User Manual

260-2500 Tipping Bucket Rain Gauge 260-2500E Heated Rain/Snow Gauge 260-2500, 260-2500E (8" Orifice) 260-2500-12, 260-2500E-12 (12" Orifice)





Phone (530) 823-7185
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Receiving and Unpacking

Carefully unpack all components and compare to the packing list. Notify NovaLynx Corporation immediately concerning any discrepancy. Inspect equipment to detect any damage that may have occurred during shipment. In the event of damage, any claim for loss must be filed immediately with the carrier by the consignee. Damages to equipment sent via Parcel Post or UPS require the consignee to contact NovaLynx Corporation for instructions.

Returns

If equipment is to be returned to the factory for any reason, call NovaLynx between 8:00 a.m. and 4:00 p.m. Pacific Time to request a Return Authorization Number (RA#). Include with the returned equipment a description of the problem and the name, address, and daytime phone number of the sender. Carefully pack the equipment to prevent damage or additional damage during the return shipment. Call NovaLynx for packing instructions in the case of delicate or sensitive items. If packing facilities are not available take the equipment to the nearest Post Office, UPS, or other freight service and obtain assistance with the packaging. Please write the RA# on the outside of the box.

Warranty

NovaLynx Corporation warrants that its products are free from defects in material and workmanship under normal use and service for a period of one year from the date of shipment from the factory. NovaLynx Corporation's obligations under this warranty are limited to, at NovaLynx's option: (i) replacing; or (ii) repairing; any product determined to be defective. In no case shall NovaLynx Corporation's liability exceed product's original purchase price. This warranty does not apply to any equipment that has been repaired or altered, except by NovaLynx Corporation, or that has been subjected to misuse, negligence, or accident. It is expressly agreed that this warranty will be in lieu of all warranties of fitness and in lieu of the warranty of merchantability.

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1 FORWARD

Thank you for purchasing NovaLynx products. NovaLynx has been designing and manufacturing weather instruments since 1988. NovaLynx represents several well-known brands of quality manufacturers, including Gill Instruments, RM Young, Kipp & Zonen, and Vaisala. It is our hope that our products will meet all your monitoring requirements.

2 INTRODUCTION

NovaLynx tipping bucket rain gauges are constructed of high quality materials and are designed to provide years of trouble-free operation with a minimum of maintenance. The 260-2500 series is available in two diameters, 8" and 12" (20 cm, 30 cm) in a range of calibration factors. Heated versions are available for areas that experience ice and snow. Dual switching is optional.

The 260-2500 series is distinguished by ball-bearing pivots which ensure smooth operation of the pivot mechanism for superior consistency. An internal, secondary funnel system helps smooth and direct the flow of water into the tipping buckets.

The 260-2500 series rain gauges include a bubble level and adjustable leveling feet to aid in proper installation. Available mounting plates simplify design and installation.

The electrical output of the rain gauge is a momentary dry contact switch closure. A transient voltage suppressor (TVS) diode is connected to the switch assembly to provide static discharge protection. The signal is compatible with many electronic measurement devices such as data loggers or event counters that include a weak pull-up voltage on their digital inputs. Each tip of the bucket mechanism can be counted and totalized in inches or millimeters depending on the rain gauge's calibration factor.

3 MODEL NUMBERING SYSTEM

Group	-	Series	Units Heating		Dia	meter	(Calibration		Features		
260	-	2500	х			х		х		х		Х
		Ø	inch	Ø	none	Ø	8"	Ø	0.01"/tip	Ø	none	
			М	mm	Е	heated	-12	12"	Ø	1mm/tip*	D	Dual-Switching
						.2	0.2mm/tip					
Ø means omit						.25	0.25mm/tip					
* 8 inch versions only							.5	0.5mm/tip				

