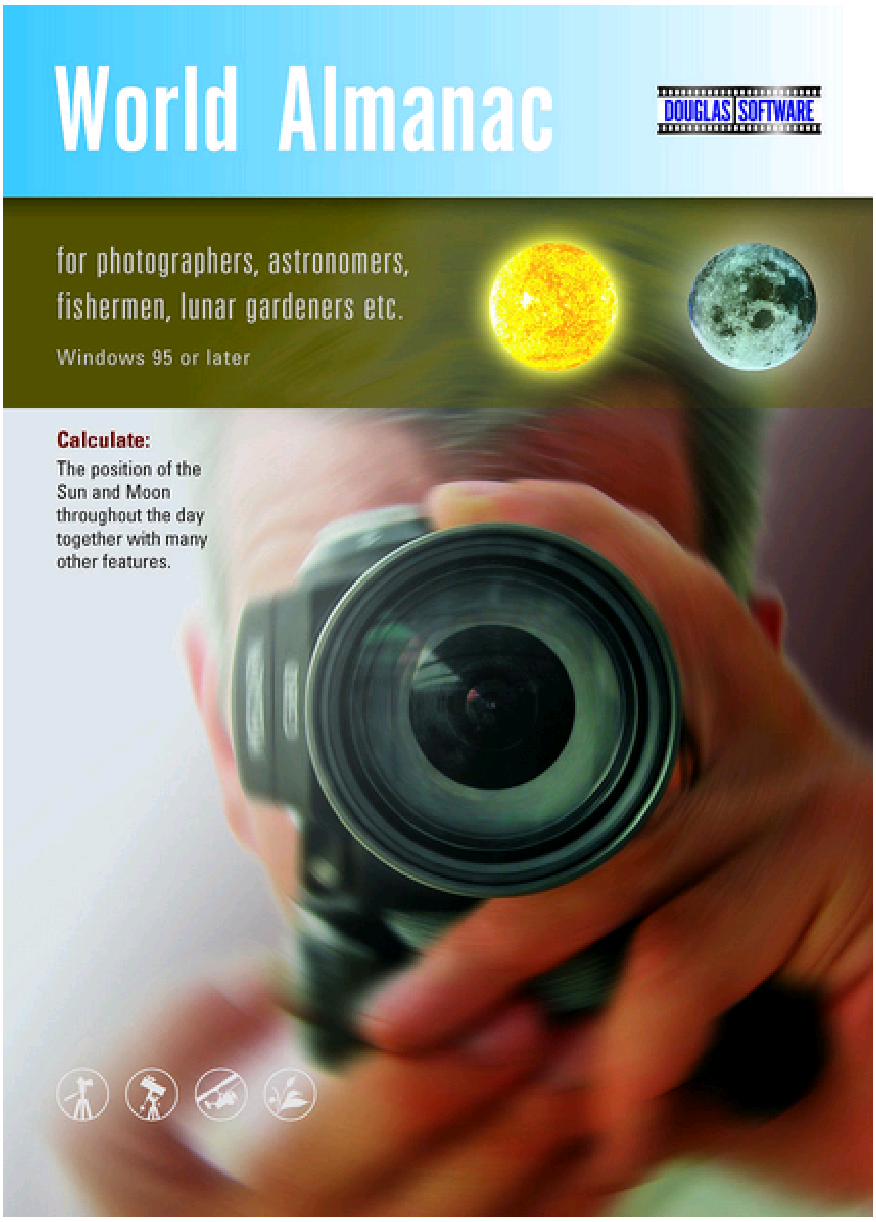

World Almanac
DOUGLAS SOFTWARE
for photographers, astronomers,
fishermen, lunar gardeners etc.
Windows 95 or later
Calculate:
The position of the Sun and Moon throughout the day together with many other features.

Table of Contents

Introduction

The World Almanac can contain many hundreds of user defined locations for anywhere in the world.
Data can be imported from the various Country (.csv) files supplied with this software and users can create their own database of locations.

