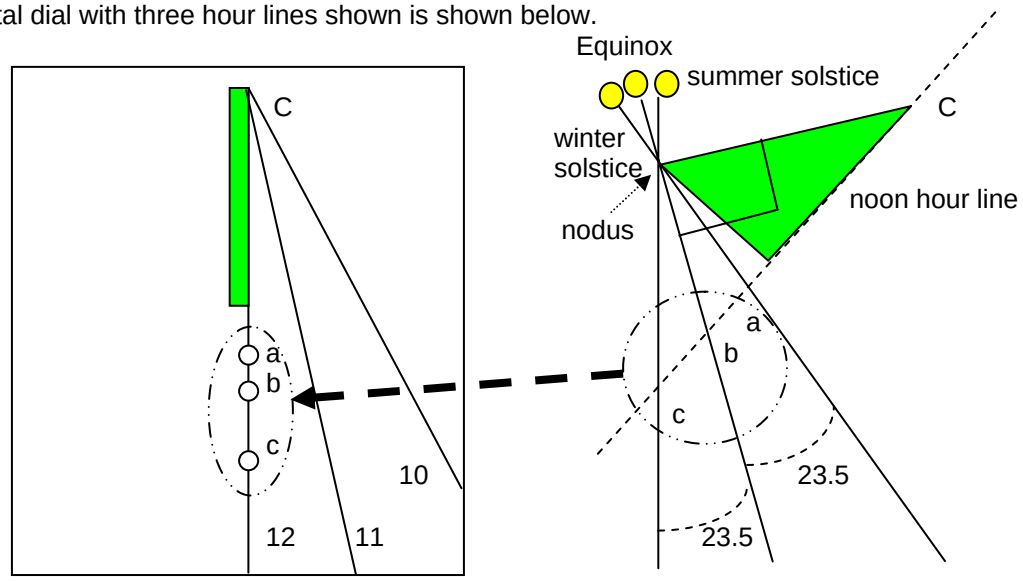
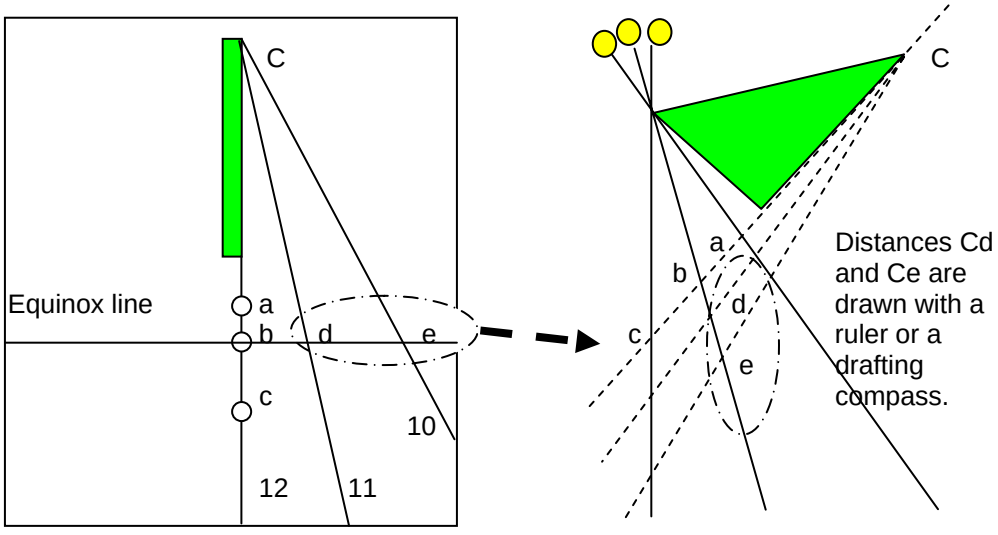
## Declination lines (or curves) for the horizontal dial using geometry.

A horizontal dial with three hour lines shown is shown below.