4 SPECIFICATIONS

Model	260-2500	260-2500-12				
Orifice	8" (20 cm)	12" (30 cm)				
Calibration	0.01", 0.2mm, 0.25mm, 0.5mm, 1mm	0.01", 0.2mm, 0.25mm, 0.5mm				
Accuracy (NovaLynx calibrated rate)	±1% at 5.1"/hr	±1% at 2.3"/hr				
Capacity	Unlimited - s	elf emptying				
Leveling	Bubble level / adjus	stable leveling feet				
Electrical						
Switch	Magnetic reed, SP	ST normally open				
Output	0.1 second sv	witch closure				
Contact maximum rating	3 watts, 0.25	amps, 24 Vdc				
Static discharge protection	Transient voltage supp	oressor, 27V nom, 16A				
Cable	PVC Jacket, 2 conduc	ctor, 20 AWG, 25 feet				
Environmental						
Operating temperature range	0 to +	+50°C				
Operating temperature (heated)	-30 to	+50°C				
Storage temperature range	-40 to	+70°C				
Humidity	0 - 100%					
Materials						
Outer cover	Aluminum, white powder coat					
Funnel, base, bucket & support hdw.	Aluminum, black anodized					
Fasteners	Stainless steel					
Optional Heater (Model number included	des "E")					
Thermostat open temperature	Thermostat open temperature 60°F ± 5°F					
Thermostat close temperature	40°F	± 7°F				
Fuse (one required)	5 A 250 VAC SLOW BLOW 3AG	1/4" x 1-1/4" (6.3mm x 32mm)				
Heater power	120 Vac 50/60 F	dz @ 400 Watts				
Power cable	Indoor/Outdoor, 3 conducto	or, 16 AWG, 13 Amp, 25 feet				
Optional Dual Switch (Part Number 26	D-2500D-K)					
Switch (x2)	Magnetic reed, SP	ST normally open				
Output	0.1 second switch closure					
Contact maximum rating	3 watts, 0.25 amps, 24 Vdc (27V surge suppressor)					
Cable	PVC Jacket, 4 conductor, 24 AWG, 25 feet					
Shipping						
Dimensions	8" x 17"	12" x 20"				
Weight / Shipping	7 lb/9 lb	14 lb/17 lb				
Weight / Shipping (heated units)	9 lb/12 lb	16 lb/18 lb				

5 OPTIONAL ACCESSORIES

Rain Gauge Accessories	Models 260-2500	Models 260-2500-12			
Mounting plate	260-950	260-950-12			
Bird spike kit	260-957 (4/set)	260-957-12 (8/set)			
48" Dia. wind screen (Alter type)	r type) 260-952 (24" legs), 260-953 (36" legs)				
Rain logger with display	260-2103				
Precipitation gauge calibrator	260-2595				
Pocket-size digital event counter	260-2598				

6 SITE SELECTION

The location of the rain gauge is very important to the successful operation of the instrument. The most accurate measurements are made in relatively sheltered areas protected from gusts and turbulent wind. Open spaces between buildings and trees offer some shelter from wind effects; however, the rain gauge should be situated at least twice the distance from such objects as their height.

Wind effects on catch losses are more pronounced during snow storms than during rain storms. Where snowfall constitutes more than 80% of annual precipitation, and in areas that are open with no nearby structures, a wind screen such as the **260-952 Alter-Type Wind Screen** is recommended to minimize wind effects.

The screen consists of 32 free-swinging metal leaves evenly spaced around a 48" diameter ring. The ring is divided into four quadrants, one of which swings open to permit access to the rain gauge.



260-952 Wind Screen

In locations with heavy snowfall, the gauge should be mounted well above the average local snow level. If a heated version rain gauge is used, keep in mind that a power source is required.

Good locations do not always remain obstruction free. Vegetation can grow quickly, changing an excellent exposure into a poor one. Sites should be inspected regularly in order to properly maintain the exposure of the gauge.

7 UNPACKING & ASSEMBLY

Remove the accessory bag from the top of the rain gauge. The bag contains the internal funnel, 3 screens, 3 leveling leg assemblies, and a 1/8" Allen wrench. Set the bag aside.

Remove the clips at the top of the rain gauge funnel and lift out the large screen. Lift the funnel straight up carefully. You will find a large cable tie is protruding through the funnel – placed there to keep the buckets from tipping during shipment. Remove the cable tie. Remove the manual from the inside of the rain gauge.

