Environdata
Rain Gauge Handbook

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Rainfall Sensor

Mechanism of Action

The RG12 Series of rain gauges collect the rain in a standard 203 mm diameter funnel. The collected rain passes through a syphon and then collects in one of a pair of buckets arranged at each end of a tipping mechanism. When a precise volume of rain has fallen, the mechanism tips, emptying the full bucket and moving the empty bucket under the spout so that this bucket now fills.

The process then repeats, tipping the mechanism backwards and forwards, with each tip being a measured quantity of rain (0.2mm per tip).

The weather station logger, or your PLC, counts the number of tips and converts this to a rainfall measurement. A gauze strainer in both the funnel and the wire mesh outlets prevents debris and insects from entering the working parts of the instrument.

Siting the Rain Gauge

There should be clear ground for 2-3 metres around the rain gauge, and the gauge should be clear of any reasonable shadow or shading effects that could impede the fall of rainfall in calm or windy conditions. The rain gauge should be mounted so the rim of the collection funnel is horizontal.

The RG12 series has an optional mounting post, designed to place the top of the rim at either 1000mm above ground level, to meet BOM recommendations, or 2m in dense vegetation.

Mounting the RG12 above vegetation growth levels ensures accurate measurements for long periods of time with no impact from vegetation, which is particularly important in remote siting applications.

The integrated level adjustment bolts and bull's-eye level ensure the RG12 is horizontal for maximum accuracy.

An alternative is to use a concrete paving stone or poured concrete pad, with appropriate bolts and nuts (not provided) set in place to level the gauge accurately using the 'bulls-eye' level.

Check that the measured water can escape freely from the bottom of the gauge. In areas where heavy rainfall or flash flooding may occur, it is advisable to raise the base of the rain gauge above the surrounding surface.

RG12 Model Range:

RG12U Reed Contact Model

The RG12U is supplied with a single Reed contact as a detector, with your input device required to provide pulse stretching and debouncing. This is a simple two wire connection. A series resistor provides protection against excessive currents.

RG12H Hall Effect Model

The RG12H models are supplied with an electronic (Hall Effect) detector, to provide an extremely robust sensor with much greater level of reliability over the old style reed switch models. With no moving parts the sensor mechanism life is indefinite.

The RG12H provides a very clean signal; a single 5V pulse 250ms in duration, square wave. This is Environdata's standard sensor for use with our systems.

RGC12 Rain Gauge Converter

The RGC12 universal Rain Gauge Converter provides a unique and reliable way to connect the RG12H to almost any PLC. User selectable outputs mean you can have sinking or sourcing, system voltage pulses, low going high, high going low, or two Voltage Free Contact out connections. Please refer to the RGC12 handbook for more information.

Specifications:

Mechanism:

- Tipping Bucket

Measurement Units:

- Millimetres (mm)

Operating Range:

- Up to 450 mm/hr

Accuracy:

- ±2% at low rainfall rates.
- ± 5% at rainfall rates above 300 mm/hr.

Resolution:

- **0.2mm** per tip.

Reliability:

Typically a minimum of five (5) years' operation before factory re-calibration is recommended.

Housing:

Stainless steel barrel and chassis, powder coated aluminium base and funnel.

Dimensions:

- Funnel Diameter: 203mm
- Height: 315mm
- Base Diameter: 250mm

Supply Voltage:

- 6 to 24 Volts DC Nominal

Ordering Information:

- RG12U for Reed Contact model
- RG12H for Hall Effect 5V 250ms Pulse

Routine Maintenance:

The filter in the funnel MUST be cleaned regularly. Depending on your site this interval could be monthly, bi-monthly, or every 6 months. This interval is determined almost exclusively by the dust, pollution, and bird contamination at your site.

Environdata recommends a monthly maintenance schedule is first implemented, where the collection funnel is cleaned if required. If your site requires less frequent cleaning then your timetables should be adjusted after sufficient experience to support that decision.

If you find a frequent accumulation of bird 'dirt' you should consider the addition of bird spike protection rings (BS30) to prevent birds landing on the rim of the gauge.

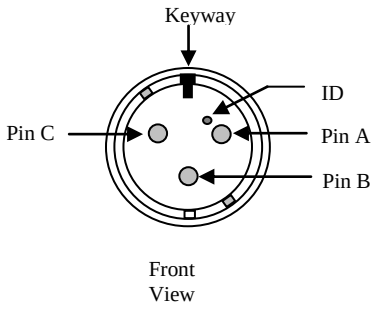
Internally, the unit is largely self-cleaning as very fine material should pass through with the measured rainfall. Occasionally - dependant upon the nature of the dusts/pollutants at your site - an accumulation may build up inside the unit.

