# Dial Types in Perspective

What do equatorial and armillary dials look like at various latitudes. How does a horizontal dial look at various latitudes, 0, 30, 60, and 90 degrees. How do horizontal dials at those latitude relate to vertical dials for the same latitudes.

for Excel, MSworks, Open Office, and DeltaCAD
cubicShadows.xls .ods .wks .bas

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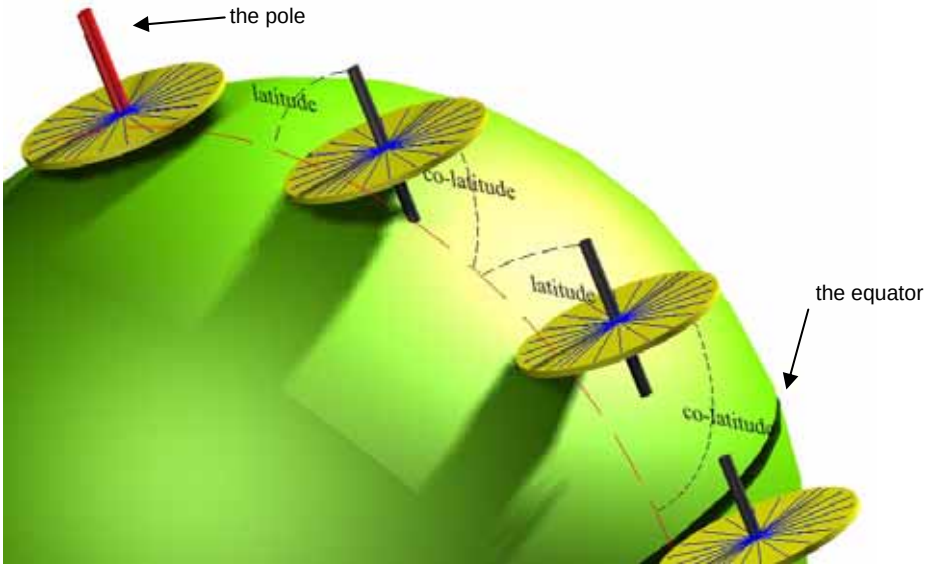
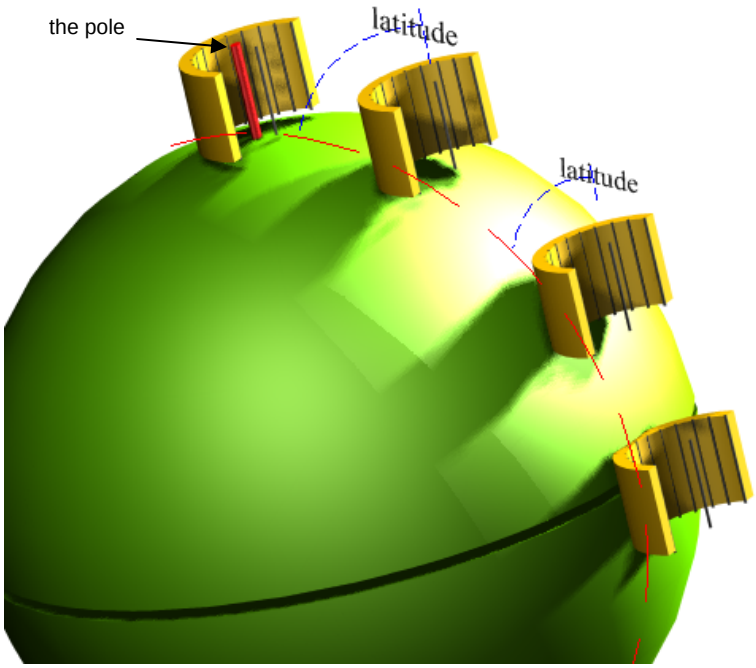
## THE EQUATORIAL DIAL




The equatorial dial plate, as far as hours go, is independent of latitude. Latitude comes into play only for the sunset line, and setting the gnomon to latitude, with the dial plate holding the hour lines, being set to co-latitude, or 90˚–latitude. Longitude and EOT must be applied. The dial plate parallels the equator, which is why this is called an equatorial dial. Some people call the armillary dial an equatorial dial. The time cannot be read as the year approaches an equinox. The hours are marked by 15˚ radials.

