ILLUSTRATING SHADOWS

illustratingshadows at yahoo.com

www.illustratingshadows.com (primary)

www.geocities.com/illustratingshadows (secondary)

First, thank you for acquiring this book. This book was designed with the web site in mind. Please use the web site for updates or clarifications. You may wish to join the North American Sundial Society, whose web site is accessible on this book's web site.

Please check:

www.illustratingshadows.com/reference

regularly for updates, typos, clarifications, or corrections, and download the articles, templates, or spreadsheets you desire.

That page provides links to the following which you may access directly:

- The acrobat file (what you are reading) of all updates is: www.illustratingshadows.com/reference-updates-2ed2pr.doc
- An all purpose spreadsheet covering most dialing functions is: www.illustratingshadows.com/reference-spreadsheets.xls

Please click on the VRML link on the main web page to see how to add a VRML browser easily that works and then to view some manipulatable 3d dials on the internet!

A backup web site is:-

www.geocities.com/illustratingshadows/reference

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December 29, 2006

Second Edition updates
Second Printing

This has 296 pages

IMPORTANT

none

RELEVANT

typo	p69	the hours "1 2 3" shown above the AB line should be shifted left the "1" being on the hour line with no time marked, the "2" where the 1 was, and the "3" moved to where the 2 was. See following.
typo	p90	fig 10.1 in chapter 10, the word AUXILIARY POLAR DIAL should say AUXILIARY EQUATORIAL, AND A POLAR DIAL or AUXILIARY EQUATORIAL DIAL or as attached. 8/19

TRIVIAL

typo	p257 p258	the formula referred to says formula A8.7, it should say A8.6
typo	p21	add if west of standard meridian subtract if west of standard meridian should say add if west of standard meridian subtract if east of standard meridian
typo	p31	"the equinoxes (June 21 and December 21, approximately)." should read "the equinoxes (March 21 and September 21, approximately)."
typo	p32	equinoctial line and is sloped because the wall does ***not*** run purely east to west. 9/13/05
typo	p34	figure 5.5 has two pictorials, the one on the left should have a note stating that the hours depicted when drawn from the pole's base produce hours that are NOT the same from day to day 2/16/06.
typo	p57	for the meridian dial, second paragraph, "and its distance from noon" should read "and its distance from 6am or 6pm"
typo	p73	top right figure, switch winter and summer solstice 2/19/06
typo	p153	top right figure, switch winter and summer solstice 2/19/06
typo	p192	the decimal mm.ss should simply say mm.ss 2/19/06
typo	p193	the decimal mm.ss should simply say mm.ss 2/19/06

KEY UPDATE: Illustrating Shadows has some notes on altitude and azimuth dials not being latitude portable. The following note is more accurate. 11/1/06

Hour angle dials use the hour angle around the style and can easily be latitude corrected by tilting. Italian and Babylonian hours are not corrected when a dial is tilted because they depend on the Earth's curvature [which causes sunset/rise] at a specific latitude. Azimuth and altitude dials may be ported across latitudes but rigid polar alignment must be retained.

THE GEOMETRICAL METHOD FOR A HORIZONTAL DIAL

Consider a dial plate ABCD. In its center draw a noon line XY. From X draw a line XZ that makes an angle with XY equal to the latitude. In essence this is the gnomon's style rotated 90 degrees and thus is lying flat on the surface of the dial plate as if the wind blew it over, resting peacefully.

Draw a line perpendicular to the style that goes to Y, that point on the style is labeled Z. Or, from Y draw a line to Z, the angle XYZ being the co-latitude, and thus intercepts the style at 90 degrees.

Our gnomon is WXZ when rotated back vertically. ZY is the path the sun's rays travel at the equinox at solar noon. ZY would be where the trigon we used in the empirical method would lie.

Rotate YZ to the top as YR, and then draw a semi-circular protractor LYM centered on R.