This should be cleaned manually by removing the barrel and cleaning the tipping bucket internally, cleaning the syphon which can be unscrewed by removing the securing nut from underneath the mechanism, and also cleaning the exit filter, if needed.

Environdata recommends an internal clean of the RG12 every 12 months if not done sooner on an as needs basis.

Electrical Connection

RG12U: A two wire connection that includes only a series 470 ohm resistor as contact protection. There are only two wires. A connector is NOT supplied.



RG12H: A three wire connection that provides a very robust and reliable signal from the Hall Effect sensing mechanism. The signal is a 5V Pulse 250ms in duration. An LED is provided to indicate when the mechanism tips.
Pin A is positive (red wire) – 6 to 24 VDC
Pin B is signal (blue wire)
Pin C is ground (green wire)

ISRG TBRG Post Installation

Step 1. Dig a small hole approximately 450x450x450mm

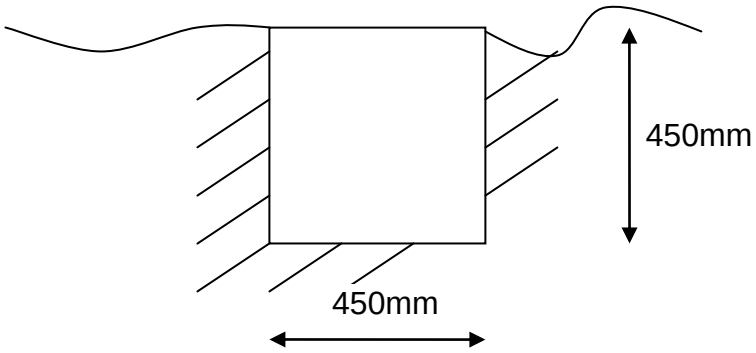
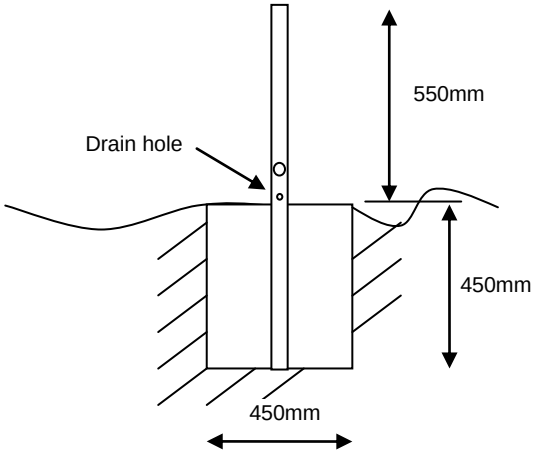
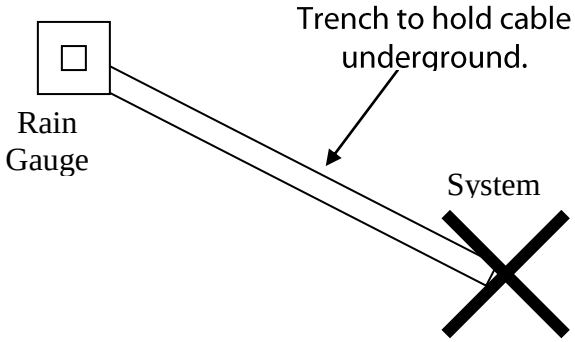


Fig2.

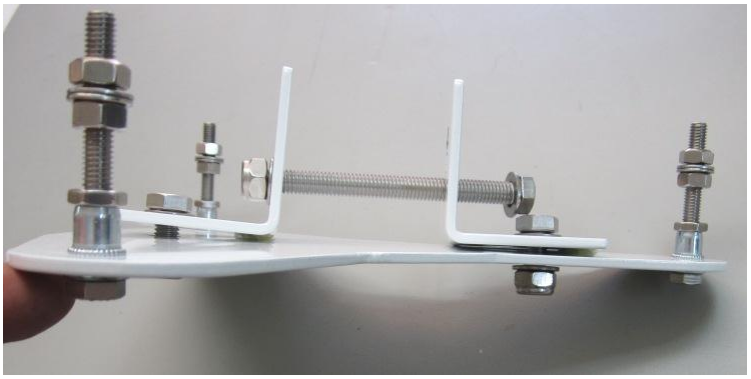
Step 2. Fit the post into position and concrete in place. Note the small drain hole must be set so it sits above ground level.



