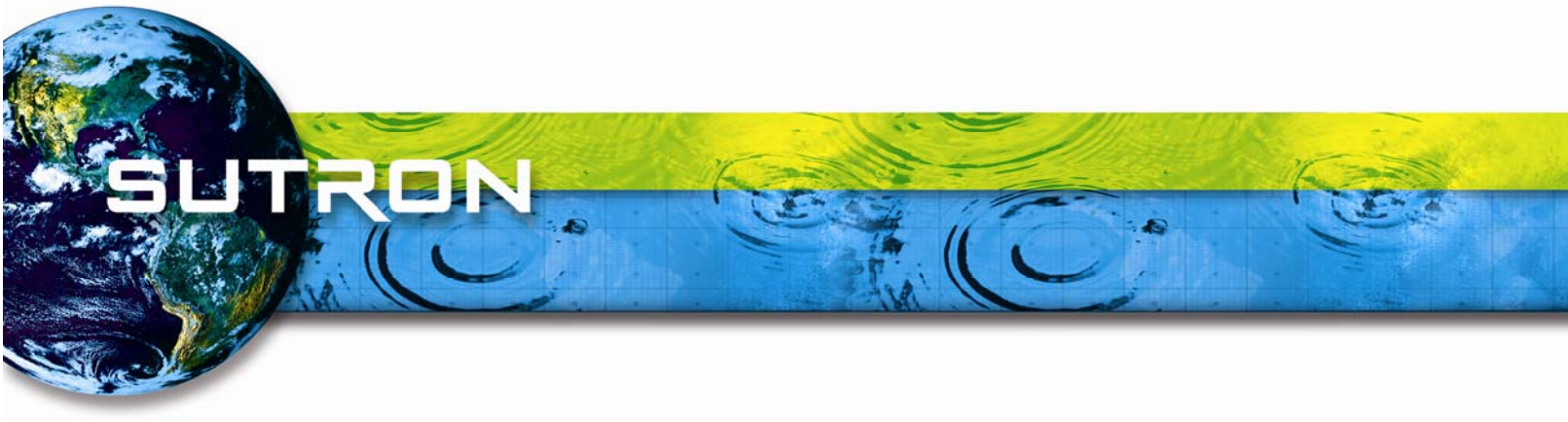


# OPERATION & MAINTENANCE MANUAL
# SUTRON MODEL 5600-0425, 5600-0525
# STAINLESS STEEL
# TIPPING BUCKET / RAIN GUAGE

**8800-1113**
**Revision E**
**May 31, 2012**

**Sutron Corporation**
**22400 Davis Drive**
**Sterling, VA 20164**
**703-406-2800**
**Fax: 703-406-2801**

# MANUAL P/N 8800-1113 FOR STAINLESS STEEL TIPPING BUCKET RAIN GAGE MODEL 5600-0425, 5600-0525

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## 1.0 WARRANTY

The Sutron Corporation warrants that the equipment manufactured by its Manufacturing Division shall conform to applicable specifications and shall remain free from defects in workmanship and material for a period ending two years from the date of shipment from Sutron's plant.

Sutron's obligation under this Warranty shall be limited to repair at the factory, or at its option, replacement of defective Product. In no event shall Sutron be responsible for incidental or consequential damages, whether or not foreseeable or whether or not Sutron has knowledge of the possibility of such damages. This Warranty shall not apply to Products that have been damaged through negligence, accident, misuse, or acts of nature such as floods, fires, earthquakes, lightning strikes, etc.

Sutron's liability, whether in contract or in tort, arising out of warranties or representations, instructions or defects from any cause, shall be limited exclusively to repair or replacement parts under the aforesaid conditions.

Sutron requires the return of the defective electronic Products or parts to the factory to establish claim under this Warranty. Transportation charges to the factory shall be prepaid by the customer. Transportation for the return of the repaired equipment to the customer shall be paid by Sutron when the validity of the damage claim has been established. Otherwise, Sutron will prepay shipment and bill the customer. All shipments shall be accomplished by best-way surface freight. Sutron shall in no event assume any responsibility for repairs or alterations made other than by Sutron. Any Products repaired or replaced under this warranty will be warranted for the balance of the warranty period or for a period of 90 days from the repair shipment date, whichever is greatest. Products repaired at cost will be warranted for 90 days from the date of shipment.

