

Model 6022

Tipping Bucket Rain Gauge



<input checked="" type="checkbox"/>	FAA APPROVED ECP240 — 2020 Mar 26
<input type="checkbox"/>	NOT FAA APPROVED

**User's
Manual**

Rev. A



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Revision History

Revision	Date	Summary of Changes
A	2019 Aug 15	Initial release.

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1. OVERVIEW

The Model 6022 series of Tipping Bucket Rain Gauges is a freestanding receptacle for measuring precipitation. It contains an open top, which allows precipitation to fall into the upper portion, called the collector. The collector funnel is made of gold-anodized aluminum. Collected water is funneled to a tipping bucket, which fills up and causes a momentary closure of a magnetic switch once the tipping bucket fills to the point where it tips over. This empties the bucket in preparation for additional measurements. The discharged water passes out of the rain gauge with no need for emptying.

The rain gauge may be connected to an event counter on a data logger or to a display such as offered by an AWOS to show and log accumulated precipitation.

Heated models allow the water equivalent of all types of precipitation, including snow and freezing rain, to be measured and logged. Two low-power heating elements are controlled thermostatically with an additional thermal overload. The heaters allow the rain gauge to be used year-round while at the same time minimizing the amount of evaporation.

The aluminum housing is finished with a white powder-coat to withstand years of exposure to the environment.

1.1 FEATURES

- Interfaces to virtually all data acquisition systems
- Knife-edge collector optimizes rainfall catch
- Splash-out protection and screen reduce wind errors
- Easy installation and maintenance
- Integrated bubble level
- Lightweight aluminum exterior with anodized aluminum collector for weather resistance

1.2 MODELS

Table 1. 6022 Models

Model	Precipitation Measured per Tip	Heated	Supply Voltage
6012-A	0.01"	—	—
6022-A	0.01"	✓	120 VAC, 1.65 A

2. INSTALLATION

The rain gauge has been tested thoroughly and fully calibrated at the factory, and is ready for installation. Unpack the rain gauge.

2.1 PHYSICAL INSTALLATION

A clear and unobstructed installation location is necessary to realize accurate rainfall readings. The rain gauge is designed to be mounted in one of three ways.

- Near the ground on a pad
- On a mast
- On a crossarm attached to a tower, about 7 ft above the ground

Rain gauges used at AWOS installations are mounted either on a pad or on the sensor tower.

The rain gauge housing must be mounted in a level position above the maximum seasonal snow depth and in a location free from vibration, large obstructions, and strong winds. If obstructions are inevitable, they must be located at a distance of 2–4 times their height from the gauge. Otherwise they may prevent the precipitation from reaching the rain gauge.

2.1.1 Pad Mounting

1. Pour a concrete pad as shown in Figure 1. Alternatively, a 2 ft by 2 ft level concrete foundation about 4" deep may be used.