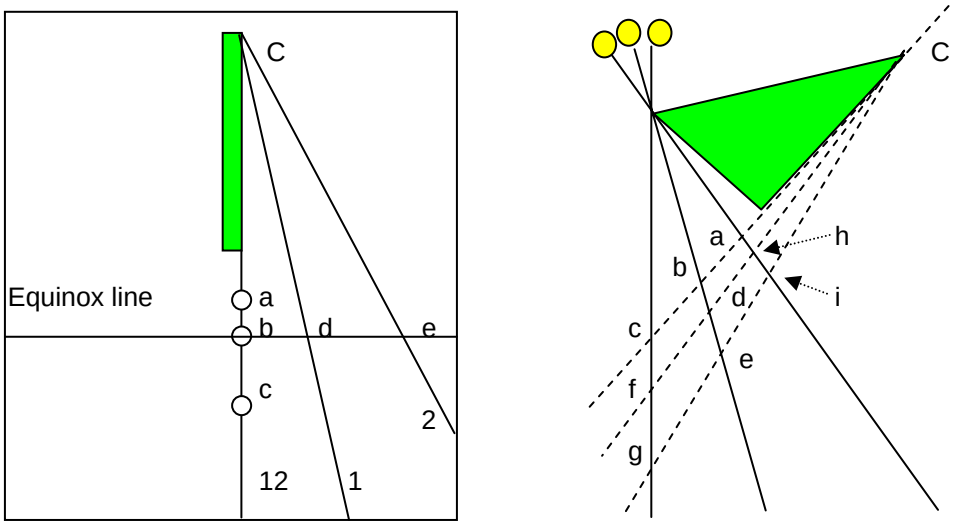



First, draw a gnomon for the dial center "C". From the nodus draw the equinox line (90 degrees to the style), and from that the solstice lines (approx 23.5 degrees on either side).The three lines (equinox and the solstices) intersect the gnomon's base line extended, or the noon line, at points a, b, and c. These three points whose distances from the dial center are Aa, Ab, and Ac are then transcribed to the dial plate (right pictorial to left pictorial).

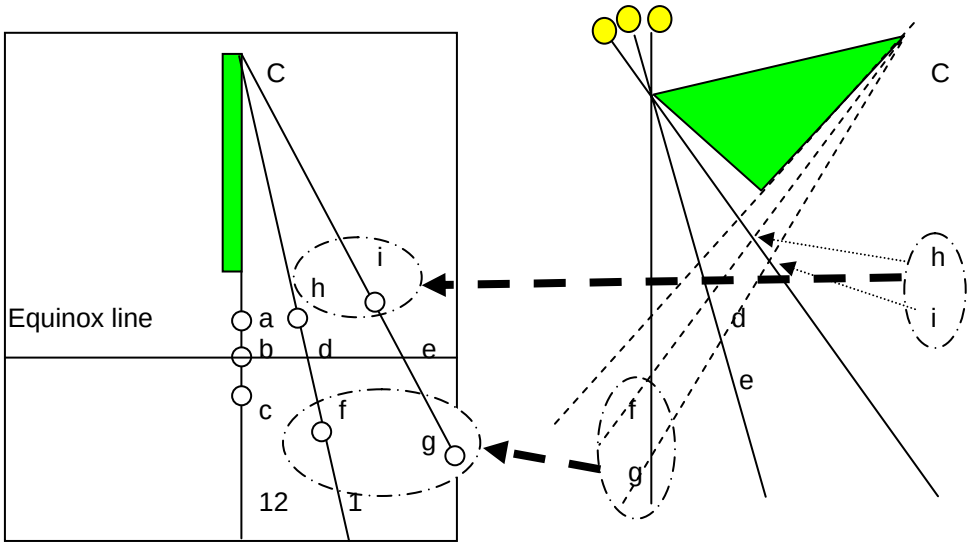



The equinox line is then drawn perpendicular to the noon line, and it produces three equinox intercepts for those additional hour lines, d and e. Distances Cd and Ce are then located from the left dial plate to the right hand picture on it's equinox line. This produces two more hour lines on the right hand side picture, Cd and Ce. Those hour lines on the right hand side do not have angles that match their hour lines on the dial plate, and this is because this is a projection.

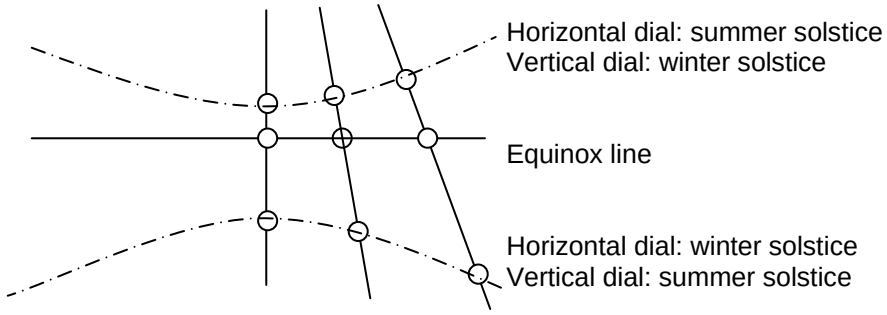
Now that there are two more hour lines, or as many as you choose, this produces intercept points for the solstice lines, namely points f, g, h and i.