### NON-SUTRON MANUFACTURED EQUIPMENT

The above Warranty applies only to Products manufactured by Sutron. Equipment provided, but not manufactured by Sutron, is warranted and will be repaired to the extend of and according to the current terms and conditions of the respective equipment manufacturers.

## REPAIR AND RETURN POLICY

Sutron maintains a repair department at the factory, 22400 Davis Dr., Sterling, VA 20164. Turn around time normally ranges from 10-30 days after equipment is returned to Sutron for repair.

Call Customer Service at (703) 406-2800 for a return authorization number, then return the defective equipment to the factory, transportation charges paid.

## PLEASE DO NOT RETURN EQUIPMENT WITHOUT FACTORY AUTHORIZATION

After the warranty period has expired, the repair cost will include time and materials. Cost repairs are warranted for a period of 90 days from date of shipment.

## EXTENDED WARRANTY AND ON-SITE MAINTENANCE

Extended warranty and on-site maintenance contracts are available. Customer Service can provide you rapid maintenance and troubleshooting service including preventive maintenance. Price quotations may be obtained from Sutron Customer Service representatives.

## 2.0 INTRODUCTION

2.1. This Stainless Steel Tipping Bucket Rain Gage is used to measure rainfall volume and/or rate. Rain entering through a funnel assembly with an 7.87-inch (200mm) orifice passes through a debris filtering screen and is funneled into one side of the tipping bucket assembly inside the gage. The bucket tips when a given amount of water, determined by gage calibration, has been collected. The model 5600-0425-1 tips for each 0-.01 inch collected; the Model 5600-0425-2 tips for each 0.2mm. As the bucket tips it caused a magnet to pass by a ruggedized mercury switch, momentarily closing the switch. The tipping of the bucket brings a second bucket into position under the funnel, ready for filling. After the rain water is measured, it is directed into drain tubes that allow it to exit out holes in the base of the gage; these are covered by screens to prevent insect entry.

2.2 All Materials used in construction of the instrument are Stainless Steel and therefore corrosion resistant. All external openings of the gage are protected from insects and foreign material by mesh screen.

## 3.0 SPECIFICATIONS

| | |
|---|---|
| Material | Stainless Steel |
| Type | Tipping Bucket |
| Sensitivity | 1 tip per 0.01" Model 5600-0425-6, 5600-0525-6<br>1 tip per 0.2mm Model 5600-0425-2, 5600-0525-2 |
| Resolution | 0.01" Model 5600-0425-6, 5600-0525-6<br>0.2mm Model 5600-0425-2, 5600-0525-2 |
| Orifice Size | 7.87" dia.(200mm) |
| Accuracy | within 2% at 2"/Hr $\pm$ 5% at (240mm/Hr) |
| Bearings | None |
| Insect protection | Mesh screens |
| Capacity | 9.5" per hour within $\pm$ 5% accuracy limits |
| Output | 0.1-second switch closure |
| Switch type | Hall-Effect Switch |
| Size | 7.87" dia. x 24.0" Ht (200mm dia. x 610mm H) |
| Weight | 6.4 lbs |
| Temperature Range, Operating | 0° to 60 °c |

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## 4.0 INSTALLATION

4.1 This instrument is thoroughly tested and fully calibrated at the factory and is ready for installation. If return to the factory is necessary please contact the Sutron Customer Service department at (703) 406-2800 for a Return Material Authorization Number.

4.2 The gage must be mounted level and adequately protected from high winds. Errors of greater than 7% can occur due to rainfall blowing over the lip of the orifice.

4.3 Install the rain gage at a distance away from surrounding obstructions two to four times the obstacle's height. Such obstacles may block the normal rainfall path into the gage or rainfall may blow off the obstructions and into the gage.