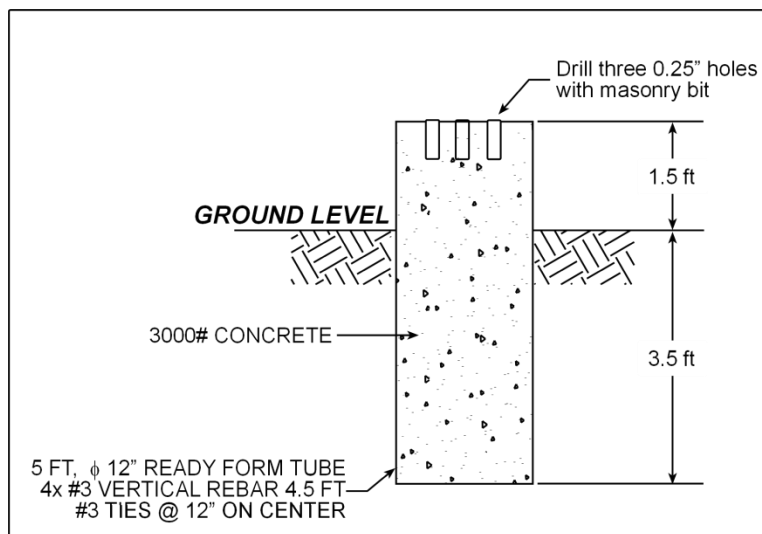


Figure 1. Concrete Mounting Pad

2. Drill three 1/4" diameter holes in the concrete pad using a masonry bit. A template is provided in Figure 2.

Note that the template might not reproduce to scale when printed. It is recommended that the information in the template is used to prepare the template that will actually be used or that the template provided be scaled accordingly.

