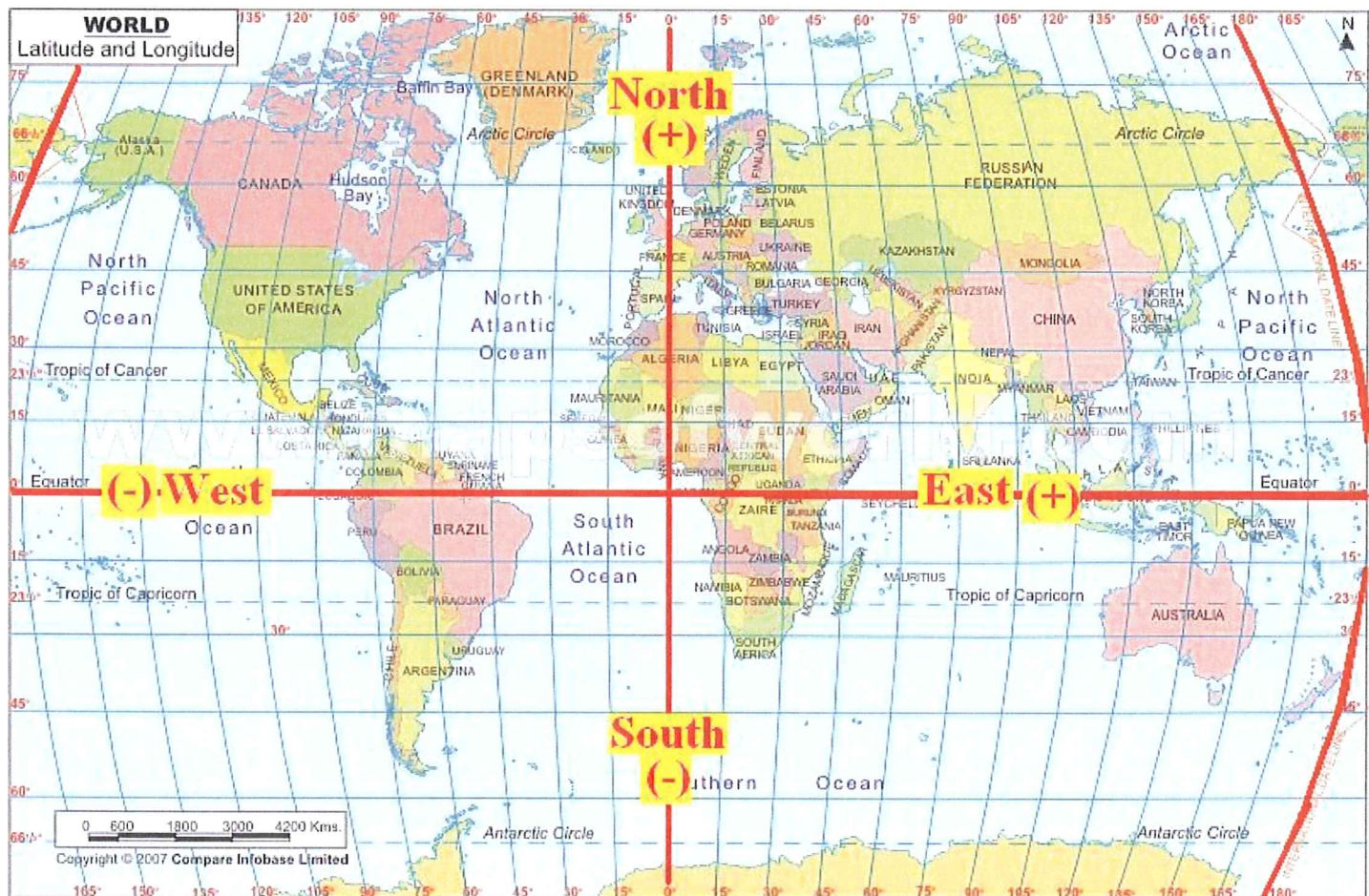


GPS Coordinates

Common Formats & Conversions

Without a doubt, the most commonly asked questions in dealing with flight locating has to do with reading and using GPS coordinates. This is not surprising since a GPS coordinate can be represented in so many different ways. Books, magazines, and online sources often display coordinates differently, some using a notation that includes values represented as pure decimal numbers, others using a notation that includes minutes and seconds of degrees. And some use NORTH, SOUTH, EAST, and WEST indicators, while others use plus and minus symbols instead. There are even books that list coordinates one way on some pages, and other ways on other pages -- within the same chapter!

