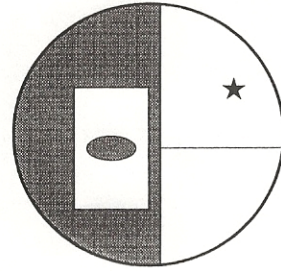
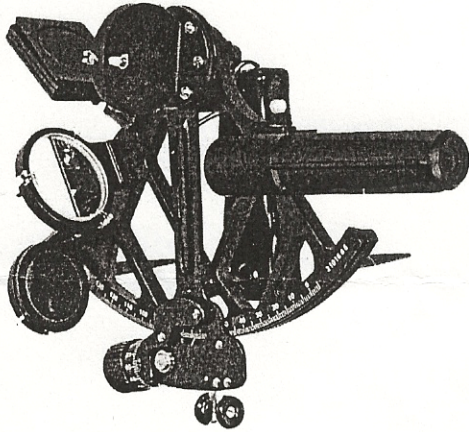


# Instructions for Practice Bubble Horizon



VIEW THROUGH THE UNIT

## The Practice Bubble Horizon (PBH)

This accessory provides an effective way to practice taking sextant sights on land without having a natural (sea) horizon, and without spending a lot of money for a Professional Bubble Horizon. With this, you can use the same sextant you will take to sea, and use it in a normal manner to take sights anywhere. It differs from the Professional Bubble in that it is unlighted, has less light gathering, and is less accurate. The PBH fits the following modern metal sextants: Astra IIIB, Cassens & Plath, C. Plath, the full sized Tamayas, and any other sextant having the same type of scope mount.

## How it Works

The PBH is of zero power magnification, and is mounted on the sextant in place of the regular telescope as shown above. A spirit level is reflected to appear upright in the left side of the field of view which is otherwise opaque. The right side admits a view of the outside world as reflected by the sextant's index mirror. (Note: if the sextant has a whole horizon mirror, a horizontal view will be superimposed, and it may be more comfortable to block this distraction with a horizon sun shade). The right side of the field of view is divided top and bottom by a horizontal hairline.

The sextant is held such that the spirit level bubble appears alongside the hairline (as shown above), and the celestial body is brought down to the hairline by movement of the micrometer drum. A reading is then taken and the time noted in the normal manner. The problem of focusing simultaneously on the celestial body and the much nearer bubble is solved by having a slit aperture in the eyepiece. This acts like a camera with a very high  $f$  stop which can focus on anything from a very short distance to infinity.

## What You Should See

Set the sextant arm to about zero degrees. Looking through the PBH, you should see the following:

A. You should be generally sighting through the center of both the horizon mirror and the reflected image of the index mirror. If the PBH seems to be too close to the body of the sextant, loosen the knob and move it outboard as necessary. If the PBH seems to be aiming too high or too low (ie. the upper or lower portion of the horizon mirror frame obstructs the view), the problem may be with the telescope mount on the sextant. (You may want to substitute the regular telescope or another device to verify this). In this case you may want to slightly loosen the screws holding the telescope mount, tilt the mount up or down as necessary with the PBH installed until a satisfactory alignment is achieved, and then re-tighten the screws.

B. The horizontal hairline should appear horizontal (not tilted to one side) when the sextant is vertical.

If a problem exists with either A or B above, contact Celestaire with a description of the problem (a drawing will help).

## Normal Operation

NOTE - USING A BUBBLE HORIZON DOES NOT REQUIRE A HEIGHT OF EYE CORRECTION.

Using the PBH is a two step process. First bring the bubble to the horizontal hairline. This brings the sextant to a nearly level attitude. Secondly bring the celestial body to the hairline by moving the sextant arm and micrometer drum. It will take some practice to hold the bubble in position, because as it moves away from the hairline, the natural tendency is to move the sextant the wrong way to get it back.

The spirit level is exposed to ambient light on top of the PBH. This supplies its illumination, and care should be taken to avoid one's fingers from blocking the light. When operating in direct sunlight, the bubble may be too bright for comfort, and a small piece of tape may be placed on the outside of the spirit level to reduce the light.

The final reading may be taken when the center of the bubble and the celestial body are both aligned with the hairline. This reading (Hs) must be corrected by the Bubble Correction (BC) discussed below, the normal sextant IC, and refraction in order to obtain observed height (Ho).

## Determining the BC

The PBH has some small error (usually less than 15 minutes) built in to it during the manufacturing process. There is no way to adjust this error out, so it must be determined and allowed for in subsequent observations. Interestingly, taking the PBH off of the sextant, and putting it back on does not introduce any new error, even if done without care, and even if attached to a different sextant. The correction for this error, called Bubble Correction or BC may be determined in two ways, after first adjusting the sextant IC to zero.

### Known Position Method

Simply take several observations from a known geographical position, and compute lines of position normally. You may attribute the average error to the bubble, and subtract this as a correction (BC) to future observations.

### Natural Horizon Method

Place all of the horizon sunshades so as to block the view of the natural horizon through the horizon mirror. Put the bubble alongside the hairline in the normal manner. Bring the natural horizon as reflected by the index mirror to the hairline by moving the micrometer drum. Next, find the dip correction from Table A2 of the Nautical Almanac for your height of eye. Now carefully turn the drum to increase the sextant reading by this amount. The resultant reading is the error which you may subtract as a correction (BC) to future readings.

## Capabilities

The PBH is unlighted, which prevents its use after dark. However, there is enough ambient light during twilight (the normal star observing time), to take some star sights. The slit aperture slightly reduces the eye's natural light gathering ability to the extent that faint stars may be harder to see. Test results with the PBH show repeatable observations to an accuracy of 2 minutes of arc under ideal conditions. Under normal conditions, and until practice is obtained, errors of up to 7 minutes may be common. Although this is quite good, and rivals that of more expensive bubble horizons, its accuracy cannot be relied upon for all lighting conditions. Accordingly, we recommend this product for practice purposes only.