MOUNTING TEMPLATE

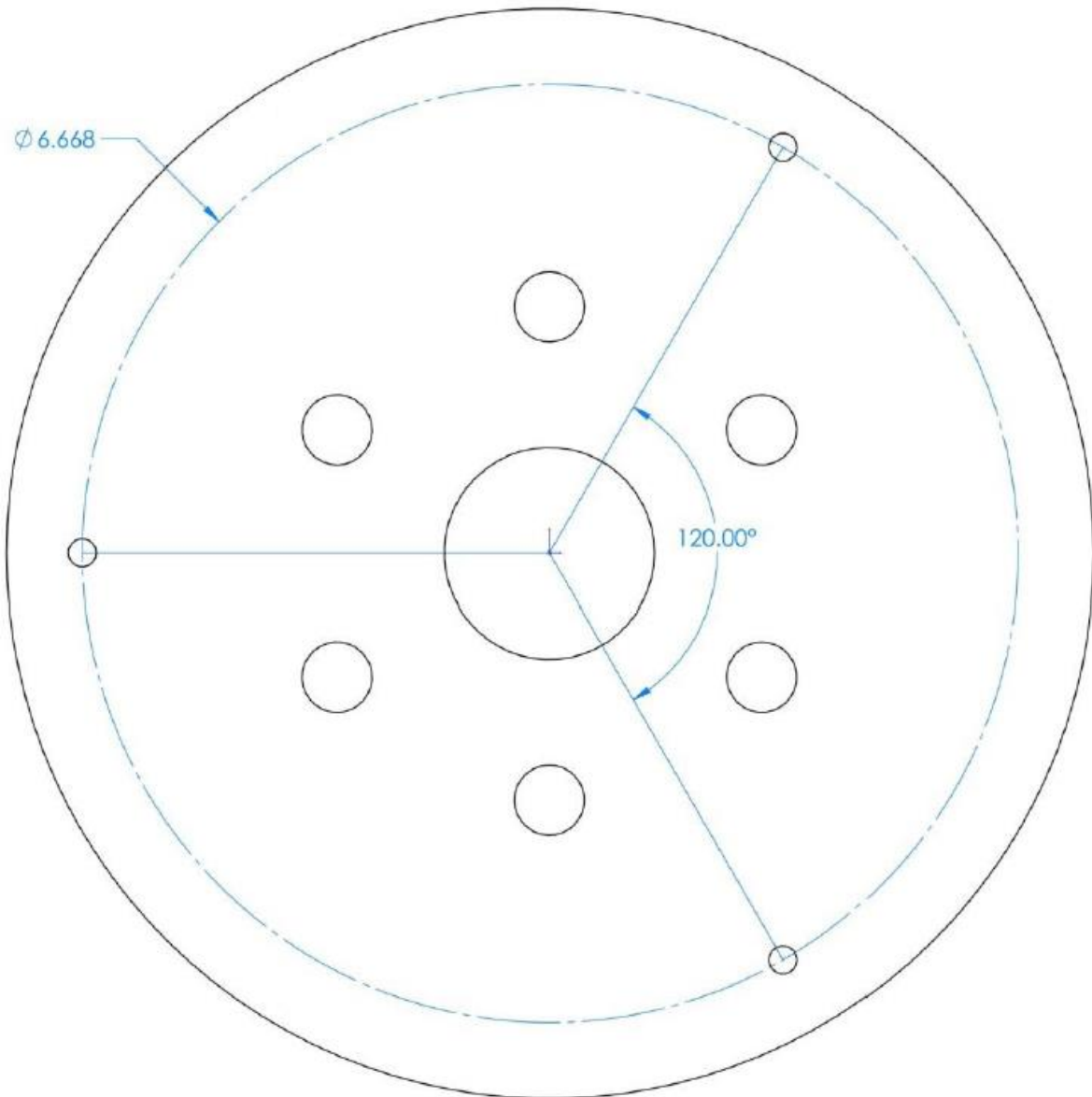


Figure 2. Mounting Template

3. Install three 1/4" screw plug inserts into the holes just drilled. Position the rain gauge feet over the holes. Use washers under the feet to level the rain gauge, referring to the bubble level to make sure the rain gauge is level. Secure the rain gauge with corrosion-resistant #6 sheet metal screws.

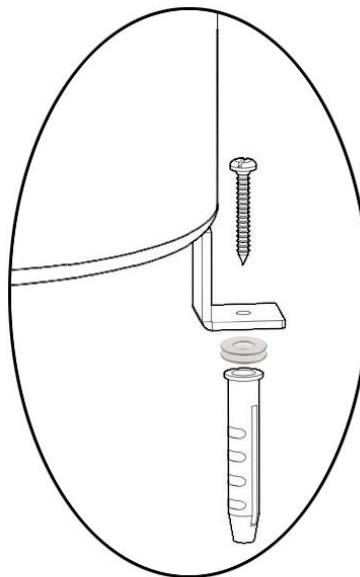


Figure 3. Level and Secure Rain Gauge to Concrete Pad

2.1.2 Mast Mounting

1. Use hose clamps to secure the rain gauge to a mast as shown in Figure 4. Hose clamps are included with the rain gauge to allow it to be clamped to a mast with a diameter up to 1".

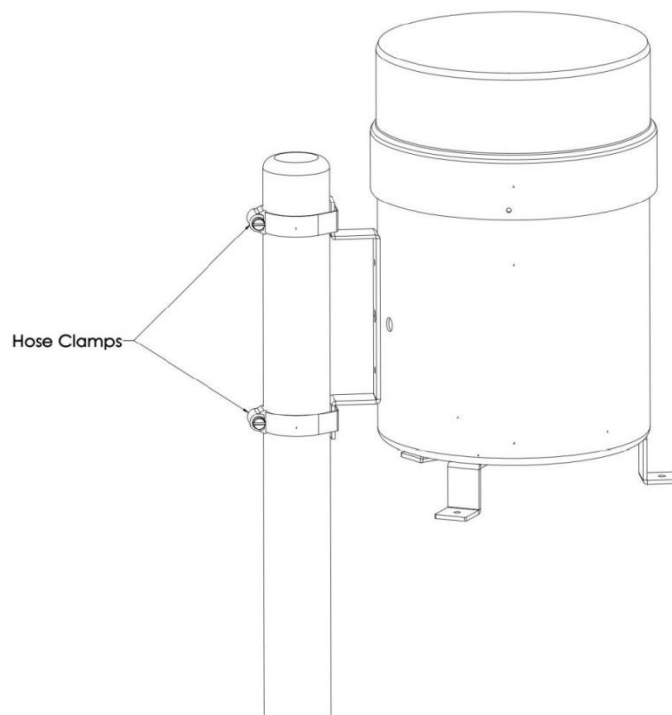


Figure 4. Mast Mounting

2. Make sure that the mast is properly guyed so that vibration in high winds is kept to a minimum.

2.1.3 Tower Mounting

The M488169-01 Tower Mounting kit is available to mount the rain gauge on a tower as shown in Figure 5.

