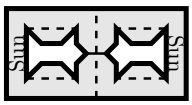
Instructions

Print the first two pages of this document (front and back) on a single piece of letter-sized (8.5 inches by 11 inches) cardstock. Be sure to align the front and back designs as closely as possible.

1 Cutting out pieces

First, cut out the Time Dial and Observer's Horizon as well as the rectangular Base Support. Cut out the outline of the Solar Frame, then carefully cut out its interior.

BEFORE cutting out the small rectangle with two smaller rectangles, cut out the interior regions first. This is the most difficult step.



On the side marked "Sun", fold the interior flaps backward. Later, these flaps will help keep this part from sliding along the Solar Arm by providing friction.

2 Incisions

Make an incision along the thick lines on the Observer's Horizon and Time Dial. For the Horizon Disk, this is from the center to due south. For the Time Dial, this is from the center to the zero or 24-hour position. Next, make three incisions on the Solar Frame along the three thick, dark lines: one from the bottom (near its feet), one below "Time of day ↓", and the other above the 80°N latitude line. Finally, make the two indicated incisions on the Base Support. If printed on cardstock, make the cuts *slightly* wider to accommodate the thickness of the paper.

3 Folds

The different dotted/dashed lines have the following meanings:

- Dotted → valley fold (the printed dotted line is in the inside of the fold)
- Dashed → mountain fold (the printed dashed line is in the outside of the fold)
- Dashed and dotted → fold both ways (it will need to go both ways)

4 Assembly

4.1 Horizon Disk

Temporarily un-fold the center two folds in the Solar Frame (largest piece) and flip it over. Slip the Horizon Disk's incision into the incision in the middle of the Solar Frame such that the support flaps in the middle of the Solar Frame are on top of the Horizon Disk and the degree markings on the Horizon Disk are face-down. Line up the "Attach here" bits on the support flap and Horizon Disk, then affix the support flaps using tape. Rotate the horizon disk so that its "south" incision slides along the "Observer's Latitude" track. It should be loose enough to move easily but tight enough to hold its position when left untouched.

4.2 Sun Slider

Place the folded Sun Slider onto the frame near the solar declination label, such that half of the slider is in front of the Solar Arm and half is behind it. Then, use a small piece of tape to make the Sun Slider into a sleeve around the Solar Arm. (Be careful not to tape the sleeve to the arm!) The slider should be able to slide to different solar declination values. It should be a snug fit: loose enough that your hand can move it, but tight enough that it stays put when you are not touching it.

4.3 Base Support

Slip the incision furthest from the folds on the base support onto the bottom of the frame, near the folds. The folded feet will be arranged in a windmill pattern for support. If done correctly, six of each letter (A, B, C and D) will be grouped together. Strongly recommended: for added stability, you can tape the feet onto the nearby legs.

4.4 Time Dial

Slip the Time Dial onto the neck of the Solar Frame. The slit in the Time Dial should line up with the slit on the Solar Frame pointed to by the "Time of day ↓" indicator, and the printed side should be facing up.

5 How to Use

5.1 Adjust the Viewing Latitude

The latitude of the observer can be adjusted by rotating the Observer's Horizon. The southern edge of the horizon disk will point to the observer's latitude on the "Observer's Latitude" track.

5.2 Adjusting the Time of Year

At different times of the year, Earth's tilt causes the Sun to appear more north or more south of the celestial equator (0° declination). Move the Sun slider to the appropriate declination for the desired date. The solar declination is approximately +23.5° on/near June 20–21, -23.5° on/near December 21, and 0° at either equinox (March 19–20 or September 22–23).

5.3 Adjusting the Time of Day

The Solar Arm (labelled "Solar Declination") acts like a hinge. Its position indicates the rotation of the Earth — or equivalently, the time of day. The Solar Arm has an indicator at the bottom which points to the time of day on the time dial. For example, at 6 AM the Solar Arm will be aligned with E (east) on the horizon disk and 6 on the Time Dial.

5.4 Simulating the Sun's Daily Motion

You can simulate the position of the Sun in the sky by pivoting the Solar Arm from 0 (midnight) to 6 (6 AM) to 12 (noon) to 18 (6 PM) to 24 (midnight). The Sun slider represents the Sun. Sunrise happens when the Sun slider crosses from behind the horizon disk (usually in the eastern sky) in the morning. Sunset happens when the Sun slider crosses from above the horizon disk to below it (usually in the western sky) in the evening. Some people find it helpful to rotate the entire model such that the printed Horizon Disk faces up.