The latitude, longitude, height, time zone, daylight savings time and magnetic variation are required for each location entered.

Whilst this software is primarily intended for those with some kind of camera, it has many other potential users to whom the information would be useful.

You will find that it is extremely simple to use with minimal use of technical jargon.
All times are shown in the 24 hour format.

The programme will show data for any date between January 1900 and December 2049 and assumes a standard temperature of 10° centigrade and a standard atmospheric pressure of 1010 millibars.

Getting Started

The programme is initially supplied with the data for a number of locations which are intended as a guide and can be deleted or amended as required.
In addition a number of .csv files are supplied containing data for over 1600 locations.
Users can create their own database of locations.

The various entries for Location are as follows:

Name: This is limited to 32 characters.

Longitude: The can be between 0° and 180° East/West

Latitude: This can be between 0° and 90° North/South. See Programme Accuracy about the accuracy of the rising and setting times above 68° for the Sun and 60° for the Moon.

Height: This can be up to 10,000 metres/32,768 ft above mean sea level. It is possible to mix metres and feet between locations.

Time Zone: This can be between 0 and 13 hours. If the longitude is West then this figure must be a minus figure. It can be calculated by dividing the Longitude by 15 to give an approximate figure.

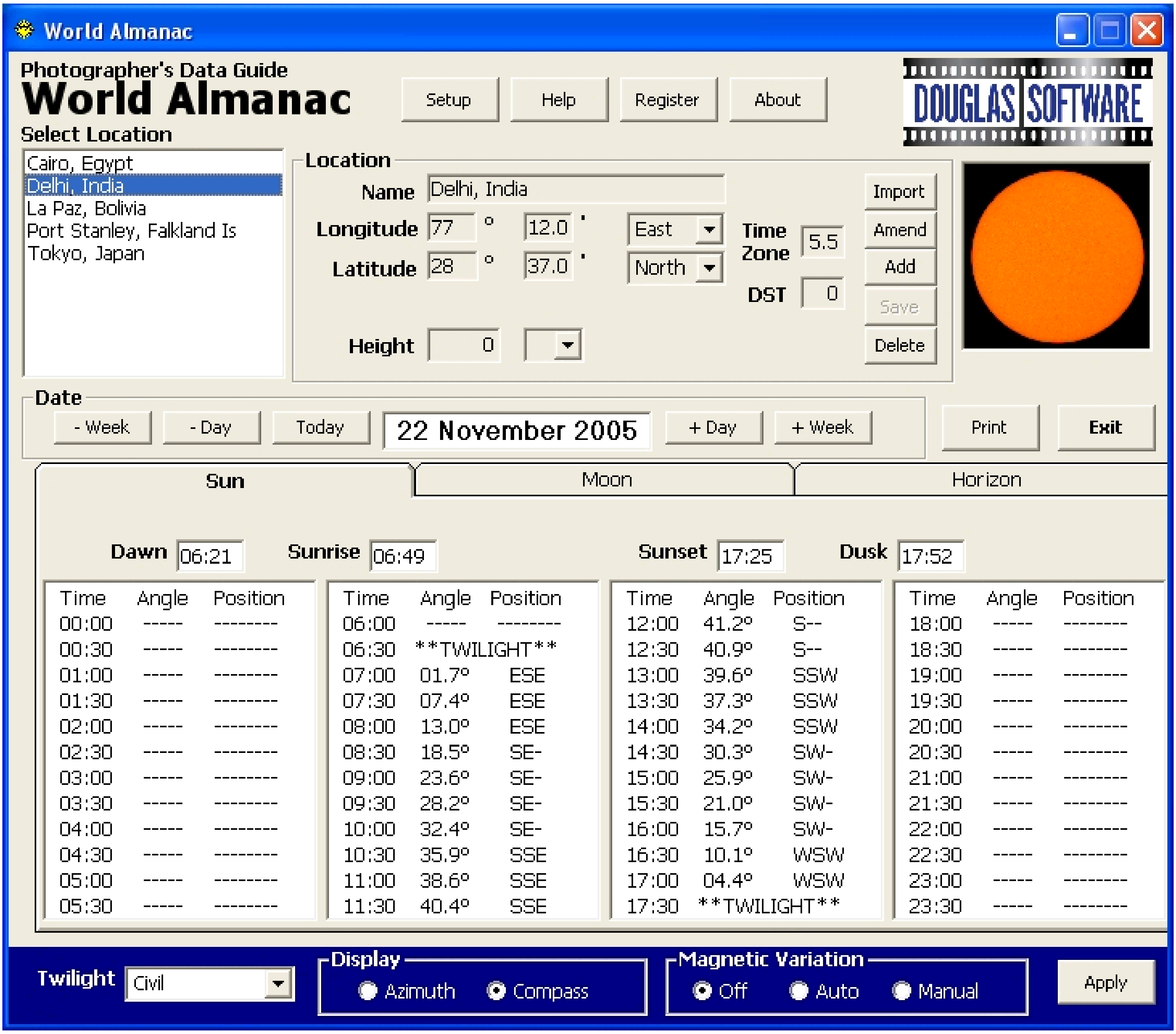
Daylight Savings: You can add up to 2 hours for this. In the Northern hemisphere daylight savings is usually between March/April and September/October, whereas in the Southern hemisphere it is the other way round, i.e. between September/October and February/March.

