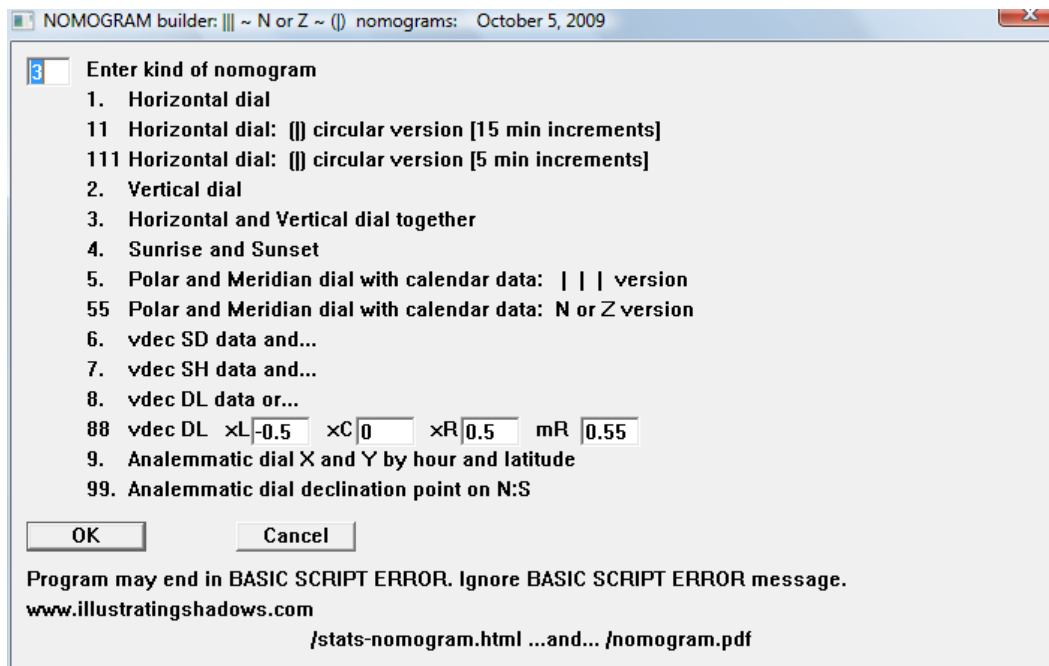


NOMOGRAMS FOR SUNDIALS

DeltaCAD and Lazarus/Pascal

Please refer to [Supplemental Shadows](#) for details on how to design your own nomograms, and how they work in much more detail.



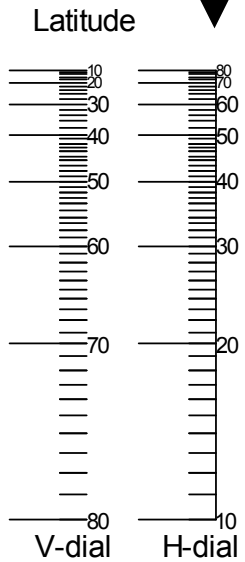
Feb 12, 2013 Added note that sunrise/set times are 12 hour clock local apparent time
Feb 15, 2013 Refers the reader to Supplemental Shadows, obsoleting "nomogram.pdf"

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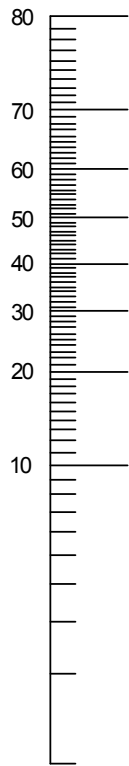
DeltaCAD nomogram program results

First, mark latitude on the left vertical line
 Next, mark the desired time on the right vertical line
 Then, read hour line angle on the center vertical line

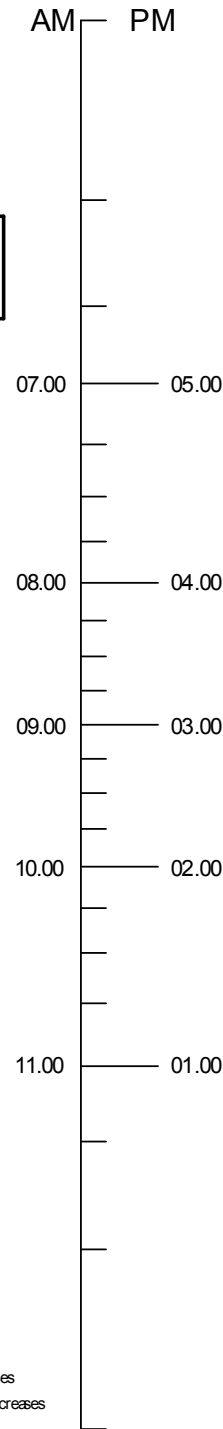
Use the h-dial line for both
 v and h dial marking



Dial Plate's hour line angle



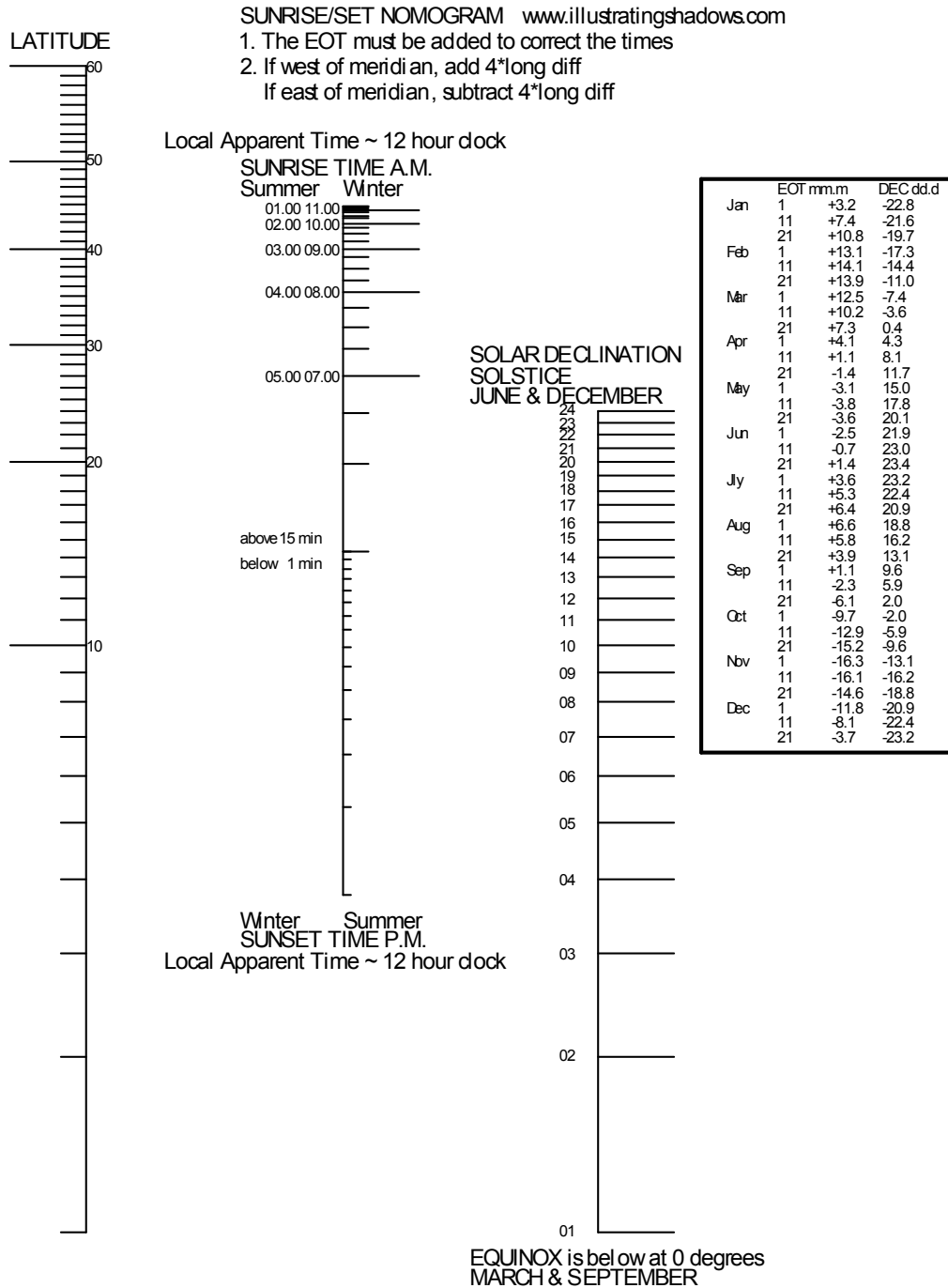
Hour around noon



Horizontal and Vertical dial plate
www.illustratingshadows.com

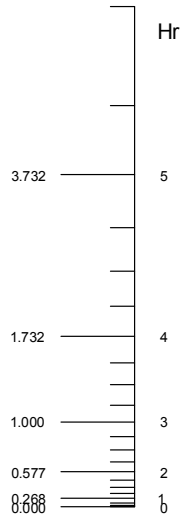
latitude is $\log(\sin(\text{lat}))$ so scale decreases vertically
 longitude is $\log(\tan(\text{lng}))$ so scale decreases first then increases
 hour line angle is $\log(\tan(\text{hla}))$ so scale decreases first then increases

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LOCAL TIME FROM TRANSIT



DIST TO HR.LN
ANSWER 1

POLAR (and meridian E/W) DIAL www.illustratingshadows.com

1. The EOT must be added to correct the times

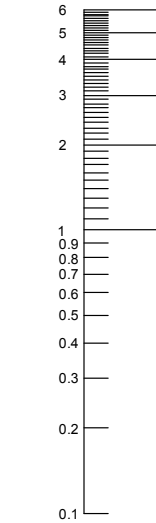
2. If west of meridian, add 4*long diff

If east of meridian, subtract 4*long diff

Assumes a style linear height of 1.0

Draw line from hour to declination, read (1) HR LINE DIST

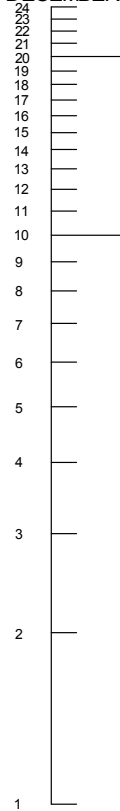
as well as (2) distance on hour line to calendar point



CAL PT DISTANCE
0.1 to 6

ANSWER 2

SOLAR DECLINATION
SOLSTICE
JUNE & DECEMBER



EQUINOX is below at 0 degrees
MARCH & SEPTEMBER

		EOT mm.m	DEC dd.d
Jan	1	+3.2	-22.8
	11	+7.4	-21.6
Feb	21	+10.8	-19.7
	1	+13.1	-17.3
Mar	11	+14.1	-14.4
	21	+13.9	-11.0
Apr	1	+12.5	-7.4
	11	+10.2	-3.6
May	21	+7.3	0.4
	1	+4.1	4.3
Jun	11	+1.1	8.1
	21	-1.4	11.7
Jly	1	-3.1	15.0
	11	-3.8	17.8
Aug	21	-3.6	20.1
	1	-2.5	21.9
Sep	11	-0.7	23.0
	21	+1.4	23.4
Oct	1	+3.6	23.2
	11	+5.3	22.4
Nov	21	+6.4	20.9
	1	+6.6	18.8
Dec	11	+5.8	16.2
	21	+3.9	13.1
Jan	1	+1.1	9.6
	11	-2.3	5.9
Feb	21	-6.1	2.0
	1	-9.7	-2.0
Mar	11	-12.9	-5.9
	21	-15.2	-9.6
Apr	1	-16.3	-13.1
	11	-16.1	-16.2
May	21	-14.6	-18.8
	1	-11.8	-20.9
Jun	11	-8.1	-22.4
	21	-3.7	-23.2

