Aligning Wind Vanes

Introduction

Wind Vanes measure wind direction relative to the orientation of the fixed base on the sensor. This Application Note gives you the information you need to orient your wind vanes correctly when they are mounted to the tower. This note also includes information on using Offset and Magnetic Declination corrections when scaling your data to obtain properly scaled and oriented data.

Magnetic Declination

Since the earth's magnetic field is not uniform, the magnetic poles do not coincide with the true geographic poles. Moreover, a compass generally doesn't point to a true geographic pole; it points to a magnetic pole. This difference between a true geographic bearing and a magnetic bearing varies from location to location and is called *magnetic declination*. Magnetic declination or "compass variation" is the horizontal angle between *true north* (also called "geographic north" or "map north") and the direction the compass points, *magnetic north*.

Magnetic declination is measured as the number of degrees of error a compass shows at a site. The declination for sites located east of the magnetic north pole is expressed as the number of degrees that magnetic north is west of true north. The declination for sites located west of the magnetic north pole is expressed as the number of degrees that magnetic north is east of true north. For example, Vermont (USA) has a magnetic declination of 15 degrees west. In other words, magnetic north in Vermont is 15 degrees to the west of true north. Magnetic north in Fairbanks, Alaska (USA) is about 27 degrees east of true north; therefore, its magnetic declination is 27 degrees east.

The earth's magnetic field varies slightly in position over time. Therefore, the magnetic declination at a site also varies over time. Because of this variation, it is important that you reference an up-to-date map of declination ("isogonic map") if you choose to orient your wind vanes to magnetic north. Later you can enter a correction for magnetic declination into your wind data analysis software if desired.

Mounting and Aligning Wind Vanes

Since a magnetic compass is the simplest direction reference, it is sometimes convenient to orient wind vanes in the field to magnetic north. Most NRG customers, however, align their wind vanes to true north. Before installing your NRG logger, decide whether you want wind direction data to report north when the wind is from the *magnetic north* or when the wind is from *true north*. Be sure to make note of your choice and maintain consistency among your sites and projects.

To align a wind vane to true north:

1. Use a transparent orienteering compass with a rotating bezel and magnetic declination markings. In the example in Figure 1, 15 degrees west means that the direction of the compass needle (magnetic north) lies 15 degrees west of true north.
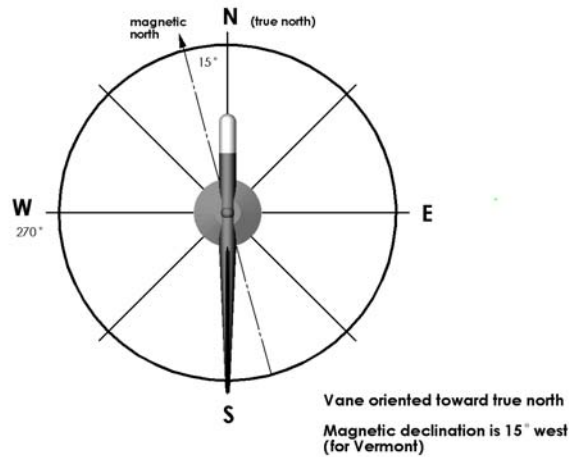

Figure 1

NOTE: Lining up the ridges on the body of the wind vane will cause the sensor to indicate a north reading. Be sure to keep this in mind when orienting the wind vane on the mounting boom.

2. Stand so that it is possible to sight along the tower from the top to the base. Align the bearing mark on the compass so that it points directly in line with the tower, top to base. The bearing of the TallTower in the example in Figure 2 is 270 degrees.
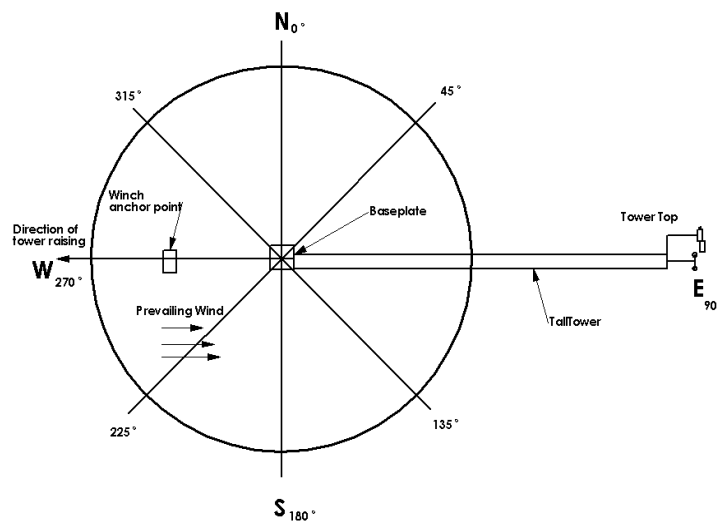

