

Installation Guide

RS-100 Rainfall Sensor for XR440 and XR5 Data Loggers



PLEASE NOTE!

This product has been replaced with the [RS-110 Rainfall Sensor](#)

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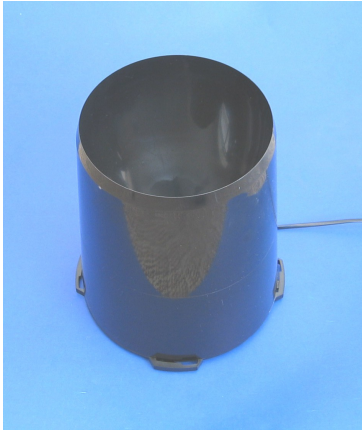
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RS-100 Rainfall Sensor



- Self-emptying tipping-bucket design
- High accuracy
- No external power required
- Forty foot (12 meter) cable
- User-configurable for 0.01" or 0.2mm rainfall increments

Description

The RS-100 is designed for years of accurate and trouble-free service. Its body and base are constructed of tough, UV resistant plastic. Tipping buckets pivot on bearings, minimizing friction and wear. Stainless steel adjustment screws under each tipping bucket allow fine-tuning the sensor's calibration. A built-in leveling trough simplifies installation. When properly mounted, the RS-100 can withstand winds of up to 140 MPH (224 kph).

Operation

Rain enters the top of the sensor and passes through a debris-filtering screen. It then collects in one of two tipping buckets. When accumulated rainfall equals 0.01" or 0.2 mm (user configurable) the bucket tips, which causes a pulse output and moves the second bucket into position. Water exits the sensor through screened drains in the sensor's base. The sensor's output connects directly to a pulse input of the XR5-SE Data Logger or to the PM-1 Pulse Module connected to an XR440 Data Logger. No external power is required.

Included Components

The RS-100 Rainfall Sensor includes the components listed below. Please be sure you have all listed components before continuing.

1. Rainfall Sensor with 40 ft (12 m) cable
2. Plastic bag containing:
 - Four 3/4" #8 screws
 - Debris screen
 - Metric adapter

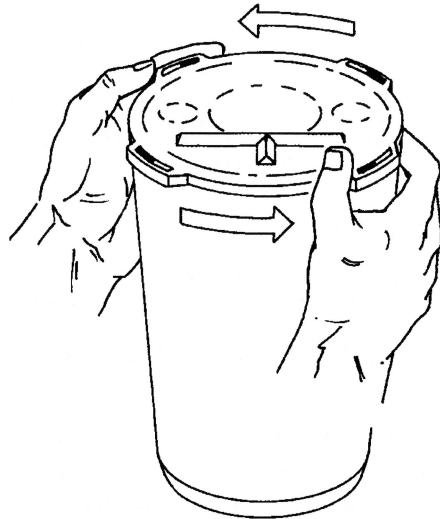
Tools and Materials

You may need some of the following tools and materials to install the Rainfall Sensor.

- Medium Phillips Screwdriver
- Drill with 3/32" (2 mm) drill bit
- 3/16" (5 mm) Wrench
- Bubble Level
- Weather-resistant Cable Ties or clips

Preparing the Rainfall Sensor for operation

1. Turn the Rainfall Sensor upside down and remove the cone from the base by rotating the base until the latches on the cone line up with the latch openings in the base and then lift the base away from the cone.



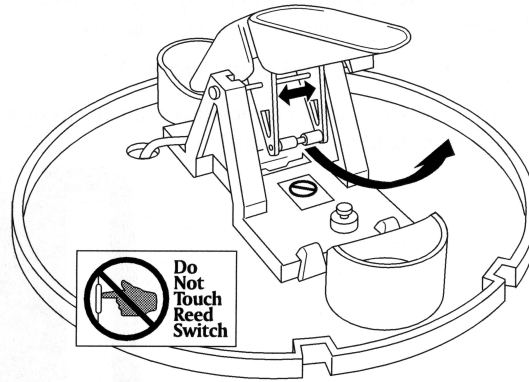
2. **IMPORTANT!** Carefully cut and remove the plastic tie which holds the tipping bucket mechanism in place during shipping.

Insert the Metric Adapter (skip this page if rainfall measurement in inches is desired!)

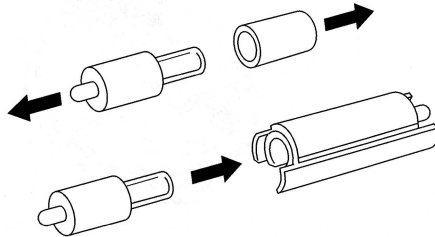
For customers who use metric rainfall measurements, an adapter can be added to the tipping bucket mechanism so that each tip equals 0.2 mm of rainfall.