Magnetic Variation: For the years 2005 to 2010, it is recommended that you set the option at the bottom of the screen to Auto and leave this field empty. Setting it to Auto will show a figure that has been calculated by the programme. For other years see Magnetic Variation.

The programme will automatically sort the locations into alphabetical order.
The only limit to the number of locations you can enter is the world.ini file size, which can go up to 3 gigabytes.

The picture below shows the programme screen with the Setup button clicked.
For the other options click on the button that interests you for an explanation of what it does.

Angle and Position
From the picture below you will see that the Angle and Position are shown for the Sun at 30 minute intervals.
The Angle refers to the angle from the horizontal to the Sun, with the highest figure being at mid day, or 1pm if there is 1 hour daylight savings in operation.
The Position refers to the compass position about which see The Compass.



The options at the bottom of the screen are as follows:

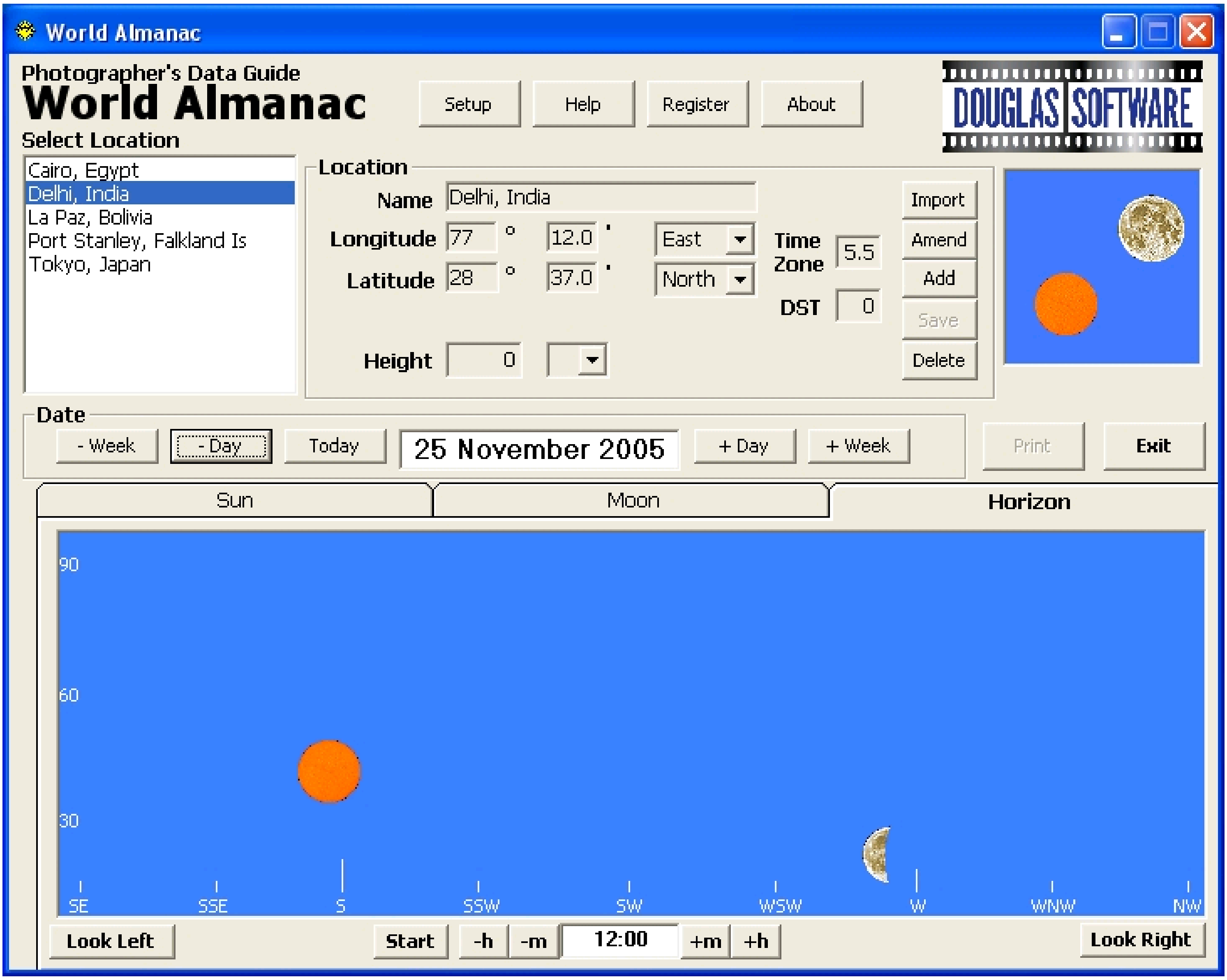
Twilight: See The Sun for the choices that you have.
Most users will only need the Civil option which is the default.

Display: The position of the Sun or Moon can be show as the Azimuth (about which see The Compass), or as the Compass direction as can be seen from the picture above. The default is the Compass direction.

Magnetic Variation: For the years 2005 to 2010 we suggest you select the Auto option which is the default. For other years see Magnetic Variation.

To stop showing these options when you have finished with them just click on the Apply button.

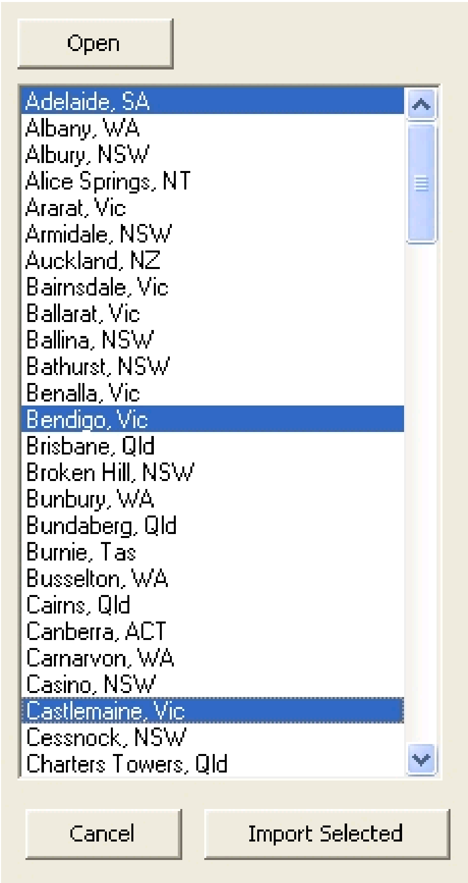
The following picture shows when the Horizon tab has been selected.