Step 3. Dig a small trench (about 200mm deep) to hold Rain Gauge cable and conduit underground.

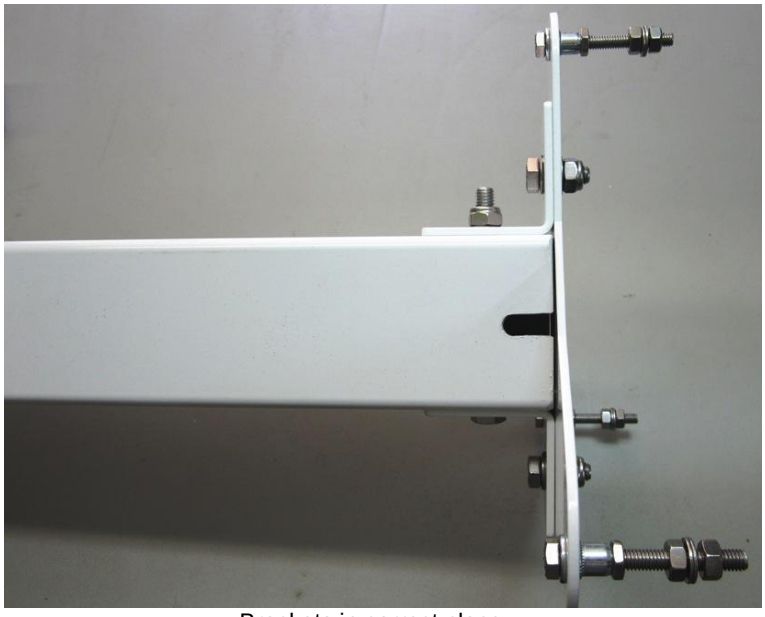


Step 4.
Rain Gauge Brackets are supplied, fitted upside down for ease of packing.



Assembly as packaged

Remove the two right angle brackets and fit on the other side.



Brackets in correct place.

Step 5.
Route the cable through the slot at the top of the post and down and out the cable post. In high humidity environments or where previous connector corrosion has been evident, liberal application of water dispersing gel on the cable connections is recommended.

Step 6.
Fit the rain Gauge to the Top Plate and adjust 3 x sets of 2 nuts until the bulls-eye level is set correctly. Once set, tighten the 3 sets of two nuts.

Appendix A: Rain Gauge Field Calibration Check:

It must be noted that like all weather sensors, the RG12 is a precision scientific instrument which can be checked for calibration accuracy in the field, however must be returned to the factory for recalibration if found to be out of calibration limits.

Background:

To check the calibration of the Rain Gauge, every millimetre of rainfall corresponds to thirty-two (32) millilitres of water passing through the mechanism. I.E. a 0.2 millimetre tipping mechanism should tip exactly 5 times for every 32 millilitres of water.

Please note that the syphon mechanism in the funnel can retain around 5 millilitres of water, hence it is important to 'prime' the syphon before conducting the test.

Also note that a suitable test rate of 100 millimetres per hour would require you to pour in the 32 millilitres steadily over 40 seconds.

Step 1: Clean & Level

You must ensure the Funnel, Syphon and Bucket mechanism are clean, and the bucket is free from residual water. Even a small amount of dirt build up in the tipping bucket can affect the balance. *See Appendix B for cleaning Instructions*

You must ensure the top of the gauge is perfectly horizontal

Step 2: Bucket operation unimpeded

You must ensure the bucket 'stops' are free from wear or residue, and the bearings are free to allow smooth tipping action.

Step 3: Prime the Syphon

With the funnel & Barrel assembly removed and placed on a level surface pour 10ml of clean water into the funnel and allow it to move through the syphon mechanism. Carefully place the barrel and funnel back onto the base.

Step 4: Measure and Pour

Measure 96ml of clean water into a suitable container. Steadily pour this into the funnel over 2 minutes (to simulate 100mm per hour of rainfall) and record the tips. You should arrive at 15 tips, with an allowable error of +/- 1 tip.

Step 5: Repeat

To confirm the calibration check you can repeat the test several times, with no need to prime the syphon in-between. Take note of the results. For results outside of the expected range, contact Environdata for advice.

APPENDIX B: Troubleshooting

Background

Incorrect data readings from the RG12 series of sensors are generally caused by incorrect interface connection set-up or a faulty sensor.