GPS coordinates are tricky and need to be specific but once you understand the different notations and you learn to recognize the patterns, using the coordinates and converting between the different formats becomes pretty easy. Now before we get into the details, understand that the coordinates on most maps and computer programs can be displayed in three different formats, making it easy for you to see the coordinates any way you want them to appear. This takes a lot of the calculations and conversion steps for you. Occasionally you may need to convert them manually. Here's how...



The coordinates are usually displayed in what is probably the most common format, which includes the hemisphere, the hours of degrees, and a decimal value representing the minutes of degrees. (N 25° 07.450') In the second format, the minutes of degrees are represented as a whole number and the seconds are also represented as a whole number. (N 25° 07' 27") The third format shows the GPS coordinates as pure decimal numbers, which is very useful for doing coordinate math, like calculating distances. (25.124167)

Let's start with a short primer. As you may recall, the earth is divided into hemispheres, divided north-from-south by the Equator, and west-from-east by the Prime Meridian and its continuation, 180th or the International Date Line. What's significant about these imaginary lines on the earth is that GPS coordinates are given relative to these positions. For example, the latitude N 25° 07.450' is a little more than 25 degrees north of the Equator. The latitude S 25° 07.450' is a little more than 25 degrees south of the Equator, which can also be written as the negative number (-25° 07.450'). The same applies to the Prime Meridian. Values to the West of the Prime Meridian (such as points in the United States) are represented with a "W" or a negative number, and values to the East (such as points in Japan) are represented with an "E" or a positive number.

The hemisphere is sometimes a source of confusion since publishers frequently omit the hemisphere from printed coordinates. This can create problems when using these coordinates with some computer programs since computers always assume a positive number when you don't enter a sign (+ and -, or E and W). So, suppose you're sending an aircraft to Mt Shasta, California in the United States and you see the coordinates:

41 18.5864, 122 18.6445

You enter these coordinates directly into your computer program and suddenly you're somewhere just north of the Yellow Sea in China! That's because the longitude was entered as a positive number, which would put it east of the Prime Meridian. Not good. Be sure to include the hemisphere!

OK, let's talk about the actual numbers. Using the latitude N 25 07.450 as an example, we can represent this same location as N 25° 07' 27", or simply 25.124167. They all refer to the same location. This is the most common source of confusion. We hear people saying things like, "the LZ book lists the coordinates as 25 07.450, but the requestor gave it as 25 07 27." See the problem? Don't ignore the decimal point! If it's there, then the seconds are represented as a fraction of the minutes. If it's not there, then the third value is the number of seconds. Let's break it down further:

N 25 07.450 is read as 25 degrees and 7.450 minutes North of the Equator.

To convert this to the second form, simply take the fraction, .450, and multiply it by the number of seconds in a minute. $.450 \times 60 = 27$. Thus, 07.450 minutes is the same as 07 minutes and 27 seconds, or simply 07' 27".

The third format, 25.124167 is just the degrees as a pure decimal number. Take the fraction, .124167, and multiply it by the number of minutes in a degree. The result? $.124167 \times 60 = 7.450$ minutes.

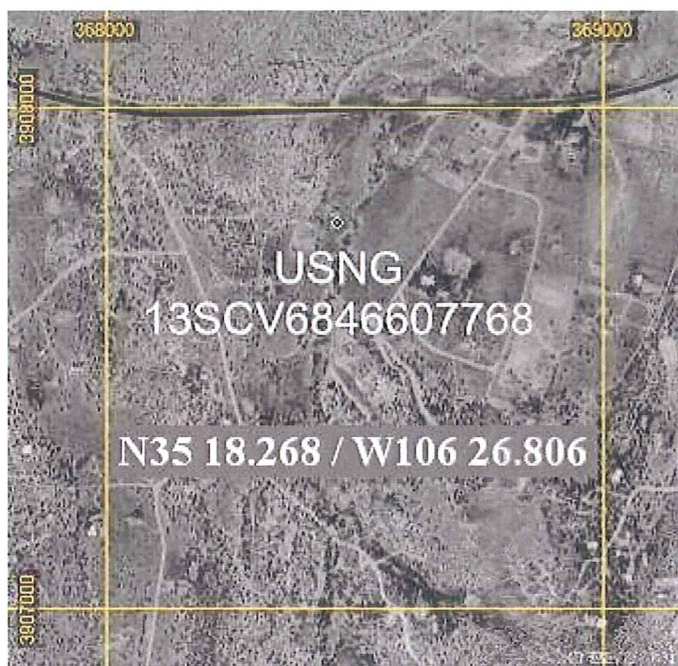
Piece of cake, right? Right! Again, most GPS coordinates are published in one of these three common formats. Just use the mapping software, CAD system or online website you prefer to convert the coordinates given to you to the format you need.