Figure 2

3. Without moving the base of the compass, rotate the bezel so the north end of the needle points to the declination mark that corresponds to local declination.

4. Loosely attach the mounting boom to the TallTower.

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5. Lift the compass to a vertical position so the bearing mark points straight up. Use a level if necessary.

6. Sight through the compass so the center of the compass is over the point where the boom contacts the tower, with the bearing mark still straight up. See Figure 3.
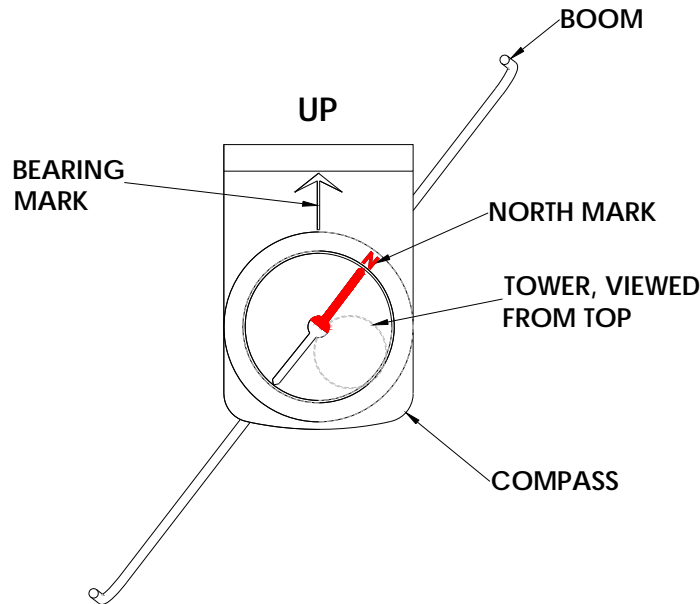
BOOM

UP

BEARING MARK

NORTH MARK

TOWER, VIEWED FROM TOP

COMPASS

Figure 3

7. Have a crew member rotate the boom until it aligns with the north mark on the compass, and tighten the boom.

8. Attach the wind vane with the north arrow index mark on the base pointing in the same direction as the north mark on the compass. The #200P wind direction vane is designed to mount with a cotter pin and set screw to a NRG sensor mounting boom. Insert the cotter pin from the side that the positive (+) terminal is on, through the sensor so the ends exit the same side as the negative (-) terminal. Separate the ends of the cotter pin so it will not fall out. The cotter pin installs horizontally through drilled holes in the boom and vane, allowing the base of the vane to point in one of two directions, toward the tower or away from the tower. See Figure 4.
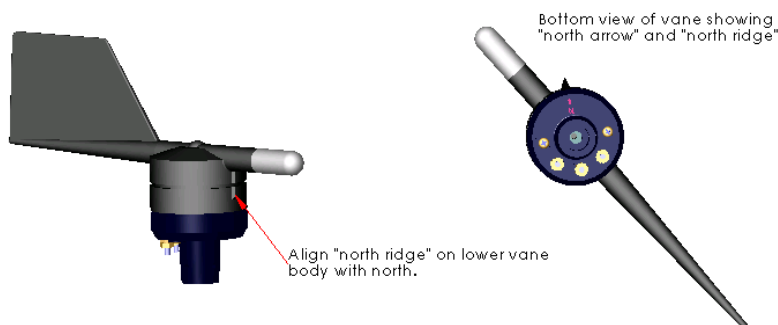
Bottom view of vane showing "north arrow" and "north ridge"

Align "north ridge" on lower vane body with north.