The RG12U is the only model that uses a Reed Switch and therefore will need regular field calibration checks to ensure no intermittent failures are occurring.

The RG12H, use the extremely robust and reliable Hall Effect sensing, which have no moving parts in the sensing circuits and do not wear out.

The first basic checks to make are the cable, the connector, and the sensor physical operation.

Cable

Ensure that all cables associated with the sensor in question are clear of punctures, cuts, or deep abrasions. Also check for breaks in the cable.

Use your sensor test box to confirm sensor operation independent of the recording device.

As the RG12 series has both a short fly lead then an extension cable, you need to check first at the furthest end of the extension cable and then at the fly lead if you have no signal from the extension cable. This will confirm if it is the sensor or the extension cable.

Sensor Connector

Examine the connector plug and check that all of the gold plated contacts with slightly recessed openings are present. Ensure that the contacts are clean and clear of contaminants.

Also check for physical damage to the connector which may result in internal breakage of the cable. (This is unlikely but still possible)

In high humidity environments or where previous connector corrosion has been evident, liberal application of water dispersing gel is recommended.

Sensor Funnel

Check the sensor for build-up of dust, dirt and debris in the sensor funnel. Pour water in the top of the gauge to determine if water is passing through the sensor freely. If water flow is restricted clean the sensor thoroughly (including syphon). Check for obvious signs of damage which may result in impaired operation of the sensor.

Sensor PCB

RG12H models all feature an indicator LED which flashes for each tip. With correct connections to your PLC, the RGC12 converter or to the Sensor Test Box, the flash will be visible as the bucket tips. (Note: the LED indicator is inside the unit on the Hall Effect sensing circuit.)

Environdata Support

Please call Environdata if you need any assistance in the operation, maintenance or fault finding with this sensor. We operate both on-site servicing and a service and repair facility in our QLD factory, with technicians available for troubleshooting and advise when needed.

APPENDIX C: Cleaning Procedure

Supplied in the cleaning kit:

1. Wire rod
2. Pipe Cleaner
3. White Filter Wadding
4. Syringe
5. 3 of M3 x 10mm screws

Items required to clean & service RG:

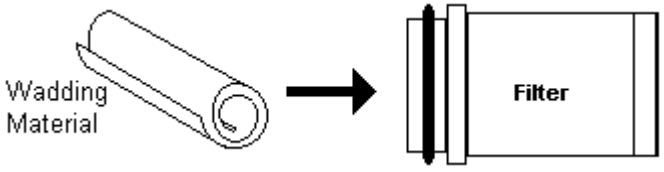
1. RG12 Cleaning Kit
2. Container of warm water (Minimum 1L)
    a. (mild detergent may be used but all residue must be washed off with clean water)
3. Empty container (Approx 1L)
4. Scrubbing brush / clean rags

Recommended Frequency:

- It is recommended that the following cleaning procedure be done as often as required.
- Your site may require cleaning of the RG monthly, every 2, 3, 6 or 12 months.
- **We recommend you begin with a monthly cleaning schedule**. If the RG shows no sign of requiring cleaning extend the interval slowly until you find an interval that suits your site.
    - Please note; if the RG is getting very dirty or blocked, then your cleaning interval is too long.
    - In best case situations, the maximum interval between cleaning is 12 months.

Recommended Method:

1. Download all data & disconnect the Rain Gauge from your recording system.
2. Remove the 3 screws holding the barrel in place. Carefully lift the barrel off the RG base.
3. Remove the filter from the funnel and wash the funnel until **completely clean** of all dirt, dust and debris. Remove the old filter wadding, clean the filter, rinse and dry.
4. Unscrew the top section of the brass siphon and remove the top cap.
    a. Use the wire rod, push it up inside the syphon so as to dislodge any dirt or mould. Now repeat using the pipe cleaner.
    b. Once all dirt has been dislodged back flush with the syringe
5. Pour clean water through the funnel to wash away any remaining residue.
6. Roll the supplied white wadding material up and insert this into the inside of the filter. This will not restrict the flow of water but will stop small particles entering the unit.



    a. The old filter material may be re-used if still in good clean condition, but must be replaced at least every 12 months
7. Screw the brass siphon top back into place, put cleaned filter back in place.
8. Clean the tipping buckets carefully, rinse with damp cloth and dry with dry cloth.
9. Replace the barrel. Use the supplied screws if required.
10. Perform field calibration check and note the results.