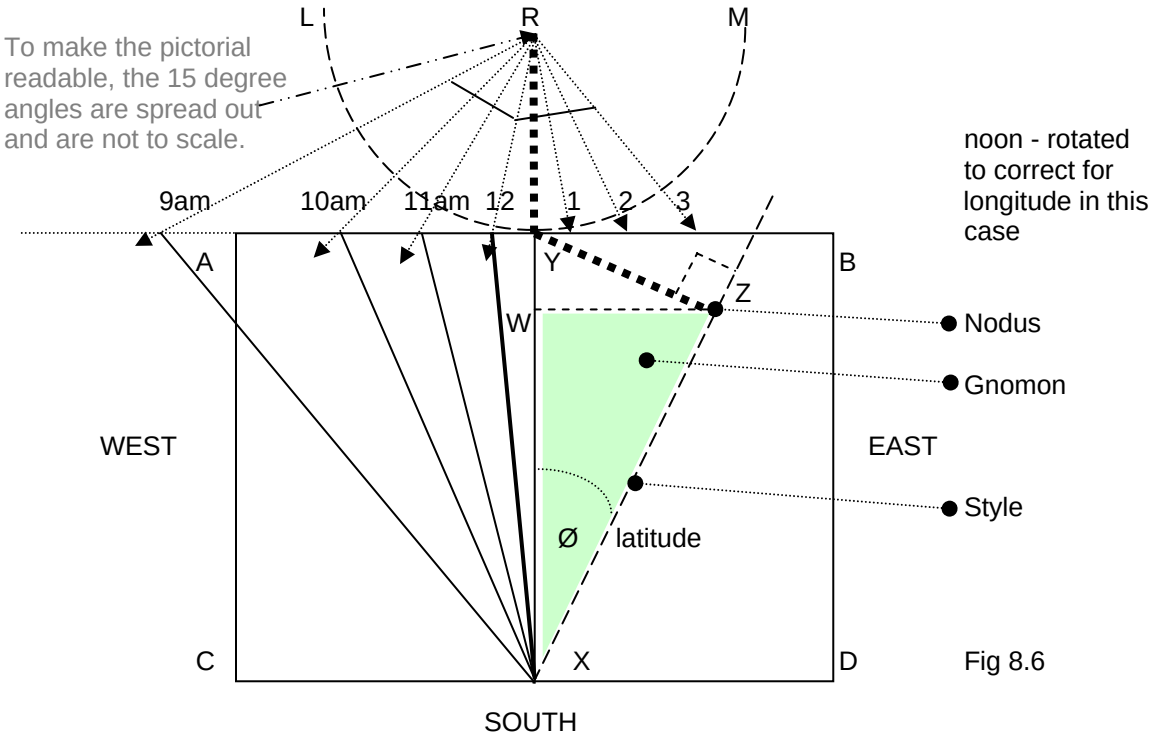

Fig 8.6

Then mark off 15 degree marks on the protractor LYM, rotating them by the longitude difference is so desired, and extend the protractor's 15 degree lines to AB. A longitude correction with the protractor rotated west or clockwise is shown. One rotates the protractor west (clockwise) when the dial's location is west of the standard legal time meridian. Finally, the hour lines are drawn from the dial center up to where the protractor lines meet the west to east line AB.

Notice that the noon line is offset to the west because the longitude correction was for a location west of the standard meridian. Another way of verifying this is that noon on the legal standard meridian happens before noon on the dial's meridian when the dial is west of the standard. So, noon must be shown before solar noon where the dial is installed. Finally, the equation of time, EOT, is managed mentally by a printed table for the sundial observer to consider.

As always, the longitude correction need not be incorporated as above, but instead blended into a EOT table that would be location specific.

A GENERAL GEOMETRIC MODEL OF THE PREVIOUS DIALS

We have now seen the geometric methods for designing the armillary and equatorial dial, the polar and meridian dials (true east or true west), as well as the vertical (true south) and the horizontal dial. We can blend all those concepts into one easy to remember model. This is intended to show a natural symmetry in geometric dial design.