Initially, the position of the Sun is shown at mid day.
From the above picture you will see that the Sun at mid day is due south, and the Moon at that time is almost West.
The Look Left and Look Right buttons allow you to look around the sky in either direction.
The Start button starts the animation which will not stop until you press the Stop button that is displayed or move from the Horizon to either the Sun or Moon screens.
The -h and -m buttons allow you to see the horizon one hour or one minute earlier than the time displayed, which, in the above picture, is noon.
The +h and +m buttons add one hour or one minute to the displayed time.

Importing Data

Data can be imported from any of the .csv files supplied with this software or other user created .csv files about which see later.



As will be seen from the above picture you can import data from more than one location at a time. The supplied files do not include a figure for height which you will have to find for yourself, neither do they currently have any provision for daylight savings time. See Daylight Saving.
The software does not put a file into alphabetical order.
It does, however, convert the decimal degrees into degrees and minutes.

CSV (comma separated variable) files can easily be created in a text editor such as Notepad.
The following is a sample taken from one of the files supplied with this software:

"Adelaide, SA","-34.917","138.583","9.5","","",""
"Albany, WA","-35.033","117.883","8","","",""
"Albury, NSW","-36.083","146.917","10","","",""
"Alice Springs, NT","-23.7","133.883","9.5","","",""
"Ararat, Vic","-37.283","142.933","10","","",""
"Armidale, NSW","-30.517","151.65","10","","",""

There are 7 'fields' as follows:

1. Name of location.
2. Latitude in decimal degrees. South must be a minus figure as shown in the above sample.
3. Longitude in decimal degrees. West must a minus figure.
4. Timezone in hours.
5. Height in metres.
6. For later use.
7. For later use.

If the files you create follow this format then they will be accepted by this software.
If the file you have created does not follow the above parameters then you will get an Invalid File Format message.

If the place you are looking for is not in any of the supplied files, then our website contains details of where you can search for this information:

http://www.photo-software.com/worldalmanac.htm

Daylight Saving

This information applies to the databases supplied with this software.

Australia	Hours+	From	To
Capital Territory, New South Wales			
South Australia, Victoria	1	Last Sunday October	Last Sunday March
Lord Howe Island	1/2	Last Sunday October	First Sunday March
Tasmania	1	First Sunday October	Last Sunday March

Note: Northern Territory, Queensland and Western Australia do not participate in Daylight Saving.

U.K. (incl European Union)	1	Last Sunday March	Last Saturday October
New Zealand	1	First Sunday October	Third Saturday March
North America	1	First Sunday April	Last Sunday October

Note: Arizona, part of Indiana and Hawaii do not participate in Daylight Saving

For Daylight Saving in other countries see http://www.photo-software.com/worldalmanac.htm

Programme Accuracy

Rising and Setting times

The figures for the Sun are accurate to within two minutes and those for the Moon accurate to within three minutes.
Because the phenomena depend upon local meteorological conditions, attempts to attain higher accuracy are not justified because of refraction.
Light rays are bent as they pass through the atmosphere from outside the Earth so that the Sun and Moon are not quite where they are calculated to be.
The actual amount of refraction depends upon the detailed disposition of the atmosphere along the line of sight to the object in question, and is only significant when the Sun or Moon are near the horizon. It is non-existent when they are at their zenith or highest point.
To take local conditions into account would mean that both the temperature and barometric pressure would be required by the programme. This would have added unnecessary complexity whilst making little practical difference to the figures even with extreme climatic conditions. These features can be added if users require them.
With the Sun the programme may on rare occasions give inaccurate results for latitudes above about 68° North or South.
With the Moon the accuracy deteriorates for a latitude of above about 60° North or South near dates on which the Moon remains above or below the horizon for more than twenty four hours.

