

HORIZONTAL SUNDIALS

Sundials are one of the most ancient instruments used for measuring time, having a history going back over two thousand years. They have no moving parts, but by moving with the earth itself are able to measure the Earth's rotation in a 24 hour period relative to the sun.

The Horizontal Garden Sundial consists of:

- a dial plate. marked off in hours
- the gnomon (pointer) which sits on the dial and projects at an angle toward the celestial pole. In the southern hemisphere therefore the high point of the gnomon faces south.

The angle of the gnomon should be equal to the latitude at which the sundial is to be used eg. Auckland sits at latitude 36.5 degrees south so its angle would be 36.5 degrees.

NB: In the southern hemisphere the sun is to the north with its apparent direction of travel being from east to west. The dial is read with morning readings to the left and afternoon to the right when facing north.

SETTING UP THE SUNDIAL

The pedestal or plinth on which the sundial sits should be set vertically, with the top plate horizontal. The dial is turned until the gnomon is on a true north/south meridian with its highest point facing south. To find true north/south, one method is to use a compass. The compass however points to magnetic N/S so for most of NZ a variation of approximately 23 degrees east must be compensated for. The north/south meridian can be checked by observing the shadow cast by the gnomon at noon, which should lie directly on the 12 o'clock mark of the Equatorial ring. ie. at true solar time not watch time. The time difference can be calculated – refer below and over page.

TELLING THE TIME

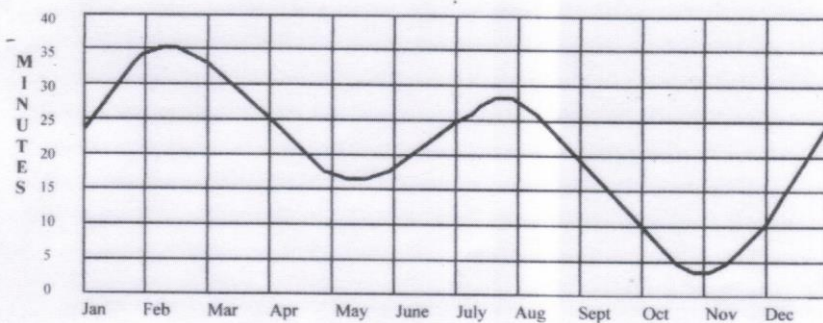
The shadow cast by the gnomon onto the dial plate gives us a reading of "True Solar Time". Solar Time however, varies by small amounts each day throughout the year relative to our watch time. Watch time is set as a standard "Mean Time". The world being divided into 24 time zones of one hour on lines of longitude 15 degrees apart. (i.e. 360 deg divided by 24 zones = 15 deg. per zone). NZ is approx 5 degrees west of its designated 180 degree time zone, so we can calculate, if the sun travels 360 degrees in 24 hours, it will travel 1 degree every 4 minutes. Therefore, the sun's shadow reading on the sundial would actually be (4 minutes x 5 degrees) 20 minutes after our watch time.

However, there is another adjustment to be taken into consideration, which is a time difference due to the fact that the earth moves around the sun in an elliptical plane which varies the transit time each day throughout the year by a few minutes and is called "The Equation of Time".

Summing up: To relate the sundial time accurately to watch time we need to do a small calculation. Using the longitude differential of +20 minutes and a figure taken from the "Equation of Time graph" which can vary between +15 to -15 minutes depending on the time of year, we can by combining these two variants finally arrive at a figure that shows watch time is fast by between 5 and 35 minutes from the time indicated by the sun's shadow on the dial. Refer over page for a combined time correction graph.

TOTAL TIME CORRECTION FOR AUCKLAND

this graph combines "the equation of time correction" with the longitude correction factor for Auckland of +20.66 minutes
Latitude 36.8 deg. South - Longitude 174.8 deg. East



TIME CORRECTION

MINUTES TO ADD TO SUNDIAL READING TO RELATE TO WATCH TIME

Example: July 1st = 25.6 minutes

This indicates that when the shadow on the sundial, say, reads 2pm the actual watch time will be approximately 25minutes past 2pm.

During Daylight Saving, Add One Extra Hour