POLAR (and meridian E/W) DIAL www.illustratingshadows.com

1. The EOT must be added to correct the times

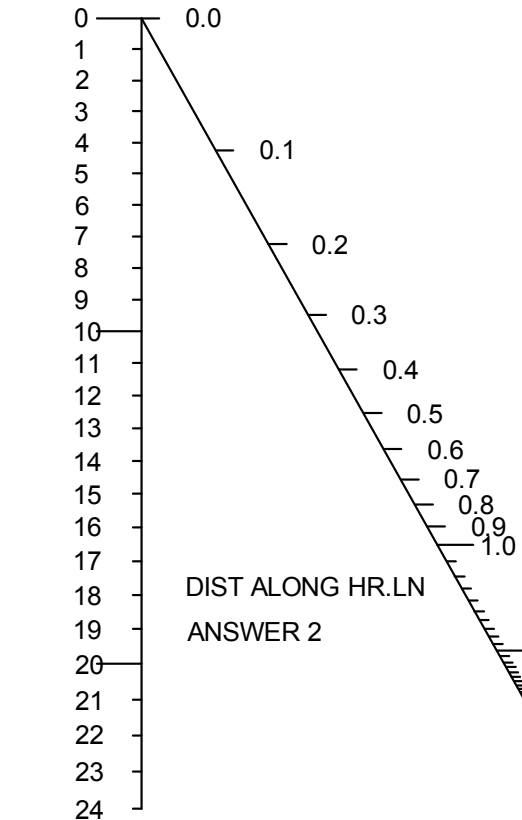
2. If west of meridian, add 4*long diff

If east of meridian, subtract 4*long diff

Assumes a style linear height of 1.0

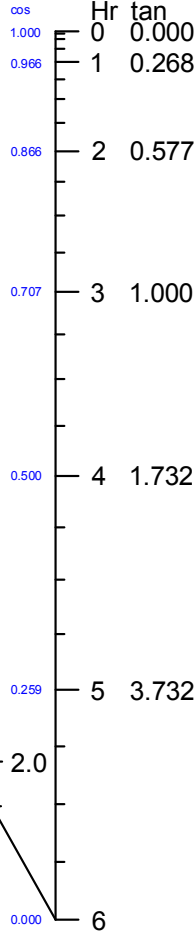
Draw line from hour to declination, read (1) HR LINE DIST as well as (2) distance on hour line to calendar point

MARCH & SEPTEMBER
EQUINOX

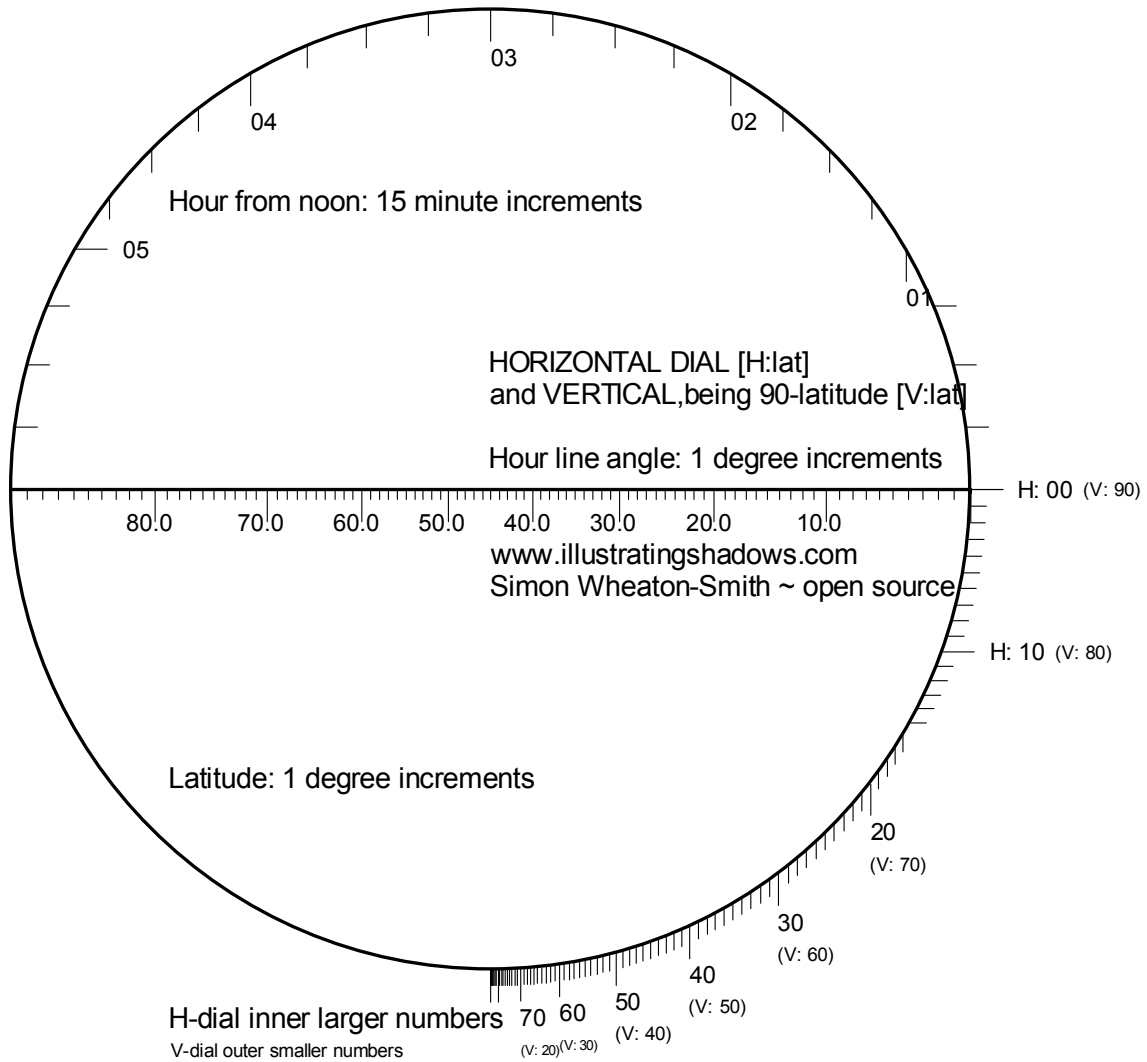


JUNE & DECEMBER
SOLSTICE

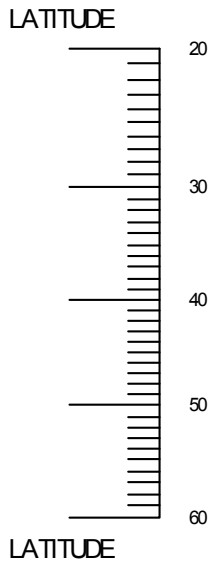
HOURS FROM TRANSIT



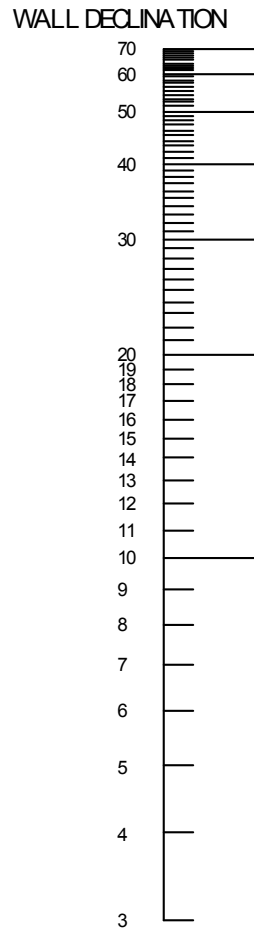
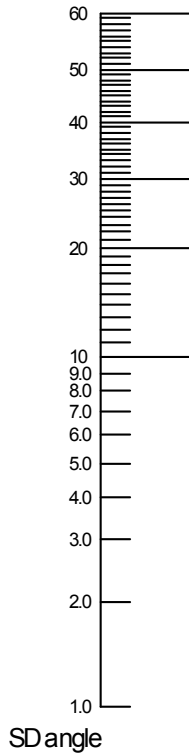
		EOT mm.m	DEC dd.d
Jan	1	+3.2	-22.8
	11	+7.4	-21.6
Feb	21	+10.8	-19.7
	1	+13.1	-17.3
Mar	11	+14.1	-14.4
	21	+13.9	-11.0
Apr	1	+12.5	-7.4
	11	+10.2	-3.6
May	21	+7.3	0.4
	1	+4.1	4.3
Jun	11	+1.1	8.1
	21	-1.4	11.7
Jly	1	-3.1	15.0
	11	-3.8	17.8
Aug	21	-3.6	20.1
	1	-2.5	21.9
Sep	11	-0.7	23.0
	21	+1.4	23.4
Oct	1	+3.6	23.2
	11	+5.3	22.4
Nov	21	+6.4	20.9
	1	+6.6	18.8
Dec	11	+5.8	16.2
	21	+3.9	13.1
Jan	1	+1.1	9.6
	11	-2.3	5.9
Feb	21	-6.1	2.0
	1	-9.7	-2.0
Mar	11	-12.9	-5.9
	21	-15.2	-9.6
Apr	1	-16.3	-13.1
	11	-16.1	-16.2
May	21	-14.6	-18.8
	1	-11.8	-20.9
Jun	11	-8.1	-22.4
	21	-3.7	-23.2