To install the metric adapter, proceed as follows:

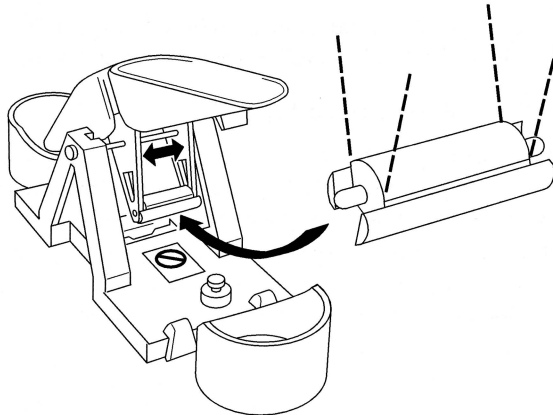
1. Find the plastic metric adapter (in plastic bag with the debris screen and mounting screws).
2. Locate the cylindrical magnet assembly between the arms of the tipping bucket mechanism.



3. Open the arms slightly with one hand while pulling the magnet assembly out with the other hand.
4. Separate an end cap from one side of the magnet.
5. Slide the magnet, with the exposed end of the magnet first, into the open slot of the metric adapter.



6. Re-insert the magnet assembly between the arms of the tipping bucket, with the solid side of the metric adapter facing up.



Bench Test with XR440 Data Logger

If using the XR440 Data Logger, before installing the Rainfall Sensor, we recommended testing the unit's pulse output operation. The Rainfall Sensor requires a PM-1 Pulse Module connected to the XR440.

Wiring

Wire the RS-100 Cable to the PM-1 Pulse Module as follows:

RS-100 Wire Color	Pulse Module	Function
Green	Yellow wire	Rainfall contact closure
Red	Black wire	Ground

Note: The RS-100's reed switch is not polarity sensitive; reversing the above wires is OK and will give the same results.

Wire the XR440 to the PM-1 Pulse Module as follows:

Pulse Module	XR440	Function
Green wire	Terminal "4"	Pulse Module Output
Black wire	Terminal "C"	Ground

Note: The two Black wires of the Pulse Module are electrically identical.

Software Setup

Using Pocket Logger Software, send a setup to the XR440 with the following selections:

Start: immediate
Sample Rate: 10 seconds
Resolution: 12 bit (High)

Channel 4: Type: Pulse

 Scaling: New Linear Scale;
 Low = 0
 High = 4095

Confirm Operation

1. While logging is active, tip the bucket from side to side a fixed number of counts (for example, 10 times).
2. Transfer the Data (Receive | Data), and confirm that the total number of counts are represented in the data.
3. When you are finished testing the RS-100, disconnect the two wires from the Pulse Module.

Bench Test with XR5-SE Data Logger

If using the XR5-SE Data Logger, before installing the Rainfall Sensor, we recommended testing the unit's pulse output operation.

Wiring

Wire the RS-100 Cable to the XR5 as follows:

RS-100 Wire Color	XR5 Terminal	Function
Green	"X"	Rainfall contact closure
Red	"C"	Ground

Note: The RS-100's reed switch is not polarity sensitive; reversing the above wires is OK and will give the same results.

Software Setup

Using LogXR Software, send a setup to the XR5 with the following selections:

Log Mode:	Manual/Slow	
Log Interval:	10 seconds	
Channel X:	(Pulse tab)	
	Type:	Mechanical Switch
	Slope:	1
	Offset:	0
	Frequency:	Not Checked

Real Time readings

1. From LogXR Software's main menu click Real Time | Standard.
2. While the Real Time screen is active, gently tip the bucket from side to side.
3. You should see an increasing pulse count each time the bucket is tipped to one side, and every 10 seconds the count will reset to 0.
4. When you are finished testing the RS-100, terminate the Real Time screen, and disconnect the two wires from the XR5's Terminal Block.

INSTALLATION

CAUTION: Please use a qualified professional to complete a roof or elevated installation. Pace Scientific specifically disclaims any liability for injury or loss resulting in the installation or use of the RS-100 Rainfall Sensor.

Choosing an installation site

Use the following guidelines to select the best location for the RS-100 Rainfall Sensor.

- The Rainfall Sensor must be mounted on a level surface. Use a bubble level or pour water into the T-shaped leveling trough in the sensor's base to ensure that the collector is level.
- Be sure there is an unobstructed path for water runoff from the drain screens in the sensor's base.
- The magnet-operated reed switch may not operate correctly if you locate the sensor near any object that can attract a magnet. If you mount the Rainfall Sensor on a sheet metal roof, mount the base of the sensor at least 1" (4 cm) away from any steel or iron surface and make sure the reed switch is at least 1" (4 cm) away from any steel or iron objects including nails.
- Choose a location that is easily accessible for normal cleaning and distant from trees or other sources of heavy pollen or debris.

Mounting the sensor

1. Separate the cone from the base (instructions on page 4).
2. Locate a suitable mounting surface, using the above guidelines.
3. Eight mounting holes are provided along the perimeter of the base. Place the base on the mounting surface and mark the location of four mounting holes spaced along the perimeter of the base that you have selected.
4. Make pilot holes using a 3/32" (2 mm) drill bit.
5. Fasten the base to the mounting surface using the #8 x 3/4" screws provided.
6. Confirm that the sensor is functioning properly as detailed in "Bench Test" on pages 6 and 7.
7. Once you are sure that the unit is functioning properly, place the cone back onto the base: Insert the latches on the cone into the latch openings in the base and rotate the cone clockwise until the latches "lock" into place.
8. Place the debris screen, points down, in the cone.
9. Secure the sensor cable every 3 to 5 feet (1 to 1.6 meter) with cable clips or plastic ties. Do not use metal staples.

