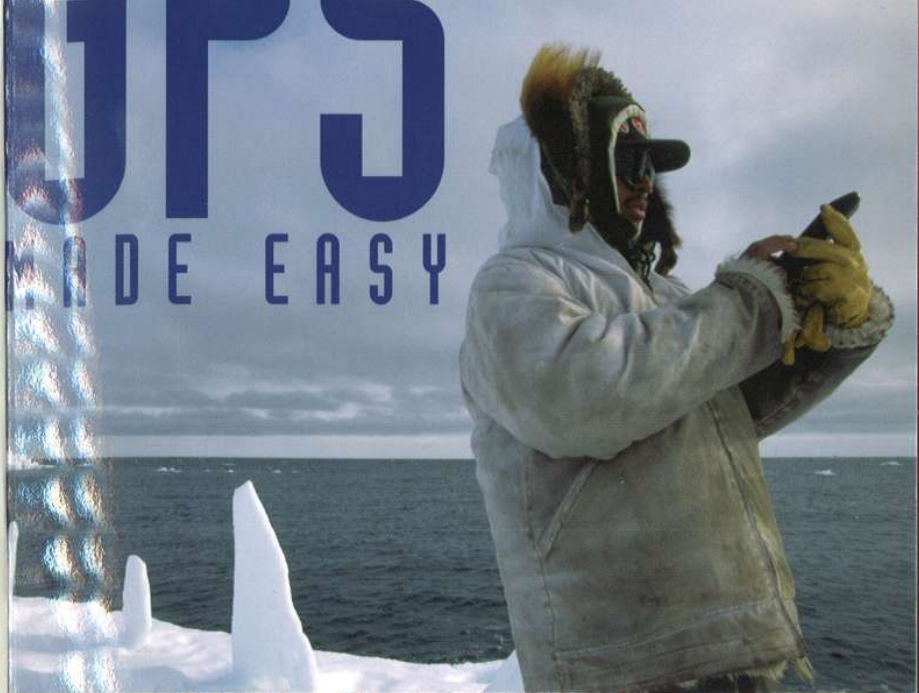


GPS

MADE EASY



USING GLOBAL POSITIONING
SYSTEMS IN THE OUTDOORS
SECOND EDITION

LAWRENCE LETHAM

THE MOUNTAINEERS 

GPS

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For Tanya
*The only thing left to map is life
and that only in retrospect*

Front Cover: Using a GPS receiver to mark the position of a camp in Ellesmere Island, Nunavut, Canada. Photo: Tony Daffern.



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Speed

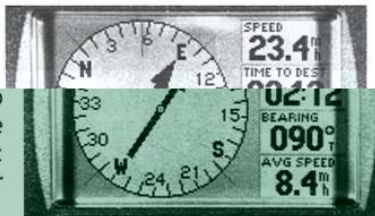
A receiver measures the time and distance between the point you were at a few seconds ago and where you are now, then it divides the distance by the time to get the speed.

There are two different ways to measure speed:

- speed over ground
- velocity made good

Both are explained below. Selective Availability does affect the speed measurement's accuracy, but newer receivers use averaging algorithms to make the calculation more precise. Even if a receiver averages, the receiver may report you are going some slow speed when you are standing still. At slow speeds, just ignore the random fluctuations. Higher speeds are measured more accurately because the variations caused by Selective Availability are a smaller part.

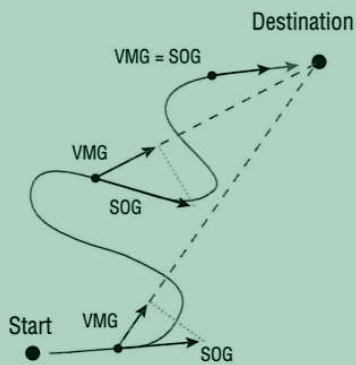
Receivers have upper speed limits, so if you plan on using it at really high speeds, be sure it will work at the speeds you want to go before you buy it. All speeds are reported in the units you select: miles per hour, kilometers per hour or knots.



Garmin compass screen showing both speed and average speed.

Speed Over Ground: Speed over ground (SOG) or ground speed is just like the speed given by the speedometer in a car; it simply measures how fast you are going at that very moment. SOG does not care if you are on course or off course, so it is a measurement of your speed irrespective of direction.

Velocity Made Good: Velocity made good (VMG) is the speed at which you approach your destination. VMG does take into account your present course and your destination. If you are directly on course, VMG is the same value as



Relationship between SOG and VMG.

SOG, but if you stray from course, VMG decreases and is zero if you are off course. The figure shows how VMG and SOG relate.

The calculations for ETA and ETE are based on VMG. If you are directly on course, ETE will decrease until it is zero at the destination. If you are slightly off course, the ETE will decrease until you determine you will never arrive at the destination, then it will increase or it disappears altogether. Refer to the section on Times on page 61.

Average Speed: Average speed tells you how fast you are going on average. It is not the same as speed over ground. SOG is the speed at any second in time. If one second you go 25 mph (40.2 km/h) and the next shows 25 mph. If a second later you go 50 mph (80.5 km/h), the average speed is 37.5 mph. If you instantaneously changes to 50 mph. Average speed divides the total distance you have gone by the amount of time it took. Suppose you travel your car for a long time and the average speed is 25 mph. If you suddenly accelerate to 50 mph, the average speed does not change, but slowly starts to rise. After you have traveled a long time at 25 mph, the average speed is only 37.5 mph.

Any receiver that provides average speed must also provide the distance you have gone and the time in transit. Usually, the timer counts only when you are moving. If you are stuck in a jam, the timer does not increment, so the average speed can be high if you go fast for a while then wait at a stop for ever.

Maximum Speed: Maximum speed is the fastest instantaneous speed reached by the receiver. If you flail your arms with the receiver in your hand, the maximum speed represents how fast you move.

Direction Indicators

All directions calculated by the receiver are expressed in degrees. Bearings are described above and in Chapter 16. Two bearings are always provided by a receiver: the bearing of the direction you are currently heading and the bearing you should be going to reach your destination. The bearing you are currently going has no effect on the bearing you should be going to get to your destination.

- Course Made Good (CMG)
- track (TRK)
- heading (HDG)

The bearing you should be going to get to your destination is:

- desired track (DTK)
- bearing (BRG)