

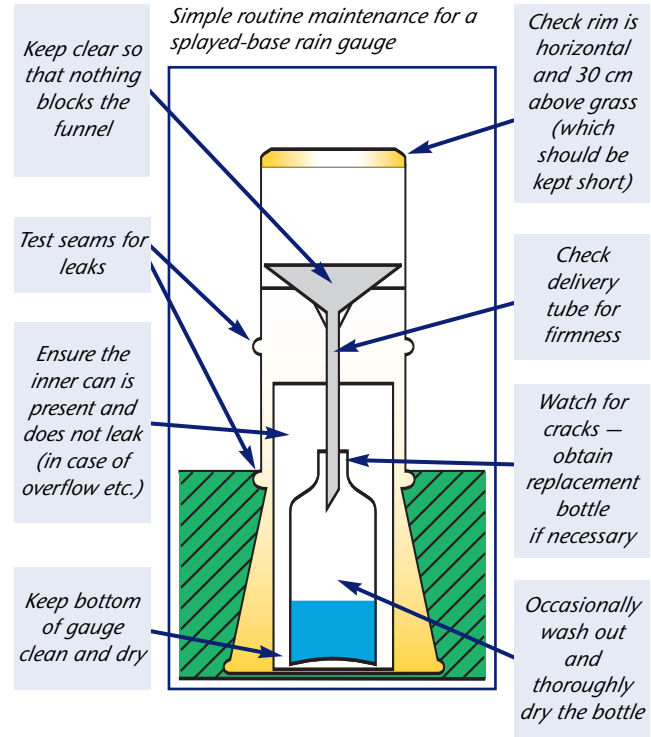
Precipitation

Version 3 September 2006

Precipitation is ‘any liquid or solid aqueous deposit from the atmosphere’. This includes rain, drizzle, snow, ice, hail, diamond dust, snow grains, snow pellets, ice pellets, rime, glaze, frost and dew, and any deposit from fog. The term ‘rain’ instead of ‘precipitation’ will be used here for simplicity.

There are generally two types of rain gauge – the automatic, which makes a record of the time a known sized container is filled and emptied – and the storage, which collects and stores the rain for later measurement. The copper splayed-base and Snowdon are examples of storage gauges, though increasing use is also being made of stainless steel. The notes below concern mainly storage gauges.

- ✔ Make sure the amount of rain collected is not increased by condensation, splash-in, or flooding, and is not decreased by evaporation, leaks or splash-out.
- ✔ Occasionally test the funnel for leaks by placing thumb over the tube end and pouring water into the funnel. Or trap air in the funnel with your thumb while lowering it upside down into a bucket of water – air will escape through any leaks. If necessary, request a replacement.



Measurements from storage gauges

- ✔ All measurements should be made as close as possible to 10 a.m. during British Summer Time or 9 a.m. for the rest of the year, unless you have an alternative arrangement, or you are unable to make the measurement for some reason.
- ✔ Always note the date and time of your reading. If your reading is not at your usual time, make a note of why not.
- ✔ If you provide values weekly instead of daily, make sure you do them on the same day each week and on the 1st of each month.
- ✔ Monthly gauge readings should be done on the 1st of each month.
- ✔ Make sure you use the measure that is appropriate for your size of rain gauge — commonly a tapered 10 mm measure for daily-read gauges, or flat-base 50 mm measure for Octapents or large Bradfords.

Manually-read gauges



Daily read



Daily read



Monthly read



Monthly read

To measure liquid precipitation

- Carefully lift the funnel out of the base of the rain gauge.
- Lift out the collection bottle.
- Carefully pour the water into the rain measure.
If there is too much for the measure, pour in less than a full measure each time, write down each value, then add them all up to get the total.
- Then empty each amount into a spare container to repeat the process to check the total.
- Carefully replace the empty bottle and put the funnel back into it.
- ✔ For accuracy, read the measure with the water surface at your eye level and the measure vertical, held between thumb and first finger.
- ✔ You can check the measure is vertical by making sure that the scales on both sides of the measure are lined up as you look through the glass.

- ✔ Take the reading from the lowest part of the water surface, which rises when it meets the sides of the measure (the meniscus).

See which line on the scale is closest to the meniscus – this may be above or below the meniscus.

- ✔ Record your measurement in millimetres (mm) to one decimal place, e.g. 0.6, 1.3, 24.0 (taking extra care if you are adding up several amounts to get the total).

If you don't hold the measure so that the water level is horizontal, you may be making a very small error on a regular basis.

Each error may be very small but, when they are added together over a whole year, they could make a total error of several millimetres for the annual rainfall at your site.

If a block of wood, or part brick, is placed inside the base of a splayed base and the inner can placed on top, it is easier to remove the bottle and guards against chipping.