## THE ARMILLARY DIAL

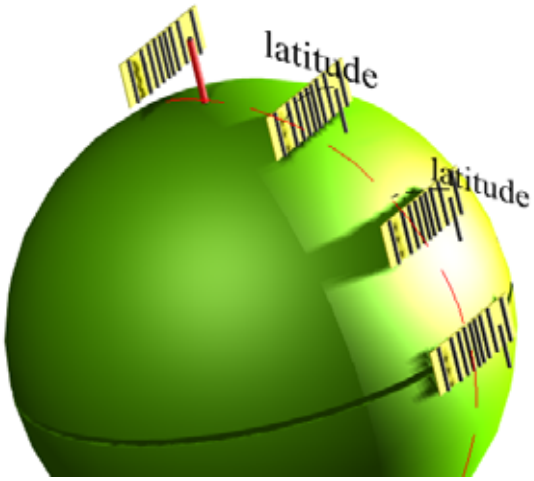



The armillary dial is often called, incorrectly, an equatorial dial. The word armillary relates to an "arm" bracelet surrounding the polar axis. Some equatorial dials do include an armillary at their edge, this allows the time to be read at the equinoxes. Longitude and EOT must be applied. The gnomon and the dial plate are set to latitude. The hours are marked by 15˚ radials.

Some armillary dials have a number of circles added, they show the solstices, and a depiction of the ecliptic, which is the plane that the earth floats on as it orbits the sun.

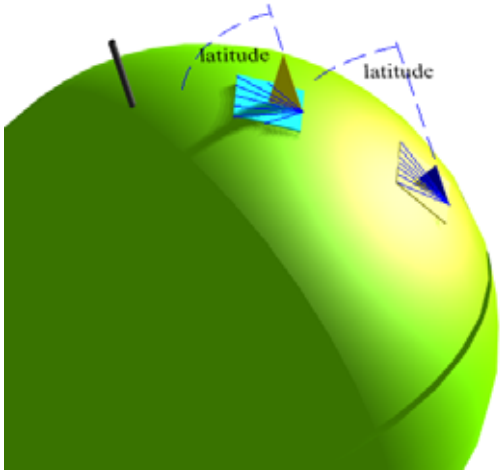
## THE POLAR DIAL



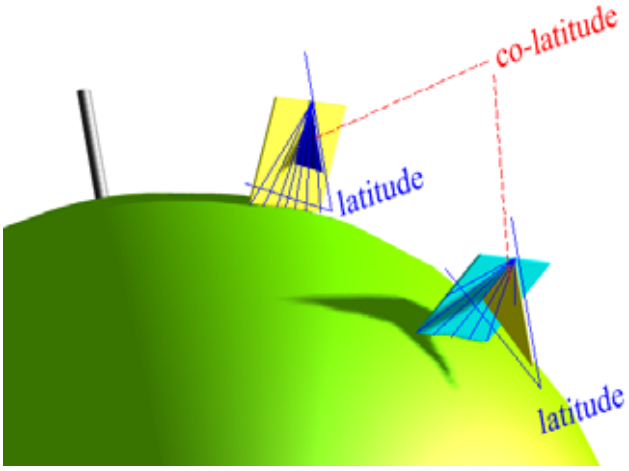

The polar dial plate parallels the polar axis, it is an armillary dial that has been flattened out. It faces the equator. Longitude and EOT must be applied. The gnomon and the dial plate are set to latitude. The hours are marked by the trigonometric "tangent" of the hour time 15˚.

A polar dial can be rotated 90˚ 90 degrees around the gnomon, then the dial plate, while still paralleling the polar axis, also parallels the meridian. It is then called a meridian dial.

## THE HORIZONTAL DIAL



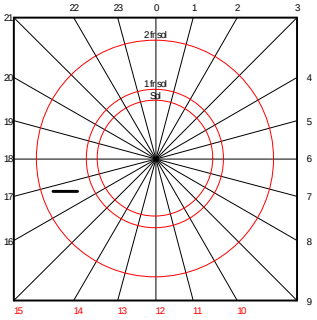

The horizontal dial has a dial plate that parallels the earth's surface, hence it is horizontal. Longitude and EOT must be applied. The gnomon is set to latitude. The hour lines are marked by the trigonometric "tangent" of the hour time 15˚ multiplied by the trigonometric "sine" of the latitude.