4.4 The gage should be securely mounted by using the mounting holes provided by the mounting feet. A recommended method of mounting the gage is to secure the gage pour a small (12" square) concrete pad at the site with three anchor bolts set for the hole pattern of the mounting feet.

4.5 Remove the two plastic screws attaching the outer housing of the rain gage to the tipping bucket mechanism.

4.6 Using the bulls-eye level on the tipping bucket mechanism, level and securely mount the gage.

4.7 Connect a two conductor cable between the two quick connect terminals on the gage and the event accumulating device. (Mating connectors are supplied)

4.8 Be sure to remove any packing material and the bucket retainers from the instrument.

## 5.0 THEORY OF OPERATION

5.1 The 7.87 inch (200mm) diameter orifice was chosen from a trade-off between the sampling area and the size of the tipping bucket mechanism. The large funnel at the orifice helps prevent evaporation inside the instrument.

5.2 Precipitation enters the funnel inside the instrument and is directed to one of two tipping buckets. When one bucket fills, its weight tips the next bucket into position, and empties the first. At the same time, a 0.05 second momentary contact closure occurs. This closure initiates an event accumulating device. The water drains through the bottom of the instrument.

## 6.0 LABORATORY CALIBRATION

For Model 5600-0425-6, 5600-0525-6
.01 inch of rain = 7.97 grams per tip

For Model 5600-0425-2, 5600-0525-2 (Metric)
.2 mm of rain = 6.26 grams per tip

6.1 To calibrate the tipping bucket rain gage, remove the outer cover by first removing the three screws at the base. BE SURE THE GAGE IS LEVEL, using the built-in bulls-eye level as an indicator. See figure for Calibration set up.

6.2 To make the first rough adjustment draw water into a B-D 20cc syringe and weigh out to 7.97 grams on an ACCULAB (or equal) Model 121 precision weighing gage. Be sure to zero out the weight of the empty syringe before weighing the water. With the bucket adjustment screws adjusted all the way counter clockwise transfer the water from the syringe into on side of the bucket. Rotate the opposite side adjusting screw clockwise until the bucket tips. Repeat these steps for the second bucket.

6.3 To make the final calibration adjustments devise a source of water with a uniform flow rate of approximately 2" per hour (50.8mm/Hr). Direct this flow onto the wall of the small funnel. After the gage has tipped several times and the buckets are wet. collect the water in two containers, one under each drain tube. (Styrofoam cups work well) Carefully insert the collection containers between tips and collect exactly 5 tips of each bucket. Remove the containers. Measure the amount of water in each container by weight using the ACCULAB weighing gage described above. (Be sure to zero out the weight of the empty collection containers) The total weight of both containers should be from 78.10 grams to 81.29 grams, or $\pm$ 2% of 79.7 grams.

6.4 Adjustments may be made to the stops located under the buckets. Raising the stop of the bucket will reduce the catch for that bucket and consequently lowering the stop will reduce the catch for that bucket and consequently lowering the stop will increase the catch. NOTE: The stop for a bucket is located under the opposite bucket. Make only small corrections at a time (1/4 turn per test). Repeat the calibration procedure until the gage is within specifications.

6.5 The above procedure is for a rate of 2"/hour (50.8mm/Hr). The gage may be calibrated at other rates of interest.

6.6 After calibration, note date and place of calibration and reinstall the outer cover and screws. Be sure the cover is correctly lined up.

6.7 If the gage has been removed from a field location for calibration be sure the gage is installed and leveled properly.

## 6.8 FIELD CALIBRATION.

To check for calibration in the field, use a HydroLynx Model 2595, or equal Rain Gauge Field Calibrator.

Bring at least 3 liters of water to the gage site for this test.

a. For a calibration check at 2"/hr (50.8mm/Hr) rate, fill the bottle with water until the meniscus level reaches the center of the reference line.

b. Screw the orifice assembly onto the bottle and slip the holder over with the feet pointing upward.

c. While holding the calibrator over the gage, flip the calibrator assembly so that water begins flowing out into the rain gage funnel. Do not allow any water to drip outside the funnel.

d. Set the calibrator in the funnel. The feet of the holder should position themselves firmly in the funnel, supporting the bottle nearly vertical above the funnel opening.