Nowadays, approved plastic bottles can be used.



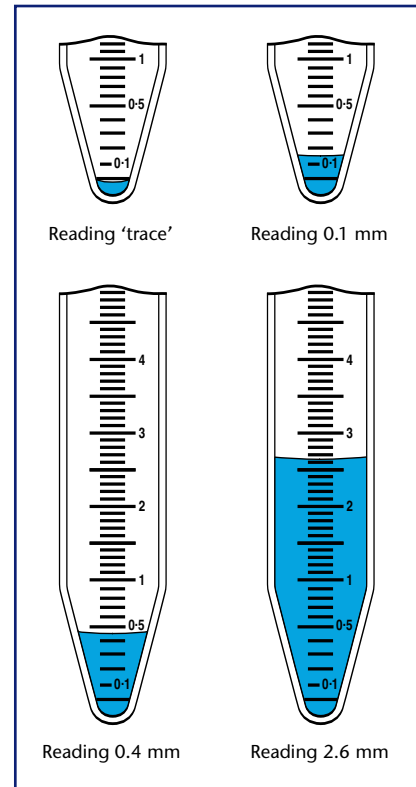
Observer reading the rain measure

Measuring a trace

There is a continuous ring below the 0.1 mm mark on the rain measure. This shows the limit of a trace.

- ✔ If the rain amount is exactly on or above that mark, your reading should be 0.1 mm.
- ✔ Record a trace when the amount is below that mark (and you are sure this is from precipitation since your last measurement).
- ✔ Also, record a trace if there have been a few spots of rain, drizzle, etc. since your last reading but the bottle is dry.
- ✔ If you know the weather has been dry since your last reading, do not record droplets left over from your previous measurement as a trace.

Take care to consider if there has been dew or frost, and make a note if there was.



Heavy rain

To get more information about heavy rain in short periods, you can measure the rainfall as soon as it stops.

- ✔ Put the rain back into the bottle so that the next reading is not affected.
- ✔ Note the start/stop times of the rain. If it is raining heavily through the day, check that the gauge won't overflow by taking a reading and discarding the water.
- ✔ Remember to add the amount to the next routine measurement.

Measuring liquid equivalent of solid precipitation

- ✔ Always try to note the type of precipitation — whether it is snow, ice pellets, hail, etc.

Slight falls

If precipitation is not falling, take the funnel and collecting bottle indoors to melt the snow.

- ✔ Keep the funnel covered while the snow is melting to prevent evaporation.

If snow is falling, you can either:

- pour in a measured amount of warm water (but not hot, as it may crack the bottle) to melt the snow. Measure the total then subtract the amount of warm water you poured in;
- or wrap a cloth dipped in hot water around the bottle and funnel to melt the snow and then measure it in the usual way. Make sure water from the cloth does not get into the bottle or freeze the cloth to the funnel.

Moderate or heavy falls

Measurement can be complicated because wind eddies may carry snow over or blow it out of the gauge, or even lift lying snow and blow it into the gauge. Sometimes the gauge may be completely buried in snow. However, your readings are very important, particularly for assessing the risk of flooding if the snow thaws quickly.

- (a) If there was no snow lying when you made your previous reading, take a sample of the (level, undrifted) snow by pressing the inverted funnel of the gauge downwards through the snow.

Take this sample indoors to melt it and measure the water.

- ✔ It is a good idea to make three readings like this, as it is often difficult to find a representative sample of snow. Take each sample about a metre apart and report the average of these three samples.
- (b) If snow was lying when you made your previous reading, you need to be able to measure the fresh snow that has fallen since. You can do this by placing a board onto and flush with the old snow. Sweep the board clean after measuring the snow on it, by taking a funnel sample as in (a), and then replace the board, ready for later measurements. You may wish to mark the place of the board with a thin cane so you can find it under new snow.
- ✔ If the gauge becomes covered with snow, make a measurement as soon as you can and clear the gauge to continue collecting. Add this measurement to your next routine reading.

Solid and liquid precipitation between readings

Extra care is needed if a mixture of rain and snow has fallen. If it is a slight fall of snow, follow the guidelines for slight falls.

- ✔ If the fall is moderate or heavy, then follow the guidelines for moderate or heavy falls. Don't forget any liquid precipitation in the bottle and make a note of the amount from melting, if possible.
- ✔ Do not throw away snow or hail in the funnel when you make a measurement — melt it and add it to the bottle to be measured in the usual way.

If measurement is not possible, leave the snow in the funnel to melt in its own time, but please note this on the relevant form (Rainfall data or 3208b) along with the reason, such as the examples below.