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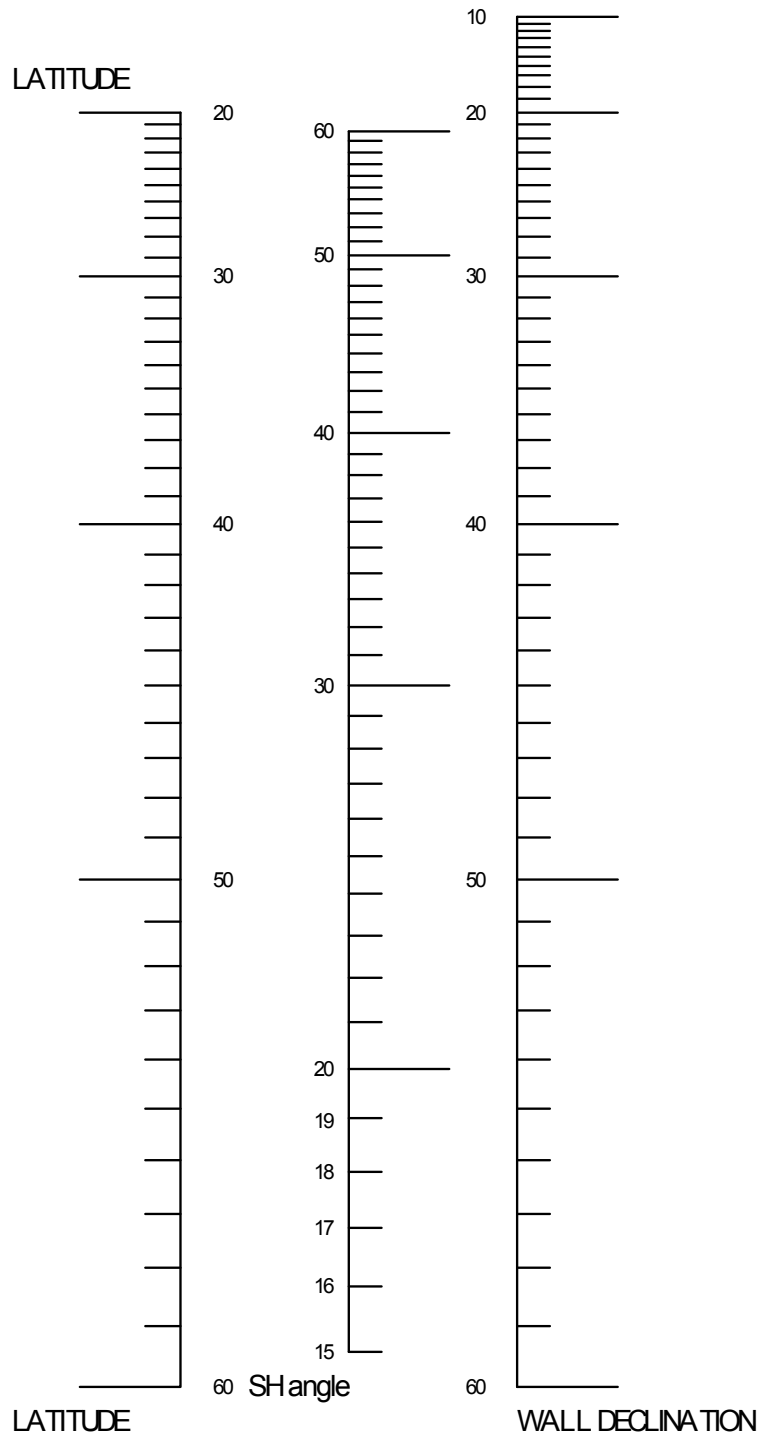


VERTICAL DECLINER DIAL SD STYLE DISTANCE NOMOGRAM

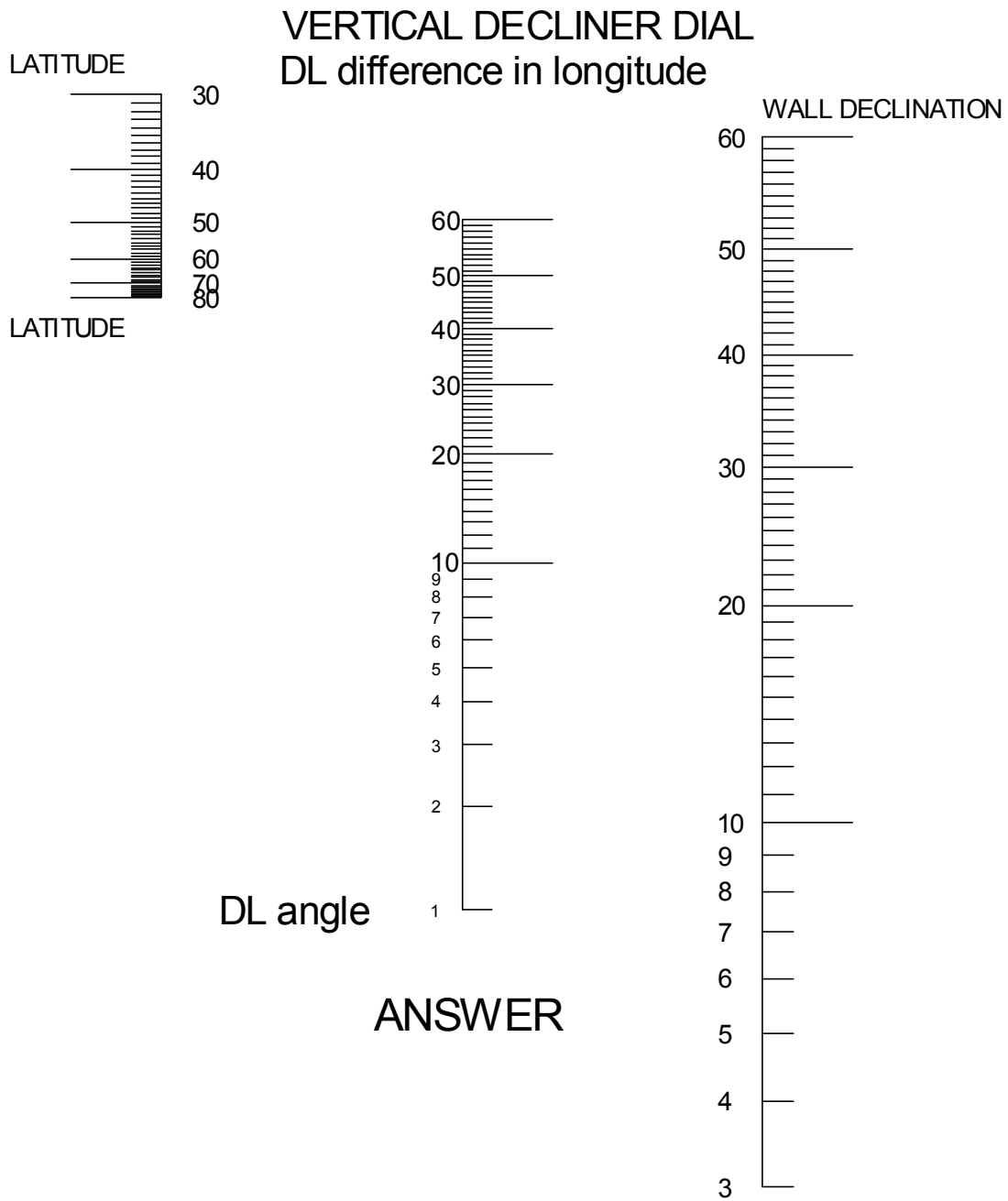


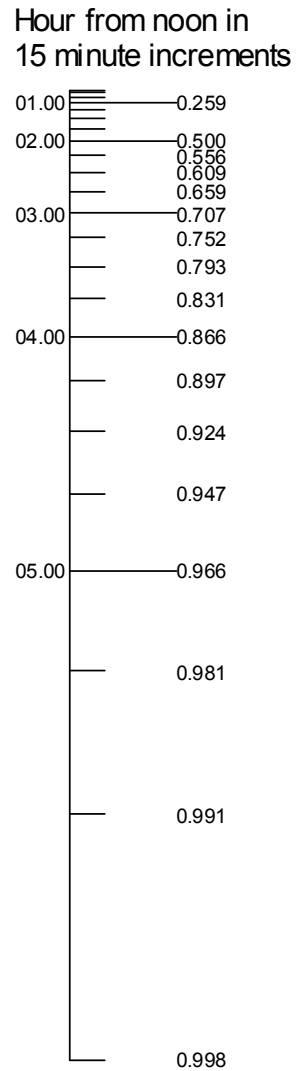
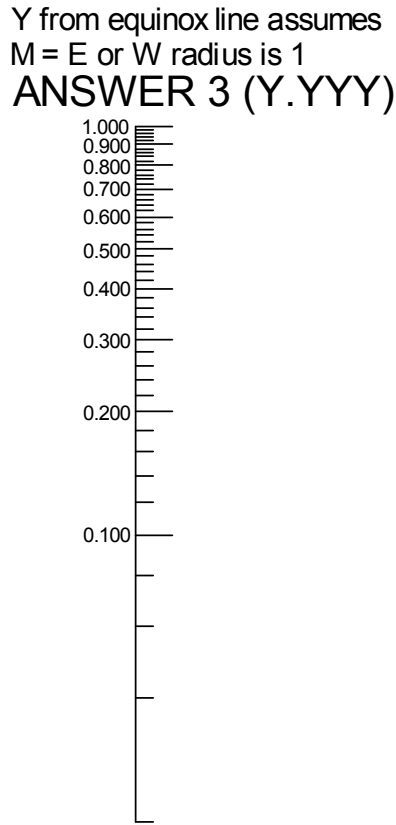
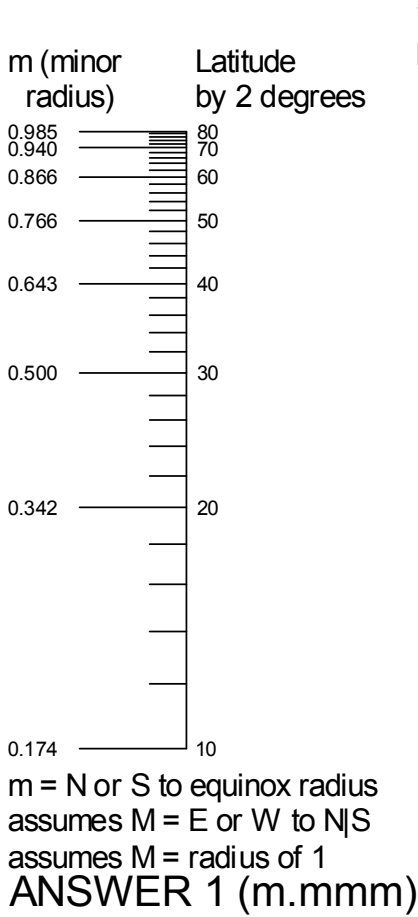
ANSWER

VERTICAL DECLINER DIAL SH STYLE HEIGHT NOMOGRAM



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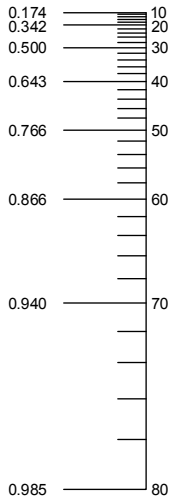


ANALEMMATIC DIAL www.illustratingshadows.com
M = west to center, or center to east radius = 1
m = equinox to north or to south radius, if M=1
Chapter 21 of Illustrating Times Shadow

X from n|s line (assumes
M = E or W radius is 1)
ANSWEER 2 (X.XXX)

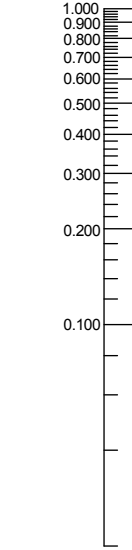
Y from equinox line assumes
M = E or W radius is 1
ANSWER 4 (Y.YYY)

m (minor radius)
Latitude by 2 degrees

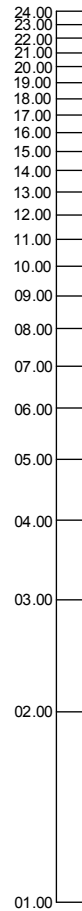


m = N or S to equinox radius
assumes M = E or W to N|S
assumes M = radius of 1
ANSWER 1 (m.mmm)