- 1. Back off the leveling nut and make sure the stud is threaded all the way into the foot (finger-tight).
- 2. Run the leveling nut down to the top of the foot.
- 3. Use the 1/8" Allen wrench to back out the three set screws in the rain gauge base plate.
- 4. Press the foot assembly up into the socket in the base of the rain gauge.
- 5. Using light pressure, tighten the set screw enough to keep the assembly in place.
- 6. Repeat for the other two leveling legs.

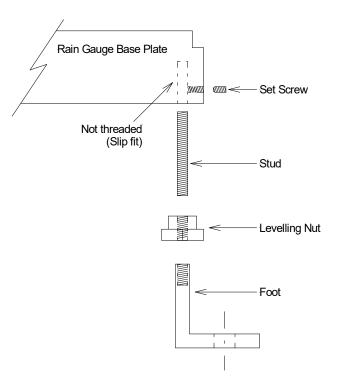


Figure 1. Leveling leg assembly diagram

8 INSTALLATION

WARNING: Never work on an electrically heated rain gauge unless the power to the rain gauge has been disconnected.

To ensure best accuracy the <u>rain gauge must be mounted as level as possible</u> on a solid platform free from vibration. The optional mounting plates (Models 260-950 and 260-950-12) are good platforms if the pipe installed to support them is anchored in a cement base or firmly attached to a stable structure. The mounting plates are supplied with the hardware necessary to attach the rain gauge.

If you prefer to make your own mounting platform, refer to Appendix A for dimensions. Use stainless steel bolts, nuts and washers if available to minimize corrosion.

Plan the cable routing before attaching the rain gauge to the support structure. In some cases the cable can be fed through the supporting pipe, in other situations it makes more sense to run the cable along the

outside of the support structure. Avoid all sharp edges or tight bends in the cable. Support the cable with cable ties at appropriate intervals.

Check the level of the support structure using a carpenter's level. If there is a significant tilt add extra washers (not supplied) under one or two legs of the rain gauge as you assemble it to the support. Align the feet squarely with the mounting plate to prevent bending the leveling studs as the bolts are tightened.

Fine-tune the level of the rain gauge after the legs have been secured to the mounting plate. Some disassembly is required in order to see the bubble level that is inside of the rain gauge.

- 1. Remove and save the three screws & nylon washers that hold the cover of the rain gauge to the base.
- 2. Gently lift the cover straight up and away from the tipping bucket mechanism, then set the cover aside on a cushioned surface (a little care will prevent chipping the white paint).
- 3. Locate the bubble level attached to the base. If the bubble is within the marked circle then the gauge is properly level. If not some adjustment of the legs will be needed.
 - a. Loosen the three set screws that attach the legs to the base.
 - b. Refer to the bubble level as you turn the leveling nuts to bring the bubble to the middle.
 - c. <u>Tighten the set screws to lock the legs in place (moderate pressure)</u>.
- 4. Place the inner funnel on the top of the tipping bucket support structure. This funnel smooths the flow of water into the buckets.
- 5. Install one screen in each of the drain ports on either side of the tipping bucket mechanism. These screens help keep insects out of the unit.
- Check the tipping mechanism by using your finger to tilt the buckets back and forth. The operation should be smooth and the buckets should rest on the nylon bumpers at the end of their swing.
- 7. If desired, connect a multimeter (set to ohms) or event counter to the output cable. Watch the meter or counter while you tip the bucket. A meter should briefly register a low resistance as the buckets reach mid-point. An event counter should increment by one count each time the buckets are tipped.

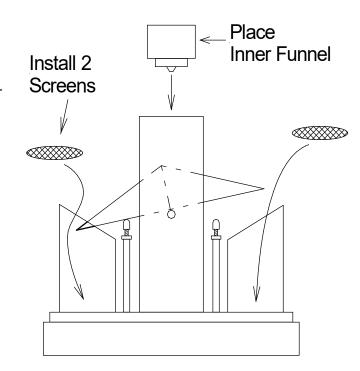


Figure 2. Inner funnel and screen assembly diagram

8. Re-assemble the cover of the rain gauge to the base using the three screws and nylon washers.

9 FINAL ASSEMBLY AND OPERATION

9.1 Heated Rain Gauges

1. Make sure the power is disconnected!

Extend the thermostat cable and plug it into the receptacle on the tipping bucket mechanism (Figure 4). Turn the coupling nut ¼ turn clockwise to lock the cable in place. Carefully lower the large funnel onto the rain gauge taking care not to knock the small inner funnel from its place.

