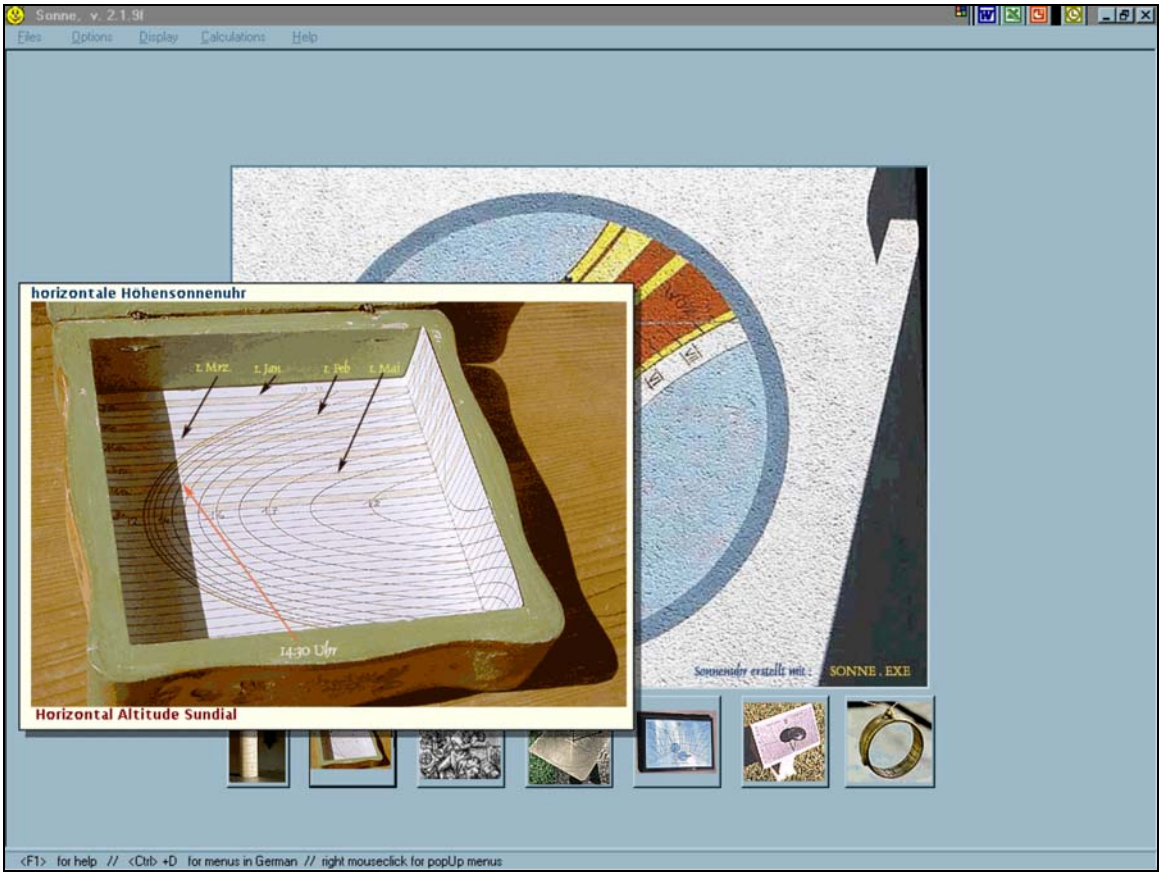

At this point I assume that you have downloaded and set up SONNE on your computer and have also read the overview document. If not please read “Getting Started with SONNE” and “SONNE and Your Sundial”.

These instructions will help you learn how to use SONNE to design a horizontal altitude sundial. Initiate the program SONNE. After entering the required information in the “Location and Reference Year” screen you will go to the “Type of Sundial” screen shown in Figure 1. There is a selection here for a horizontal altitude sundial.

The horizontal altitude sundial is a box sundial where one of the edges acts as the style. The sundial can be extended up the opposite side to include a vertical altitude sundial.

The parameters for the horizontal altitude sundial are entered on a single input sheet. This is shown in Figure 2 and is the “Parameter of Sundials” screen. Here information is entered that is relevant to the design of the sundial. The following describes the various entries and selections that can be made in this screen.