IMPORTANT: The water stream from the bottle should be directed to hit the funnel so that the water drips from the gage's funnel into the tipping bucket mechanism. DO NOT allow the water stream from the calibrator to bypass the funnel and pour straight into the tipping bucket mechanism.

e. In about half an hour the water stream should cease. Tap or shake the bottle slightly to make sure all the water is out.

f. Repeat the above test about three times, recording the number of tips after each test. (Note: The number of tips during each test can vary by a count or so because of the residual water left in one bucket at the end of the preceding test.

g. For 2"/hr (50.8mm/Hr) rain rate the number of tips should be from 107 to 111. If the values fall below or above, remove the gage from the field and recalibrate using the Laboratory Calibration Check.

## 7.0 MAINTENANCE

7.1 Maintenance is limited to cleaning debris out of the input orifice and output drains.

## 8.0 SCHEMATIC AND ASSEMBLY DRAWINGS

8.1 The following page includes an assembly drawing for this instrument.

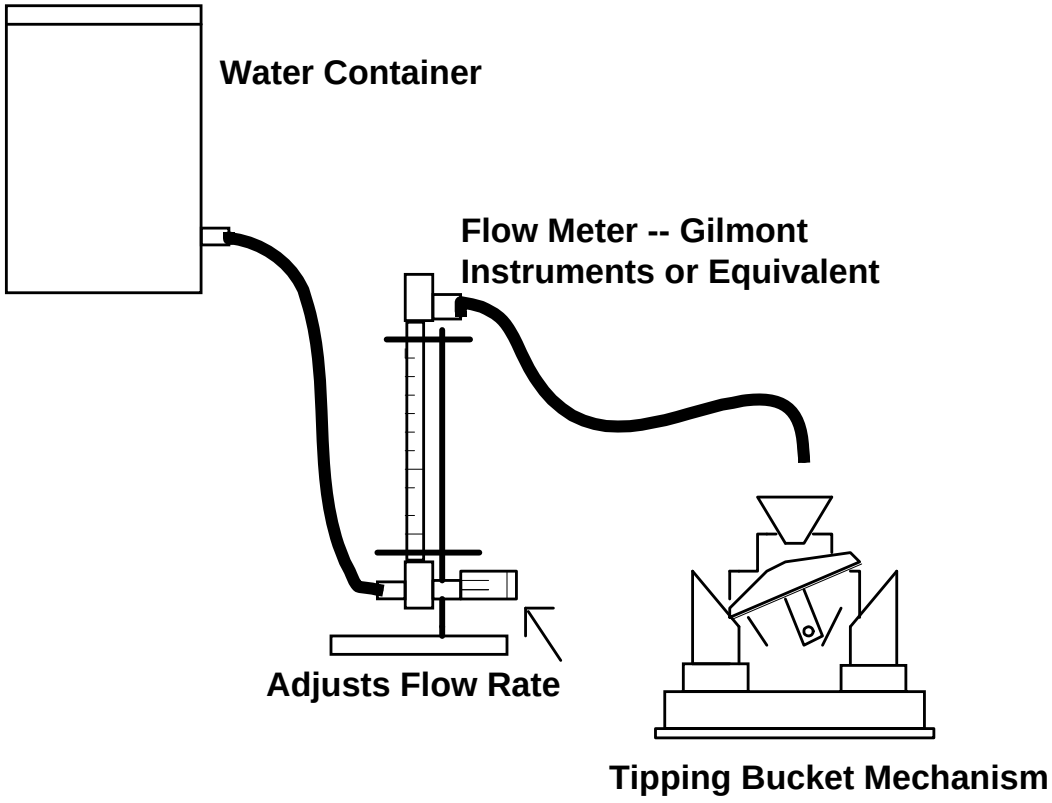


**Fig.2**