RS-100 Cable Termination			
RS-100 Wire color	If using XR440	If using XR5-SE	Function
Green	PM-1 Yellow wire	Terminal X, Y, or Z	Rainfall pulse
Red	Black wire	Terminal "C"	Ground

Note: The RS-100's reed switch is not polarity sensitive; reversing the RS-100's Green and Red wires is OK and will give the same results.

Extending the cable

If the cable supplied with the Rainfall Sensor is not long enough for your application, it may be extended with 24 or 22 gage two conductor copper cable. Maximum length is 500 ft (150 meters).

Software Setup if using the XR440 Data Logger

Using Pocket Logger Software, select Setup | Send. Set the Resolution to 12 bits, set the desired Sample Rate, Start and Run mode, and set Channel 4's Type to "Pulse". Also for Channel 4, Select New Linear Scale, enter a Lo value of 0, and enter the Hi value from the table below.

RS-100 unit of measure	High value
Inches	40.95
Millimeters	819

For full details on how to use Pocket Logger Software and the XR440 Data Logger please refer to the Help system selected from Pocket Logger Software's main menu (Help | Contents). Instructions pertaining to using the PM-1 Pulse Module with a tipping bucket rain gage like the RS-100 are in the help topic "PM-1 Pulse Module".

Software Setup if using the XR5-SE Data Logger

When creating a Setup in LogXR for the XR5 Data Logger, select the Pulse tab that the Rainfall Sensor is wired to (Green wire), and select the following:

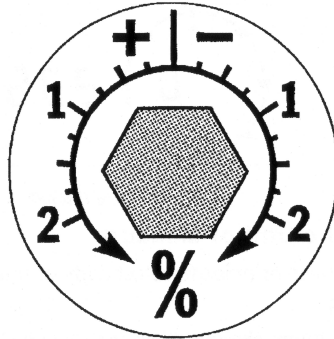
Type: Mechanical Switch
Slope: (see table below)
Offset: 0
Frequency: Not Checked

Rainfall unit of measure	Slope value
Inches	0.01
Millimeters	0.2

For full details on how to use LogXR Software and the XR5 Data Logger please refer to the XR5-SE User's Guide, which is a free download from the Pace website: www.pace-sci.com/XR5-SE.pdf

Adjusting the Rainfall Sensor

The Rainfall Sensor is factory calibrated for 0.01" (or 0.2 mm if the metric adapter was installed) of rainfall. To adjust the calibration slightly, use a 3/16" (or 5 mm) wrench to rotate the adjustment screws which are located underneath each bucket. The adjustment guide embossed in the base (see illustration below) shows how far you must rotate both screws in turn to effect a 1% or a 2% change. Moving the screws in the positive (+) direction (counterclockwise) causes the bucket to tip more times (giving a higher pulse count) for a given amount of water.



Adjustment guide embossed on base of sensor.

IMPORTANT! Modify both adjustment screws by the same amount.

Maintaining the Rainfall Sensor

For greatest accuracy the Rainfall Sensor should be thoroughly cleaned at least once or twice a year.

1. Separate the cone from the base.
2. Use warm soapy water and a soft cloth to clean pollen, dirt and debris from the cone, debris screen, tipping buckets, and base drain screens.
3. Use a pipe cleaner to clean the funnel hole in the cone and the drain screens in the base.
4. When all parts are clean, rinse with clear water.
5. Reattach the cone and replace the debris screen.

Technical Support

For questions or comments regarding the RS-100 or any Pace Scientific product, please contact Pace Technical Support:

Phone: 704-799-0688 (8-5pm EST)
Email: support@pace-sci.com
Fax: 704-799-0177

RS-100 Specifications	
Sensor	
Type	Tipping buckets activate magnetic reed switch
Resolution (rainfall per pulse)	0.01 inches or 0.2 mm (user configurable)
Accuracy	±4%, ±1 rainfall count between 0.01" and 2.00" per hour (0.2 mm and 50.0 mm per hour); ±5%, ±1 rainfall count between 2.00" and 4.00" per hour (50.0 mm and 100.0 mm per hour)
Attached Cable	
Length	40 ft (12 meter)
Type	2-conductor, 26 AWG, unshielded
Termination	Stripped and tinned leads
Maximum cable length (if user extended)	500 ft (150 meters)
Physical	
Housing material	UV-resistant ABS plastic
Collection area	33.2 in ² (214 cm ²)
Overall Dimensions	8.75" diameter x 9.5" high (16.5 cm diameter x 24 cm high)
Weight	2 lbs. 3 oz. (1 kg)
Pulse Output	
Minimum pulse width	30 ms
Pulse origin	Normally open contact closure (reed switch)