

How to Read a Vernier Scale

Most sextants include a vernier scale next to the drum scale. This extra scale is used to interpret the proportional parts of the drum scale reading. If the index mark, for example, lies about halfway between 47' and 48' (as shown in fig. A), it is the vernier reading that will tell us if this should be 47.4', 47.5', or 47.6'.

This clever arrangement of scales was an important invention from the early 1600's. Notice in fig B that the parallel scales are similar, except that the divisions on the vernier scale are smaller: five divisions on the vernier span only four divisions on the drum. The scale in fig. B reads 47.0' because the index mark (or zero mark) of the vernier scale aligns exactly with the 47 on the drum. Notice, in this case, that the last mark on the vernier scale also aligns exactly with one of the drum marks (51 in this case). This is the way we tell that a drum reading is exact, the first and last vernier marks align precisely with two marks on the drum scale.

When the drum reading is not exact, the index mark of the vernier will not align with a drum mark, but one of the subsequent vernier marks will. The vernier mark that lines up is the one that tells us the tenths. Each vernier mark is 0.2'. In fig A, the proper reading is 47.6', because the third vernier mark aligns with a drum mark. Notice that this third mark is the only one that lines up with a corresponding drum mark.

Some vernier scales are marked with numbers to help with the reading (as in fig C), but most are not. Scales with a dot or arrow marking the zero point and no other labeling are common. Our job, then, is to check the alignment, count the marks, and figure the tenths -- then double check it.

Some verniers are marked in individual tenths (showing ten divisions instead of just five; quite nice, if you find one), but most are in two-tenth intervals. When the vernier is marked in two tenths, we have a problem with odd tenths. A 0.3 reading, for example, will not show a single exact alignment, but the 0.2 and 0.4 marks will be in closer alignment than any other, and these two will be equally unaligned in opposite directions, as shown in fig. D. When there is no single mark aligned, look for two that are equally close. Always check the drum, however, to see that you are about right; that is, make a rough estimate from the drum reading alone, and then confirm the details with a vernier reading. If the drum and vernier read as shown in fig D during an index error check, the index error would be 60 - 58.3, or IC = 1.7' off the scale.

An example of a 0.5' reading is shown in fig E.

Not all high quality sextants have verniers and in practice you won't really lose accuracy by estimating the tenths. Generally there are uncertainties in individual sights that cause uncertainties and fluctuations in measurements of some 0.2' to 0.3', even with good instruments, in good conditions, and in experienced hands. Nevertheless, if you have one, it is good practice to use it. On the other hand, there is no justification for using a vernier reading on a plastic sextant. These readings are not accurate enough to justify this extra precision.