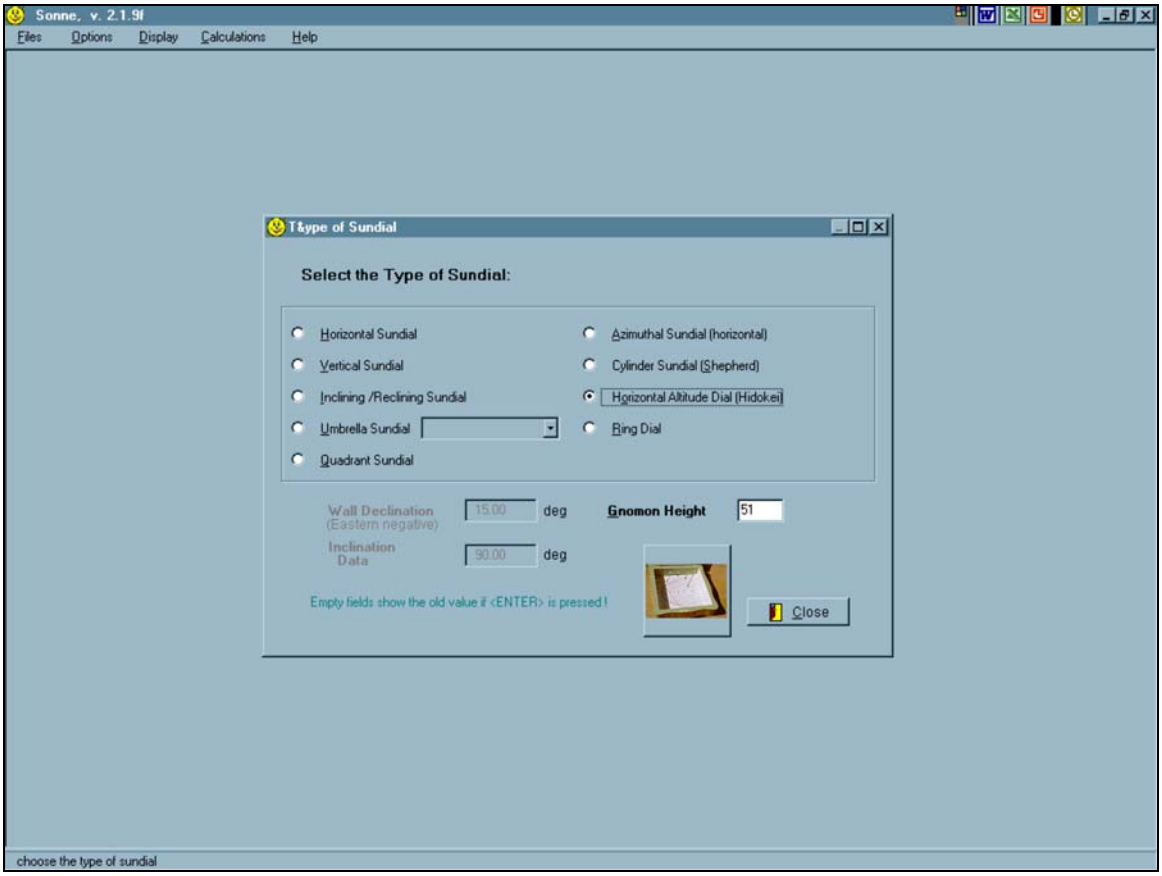

Figure 1: Type of Sundial

Length of Gnomon

The gnomon is one side of the box with the top edge acting as the style. The "Length of Gnomon" is the height of the box in millimetres.

Length of Scale for Months

This is the width of the box in millimetres. The scale of dates is drawn along this side of the box.

Maximum of Shadow Length

This is the length of the box in millimetres. It is the distance from the gnomon to the vertical altitude sundial.