Points f, h, g, and i are now transferred back to the dial plate, from the right projection pictorial to the left picture.

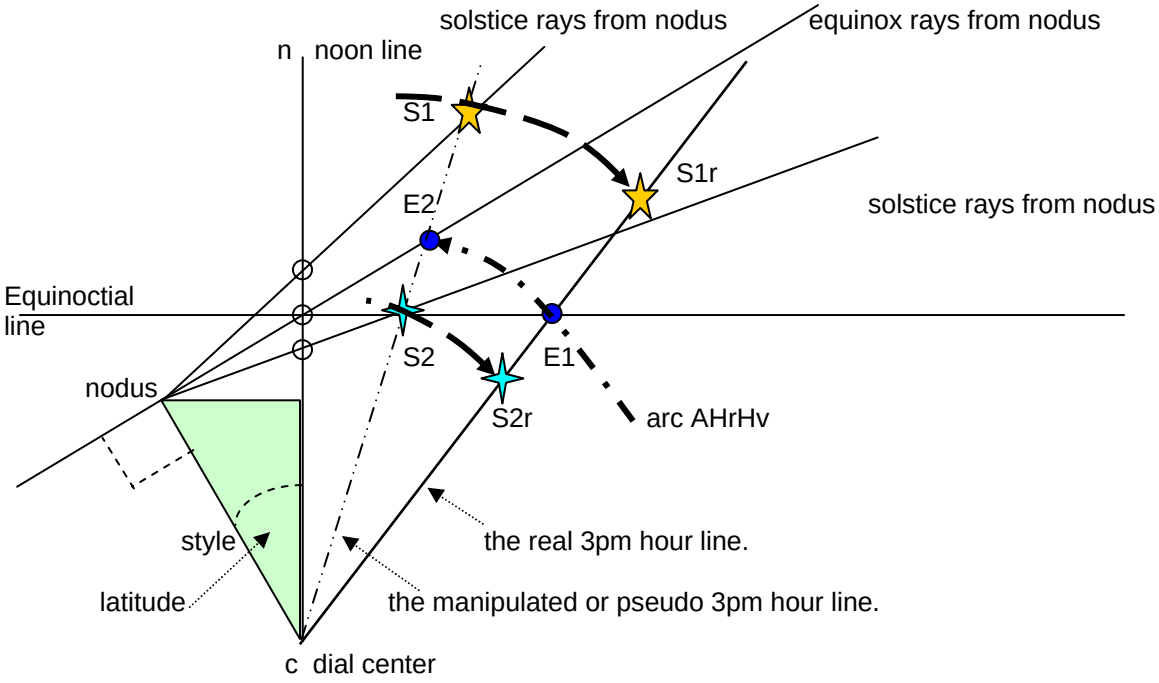



When this process is completed for as many hour lines as desired, the dots are connected and then the declination lines drawn.



The method described above uses a flip-flop technique, well suited for a template such as the one provided, a blank of which is in appendix 8.

The flip-flop technique can also be managed on one diagram, however it takes a little study to see what is going on. The gnomon is drawn on a noon line, and from the nodus comes the perpendicular equinox solar rays, which defines the dial plate's equinox line, also from the nodus come the two solstice rays. The intercepts on the noon line create the first set of declination points.




Then, any desired hour line is drawn. Using the tables for latitude 32, the 3pm hour line angle for a horizontal dial is 27.92 degrees, so that hour line is drawn.

Where the dial plate's equinox line intercepts the real hour line, at E1, relocate that point to the equinox ray line at E2, using C as the center of an arc,AHrHv.

Draw a pseudo hour line, the manipulated hour line for the selected hour, as a line from dial center C through point E2.

And where the solstice rays intercept the pseudo manipulated hour line, arc those intercepts back to the real hour line, point S1 rotates to S1r, point S2 rotates to points S2r, again, using the dial center as the center of the arc.

Thus, for the real hour line, points S2r, E1, and S1r are the calendar lines for that hour. The process is repeated for each hour line.

The template on this web site is in reality probably the easiest way to draft calendar lines.

There is another common technique which instead of having a fixed gnomon with the hour lines being manipulated, in its place has fixed hour lines with the gnomon being manipulated for each real hour line. Different ways of doing things, same results. That other method is described in appendix 8 as an apparent inconsistency, however it is not in fact inconsistent.