look along the border of the map on the right or left sides and you will see numbers that look like this:

**48 63**



Notice that the large bold numbers increase as you go north.

Look on the bottom or top borders and you will see numbers that look like this:

**3 13**

Notice that the large bold numbers increase as you go east.

Those are basic UTM coordinates. You may have coordinates in your GPS or in your notes that you would like to pin point on a paper map. They will look like this:

**E 313637 000000N 4863683 (zone 19)**

See the similarity to the numbers on the borders?

**48 63**  
**N 48 63 683**

**3 13**  
**E 3 13 637**

### NORTHING AND EASTING

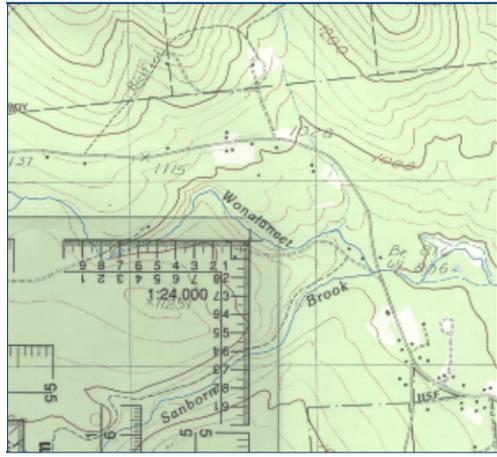
The N stands for "Northing", meaning where, only in respect to how far north or south, or in other words a line. The E stands for "Easting", meaning where, only in respect to how far east or west, or in other words a line. Both numbers together can pin point a location where these two lines cross. Just like latitude and longitude lines.

To find that spot, called a waypoint, and mark it on your paper map, start on the right or left border of the map and find the Northing numbers beginning with (48 63) in our example. Then look on the bottom or top of the map and find the Easting numbers (3 13).

There should be lines adjacent to these numbers, or at least a little mark. Follow the lines, or draw them straight across to the same number on the opposite side of the map, so you can see where these two lines cross and get to the "neighborhood" of your waypoint. This is just like a regular street atlas where you will have coordinates that are expressed as B18, B=X axis and 18=Y axis.

Your full Northing coordinate is 48 63 683. You have already found the 48 63 part, now you need to find the 683 part. This is the Northing number, so you will look for your waypoint north of the 48 63 line.

Your full Easting coordinate is 3 13 637. You have already found the 3 13 part, now you need to find the 637 part. This is the Easting number, so you will look for your waypoint east of the 3 13 line.



### APPLYING THE UTM GRID READER

I find that it best to locate the exact position of your waypoint using the last string of Easting and Northing numbers at the same time. This is where the UTM Grid Reader comes into play.

On your Grid Reader find the scale that matches the SCALE printed on your map. For this example the scale is 1:24,000. Place the Grid Reader on the map. You can see right through it! On the 1:24,000 scale ruler you will see the numbers that 1 = 100 meters, through 10 = 1,000 meters. On maps with the NAD 27 Datum you most likely see a grid pattern, each square is 1,000 meters on a side. Position your Grid Reader so that the corner of the little "carpenter's square" is east of your north-south line 3 13 and north of your east-west line 48 62.

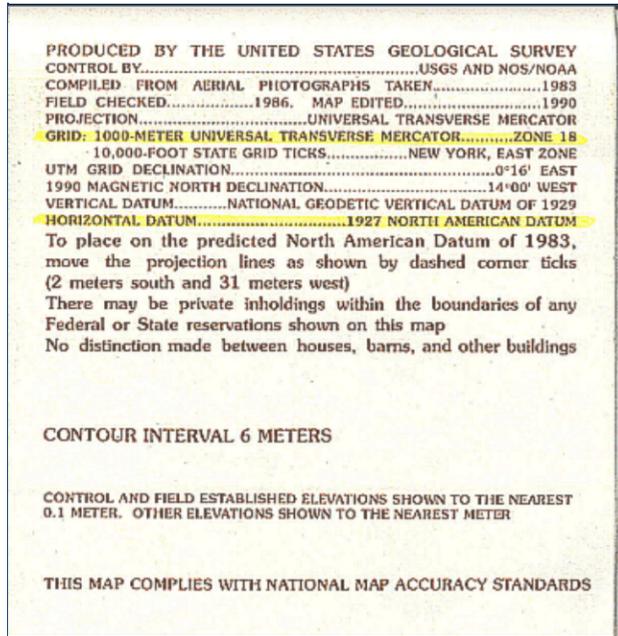
We will start with the Northing number 683. Find the six on the vertical part of the UTM Reader scale. Line the six up with the 48 63 line. Slide it northward counting the tiny marks until you have reached "68". That is close enough, finding the last three meters is not necessary, but you can round up or down as needed.

Now for the Easting number 637. Try not to let the Grid Reader slip around too much, it is OK if it does, you will just have to re-set it. Find the six on the horizontal part of the UTM Reader scale. Line the six up with the 3 13 line. Slide it eastward counting the tiny marks until you have reached "63". Don't worry about the last seven meters, but you could round up to 64 and call it close enough.

Double check both edges of the scale to ensure you have them lined up to the right numbers. Take a look at the grid pattern on the map and "eye ball" to see that it is square with the Grid Reader. Note: The grid pattern on the map will NOT be square to the borders of the map, don't let that confuse you.

Now you have pin pointed your waypoint right on the map from just a bunch of numbers! With a sharp pencil mark on your map the point at the corner of the scale. You may have to slide the Grid Reader carefully away keeping an eye on the spot to mark. Mark your spot and re-check it. Some folks will drill a teeny tinny hole right on the corner of the scale so they can poke a pencil in and mark with out lifting the Grid Reader. There is a "cross hairs" to help you find the "point". (Most of the scales on the Grid Reader shown above are on the edge of the reader for convenience.)

### REPORTING COORDINATES TO GPS USERS



Use the cross hairs to help center it. Turn the Grid Reader so that it is square with the grid lines, not necessarily the border.

Count the numbers down, south, to the 48 81 line. Each number equals 100 meters. In our example I count down to just more than 57, so I round off to 575. That makes my Northing number 48 81 575.

Then count the numbers west, to the left, along the horizontal bar of the scale. I count 55 and just a bit more so I round off to 555. That makes the Easting number 5 20 555.

Write it out like this for the GPS buddy:

**Lakeside Campsite**  
**NAD 27, Zone 18**  
**N 4881575**  
**E 520555**

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We have just used some numbers to mark a spot on a map. You can also turn a spot on a map into coordinate numbers. This will come in handy when you want to tell a GPS using buddy where a good campsite is.

Check the notes on the border of the map to find out if it is **NAD 27** or **83**. We will use a 1:25,000 scale topo map, zone 18, NAD 27, for this example.

Find your spot on the map. Then find the closest grid line that is south of the spot and the closest grid line that is west of the spot. If your map does not have a grid you will have to draw those lines in using the marks at the borders of the map. Follow those lines to the borders.

On this map we will see that the camp is north of the 48 81 line, the first string of numbers in our Northing coordinate. We will also see that the camp is east of the 5 20 line, the first string of numbers in our Easting coordinate.

Get out the Grid Reader and find the scale that matches the map, 1:25,000. Place it so the point of that scale is right on top of the camp.