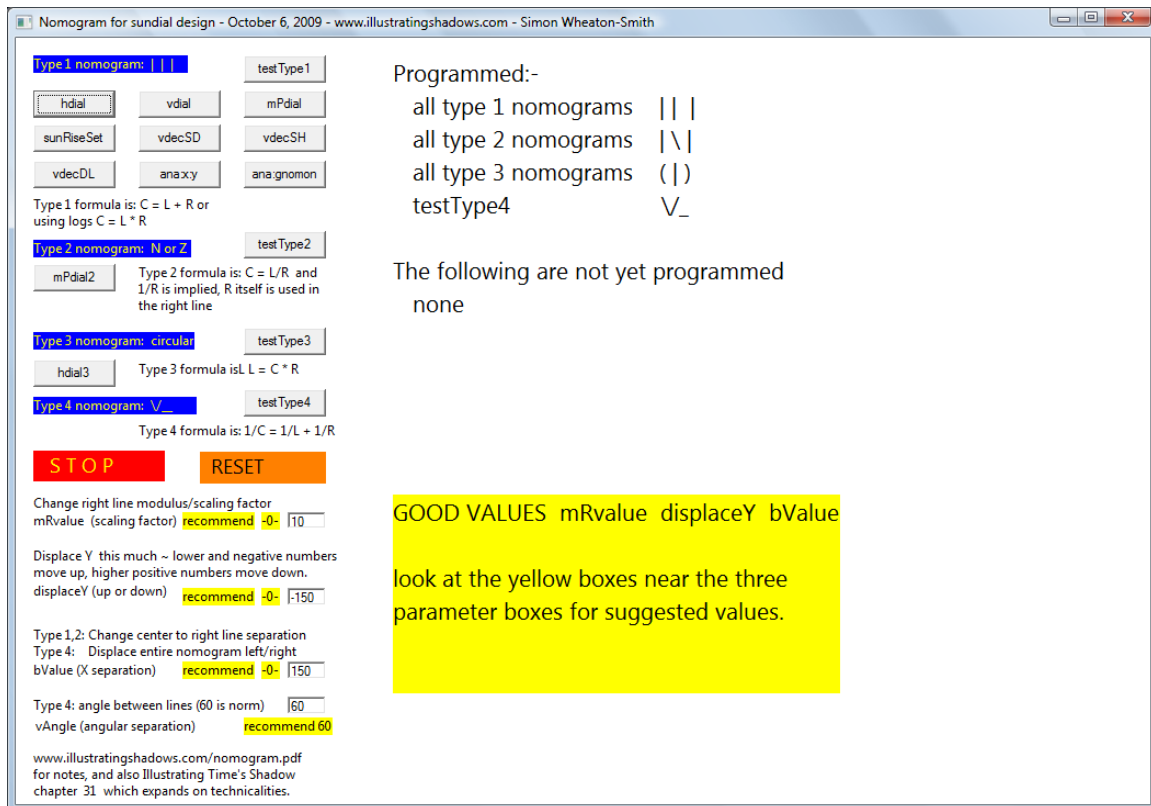
ANALEMMATIC DIAL www.illustratingshadows.com
Relative distance on N:S line for gnomon base
M = west to center, or center to east radius = 1
Chapter 21 of Illustrating Times Shadow



Declination in 1 degree increments



		EOT mm.m	DEC dd.d
Jan	1	+3.2	-22.8
	11	+7.4	-21.6
	21	+10.8	-19.7
Feb	1	+13.1	-17.3
	11	+14.1	-14.4
	21	+13.9	-11.0
Mar	1	+12.5	-7.4
	11	+10.2	-3.6
	21	+7.3	0.4
Apr	1	+4.1	4.3
	11	+1.1	8.1
	21	-1.4	11.7
May	1	-3.1	15.0
	11	-3.8	17.8
	21	-3.6	20.1
Jun	1	-2.5	21.9
	11	-0.7	23.0
	21	+1.4	23.4
Jly	1	+3.6	23.2
	11	+5.3	22.4
	21	+6.4	20.9
Aug	1	+6.6	18.8
	11	+5.8	16.2
	21	+3.9	13.1
Sep	1	+1.1	9.6
	11	-2.3	5.9
	21	-6.1	2.0
Oct	1	-9.7	-2.0
	11	-12.9	-5.9
	21	-15.2	-9.6
Nov	1	-16.3	-13.1
	11	-16.1	-16.2
	21	-14.6	-18.8
Dec	1	-11.8	-20.9
	11	-8.1	-22.4
	21	-3.7	-23.2



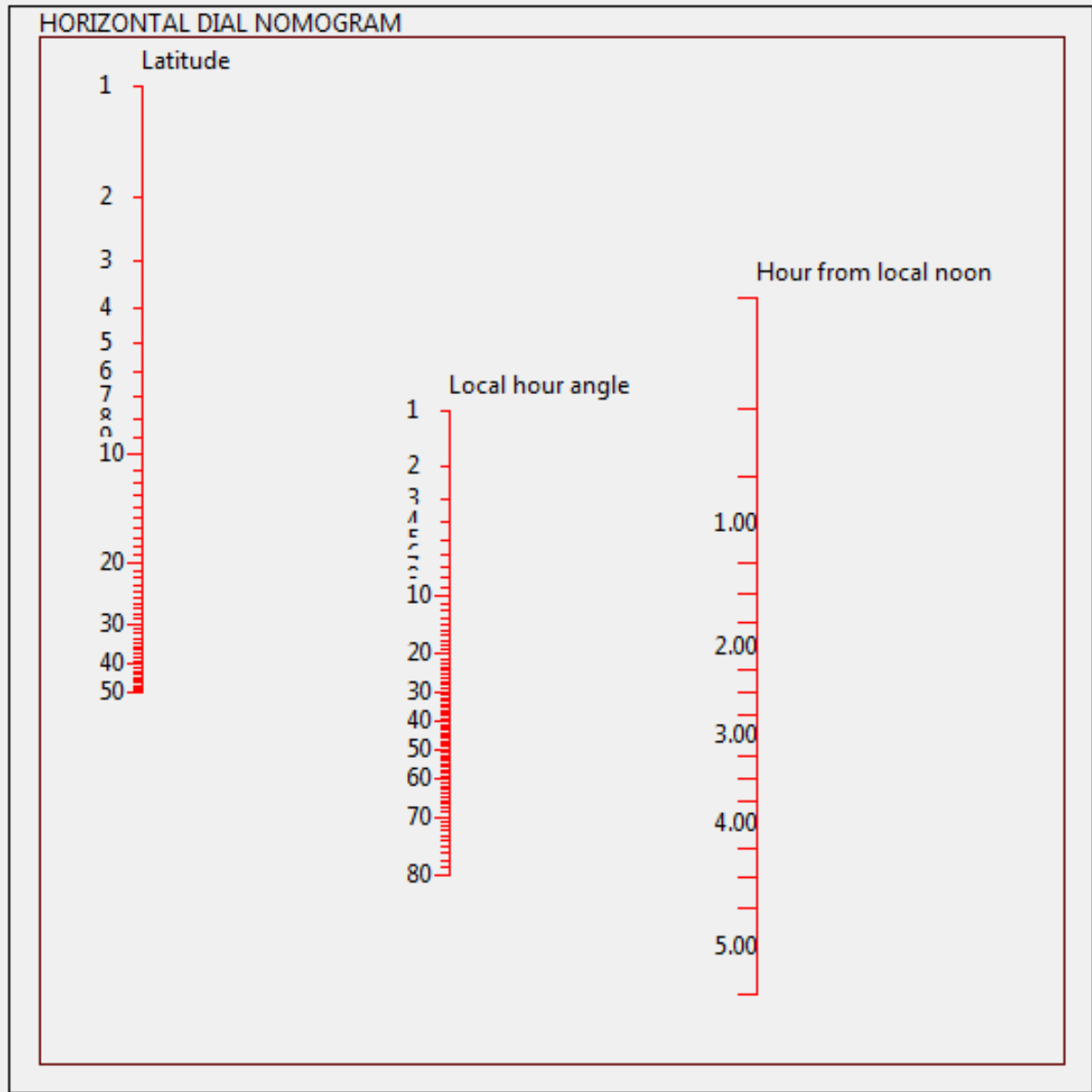
Lazarus/Pascal nomogram program results

The Lazarus program "nomogramProj.exe" allows you to manipulate the nomogram more, however it has no export ability, so a screen copy program is required. I use PhotoMAX Pro however, several free ones are available on the web.

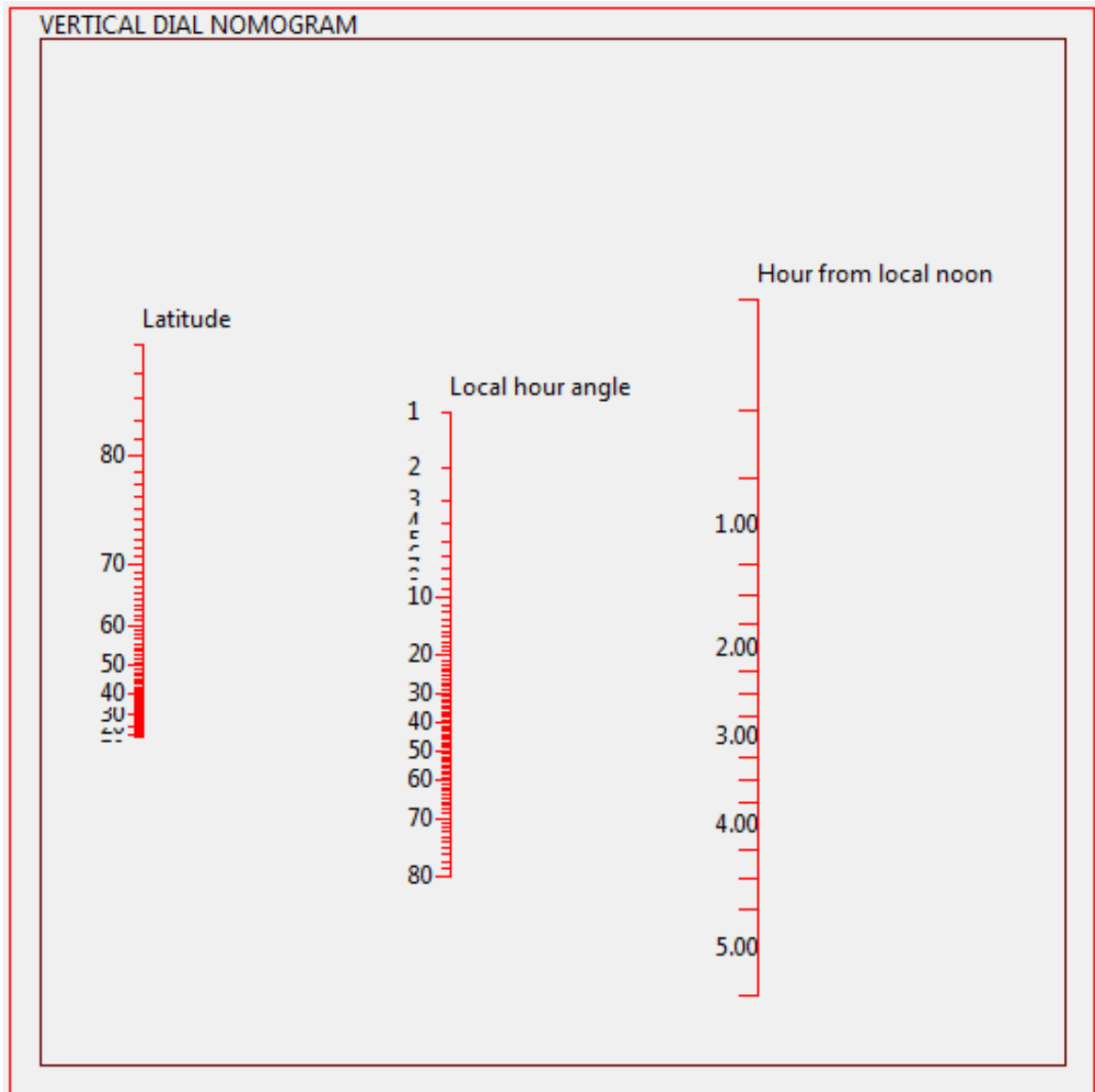
Also, the Lazarus program is standalone, runs on Windows XP and Vista win64, and you may recompile it on other platforms, and is free.