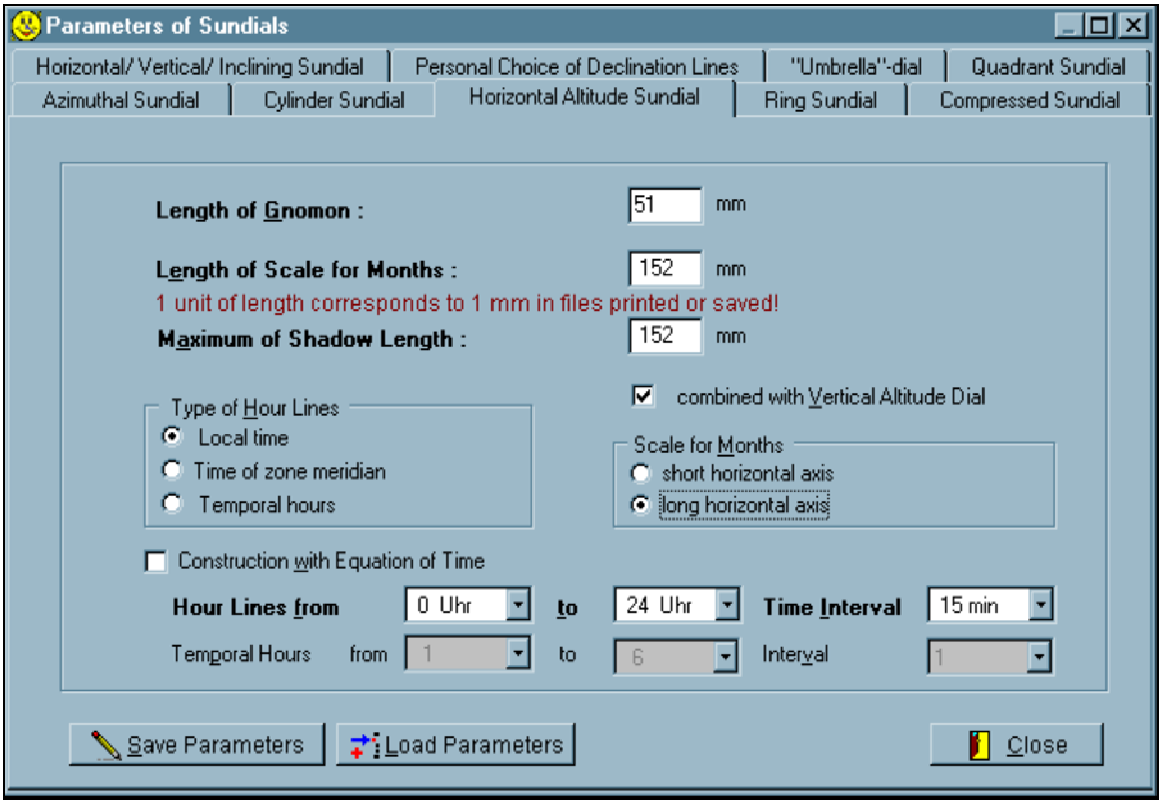

Figure 2: Horizontal Altitude Sundial

combined with Vertical Altitude Scale

If this option is not selected the hour lines end when the “Maximum of Shadow Length” distance is reached. Selecting this option will carry the hour lines up the side of the box opposite the gnomon end creating a vertical altitude sundial. The height of this side of the box is equal to the “Length of Gnomon”.

Type of Hour Lines

Select the type of hour lines that will be shown. “Local time” will display hour lines that show local apparent or sun time. “Time of zone meridian” will display hour lines that show zonal solar time, which is local apparent time corrected for longitude but not the Equation of Time. “Temporal hours are described in the “SONNE Glossary”.

Hour Lines from … to

Select the range of hours the sundial will display using the 24 hour clock; midnight = 0/24 Uhr, 6 a.m. = 6 Uhr, noon = 12 Uhr, 6 p.m. = 18 Uhr. Enter the earliest time in “from’ and the latest in “to”. If the range is entered as “from” 0 Uhr “to” 24 Uhr the program will automatically display only the hours that the sundial is illuminated at a given location.

Time Interval

Select the “Time Interval” between the hour lines; 15, 20, 30 or 60 minutes.

Construction with Equation of Time

Because this particular sundial has a date scale the Equation of Time can be applied to the hour lines. Applying the EoT to a sundial with small “Time Intervals” will result in a busy sundial. Try it and see.

Scale for Months

- **short horizontal axis**

  The sundial design will display only the months from July to December on screen. The printout or saved file contains more information. This selection will work only with designs that are symmetrical about the vertical axis defined by June 21. Do not apply the Equation of Time to this selection.

- **long horizontal axis**

  The sundial design will display all 12 months of the year.

When all the sundial parameters have been entered select the “Save Parameters” button.

HAPPY DIALLING!

Let's work through an example that you can use to design a horizontal altitude sundial for your specific location. This design will be saved as a dxf file and opened in DeltaCad where it will be modified so a sundial can be made from card stock.