2. Complete the installation by routing the signal and power cables and securing them with cable ties. Provide warning signs and barricades so that no one will accidentally approach the unit when the power is on.

3. Spring and Summer Operation

- a. Install one small screen in the large funnel so that it rests horizontally.
- b. Install the larger screen in the funnel and secure it with the screen clips. If you purchased birdspikes, space them evenly around the rim of the funnel with the points upwards.
- c. Do not connect the heater power during the spring and summer when heat is not needed. This reduces the chance of damage by lightning or power surges.

4. Fall and Winter Operation

- a. Remove the two screens from the large funnel. This allows snow to reach the heated area of the funnel. Re-install the bird spikes if needed.
- b. Connect the power cord to an outlet that has a ground-fault circuit interrupter (GFCI) only after all installation is complete and all personnel have left the area.

9.2 Non-heated Rain Gauges

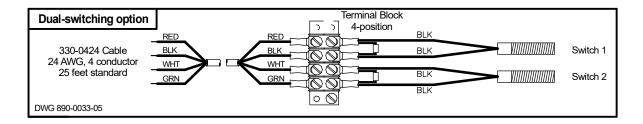
- 1. Carefully lower the large funnel onto the rain gauge taking care not to knock the small inner funnel from its place.
- 2. Install one small screen in the funnel so that it rests horizontally.
- 3. Install the larger screen in the funnel and secure it with the screen clips. If you purchased bird-spikes, space them evenly around the rim of the funnel with the points upwards.
- 4. Complete the installation by routing the signal cable and securing it with cable ties.

9.3 Dual-switch Rain Gauges

The dual-switch option adds a second independent output signal from the rain gauge. The second switch is mounted opposite the primary switch, and the same magnet triggers both when it swings between them each time the bucket tips. Each switch is protected by its own TVS diode.

1. Connect the RED and BLACK signal wires (from the primary switch) to a digital input channel on your logger. The signal output has no polarity and either wire can be signal and the other ground.

- 2. Connect the WHITE and GREEN wires (from the secondary switch) to an independent channel on the logger or other monitoring device. The signal output has no polarity and either wire can be signal and the other ground.
- 3. Test your connections by tipping the bucket a few times and verifying that both channels register one count per tip, and the total counts match.



10 ROUTINE MAINTENANCE

Annual maintenance is recommended for all 260-2500 series rain gauges. More frequent check-ups are needed in locations where debris are likely to fall into the funnel and clog the screens. Heated units will require more attention to ensure the funnel is clear, that power is connected during seasons when heating is needed, and to ensure the fuse is good.

10.1 Cleaning

WARNING: Never work on an electrically heated rain gauge unless the power to the rain gauge has been disconnected.

CAUTION: Be aware that spiders or insects may be nesting inside the rain gauge.

Disassemble with caution to avoid being bitten or stung.

- 1. Remove debris from the top screen and around the base of the rain gauge. Inspect the cables to ensure they are not damaged and are secured properly.
- 2. Remove the clips holding the top screen and remove the screen. Lift the small inner screen out and set it aside.
- 3. Be very careful when removing the funnel from a heated rain gauge because the thermostat is attached to it. Lift the funnel assembly carefully and just high enough so that you can reach into the rain gauge and unplug the thermostat connector mounted on the tipping bucket support bracket (Figures 3 & 4). Turn the coupling nut ¼ turn counter-clockwise to release the cable. Set the funnel aside.