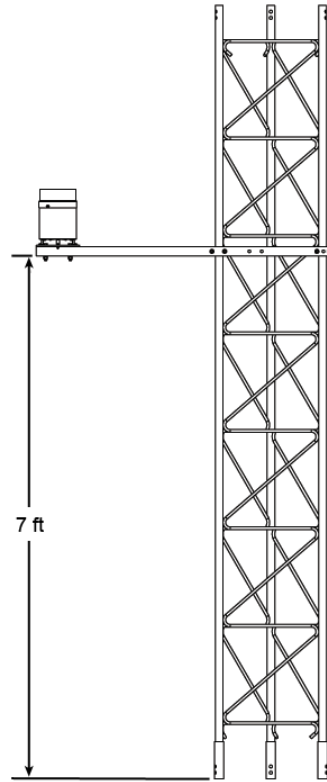
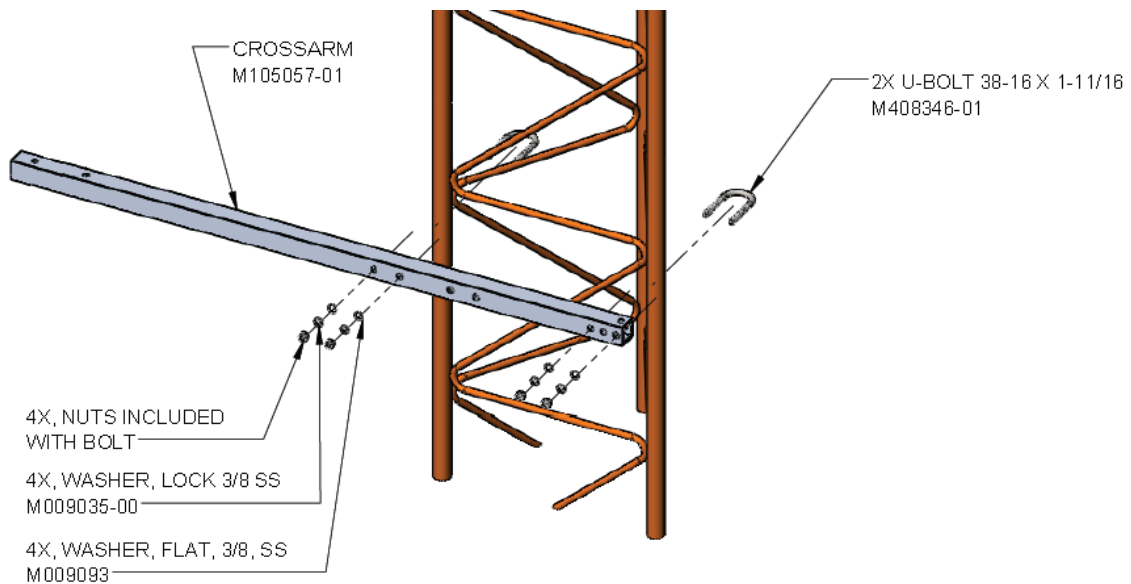
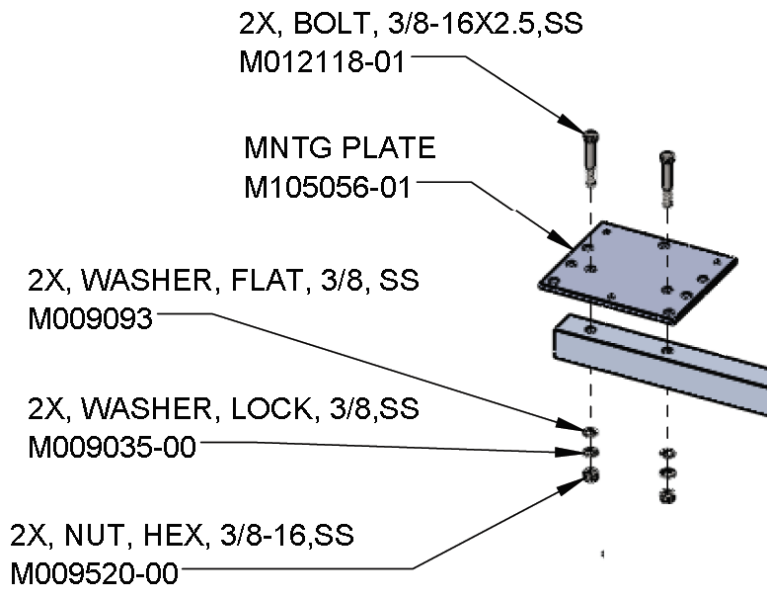


