

Converting Azimuth to Declination

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When you are in the field working with a theodolite you will be measuring azimuth and altitude of a stone or of a line of the horizon. You can then use a planetarium program to recreate your date and location and then move it through time to determine if any celestial event happens at this azimuth and altitude.

However what is more useful is to convert your field measurements into declination. The benefit of this is that once you know that a particular point you are considering is aligned with a particular degree of declination for that latitude and horizon altitude then you can observe a set of tables such as given below to see if any bright star or solar and or lunar alignment would have touched the horizon at that point.

For example if you are measuring a site and you determine that there is an orientation or a stone is at, an azimuth of $139^{\circ} 56'$ and that the horizon line of the hills is at $8^{\circ} 30'$ of altitude from you point of observation and your site it at a latitude of $51^{\circ} 30'N$.

Step 1 – Convert your field readings to declination using the Excel spread sheet. You will find that the declination is -20.809 or $-20^{\circ} 48'$.

Use this figure to look at the star tables and you will note that for 2500 BCE that the bright star Sirius had a declination of $-20^{\circ} 52'$. Thus you know that Sirius would be seen rising at that key point you are observing. However 500 years later in 2000 BCE this would have been the star Rigel.

Converting your field readings to declination means that they can be compared across sites as well as across eras.

Star	Declination 2500 BCE		
Achernar	-81°08'	Alpheratz	+07°20'
Ankaa	-62°52'	Zuben Elgenubi	+07°37'
Canopus	-55°25'	Altair	+08°30'
Phact	-44°33'	Scheat	+09°24'
Fomalhaut	-44°27'	Sualocin	+10°10'
Acrux	-39°53'	Mirach	+11°57'
Toliman	-37°50'	El Nath	+12°44'
Agena	-36°07'	Spica	+12°53'
Rukbat	-33°11'	Zuben Eschamali	+13°23'
Murzim	-25°52'	Acubens	+17°10'
Deneb Algedi	-25°24'	Algol	+17°38'
Rigel	-23°11'	Regulus	+24°10'
Al Rescha	-21°27'	Pollux	+24°38'
Sirius	-20°52'	Ras Alhague	+25°48'
Acumen	-20°25'	Castor	+26°51'
Menkar	-19°01'	Mirfak	+26°53'
Aculeus	-16°59'	Capella	+28°42'
Alnilam	-14°45'	Ras Algethi	+28°56'
Sadalsuud	-14°39'	Capulus	+33°00'
Facies	-13°57'	Schedar	+33°11'
Sadalmelek	-12°58'	Vindemiatrix	+34°25'
Bellatrix	-08°34'	Denebola	+34°50'
Antares	-06°43'	Deneb Adige	+36°16'
Betelgeuse	-05°04'	Zosma	+37°48'
Markab	-02°51'	Diadem	+41°02'
Aldebaran	-02°15'	Vega	+42°38'
Hamal	-00°34'	Arcturus	+45°43'
Alkes	-00°23'	Alderamin	+48°00'
Alphard	+01°07'	Alphecca	+48°09'
Alcyone	+02°24'	Polaris	+65°04'
Procyon	+04°32'	Dubhe	+71°01'
Alhena	+07°12'	Thuban	+88°20'

Star	Declination 2000 BCE		
Achernar	-78°54'	Regulus	+24°05'
Ankaa	-61°37'	Pollux	+26°23'
Canopus	-54°37'	Ras Algethi	+26°32'
Fomalhaut	-44°11'	Castor	+28°47'
Phact	-42°39'	Mirfak	+29°40'
Acrux	-42°05'	Capella	+31°25'
Toliman	-40°26'	Vindemiatrix	+32°17'
Agena	-38°41'	Denebola	+33°29'
Rukbat	-35°24'	Schedar	+35°24'
Deneb Algedi	-25°45'	Capulus	+35°37'
Murzim	-24°03'	Deneb Adige	+36°29'
Acumen	-23°01'	Zosma	+37°04'
Rigel	-20°43'	Diadem	+38°51'
Aculeus	-19°37'	Vega	+41°25'
Sirius	-19°25'	Arcturus	+42°45'
Al Rescha	-18°52'	Alphecca	+45°20'
Menkar	-16°14'	Alderamin	+49°06'
Facies	-16°13'	Polaris	+67°35'
Sadalsuud	-14°56'	Dubhe	+72°25'
Sadalmelek	-12°44'	Thuban	+85°31'
Alnilam	-12°22'		
Antares	-09°31'		
Bellatrix	-06°03'		
Betelgeuse	-02°42'		
Markab	-01°44'		
Alkes	-01°31'		
Aldebaran	+00°30'		
Alphard	+01°11'		
Hamal	+02°01'		
Zuben Elgenubi	+04°51'		
Alcyone	+05°13'		
Procyon	+05°50'		
Altair	+07°22'		
Alpheratz	+09°09'		
Alhena	+09°22'		
Sualocin	+09°42'		
Spica	+10°31'		
Zuben Eschamali	+10°34'		
Scheat	+10°40'		
Mirach	+14°14'		
El Nath	+15°23'		
Acubens	+17°56'		
Algol	+20°24'		
Ras Alhague	+23°28'		