Sun/Moon Angles & Position

Even though the calculations are only shown to one decimal place, we thought it would be a useful excercise to compare our calculations with those of the JPL Horizons On-Line Solar System Data

and Ephemeris Computation Service, (*http://ssd.jpl.nasa.gov/horizons.html*), which provides highly accurate ephemerides for solar system objects.
Both sets of calculations were to four decimal places and did not take magnetic variation into account.
We can confirm that the accuracy of our calculations for a sample location never exceeds the following:

	Azimuth	Altitude
Sun	0.0009°	0.0007°
Moon	0.0086°	0.0060°

This effectively means that only very occasionally, will our predictions differ by no more than 0.1°.
See also Magnetic Variation.

Magnetic Variation

The calculations for this are based on WMM (World Magnetic Model) coefficients for 2005.
These are accurate for the years 2005 to 2010.

For those seeking data for earlier years, the accuracy depends upon the year and your location.
The figures are generally most accurate during those times where there is global satellite data, namely from 1980 onwards.

However, our web site gives details of where you can obtain a figure for earlier years and find out more about the complexities of Magnetic Variation:

http://www.photo-software.com/worldalmanac.htm

The World Magnetic Model is a product of the United States National Geospatial-Intelligence Agency (NGA). The U.S. National Geophysical Data Center (NGDC) and the British Geological Survey (BGS) produced the WMM with funding provided by NGA in the USA and by the Defence Geographic Imagery and Intelligence Agency (DGIA) in the UK.

The World Magnetic Model is the standard model of the US Department of Defense, the UK Ministry of Defence, the North Atlantic Treaty Organization (NATO), and the World Hydrographic Office (WHO) navigation and attitude/heading referencing systems.

It is also used widely in civilian navigation systems.

Upgrades to this software will include the latest WMM coefficients

The Sun

The Sun is the most important planet in our lives which gives us all our light and heat, and without which, life as we know it would be impossible.

Twilight
Twilight is the period of semi-darkness before sunrise and after sunset which is caused by atmospheric conditions.
When the Sun is less than 18° below the horizon at sunrise, light is reflected by the atmosphere so that we see sunlight before the Sun actually rises. The same situation occurs at sunset when the Sun is no more than 18° below the horizon.
Three types of twilight are in common use, namely Civil, Nautical and Astronomical.
They refer to how much the Sun is below the horizon as follows:

Civil	- 6°

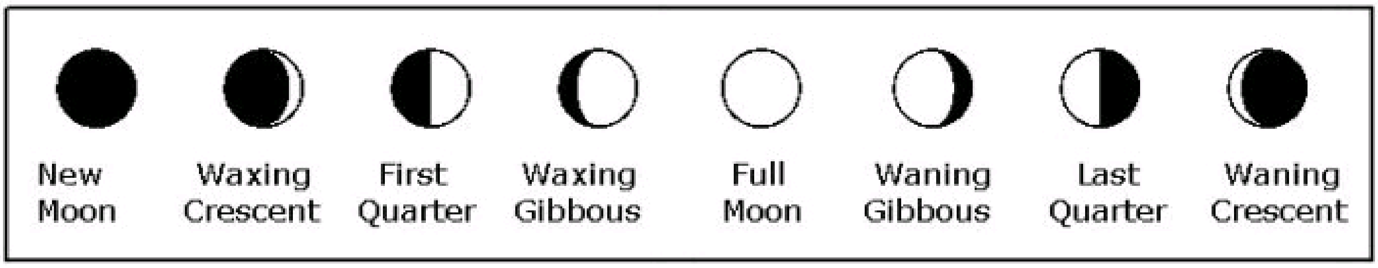
Nautical	- 12°
Astronomical	- 18°

The default is Civil which is the most satisfactory for photographic purposes.

The Moon

The Moon is the most visible of all the objects in our night sky and is regularly visible during daylight hours. Its dominance of the night sky has been a source of wonder throughout the ages and has been the inspiration of many science fiction writers.