- snow filling funnel — no more snow can enter
- snow being blown out of funnel, even if not full
- drifting or blowing snow being deposited in funnel
- gauge covered by snow due to heavy falls or drifting

Measuring the depth of frozen precipitation

This includes snow, hail and ice pellets.

- ✓ If, at the time of your observation, the ground representative of the station is covered by snow or other solid precipitation, then the depth should be measured and reported.
- ✓ Measure the depth in centimetres using a ruler held vertically in a location free from drifting or scouring by wind.
- ✓ Choose a location as near as possible to the rain gauge. Ideally, take three measurements at different places and report the average of these.

You must ensure that the ruler is either adapted to read zero at ground level or you take account of the length of the short gap between the end of the ruler and the zero mark, when you make your measurement.

- ✓ Make sure your ruler does not pierce the grass or other ground surface beneath the frozen precipitation, as this will give a false reading.

Entering readings onto the rainfall data form (See page 11)

Before despatch, check that the postcard includes official station name, time of observation, month and year. Daily measurements should be taken at the same time each morning. Such standard procedures enhance the value of your records. Rainfall amounts are always in millimetres and tenths.

Always ensure that the recorded rainfall is entered on the form for the previous day. So the rainfall total measured at 9 a.m. on Monday is recorded in Sunday's box. This is because most of the 24 hours up to 9 a.m. on Monday are actually from Sunday. Throw back your reading even if you know that, for example, that all Sunday was dry and the rain you measured on Monday morning had all fallen that day.

You should have at least one deputy to record the rainfall when you are away or ill. Try to recruit additional readers, to cover when you are absent, but if you do miss some days' readings, group the dates it applies to

with a bracket. See page 11 for an example of missed readings on the 11th, 12th and 13th.

If cross-month accumulations do occur ensure that the reading is entered both:

- at the bottom of the card for the first month where 'if the gauge was not read on 1st of next month etc';
- **and** on the card for next month when the readings started again;

always enter readings to one decimal place, for example: 0.7, 1.6, 32.0, etc.

When you know there was no rainfall at all, the **ONLY** acceptable entry on the card is a short dash. If you have been using anything else, please change.

If you are unsure about any figure, put a '?' beside it and add a note explaining why you are unsure.

If your reading is from melted precipitation, put an 's' beside your entry on the form.

When recording a trace, show what caused it by entering
tr for rain tr(fe) for fog
tr(x) for frost tr(w) for dew.

Make a note if the gauge is flooded or buried in snow.

You are encouraged to make entries of any significant weather, on the raincard. Comments should be mainly precipitation related but should also include non-standard time of reading the gauge, confirmation of high readings, note of damage to the gauge, and any vandalism or suspect readings. Precipitation comments should cover type, intensity and timing, if possible.

Examples	
Type	drizzle, rain, showers, sleet, snow etc
Intensity	light, moderate, heavy
Timing	mid-afternoon to early evening, 0930-1510, 1408-1410 etc
Additional	dry at site but showers in area, blizzards/floods in area etc

Enter weekly or variable readings in the same way as described on page 11, with a bracket to group the days for which your reading applies – remember to enter in the correct box and note the time of reading in the remarks column.

For monthly only readings, enter the monthly total in the TOTAL column – there is no need to use brackets. The monthly rainfall is that read on the 1st and entered for the previous month as described.

Daily data

METFORM 7137 RAINFALL DATA

STN. name: **LITTLE BOTTLINGTON** MET OFFICE R. Stn. No. **157963**

Observer's name and address: **JAN** Month: **JAN** Year: **1997**

Enter amount measured at 9h UTC against WESTERON'S date

Date	mm	FOR MET USE ONLY	Enter time of measurement if not done to 9h UTC and notes on significant weather
1	2 * 6		Rain until midday.
2	7 * 5		Showers; drizzle; mists of times.
3	tr *		One slight shower midday.
4	- *		
5	- *		
6	- *		
7	7 * 5		Rain between midday and 8:00 PM
8	47 * 3		Cont. heavy rain - most of day & night.
9	12 * 7		Squally showers by day; clear evening.
10			Showers of drizzle; heavy in afternoon.
11	*		
12	*		
13	20 * 3		Dry day.
14	- *		
15	- *		
16	tr *		Clear morning.
17	0 * 2		Drizzle overnight; showers midday.
18	7 * 6		Showers morning and afternoon.
19	10 * 6		Continuous rain; from 6 PM.
20	0 * 1		Slight rain until 10 AM.
21	tr *		Very light showers in afternoon.
22	tr *		Showers of light snow in morning.
23	*		Referred to be dry all day.
24	5 * 3		Sleet in evening; turning to snow.
25	41 * 5		Cont. sleet; some 30 cm deep at midday.
26	7 * 6		Snow; sleet until midday; 66 cm.
27	- *		Snow; sleet until midday; 46 cm.
28	- *		Thaw setting in; Snow 13 cm at 9 AM.
29	tr *		Drizzle from 6 PM; Snow clearing.
30	tr *		Drizzle at times.
31	0 * 2		(Rain every hours of the 24h)
TOTAL	171 * 0		

Observer's name and address

Changes of equipment or its location during this month

RULES FOR RAINFALL OBSERVERS gives details of observing procedures.