Figure 3. Thermostat

- 4. Remove the three screws and nylon washers that hold the cover of the rain gauge to the base. Lift the cover straight up until it clears the tipping bucket mechanism, then set the cover aside.
- 5. Inspect the screens in the drain ports (Figure 2). If debris have collected in the drain ports, remove the screens and set them aside.
- 6. Avoid washing the bearings and electrical components as water in these areas could cause corrosion. These areas can be dusted off with a dry brush if needed.
- 7. Use clean water and a soft brush to loosen and rinse off dirt or debris from the outer funnel, inner funnel, tipping buckets, screens and drain ports. Do not use detergents or cleaning solutions because they might dissolve the bearing lubricant. Clean any other areas (except the bearings and electrical components) that need attention in the same manner.
- 8. Clean and re-install the drain port screens, if removed earlier.
- 9. Remove excess water with a dry cloth.

10.2 Leveling

Inspect the spirit level on the base plate of the rain gauge. If the bubble is not centered, then loosen the set screws holding the leveling legs to the base (Figure 1). Raise or lower the leveling knobs until the bubble is centered. Tighten the set screws.

10.3 Reed Switch Test

Use your finger to tip the bucket mechanism to ensure it operates smoothly. Use a multimeter (set to ohms) or digital event counter to test whether the reed switch closes whenever the magnet swings past the reed switch. If the rain gauge is a dual-switching model, test the secondary switch in the same manner.

NOTE: If the reed switch does not activate and the switch seems to be short-circuited, it may be due to failure of the transient voltage suppressor (TVS) diode. The diode can short-circuit if hit with too much energy. Disconnect the diode and test it with an ohm-meter. If the resistance is low then replace the reed switch / diode assembly (NovaLynx Part# 10000160).

10.4 Heater Fuse Test (Heated units only)

Heated units are protected by a 5A fuse located next to the thermostat receptacle (Figure 4).

- 1. Make sure the power is disconnected!
- 2. Press down on the fuse holder cap and turn counter-clockwise ¼ turn. The cap will pop up and may be removed.
- 3. Remove the fuse and test its continuity with a meter.
- 4. Replace the fuse and fuse holder cap.

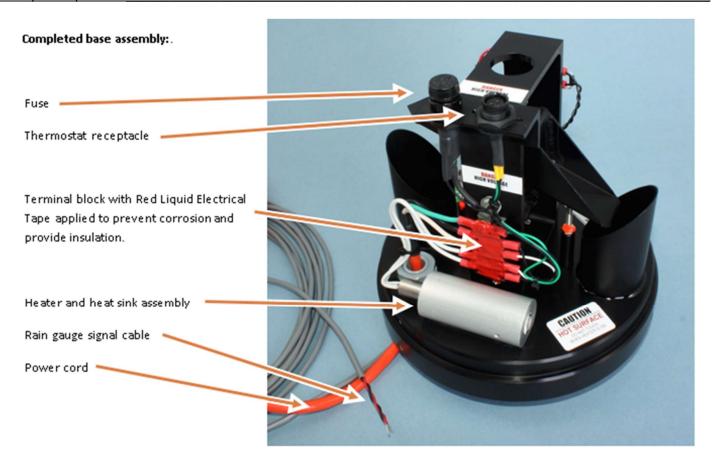
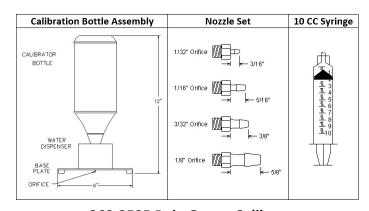


Figure 4. 8" Rain Gauge Base Assembly, with Heater Option

10.5 Calibration

Each rain gauge is thoroughly tested and calibrated before being shipped to the customer. The calibration can be field-tested as part of a yearly maintenance cycle or the unit can be returned to NovaLynx for re-calibration as needed.

Complete details for calibration using the NovaLynx 260-2595 Rain Gauge Calibrator are available to download from the NovaLynx website (www.novalynx.com).