NOTE: The Lazarus program "nomogramProj.exe" may have better nomograms that have been refined, so please use it.

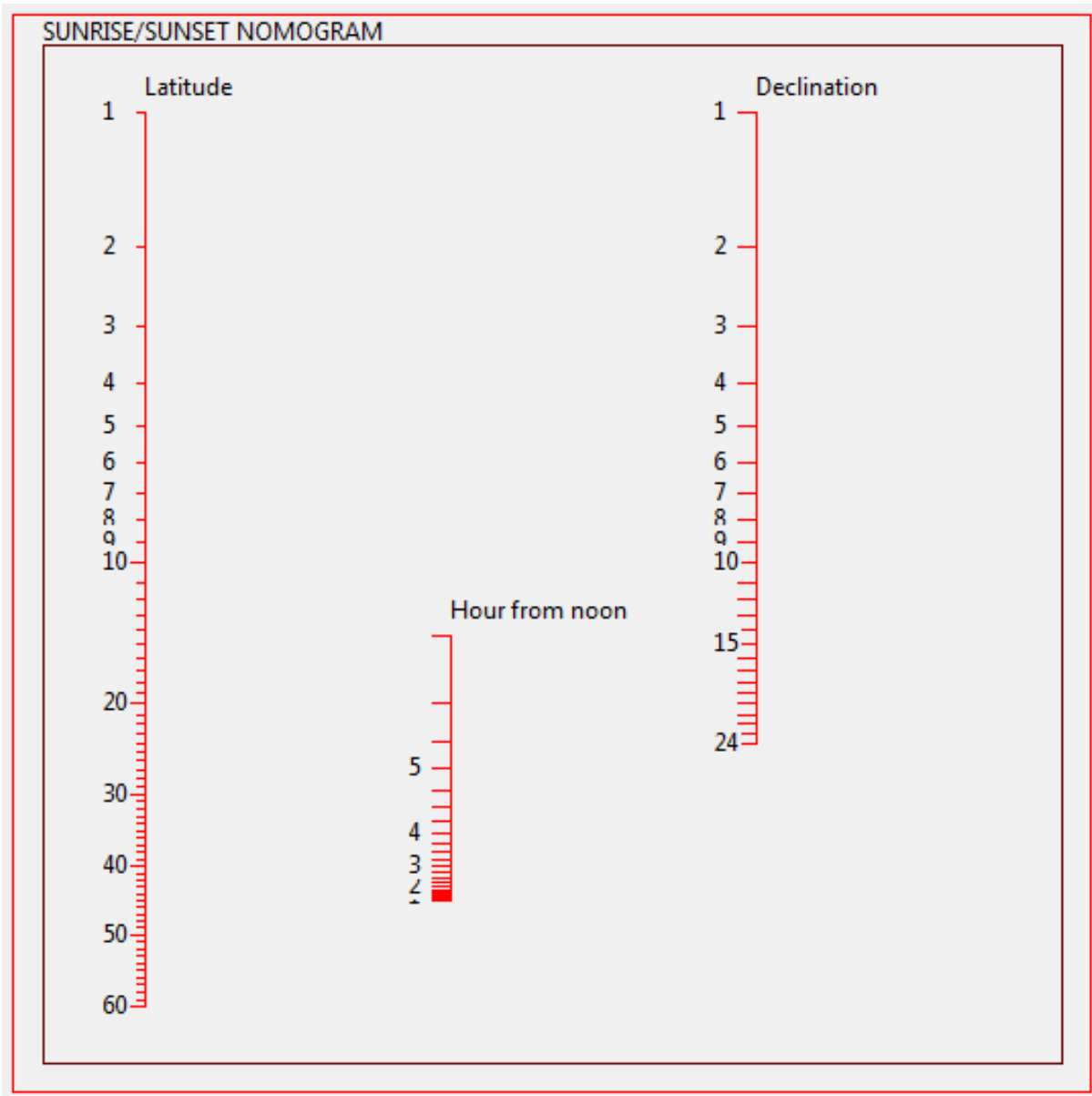
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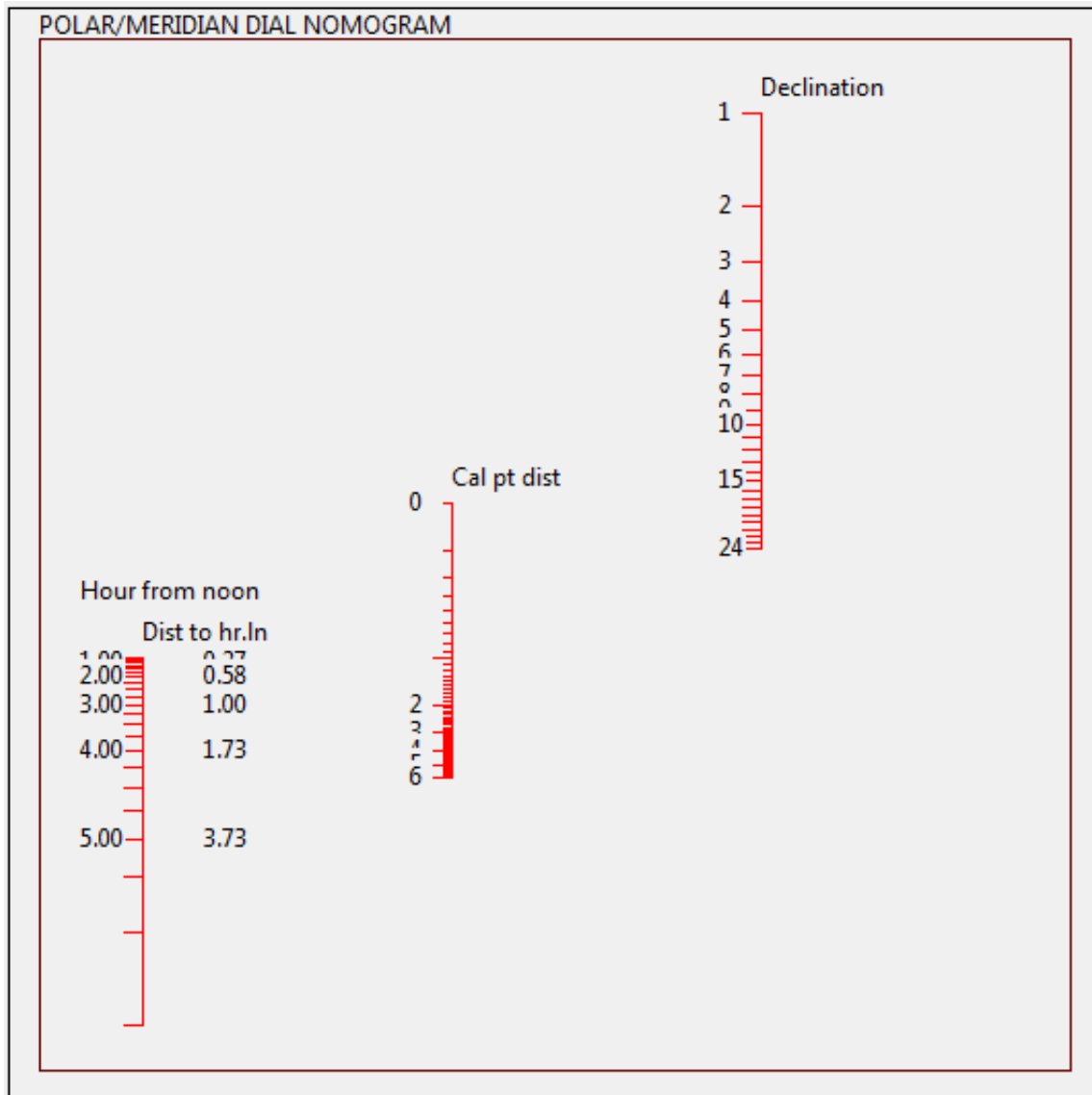
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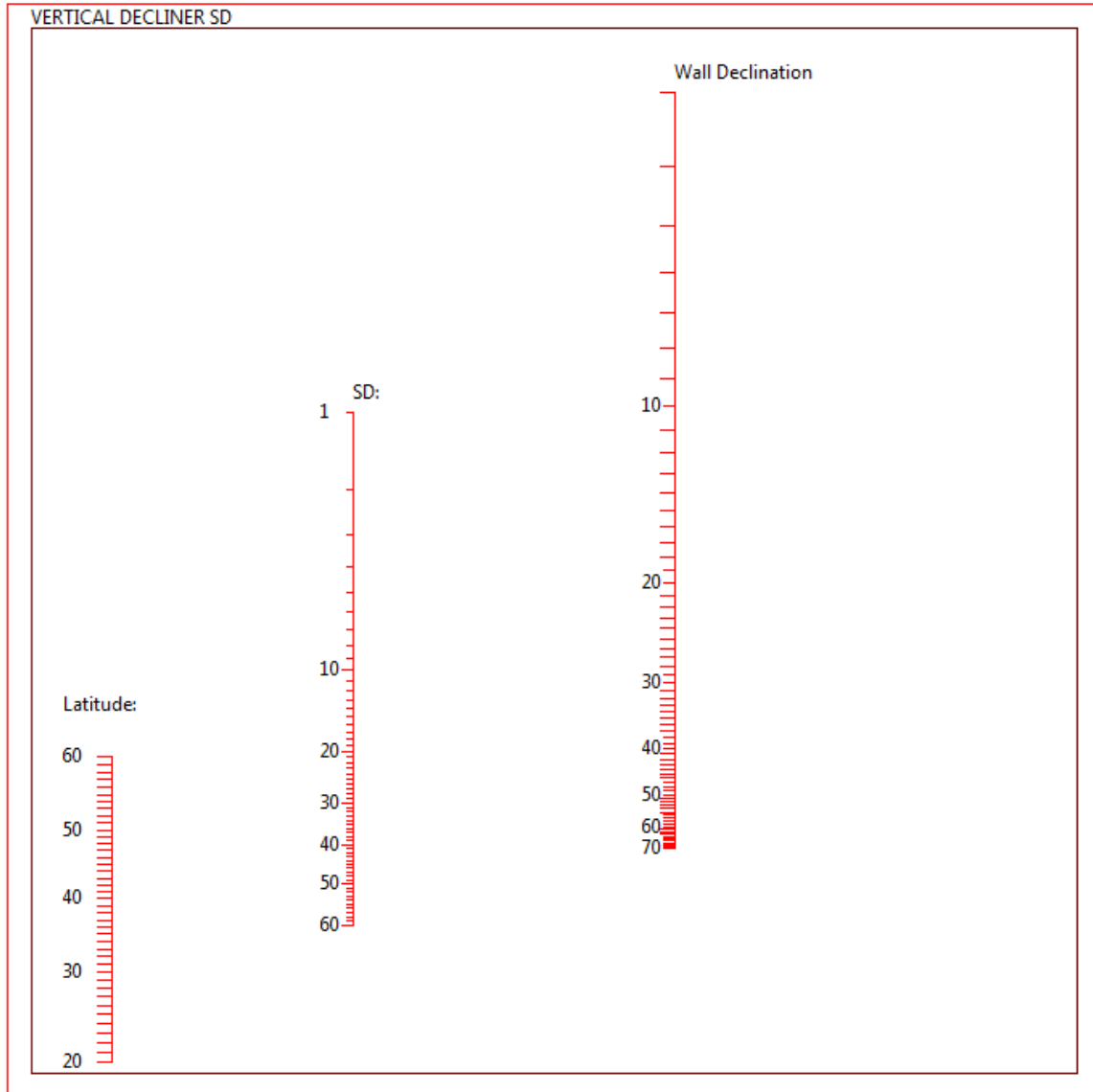