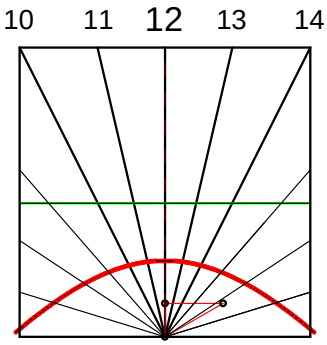

A vertical dial facing the equator is the same design as a horizontal dial for the co-latitude, or, 90˚–latitude. But if a longitude correction is built in, then it is in the opposite direction because the shadow moves in the opposite direction compared to a horizontal dial. It all works out well.

Vertical dials may sometimes not face true south, they are called vertical decliners since the wall on which the dial is mounted declines. In the extreme, they parallel the meridian, when they become meridian dials.

Relationship between horizontal dials and vertical dials, except that as the shadows rotate in opposite directions, longitude correction if used, is reversed between horizontal and vertical dials.

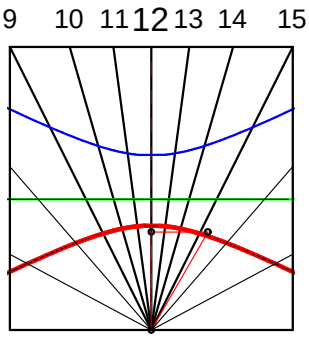