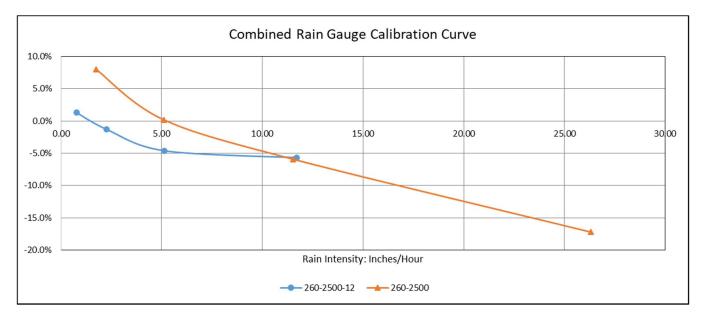
260-2595 Rain Gauge Calibrator

NovaLynx calibrates series 2500 rain gauges using the 1/16" orifice, which delivers 70 cc / minute into the gauge during testing. The calibrator kit includes additional nozzles so that the gauge can be tested at different rates of flow.

The following chart shows the rain intensity that can be simulated depending on the nozzle chosen and the rain gauge inlet diameter.

Rai	in Gauge		Dain Intensity			
Inlet	Diameter	1/32"	1/16"	3/32"	1/8"	Rain Intensity
8	inch	1.75	5.10	11.51	26.30	inches/hour
12	inch	0.78	2.27	5.12	11.69	inches/hour
8	inch	44	130	292	668	mm/hour
12	inch	20	58	130	297	mm/hour

Tipping bucket rain gauges are subject to a systematic mechanical error which is a function of rain intensity. The bucket takes a small time to tip, and during that time additional rain may enter the compartment. The error is non-linear, so a calibration curve is sometimes used to correct the data.

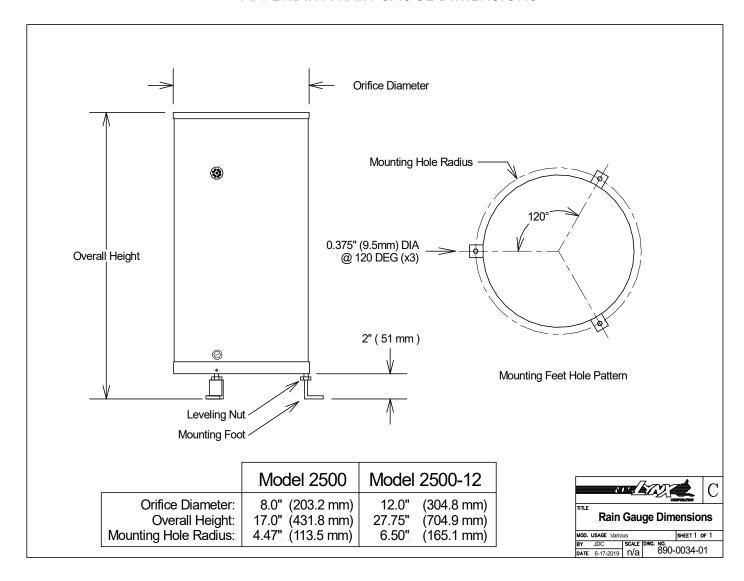


The rain gauge can only be calibrated to one rainfall rate at a time. At a given flow rate the expected number of tips is calculated from the inlet diameter of the rain gauge and the desired calibration factor, as shown below.