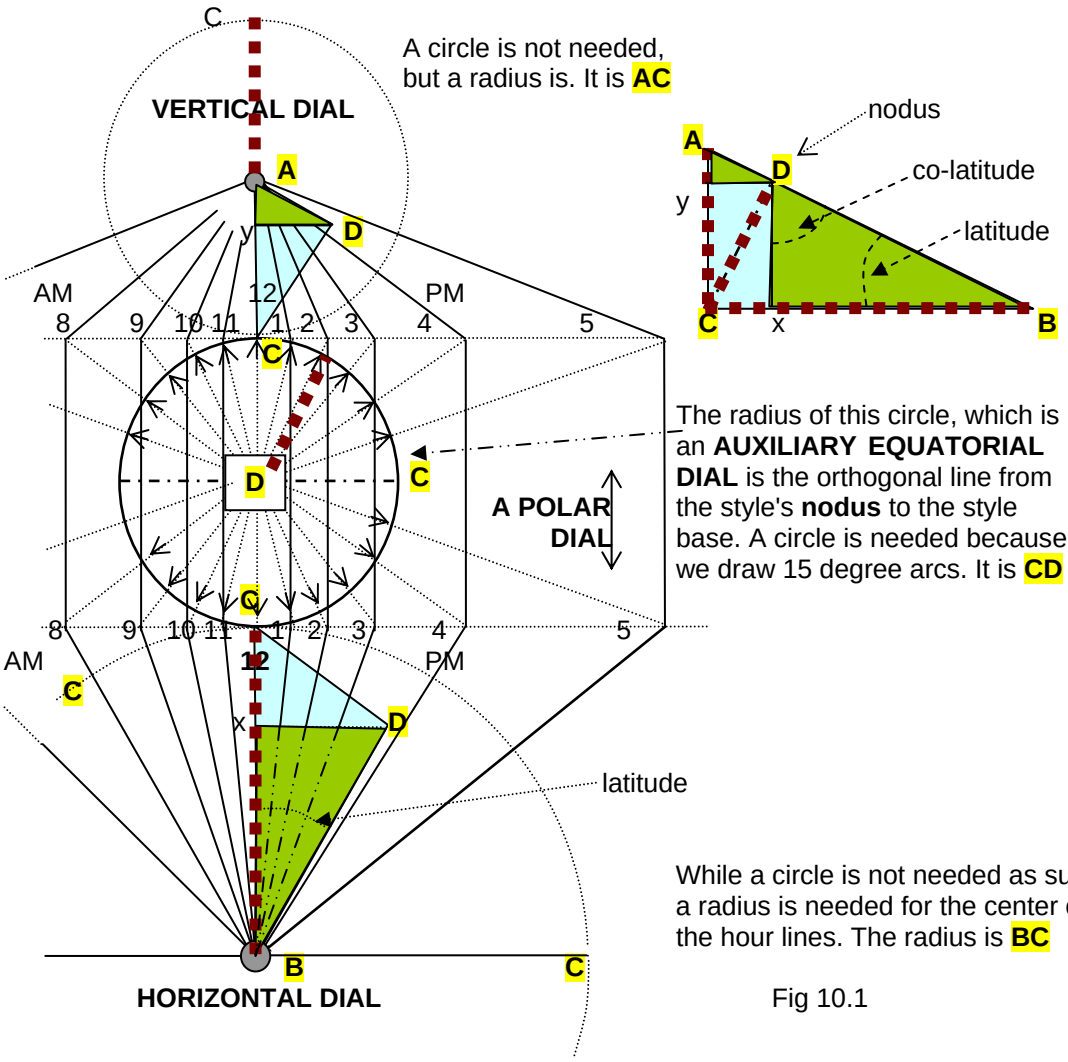

Fig 10.1

The above general geometrical model shows a symmetry in the design of the polar, vertical, and horizontal dials in the context of their gnomon's style. For a polar or a meridian dial, CD is the linear height of the style's nodus above the dial plate. In this model, CD does different things depending on dial type.

For a horizontal dial, this model is based on the ratio of the DC to CB. For a vertical dial the ratio is based on DC to CA. In all cases, DC is the equinoctial ray going to the dial plate at C from nodus D.