Additional Formatting:

US National Grid System

Homeland Security and the US Geological Survey have partnered to develop a national standard system for use during major disasters and for national interoperability. This is called the US National Grid (USNG). This grid system is meant as an overlay for other GPS/GIS maps used by most consumers.

www.ngs.noaa.gov/TOOLS/usng.html has several tools that can be used to learn this more detailed method of locating anywhere in the World. An additional training article will be written to cover this in more detail.



Lastly we leave you with this advice: Always confirm landmarks and/or road intersections when you have to convert coordinates to other formats.

NOTE:

Latitude Degrees are consistent at roughly 60 nm from North to South.

Longitude Degrees are roughly 60 nm apart @ the Equator and come together at the N & S Poles.

North Pole Coordinates = N90 deg E000' or +90.0000 deg + 000.000 deg

South Pole Coordinates = S90 deg E000' or -90.0000 deg + 000.000 deg

Reference for US National Grid: www.nationalmap.gov



GPS Coordinates

Common Formats & Conversions

1. Standard GPS Coordinates (Latitude/Longitude) are generally depicted in ____ different formats.
 - A. 2
 - B. 3
 - C. 4
 - D. 5
2. The most common format for most HEMS programs is:
 - A. **(25.124167)** Degrees
 - B. **(N 25° 07.450')** Degrees & Minutes
 - C. **(N 25° 07' 27")** Degrees, Minutes & Seconds
 - D. None of the Above
3. The Earth, as it pertains to GPS coordinates is divided into:
 - A. Hemispheres
 - B. Quadrangles
 - C. Perimeters
 - D. Meridians
4. Latitude degrees depicted as a positive number are ____ of the Equator.
 - A. North
 - B. South
 - C. East
 - D. West
5. Longitude degrees depicted as a negative number are ____ of the Prime Meridian.
 - A. North
 - B. South
 - C. East
 - D. West
6. The imaginary line that runs "horizontally" around the Earth and is depicted as "0 degrees" on printed charts and is drawn at a constant 90 degrees (right angle) relative to the north and south poles is the:
 - A. Prime Meridian
 - B. International Date Line
 - C. Equator
 - D. 180th Meridian
7. The imaginary line that runs "vertically" on most maps and is depicted as "180 degrees" on printed charts and is drawn from the north to the south pole is the:
 - A. Prime Meridian
 - B. International Date Line
 - C. Equator
 - D. The Great Divide
8. Using the calculations shown earlier, convert this coordinate. N38.875186 deg
 - A. N38 Deg 52.51116'
 - B. N38 Deg 52' 30.6"
 - C. Both A & B
 - D. None of the Above

9. US Geological Survey and the Department of Homeland Security are developing a national grid system for interoperability called:

- A. USNG
- B. USGS
- C. FEMA Maps
- D. USAR

10. Priority should be given to accuracy when dealing with GPS and/or other coordinate formats. This can be accomplished by:

- A. Making sure all your requestors only give you the format you use
- B. Confirming the location w/ the requestor using landmarks and road intersections as available
- C. Only using US Post Office approved shipping addresses
- D. Always have your pilots utilize Air Traffic Control when responding to scene flights

NAACS

GPS Coordinates

ANSWER SHEET

Name: _____
Organization: _____
Address: _____
City: _____
State: _____ Zip: _____
Country: _____
Email: _____

Please Print Legibly

NAACS Member #: _____
CFC Certification #: _____

Circle the appropriate letter

- 1 A. B. C. D.
- 2 A. B. C. D.
- 3 A. B. C. D.
- 4 A. B. C. D.
- 5 A. B. C. D.
- 6 A. B. C. D.
- 7 A. B. C. D.
- 8 A. B. C. D.
- 9 A. B. C. D.
- 10 A. B. C. D.

NAACS Education Committee
P.O. Box 19240
Topeka, KS 66619

After Completing, mail a copy of the answer sheet along with \$5.00 to NAACS Education Committee. Please allow four weeks for notification of your score. Once processed, CE acknowledgement will be either mailed or e-mailed to you.

Please retain your CE acknowledgement to be submitted with your recertification.