As it moves in its orbit around the Earth, the amount of its surface that we see illuminated changes - it appears to go through phases.
The picture below illustrates the Moon at various point during the lunar month which takes about 29.53 days, as seen from the Earth.



The cause of these phases is the relative positions of the Sun, Moon and Earth.
As the Moon proceeds from New Moon to Full Moon it is said to be waxing, and when it proceeds from Full Moon to New Moon it is said to be waning.
The term Gibbous refers to the time when the Moon is between First and Last Quarter, during which time more than half of the visible portion of the Moon is illuminated.

There are three measures which are used to describe how much of the Moon is illuminated, or at which point the moon is in its cycle.
These are the age of the Moon, the phase of the Moon, and the percentage illumination.
In this context, the age of the Moon is an angle, (the phase angle) which measures how much of its orbit has been completed. This is measured from the Moon's current position to the position where the Moon is not illuminated at all (as viewed from the Earth). This position of no illumination is called the New Moon as indicated in the picture above. At New Moon, the age of the Moon is 0°. When the age is 90°, half of the visible portion of the Moon is illuminated and it is said to be a First Quarter Moon. At age 180°, the Moon is at maximum illumination and is called a Full Moon. 90° later, when the age is 270°, the Moon is again half illuminated and is said to be a Last Quarter Moon. Notice that First Quarter and Last Quarter Moon are equally illuminated but the portion illuminated is different.

In addition, the age of the Moon can be expressed in terms of days rather than degrees. In this case, the Moon moves about 12.19° per day, so that the age in days is simply the age in degrees divided by 12.19.
The phase of the Moon in this instance is calculated by this equation:

$$\text{phase} = \frac{1 - \cos(\text{Age})}{2}$$

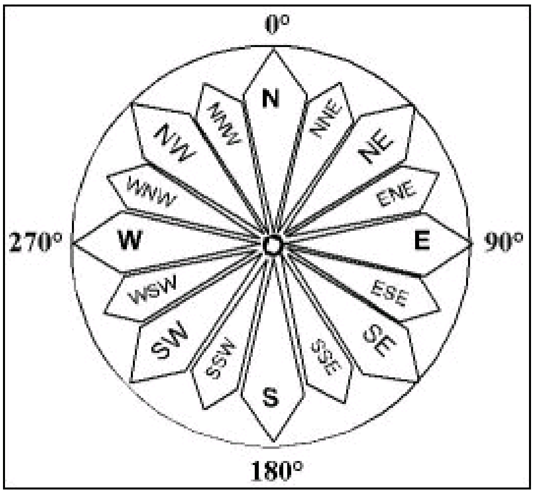
Finally, the amount of the Moon illuminated by the Sun can be expressed as a percentage.
The table below shows the relationship between age, phase, and percentage illumination.
Each of these measures is simply another way of expressing how much of the Moon is illuminated by the Sun as seen from the Earth.

Phase	Age °	Days	Phase	% illumination
New Moon	0	0	0.00	0
Waxing crescent	45	3.69	0.15	25
First quarter	90	7.38	0.50	50
Waxing gibbous	135	11.07	0.85	75
Full moon	180	14.77	1.00	100
Waning gibbous	225	18.45	0.85	75
Last quarter	270	22.15	0.50	50
Waning crescent	315	25.84	0.15	25

Please note that the lunar phase data shown by the programme is at mid day, irrespective of whether the Moon is above or below the horizon at that time.

The Compass

The position of the Sun or Moon can be shown by the programme either as a sixteen point compass (the default) or as the Azimuth.
This allows the user with any type of compass to use the programme.
The Azimuth is described by astronomers as 'the direction of the astronomical body measured clockwise from the north in a direction parallel to the horizon.
Navigators and meteorologists measure it from the north, a practice which we follow here.
Thus an Azimuth of 0° would be north, 90° east etc.
The picture below shows the connection between the two.