Weekly data

METFORM 7137 RAINFALL DATA

STN. name: **LITTLE BOTTLINGTON** MET OFFICE R. Stn. No. **157963**

Observer's name and address: **JAN** Month: **JAN** Year: **1997**

Enter amount measured at 9h UTC against WESTERON'S date

Date	mm	FOR MET USE ONLY	Enter time of measurement if not done to 9h UTC and notes on significant weather
1	2 * 6		Rain until midday.
2	7 * 5		Showers; drizzle; mists of times.
3	tr *		One slight shower midday.
4	- *		
5	- *		
6	- *		
7	7 * 5		Rain between midday and 8:00 PM
8	47 * 3		Cont. heavy rain - most of day & night.
9	12 * 7		Squally showers by day; clear evening.
10			Showers of drizzle; heavy in afternoon.
11	*		
12	*		
13	20 * 3		Dry day.
14	- *		
15	- *		
16	tr *		Clear morning.
17	0 * 2		Drizzle overnight; showers midday.
18	7 * 6		Showers morning and afternoon.
19	10 * 6		Continuous rain; from 6 PM.
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21	tr *		Very light showers in afternoon.
22	tr *		Showers of light snow in morning.
23	*		Referred to be dry all day.
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26	7 * 6		Snow; sleet until midday; 66 cm.
27	- *		Snow; sleet until midday; 46 cm.
28	- *		Thaw setting in; Snow 13 cm at 9 AM.
29	tr *		Drizzle from 6 PM; Snow clearing.
30	tr *		Drizzle at times.
31	0 * 2		(Rain every hours of the 24h)
TOTAL	171 * 0		

Observer's name and address

Changes of equipment or its location during this month

RULES FOR RAINFALL OBSERVERS gives details of observing procedures.

Monthly data

METFORM 7137 RAINFALL DATA

STN. name: **LITTLE BOTTLINGTON** MET OFFICE R. Stn. No. **157963**

Observer's name and address: **JAN** Month: **JAN** Year: **1997**

Enter amount measured at 9h UTC against WESTERON'S date

Date	mm	FOR MET USE ONLY	Enter time of measurement if not done to 9h UTC and notes on significant weather
1	2 * 6		Rain until midday.
2	7 * 5		Showers; drizzle; mists of times.
3	tr *		One slight shower midday.
4	- *		
5	- *		
6	- *		
7	7 * 5		Rain between midday and 8:00 PM
8	47 * 3		Cont. heavy rain - most of day & night.
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11	*		
12	*		
13	20 * 3		Dry day.
14	- *		
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16	tr *		Clear morning.
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26	7 * 6		Snow; sleet until midday; 66 cm.
27	- *		Snow; sleet until midday; 46 cm.
28	- *		Thaw setting in; Snow 13 cm at 9 AM.
29	tr *		Drizzle from 6 PM; Snow clearing.
30	tr *		Drizzle at times.
31	0 * 2		(Rain every hours of the 24h)
TOTAL	205 * 7		

Observer's name and address

Changes of equipment or its location during this month

RULES FOR RAINFALL OBSERVERS gives details of observing procedures.

Automatic gauges

Increasingly, sites are being equipped with automatic gauges due to the need for data from remote areas or the lack of persons able to make daily readings. Rainfall is monitored by counting the number of tips of a bucket of known capacity.

The data can be stored at the site for collection by field staff or remotely polled by telephone line. In most cases the automatic gauge will have a manual one alongside to act as a check.

Whilst automatic, they still need monitoring and servicing to keep them operating correctly. Great care must be taken to ensure that such gauges are not blocked by debris, and over-shelter by trees etc should be avoided.

In England and Wales these gauges are largely supplied and maintained by the various regional Environment Agency (EA) offices.

In Scotland they are provided by a mix of Scottish Hydro Electric, Scottish Water and the Scottish Environment Protection Agency (SEPA). Data from all registered automatic sites is combined with that from Met Office sites and the voluntary climate network at Quality Control, Edinburgh, where it is checked and archived.



Some of the automatic gauges currently in use across the UK

SPOT-ON Observers Guide: Precipitation v3 9/06

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