Figure 4

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9. When you raise the TallTower, the north arrow on the base of the wind vane will point to true north.

10. Use the compass to verify your settings. If necessary, adjust the position of the mounting boom before raising the TallTower.

Figure 5
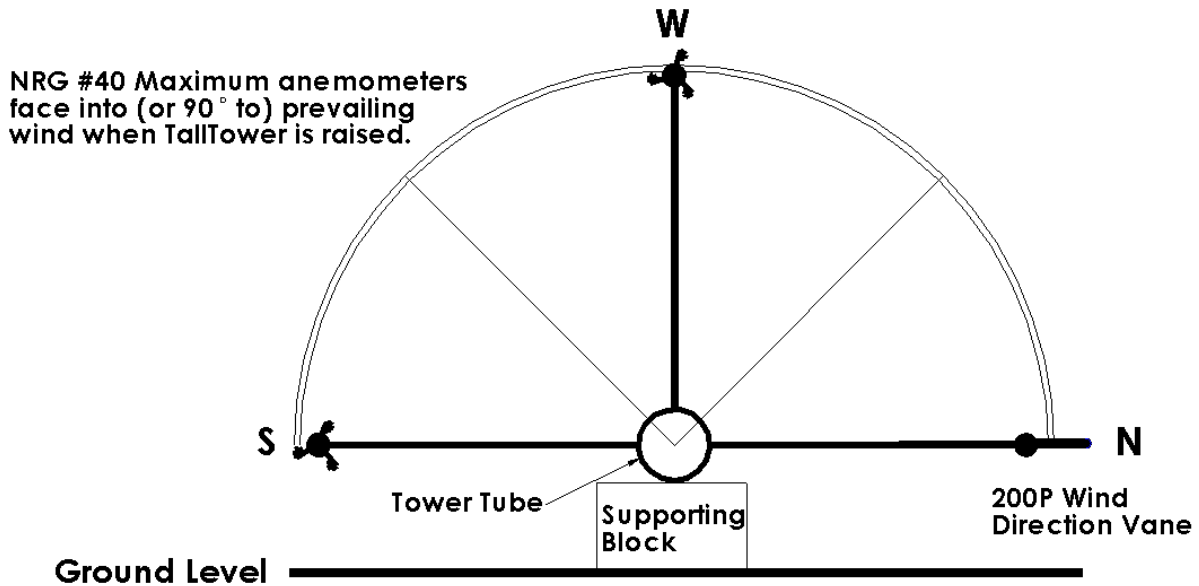
Using Data Analysis Software to Correct for Magnetic Declination

If you orient your wind vanes toward magnetic north but want the direction data reported relative to true north, enter the magnetic declination for the site into the offset or magnetic declination field in your wind data analysis software. NRG's BaseStation Software, for example, has a field called **Mag Declin.** BaseStaion applies the declination to all wind direction data for the site if the Mag Declin field is set to anything but zero. **Declination is not needed if you orient your wind vanes to true north.**

Note: Wind direction vanes have a small range centered around the sensor's north reading that is called the dead band and produces a zero reading. Although NRG Loggers have an algorithm that interprets north readings correctly, when the prevailing wind is from the north, it may make sense to orient the vane to a direction other than north. If you do this, compensate for the orientation by entering a value in the wind vane 'offset' field of your data analysis software. For example, if you orient your wind vane to the south (180 degrees), enter an offset of −180 for the vane.

Note: If you orient your wind vane to a magnetic bearing other than magnetic north, you need to enter values for both magnetic declination and offset in your data analysis software. Enter the site's magnetic declination so that your software can compensate for the declination; enter an offset to compensate for the orientation of the vane. If just one offset field is available in your software, such as NRG's Symphonie Data Retriever software, you will need to combine the magnetic declination value with the offset value (if wind vanes are not oriented to true north) and enter the net value. For example, if your wind vanes are oriented to the south instead of north, and your site has a magnetic declination of 15 degrees west, you would enter −195 in the offset field. Declinations to the west of true north are subtracted from the magnetic reading, and declinations to the east of true north are added to the magnetic reading.

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