A compass points not to true north, but to magnetic north. The position of magnetic north not only varies with time, but according to your location in the world, mainly your latitude.
The difference between true North and magnetic North is known as Magnetic Variation.
It can be found on many local maps.
For more information see Programme Accuracy.

Photography and the Sun & Moon

The Sun

The position of the Sun in the sky and the extent to which it is diffused by clouds or haze are the two factors that control the quality of natural light.
The height of the Sun above the horizon determines brightness and colour temperature, the latter also being affected by the cloud cover.
The Sun is at its highest at noon, or where daylight savings is operative and is one hour ahead, one

hour later.
Generally, the Sun reaches its greatest intensity when it is 36° above the horizon.
It has been shown that, with the Sun at the same elevation, its intensity is practically constant regardless of the geographical location or the time of year. Any difference in photographic results in various parts of the world is mainly due to variations in the amount of haze.
There is usually less water vapour and dust in the atmosphere at higher altitudes with the result that detail in the distance is clearer.
Photographing the Sun as it is rising or setting is the most popular use of this software.
Secondly, comes the fact that the angle of the Sun is required if we wish to photograph, for example, a building at a particular time, so that the Sun will be in the right position, or when the Sun is at a particular height so that we can predict the shadow that it will cast.
Sidelighting at angles of 45° to 80° to the line of vision is used for depicting texture on buildings and other objects.
Backlighting at angles of 100° to 160° is used for isolating the subject from its background.

Twilight
This is when there can be an almost magical quality to the light, even feature films have been made during this short period.
It is a time of a large, evenly toned sky which is particularly effective with reflective surfaces such as water, and when the most strikingly lit cloud formations occur.
As the light level changes rapidly changes during this period constant exposure monitoring is necessary.

The Moon
When it comes to the Moon, even a Full Moon does not have sufficient light for normal photography, as the Sun is about 500,000 times more brilliant than the Full Moon.
Moonlight scenes therefore require long exposures even with the modern camera, and, if the Moon is included in the picture, would mean that the Moon would be a blur as it would have moved some distance during the exposure.
Reciprocity failure must be taken into account with long exposures.
Because Moonlight is simply reflected Sunlight there is little actual difference in colour from daylight, so that a scene without the Moon included would be little different for the same scene taken in Sunlight.
The best way to photograph the Moon where an image of the Moon itself is required in the picture is at twilight, as the exposure for the twilit landscape is about right for the Moon.
In this instance it should be photographed just after Sunset at a time when the Moon rises early in the evening. The same applies to just before Sunrise, when the Moon is on the verge of setting.
This overcomes the fact that the Moon, when photographed with a normal lens, will appear small, and is thus best photographed when it is near to the horizon as it then appears larger than it actually is.
Taking a photograph of the Moon on its own is relatively straightforward and can usually be done with quite high shutter speeds, with reciprocity failure not being a problem.
Even though the Moon varies by as much as 50,000 km/31,000 miles in its distance from the Earth, its diameter is never larger than about 0.5°. This means that the 35 mm photographer would need a lens the equivalent of about 4500 mm to get the Moon completely into the frame.

Registration

To register this product go to:

http://www.photo-software.com/register.htm

When you register World Almanac, you will be supplied with a License Key.
It is important that you keep this key in a secure place as you will need it whenever reinstalling the software.

Backup

The world.ini file contains all the location data that you have stored, so that it is prudent to back this file up from time to time.
This file, unless you have stored thousands of locations, is not very big and can be found at:

C:\Program Files\World Almanac

Support

In addition to this help file, Douglas Software have a product support page:

http://www.photo-software.com/support.htm

In the event that the answer to your question is not there you can email:

support@photo-software.com

In addition, our web site, http://www.photo-software.com, contains details of our telephone and fax numbers. This information is not listed in this help file because phone numbers and addresses change as offices move, etc.
The Web Site contact information is always up to date.

Suggestions

In addition, we are more than willing to hear from those with practical suggestions as to how this software could be improved.
Please send these to our support email above.