Figure 5. Tower Mounting

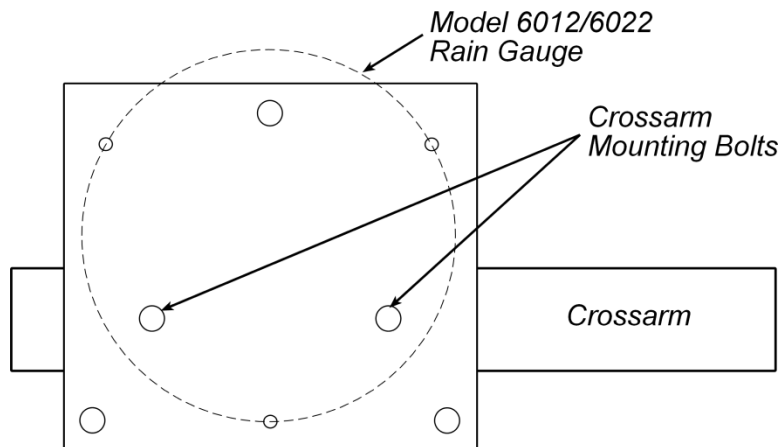
1. Use the U bolts and the associated nuts and washers to attach the crossarm to the tower. If a level is available use it to level the crossarm before tightening the nuts.



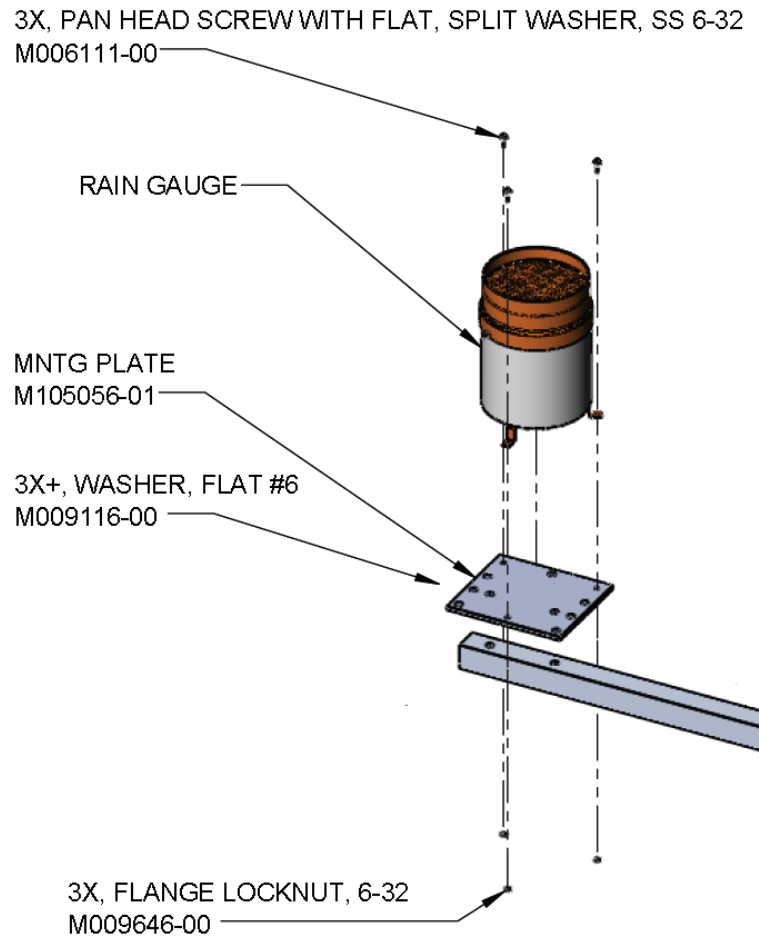
- Use the two 3/8-16 × 2.5 bolts and the 3/8-16 nuts and washers to secure the mounting plate to the crossarm.



