

# **APPENDIX 12**

## **USING & PLOTTING MAGNETIC COMPASS DIRECTIONS**

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## USING AND PLOTTING MAGNETIC COMPASS DIRECTIONS

### Points on Magnetic Compass

Many emigrants used a pocket magnetic compass which had direction points on the face of the compass (8 lettered points in each 90° quadrant). On occasion they made reference in their diary accounts to these lettered compass points to indicate the direction of travel. For purposes of making use of these lettered compass directions, they can be converted easily to degrees. Just remember that the angular distance between each lettered point on a magnetic compass is **11¼ degrees**. Thus, WNW is equal to 292½° or 22½° north of west. The following direction points are from a typical 19th century magnetic pocket compass of the type emigrants carried overland.

Moving clockwise from north the lettered points on the magnetic compass are:

<i>N</i>	<i>E</i>	<i>S</i>	<i>W</i>
<i>N by E</i>	<i>E by S</i>	<i>S by W</i>	<i>W by N</i>
<i>NNE</i>	<i>ESE</i>	<i>SSW</i>	<i>WNW</i>
<i>NE by N</i>	<i>SE by E</i>	<i>SW by S</i>	<i>NW by W</i>
<i>NE</i>	<i>SE</i>	<i>SW</i>	<i>NW</i>
<i>NE by E</i>	<i>SE by S</i>	<i>SW by W</i>	<i>NW by N</i>
<i>ENE</i>	<i>SSE</i>	<i>WSW</i>	<i>NNW</i>
<i>E by N</i>	<i>S by E</i>	<i>W by S</i>	<i>N by W</i>
<i>(E)</i>	<i>(S)</i>	<i>(W)</i>	<i>(N)</i>

### Plotting Magnetic Compass Directions

When plotting these magnetic compass directions on topographic maps, either from diary accounts or a pocket compass, they must be corrected for true directions by using the magnetic declination. The *magnetic declination* is the angular distance between *True North* and *Magnetic North*. This is because the earth is a colossal magnet with a polar axis running through it from the north to the south magnetic pole; and this magnetic pole has a different angularity from the true or geographic north-south pole by which topo quads are oriented. Thus magnetic compass directions will vary from place to place and this variation is called *magnetic declination*.

In the western trail states the magnetic declination will always be to the east of north, anywhere from about 20° in the northwest to about 11° in the southwest and about 8° along the Missouri River. Most 7.5 minute topographic quadrangles will indicate the magnetic declination for the map area on a direction figure (at the bottom left hand side of the map). Provisional quads do not have this direction figure but indicate the magnetic declination in the map information at the lower left hand corner of the map.

West of the Missouri River, this magnetic declination must be **added** (because it is to the east of north) to any magnetic reading in order to find the true direction to plot on topographic quads.

For example, if the magnetic reading is NW ( $315^\circ$ ) and the magnetic declination is  $15^\circ$ , the true direction will be  $330^\circ$ . *[continued]*

There is one added complication in arriving at the magnetic declination for a particular locality. Not only does the magnetic declination vary from place to place, but it varies from time to time, due to the magnetic pole wandering a bit from year to year. In the short run, this is of no major consequence for using or plotting magnetic compass directions. In the western trail states this wandering factor will amount to only a few minutes of variation per year (since the 1920's the variation has been decreasing in the west). However, if you are converting an emigrant magnetic compass direction, then you are dealing with a change of up to 165 years. According to the "Estimated Values of Magnetic Declination" tables prepared by the National Geophysical Data Center, the differences between 1850 and 2000 in trail states range from  $1^\circ$  to  $6^\circ$ , with  $1^\circ$  to  $3^\circ$  being more common (and always a decrease from 1850). Fortunately, this means the magnetic declination for a particular locality in emigrant days is very close to what it is today for that same locality.