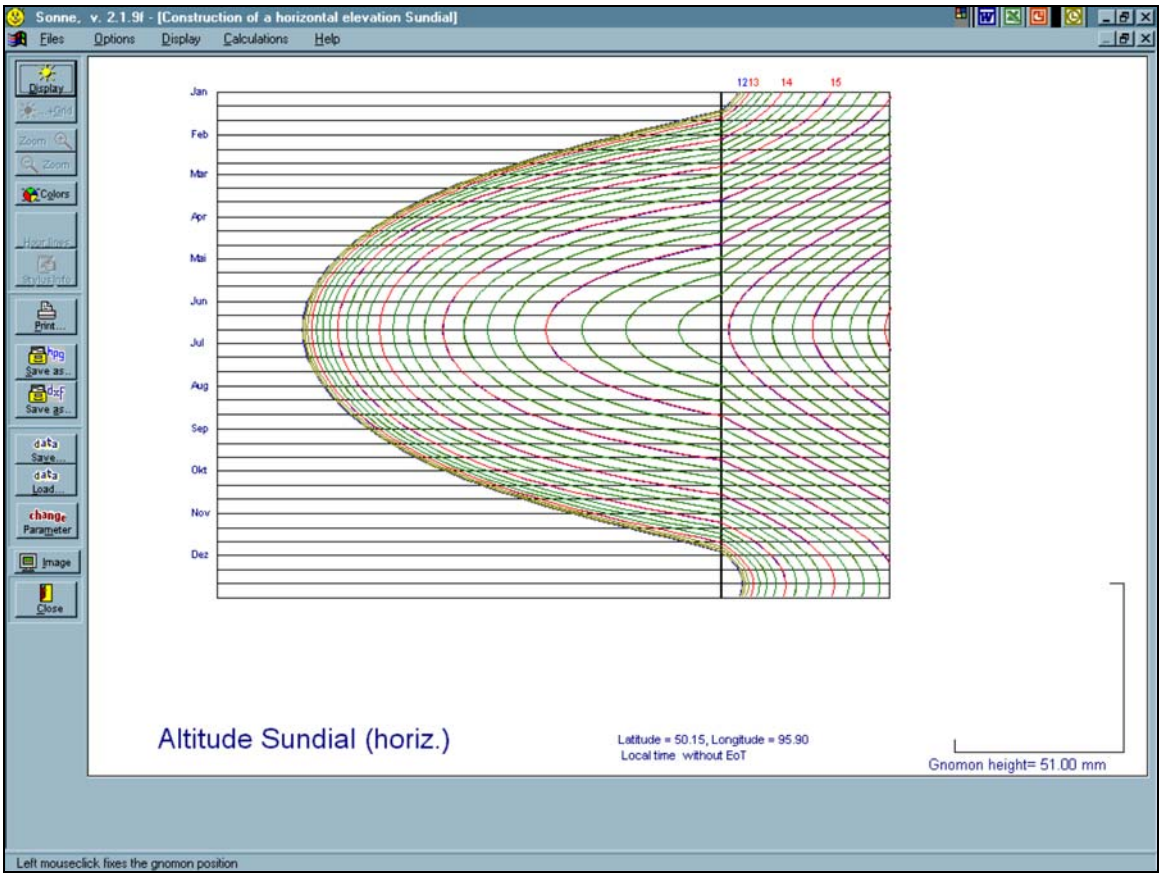

Figure 3: Horizontal Altitude Sundial

This sundial design will be for my location and the following information was entered in the "Location and Reference Year" screen:

- Latitude: 50º 08' 56" North
- Longitude: 95º 53' 26" West
- Time Zone: 90º 00' 00" West
- Selected Year: 2007

In the next screen, "Type of Sundial", the "Horizontal Altitude Dial" was selected as shown in Figure 1. The "Gnomon Height' will be entered in the next screen, "Parameters of Sundials". The sheet for "Horizontal Altitude Sundial" is selected as shown in Figure 2.

The sundial will be designed to fit on a sheet of paper 8.5 inches by 11 inches. As all the entries on this sheet are in millimetres some conversions will have to take place along the way.

Remember that 1 inch is equal to 25.4 millimetres. A 3/8 inch border will be left around the outside of the sheet. This leaves 7.75 inches (197 mm) by 11.25 inches (286 mm) inside the margin. The design of the sundial can be smaller but should not exceed these limits.

The sundial parameters are shown in Figure 2 and are as follows:

- Length of Gnomon: 51 mm (2 inches). This is the height of the box.
- Length of Scale for Months: 152 mm (6 inches). This is the width of the box.
- Maximum of Shadow Length: 152 mm (6 inches). This is the length of the box.
- combined with Vertical Altitude Dial: 51 mm (2 inches). This is the far side of the box.
- Type of Hour Lines: Local Time. The sundial will show local apparent or sun time.
- Hour lines from 0 Uhr to 24 Uhr.
- Time Interval: 15 minutes.
- Scale for Months: long horizontal axis. All 12 months will be displayed.

Note that the total length of the sundial, including the two vertical ends, will be 254 mm (152 + 51 + 51).

The sundial is now ready to be drawn. Select “Display” and then “Drawing the Sundial” or just press “F8”. The sundial design shown in Figure 3 will be automatically displayed. This design can now be printed. If you were making a wooden box it must be built to the dimensions listed above. The printed design is cut out and the horizontal sundial portion glued to the bottom of the box and the vertical portion to one end. The opposite end will be the gnomon.

If you would like to modify the design then you can do it by hand or use a computer aided design or CAD software package. To do this the design must first be saved as a dxf file. To save the design as a dxf file that can be opened in a CAD package select “Save as…dxf”. Follow the instructions. Open the dxf file with your CAD package and have fun!