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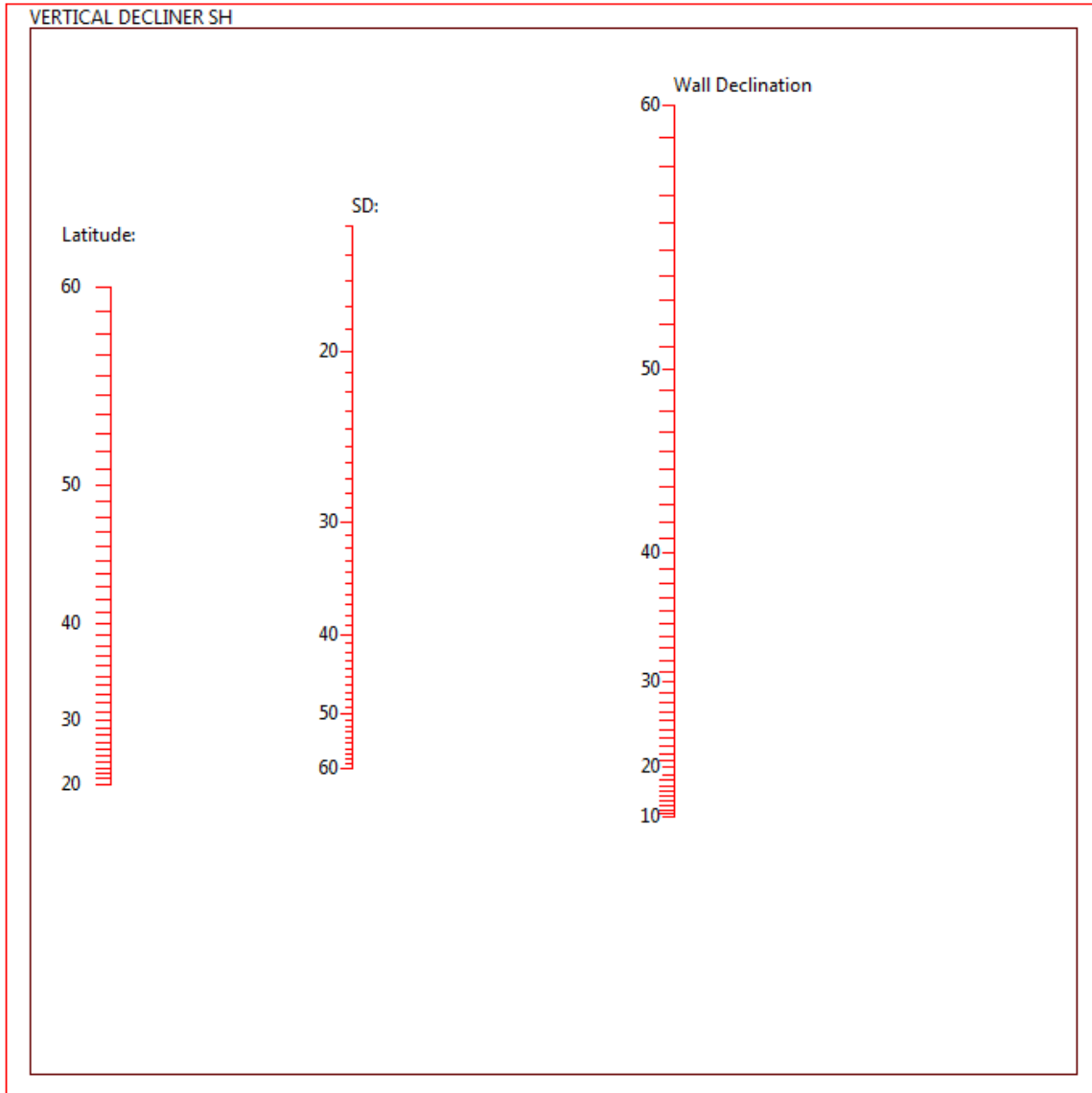
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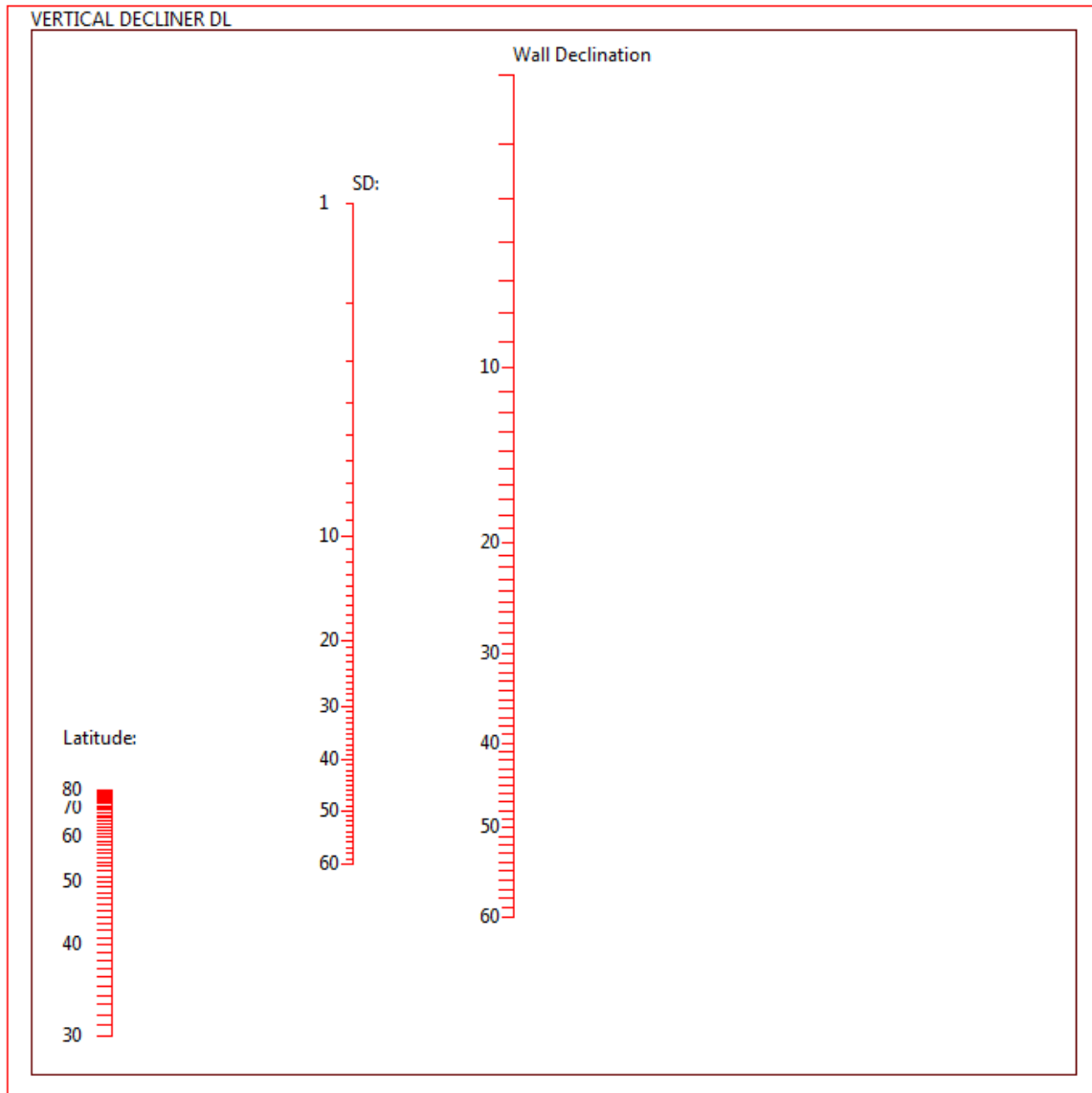
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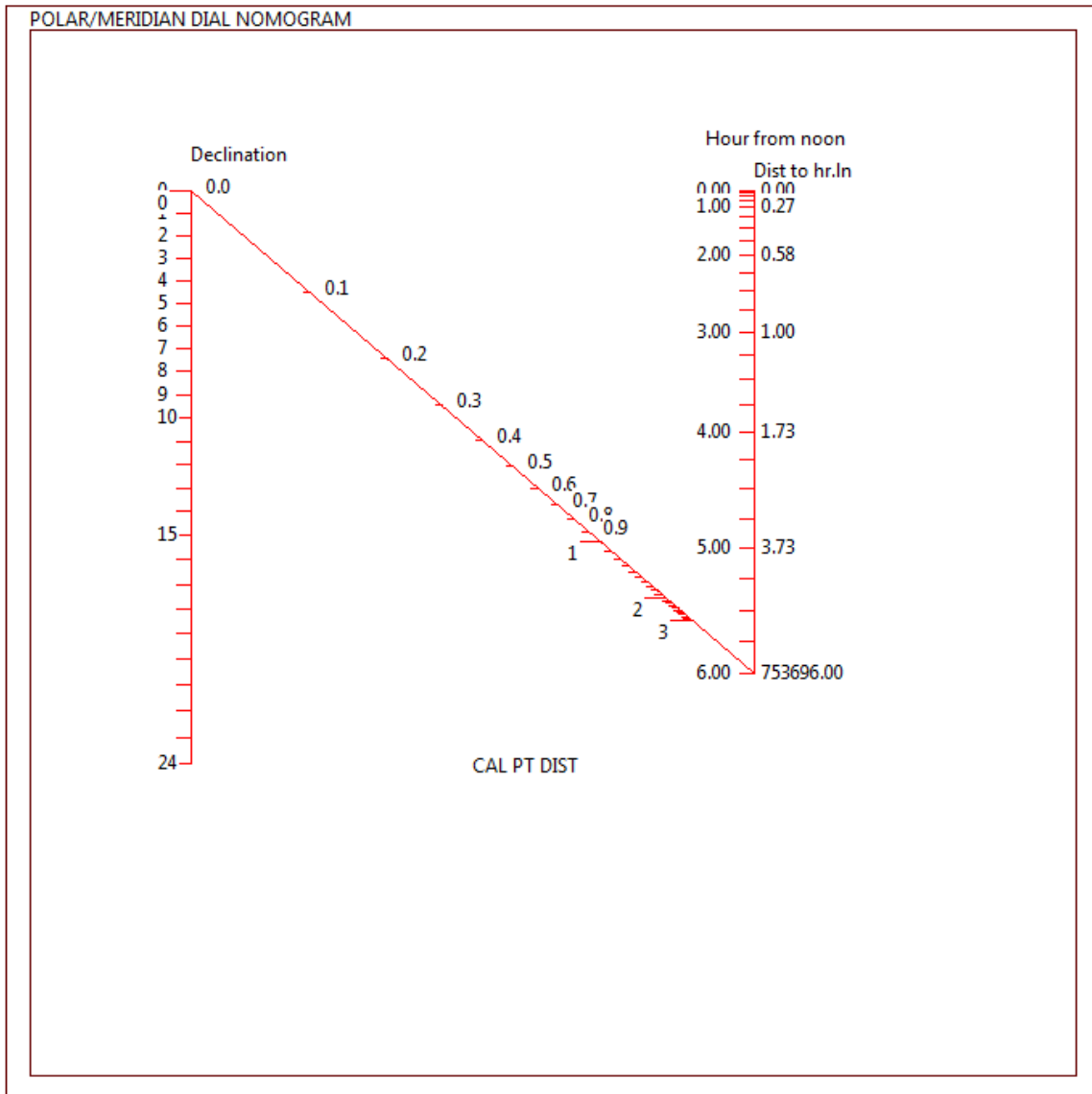