- Position the rain gauge feet over the mounting plate to line up the feet with the corresponding mounting holes.



4. Insert flat #6 washers as needed between the rain gauge feet and the mounting plate to level the rain gauge, referring to the bubble level to make sure the rain gauge is level, Secure the rain gauge to the mounting plate with the 6-32 pan head screws and flange locknuts.



2.2 CONNECTIONS

Once the rain gauge has been installed physically, remove the screen and the gold funnel to observe the black tipping bucket. The tipping bucket should not be held in a dead center position by the magnetic attraction of the bucket magnet and the magnetic switch. Press either end of the bucket down against the stop to be sure it is not centered.

2.2.1 Signal Cable

The signal cable from the rain gauge may be shortened or lengthened as required. Strip off ¼" insulation from the ends of the two wires from the signal cable. Connect the two wires to the display or logging device.

When connecting the signal cable to the Model 1190 or 1190-I Data Collection Platform, connect one of the two wires to terminal 8 of TB3 and connect the other wire to terminal 7.

When connecting the signal cable to the Model 1191-I Data Collection Platform, connect one of the two wires to Pin 1 of Terminal Block P4 and connect the other wire to Pin 2.

2.2.2 Heater Cable

The rain gauge heater consists of two heaters, one attached to the underside of the inner collector funnel and one attached to the lower inside portion of the sensor housing. The two heaters are connected in series with a thermostat positioned near the tipping assembly.

Local electrical codes vary, and so no power cord or conduit is supplied with the heated rain gauge. A service box attached to the outside of the rain gauge has conduit fitting knock-outs on all four sides. A cable gland is included if codes allow cabling to be run without conduit, also three wire nuts have been provided. Open the service box to access the three heater wires to connect to the power cord.



Figure 6. Heater Power Cord Service Box

3. MAINTENANCE

Normal maintenance is limited to cleaning debris out of the orifice. Use the precipitation screen during periods of rain to prevent insects and stones from entering the rain gauge, but remove this screen during the winter. When the rain gauge is installed as part of an AWOS, special maintenance procedures are required, as described below.

3.1 AWOS MAINTENANCE PROCEDURES

AWOS maintenance procedures are divided into three categories: monthly, triannual, and annual. The maintenance routines are performed according to that schedule.

3.1.1 Monthly Maintenance

1. Remove the screen from the funnel of the rain gauge and gently tap the screen to free any dirt or debris.
2. Check the rain gauge funnel for insect activity (cobwebs, hornet's nests, etc.), as well as birds' nests, and clean out any debris. Be sure to check underneath the instrument as well.
3. Water and a damp cloth can be used to clean the rain gauge as needed. Do not use soap.
4. Never paint the rain gauge.
5. Reinstall the screen
6. If the ambient temperature is below 40°F, feel the rain gauge cover to check operation of the heaters. If they are working, the outer cover should be warm to the touch.
7. If repairs are needed, report the problem.

3.1.2 Triannual Maintenance

Perform the monthly maintenance. No additional procedures are required.

3.1.3 Annual Maintenance

1. Remove the collection funnel thumbscrews and lift up the collection funnel .
2. Check the level by viewing the bubble level provided on the base. Adjust if necessary.
3. Inspect the interior of the rain gauge for physical lightning damage.
4. Remove any dirt or debris that may be present inside the rain gauge.
5. If the ambient temperature is below 40°F, feel the rain gauge funnel and bottom to check the operation of the heaters. If they are working, the rain gauge funnel and bottom should be warm to the touch.

