

# Sunshine

Bright sunshine is still measured using the Campbell–Stokes sunshine recorder. However, automatic sunshine sensors have now been introduced at many stations, and this is now the recommended method of measurement.

The Campbell–Stokes recorder is a solid glass sphere mounted on an adjustable stand, which also holds a card in one of three sets of tracks, depending on the time of year.



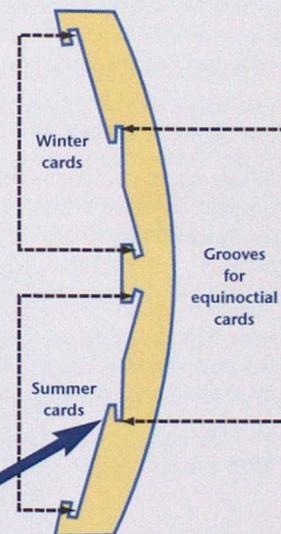
Campbell–Stokes sunshine recorder

Tracks hold the sunshine card in place

Keep sphere clean with a lint-free cloth, but do not polish. Keep free of frost and dew

When changing to a new set of tracks, make sure they are clean

The sphere focuses the sunlight on to a card to burn it. You measure these marks to produce your daily sunshine reading. Three varieties of cards are used for the different sensors, as indicated below.



## Analysing the sunshine card

In bright sunshine the burn can spread across the card as it becomes scorched. These burns have rounded edges and should be analysed only to the point halfway between the centre of curvature and the extreme visible limit of the burn. The small circular burns are usually due to very short periods of sunshine.

- ✓ Include all burns that are elongated and parallel to the edge of the card.
- ✓ Ignore small circular burns that are not elongated, unless there are no other burns, then record 0.1 hour for the whole day against the hour with the most prominent burn. The small circular burns are usually due to very short periods of sunshine.
- ✓ Include tapered burns (that may not have burnt through the card) in the total — these often occur close to sunrise or sunset.
- ✓ Include faint brown scorches due to haze, mist, thin high cloud or when the sun is low in the sky.

## Compiling the daily sunshine total

Line up reverse edge of same type of card with burns.

The diagrams illustrate the process of measuring the total duration of burns on a sunshine card using an Equinoctial Card. Each diagram shows a portion of the Equinoctial Card (with a timescale from 6 to 12) and a sunshine card with a burn. A blue arrow indicates the measurement of the burn's duration against the timescale.

**Diagram 1:** Shows the first burn marked off, then the second burn is marked off. The total duration is measured as 4.8 hours.

**Diagram 2:** Shows the second burn marked off, then all burns are marked off. The total duration is measured as 4.8 hours.

**Diagram 3:** Shows the accumulated total duration measured against the timescale, which is 4.8 hours in this example.

Equinoctial Card  
Met Office Metform 6732A For use between 1st MAR & 11th  
Date/TIME OFF...../.....UTC Station.....  
Duration SUNRISE to TIME OFF.....hrs Month/Year.....  
ISBN 0 86180 337 X Astron J142

## Completing the card

Record the sunshine total against the actual date it occurred, from sunrise to sunset. If the card can be taken off at sunset each day, this procedure is simple, but most cards are changed daily at 0900 UTC, so the sunshine has to be totalled from two cards.

Mark each card with two dates — the date the card was put on and the date when it was taken off — including the times, usually 0900 UTC. This should be done after the card has been exposed — a burn through the card can destroy the information. Please also put the station name on each card.

After the card has been analysed, write the two sunshine totals on it, split into values for each of the two dates now on the card. The sunshine for a particular date is then the sum of the two values marked against that date on two cards.

The cards should be retained for collection at the next routine inspection.

## Automated instruments

Sunshine can be measured with automatic equipment. The Kipp and Zonen sunshine sensor is now used in preference to the Campbell–Stokes method. It registers 'bright sunshine' and must be kept clean with a damp, lint-free cloth (with anti-static foam cleaner).

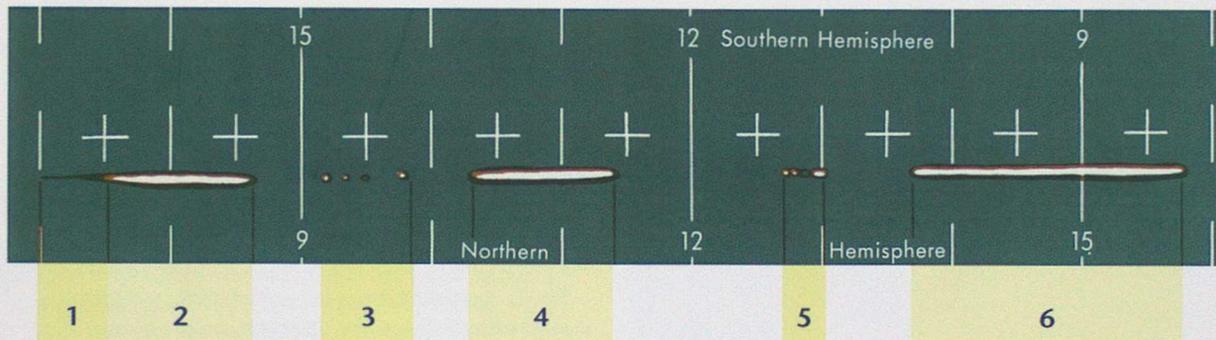
Make sure you clean the sensor regularly, even if it looks clean, as the measurements can be affected by particles that are too small to be seen by eye. Pay special attention to removing water drops after rainfall.

Try to do the cleaning before sunrise if possible. Remove frost using cold tap water, not de-icer.



*Kipp and Zonen  
automated sunshine  
recorder*

## Example of different types of burns seen on sunshine cards



1. Faint brown trace, often seen after sunrise/before sunset (measurement taken from extreme end of the brown trace)
2. Bright sunshine that burns completely through the card (measurement taken to a point about halfway between centre of curvature and extreme visible limit of burn)
3. Small circular burns (not measured even if the card is completely burnt through)
4. Continuous bright sunshine producing rounded ends (allowance is made for spread of burn by measuring between points about halfway between centre of curvature and the extreme visible limits of the burns)
5. Small circular burns plus elongated burn joined together, thus no uncharred blue card visible between them (measured in same way as continuous burns)
6. Same as 4