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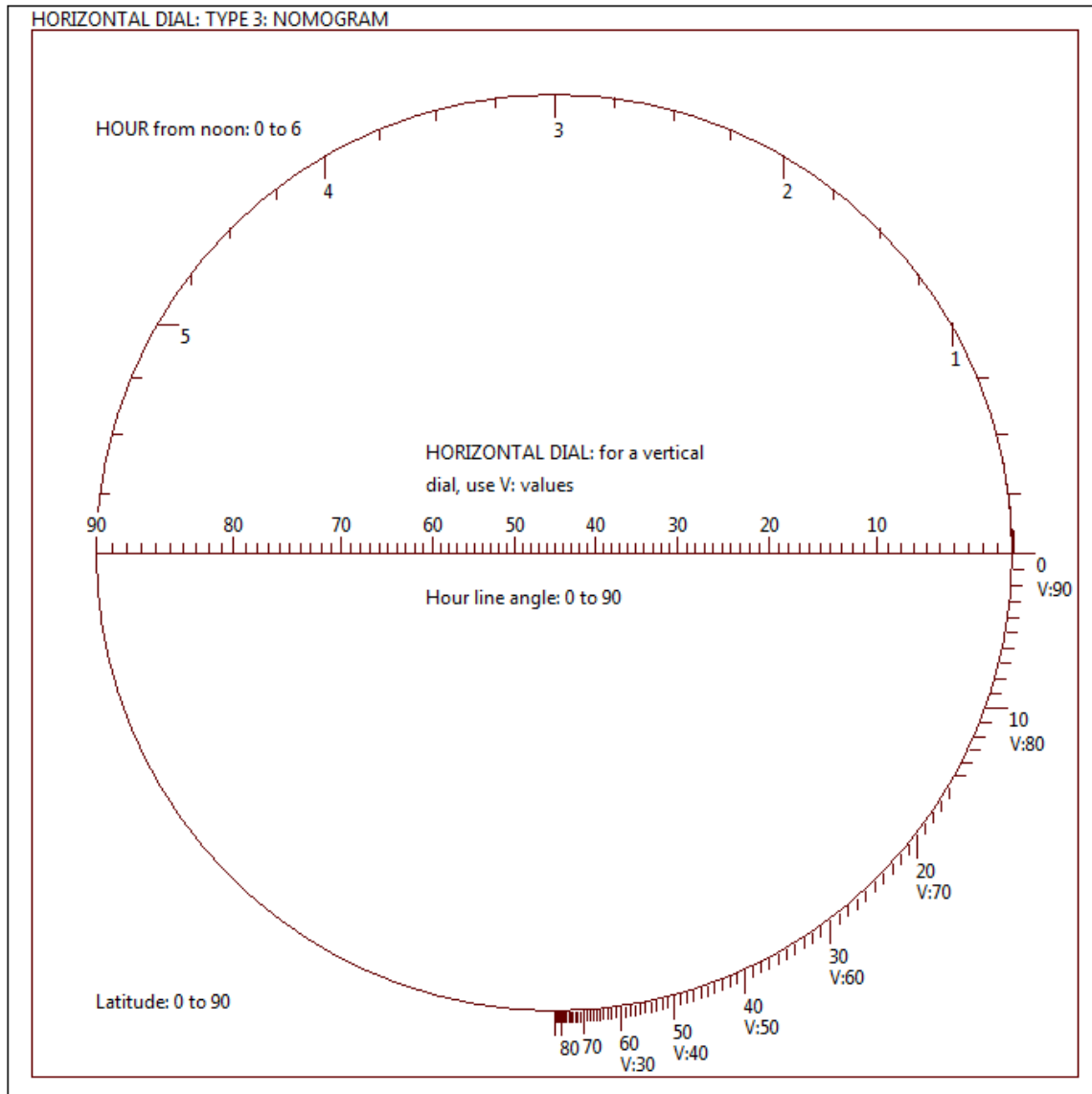
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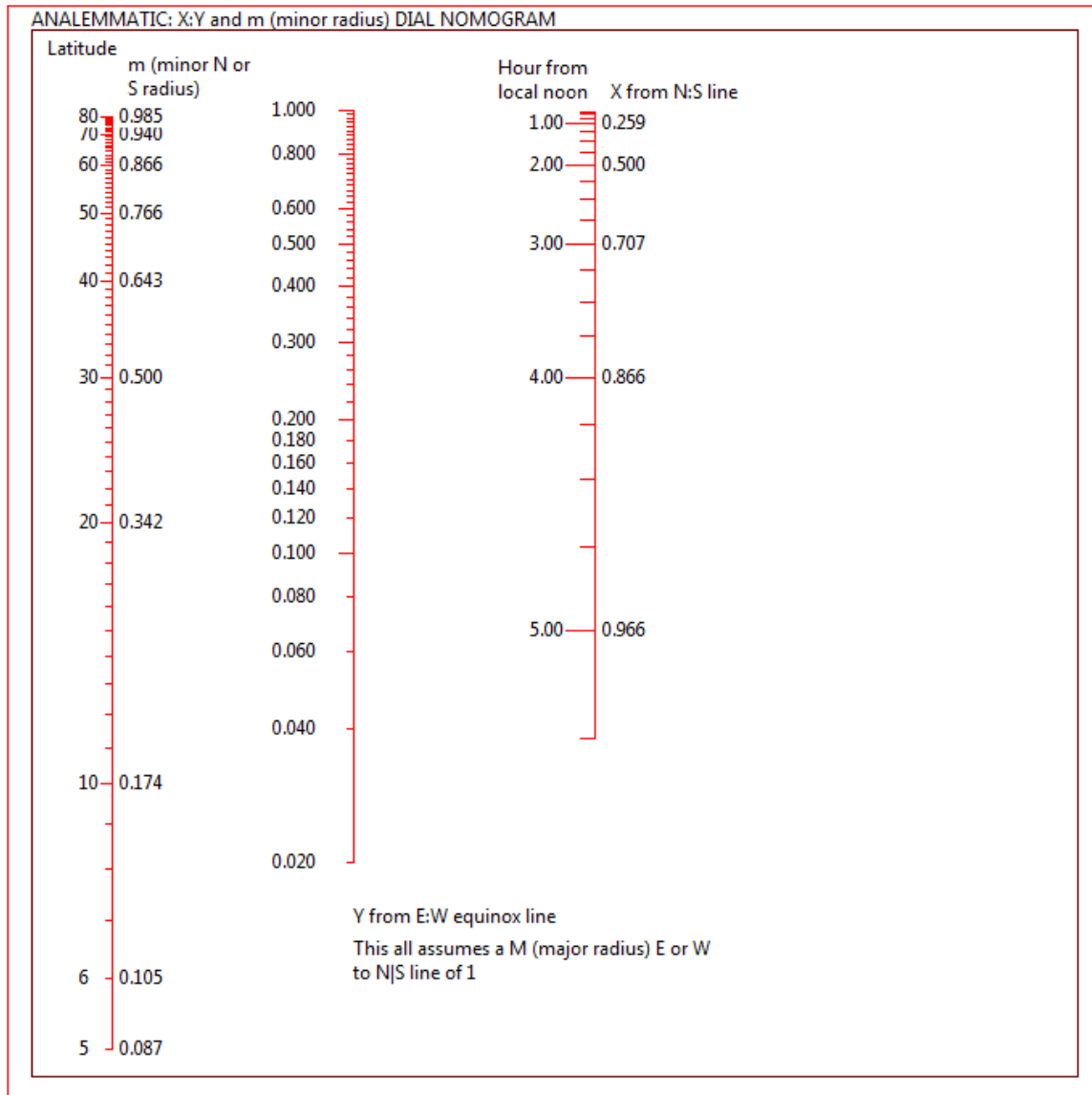
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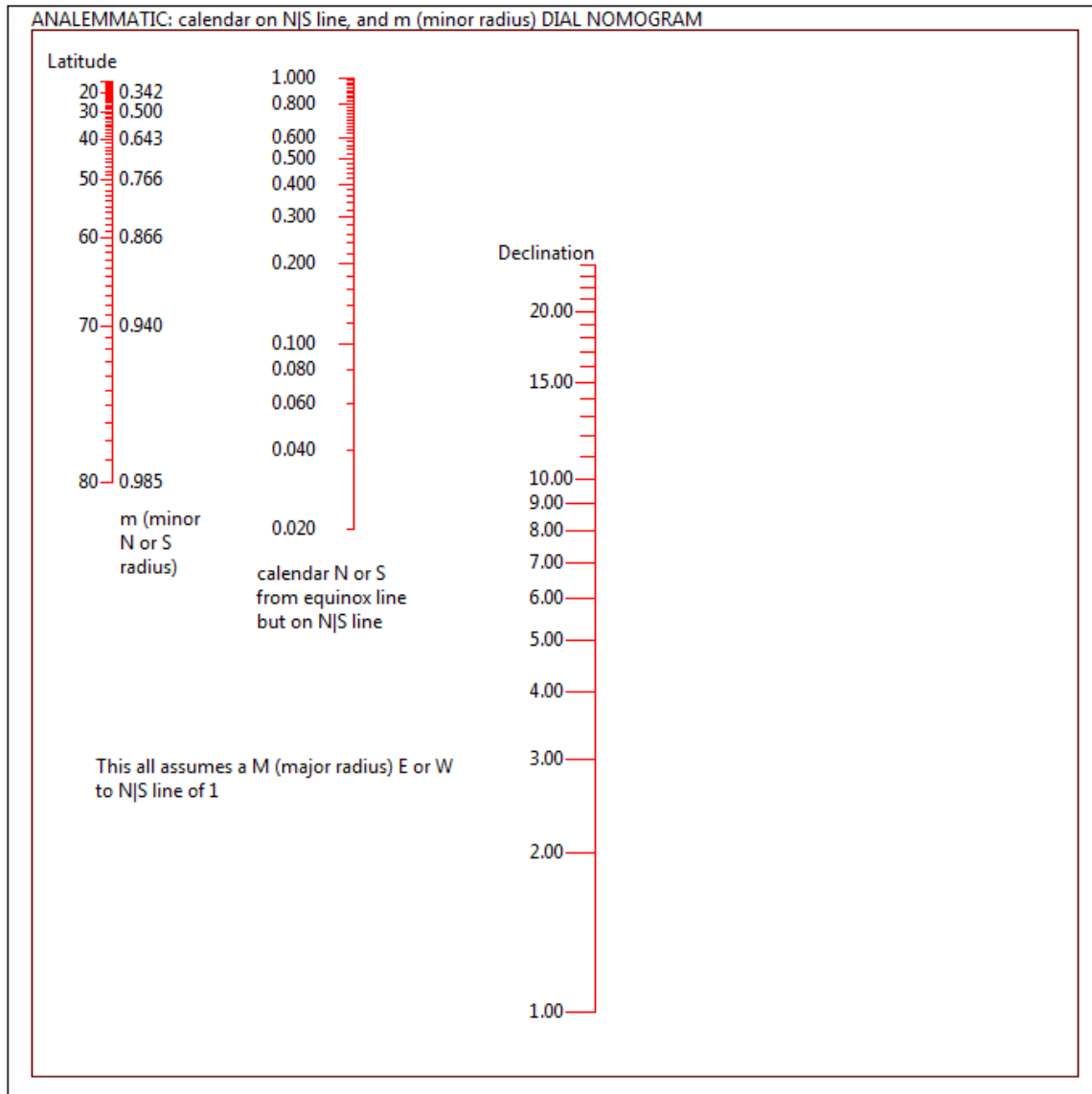
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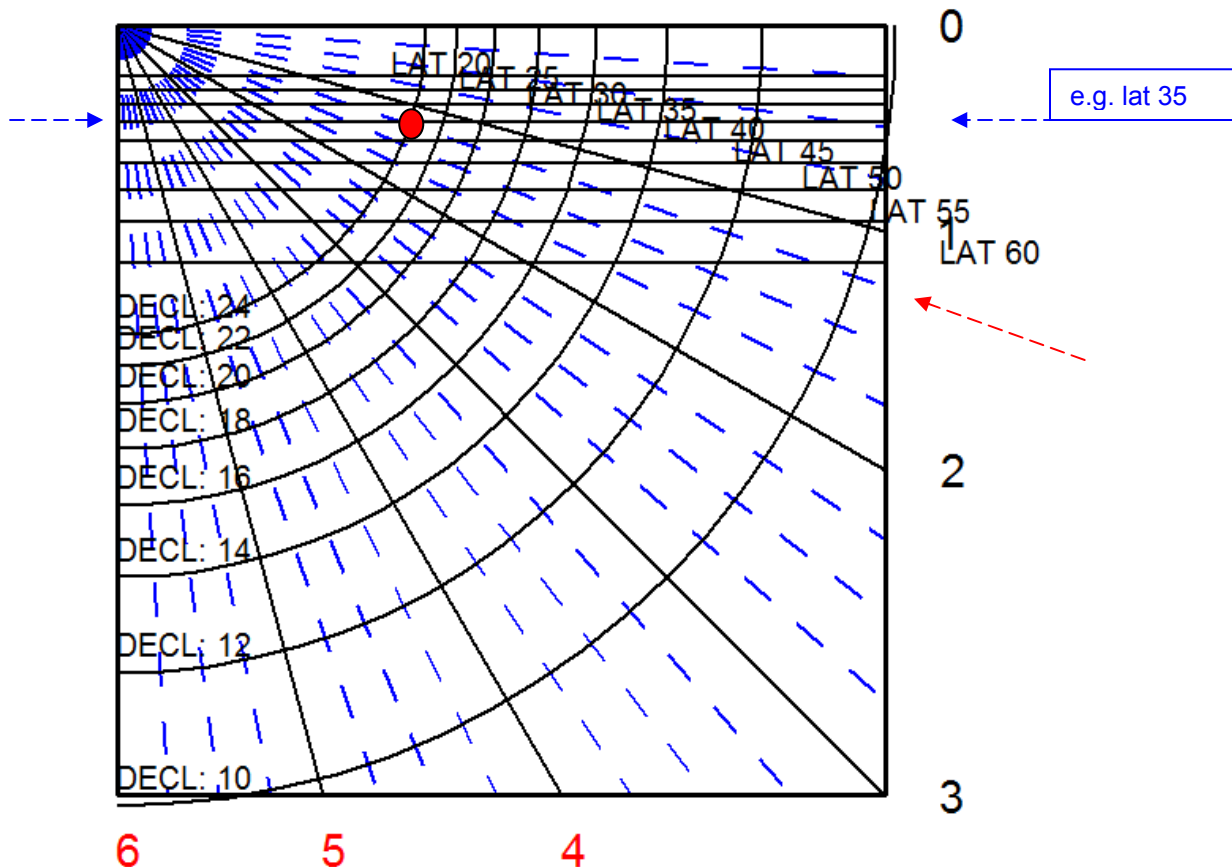