6. Note the precipitation quantity on the DCP's LCD display. Toggle the bucket assembly one cycle. Again read the precipitation quantity on the LCD display. It must be 1 count greater than before.
7. Replace the outer cover or collection funnel, and the thumbscrews. Coat the thumbscrews with anti-seize compound. Replace the screen.

4. CALIBRATION

This chapter describes the calibration procedure for the tipping bucket rain gauge. Calibration is performed at the factory prior to shipping, and will only need to be done if damage has occurred or if serious doubt about its accuracy exists.

1. Make sure that the rain gauge is leveled by centering the bubble on the bubble level.
2. Calibration is best accomplished using a uniform flow of water at a rate of 400 mL per hour. Allow a few preliminary bucket tips to insure that the internal funnel, tipping bucket, and drains are wet before beginning the calibration procedure.
3. Use a recording device to count the switch contacts, and position a calibrated container with 946 mL of filtered water over the orifice (offset to one side so water is not dripping directly into the center of the orifice).
4. Apply the water flow, directing the water flow to the edge of the collection orifice.
5. The counts resulting from this calibrated amount of water passing through the rain gauge should be 200 ± 4 .
6. If the count in Step 5 does not agree with the specified accuracy, then the bucket stops may need adjustment as described in Step 8 below. Before making any changes to the instrument, repeat Steps 4 and 5 several times to insure no errors were made during the test.
7. Turn the rain gauge upside down to locate the two adjustment screws. When adjusting the calibration of the rain gauge, both screws must be turned the same amount to keep the tipping bucket balanced.
8. Keep the rain gauge in the upside down position to adjust the set screws. To increase the reading, turn each set screw clockwise (increases height of screw). To decrease the reading, turn each set screw counter clockwise. As a general rule, a $\frac{1}{4}$ turn of both screws represents approximately 1 count.
9. Repeat Steps 4 and 5 to check the adjustment that was just made.

Use the bubble level to make sure the rain gauge is level when it is returned to the field.

All Weather Inc. offers the Model 60103 Precipitation Gauge for checking the rain gauge calibration in the field. A measured amount of water, equal to 200 tips of the bucket assembly, is directed into the rain gauge at a constant rate of 2 inches per hour.

5. SPECIFICATIONS

Parameter		Specification	
		6012-A	6022-A
Sensor Type		Tipping bucket	
Switch		Momentary potted reed switch	
Output		135 ms switch closure	
Sensitivity		1 tip per 0.01" precipitation	
Resolution		0.01"	
Calibrated Accuracy		±1% (0–2"/h)	
Precipitation Measurement Rate		0–700 mm/h (0–27"/h)	
Collector Orifice		6.060" (154 mm)	
Height		10.25" (260 mm)	
Heaters	Collector	N/A	71 W
	Housing	N/A	127 W
Thermostat Set Point		N/A	7°C (45°F)
Heater Power		N/A	120 VAC, 1.65 A
Environmental			
Operating Temperature		0 to +70°C (32 to +158°F)	-54 to +70°C (-65 to +158°F)
Storage Temperature		-40 to +85°C (-40 to +185°F)	
Relative Humidity		0–100%, noncondensing	
Mechanical			
Dimensions (without feet or pole mounting arm)	Rain Gauge	260 mm H × 163 mm D (10.25" H × 6.4"D)	
	Heater Service Box (on side of rain gauge)	63 mm W × 63 mm H × 55 mm D (2.5" W × 2.5"H × 2.2"D)	
Weight		1.8 kg (4.0 lb)	

6. WARRANTY

Any defect in design, materials, or workmanship which may occur during proper and normal use during a period of 1 year from date of installation or a maximum of 2 years from shipment will be corrected by repair or replacement by All Weather Inc.



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