| HORIZONTAL DIAL | VERTICAL DIAL |
|---|---|
| pole | equator |



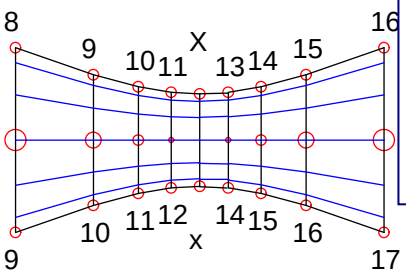

| | |
|---|---|
| latitude 60 | latitude 30 |

Latitude 60 h-dial



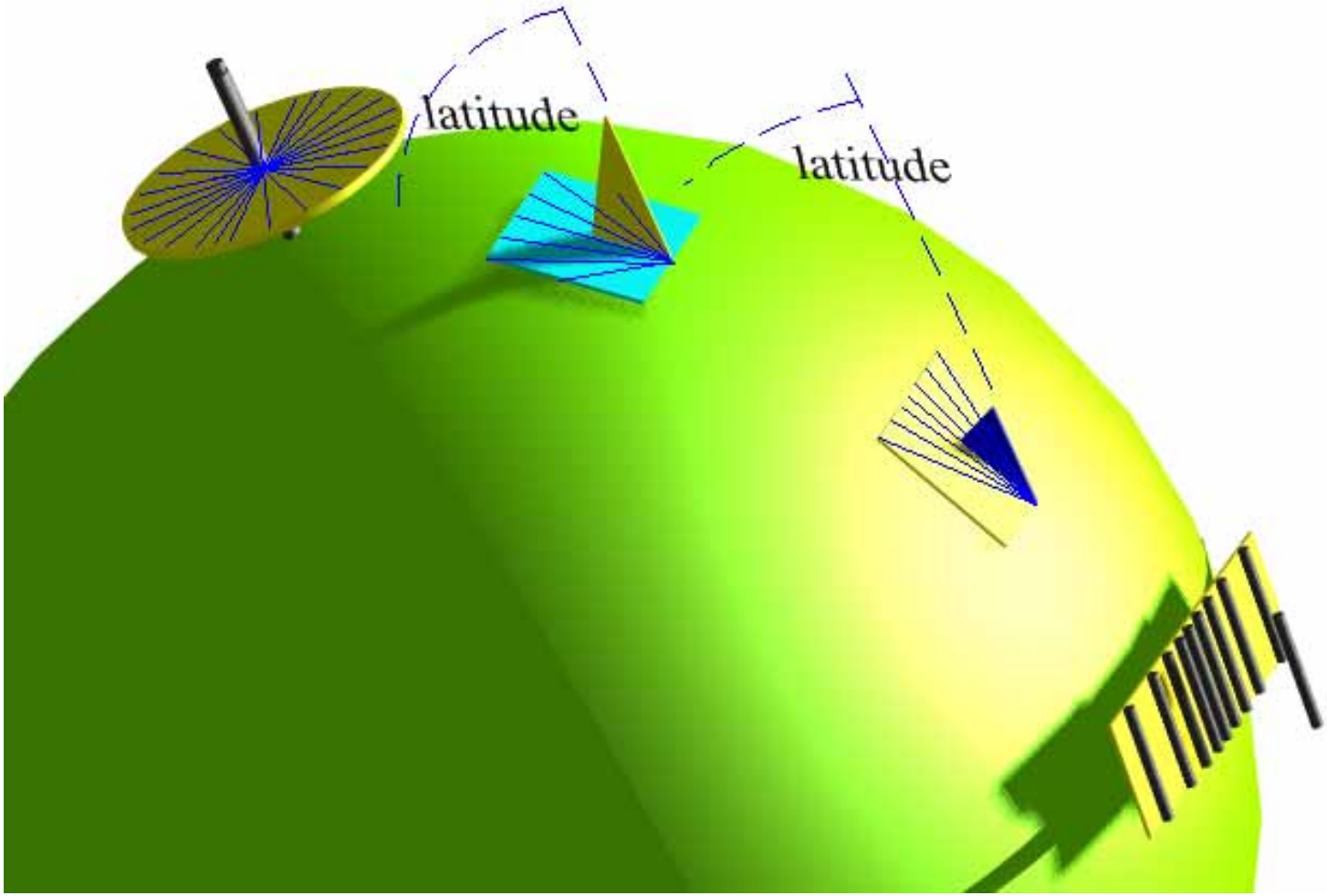

| | |
|---|---|
| latitude 30 | latitude 60 |

Latitude 30 h-dial

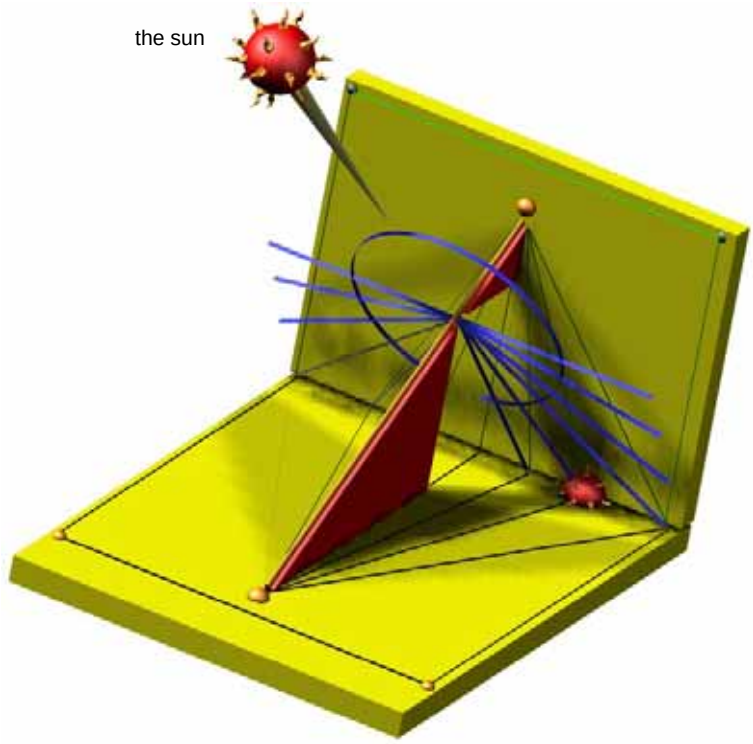



| | |
|---|---|
| equator | pole |




Relationship between horizontal dials and what they become as they approach extremes in latitude.




The picture to the left is one based on the work of Albrecht Durer in 1525, and shows a horizontal dial joined to a vertical dial, and an equatorial dial meets them at their junction.

The picture to the right is the same as the one above, however, the vertical dial is rotated, or declined.