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A DELTACAD NOMOGRAM FOR SUNRISE/SET BASED SOLELY ON AN EQUATORIAL DIAL



NOMOGRAM FOR SUNRISE/SET BASED ON Q-DIAL HOURS FROM 0600 or 1800 for sunrise/set

For the theory of this, refer to chapter 9 of *Illustrating Time's Shadow*, and chapter 23, also appendix 6

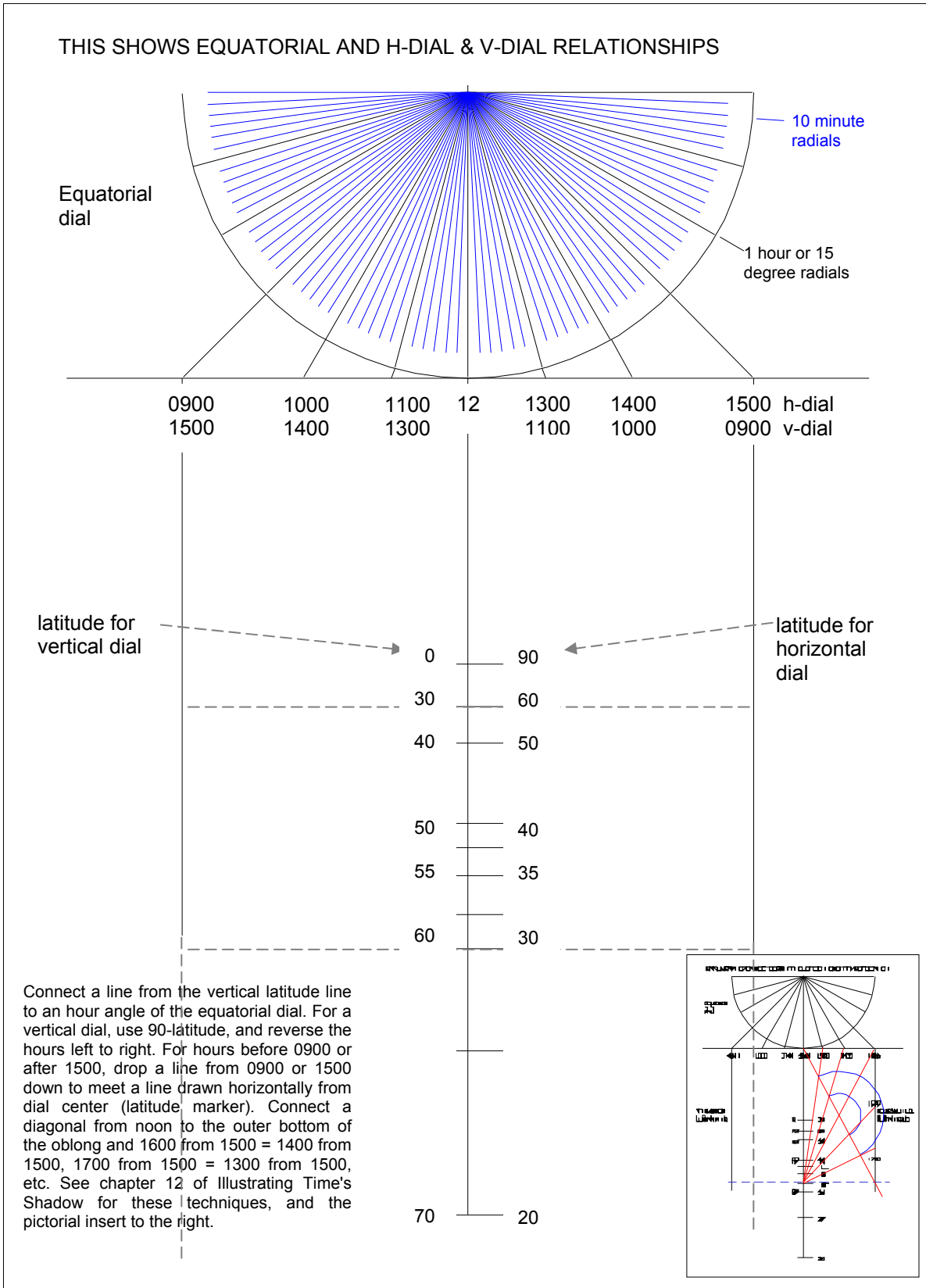
This shows the hour from 6 am for sunrise, + for winter, - for summer as well as the hour from 6 pm for sunset, + for summer and - for winter (note sign reversal). The longitude and EOT must still be applied.

E.G. for latitude 35, blue dashed line above, for declinations of 24 through 10, the declination curve intersects with the horizontal latitude line and the resulting intersection is an hour line. That hour line is the time from 0600 or 1800 for sunrise or sunset.

So, for latitude 35 (horizontal line above) with a declination of 22, the intersection is in red above, and the radial hour line is 1.25, meaning in winter the declination of -22 generates 1.25 hours after 0600 for sunrise, and 1.25 hours before 1800 for sunset. Longitude and EOT must then be applied.

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A TEMPLATE FOR HORIZONTAL (AND VERTICAL DIAL DESIGN). SEE CHAPTER 12



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THE END

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