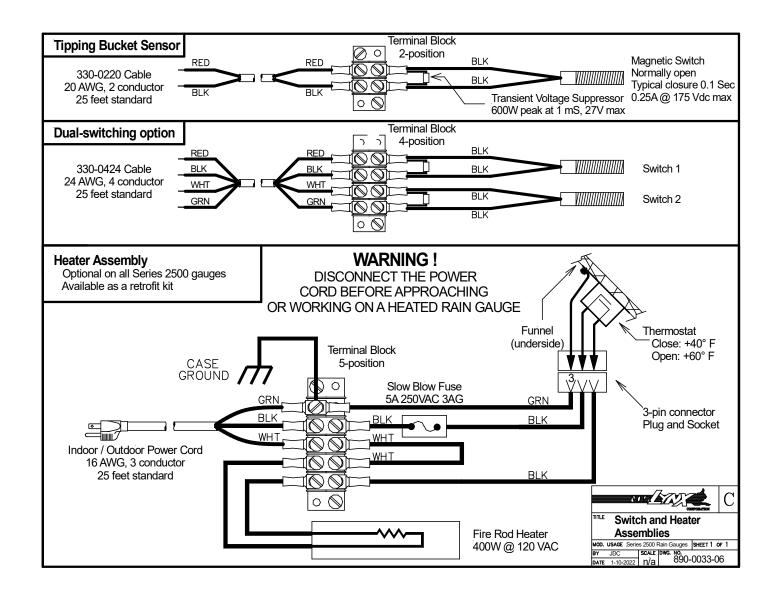
Rain Gauge Calibration Table

							Ti	ps per t	est volu	me
Series	Models	Inlet Dia	ameter	Calibration	on Factor	cc/tip	150 cc	450 сс	750 cc	946 сс
260-2500	260-2500, 260-2500D, 260-2500E	8	inch	0.01	inch/tip	8.24	18.2	54.6	91.1	114.8
	260-2500M, 260-2500ME	8	inch	1	mm/tip	32.43	4.6	13.9	23.1	29.2
260-2500M	260-2500M.2, 260-2500ME.2	8	inch	0.2	mm/tip	6.49	23.1	69.4	115.6	145.9
260-2500IVI	260-2500M.25, 260-2500ME.25	8	inch	0.25	mm/tip	8.11	18.5	55.5	92.5	116.7
	260-2500M.5, 260-2500ME.5	8	inch	0.5	mm/tip	16.21	9.3	27.8	46.3	58.3
260-2500-12	260-2500-12, 260-2500E-12	12	inch	0.01	inch/tip	18.53	8.1	24.3	40.5	51.0
	260-2500M-12.2, 260-2500ME-12.2	12	inch	0.2	mm/tip	14.59	10.3	30.8	51.4	64.8
260-2500M-12	260-2500M-12.25, 260-2500ME-12.25	12	inch	0.25	mm/tip	18.24	8.2	24.7	41.1	51.9
	260-2500M-12.5, 260-2500ME-12.5	12	inch	0.5	mm/tip	36.48	4.1	12.3	20.6	25.9

APPENDIX A RAIN GAUGE DIMENSIONS



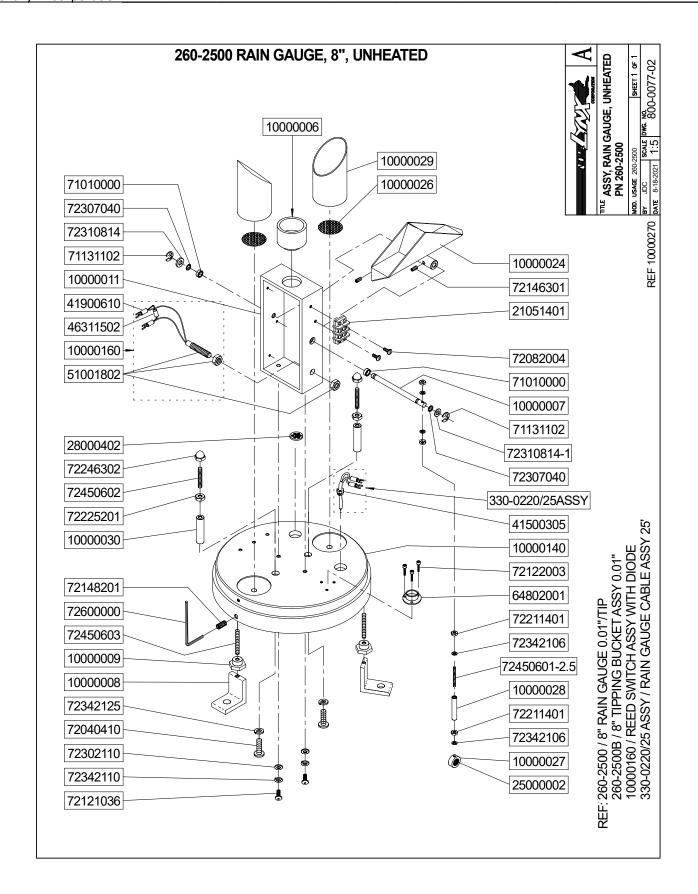
APPENDIX B WIRING DIAGRAMS

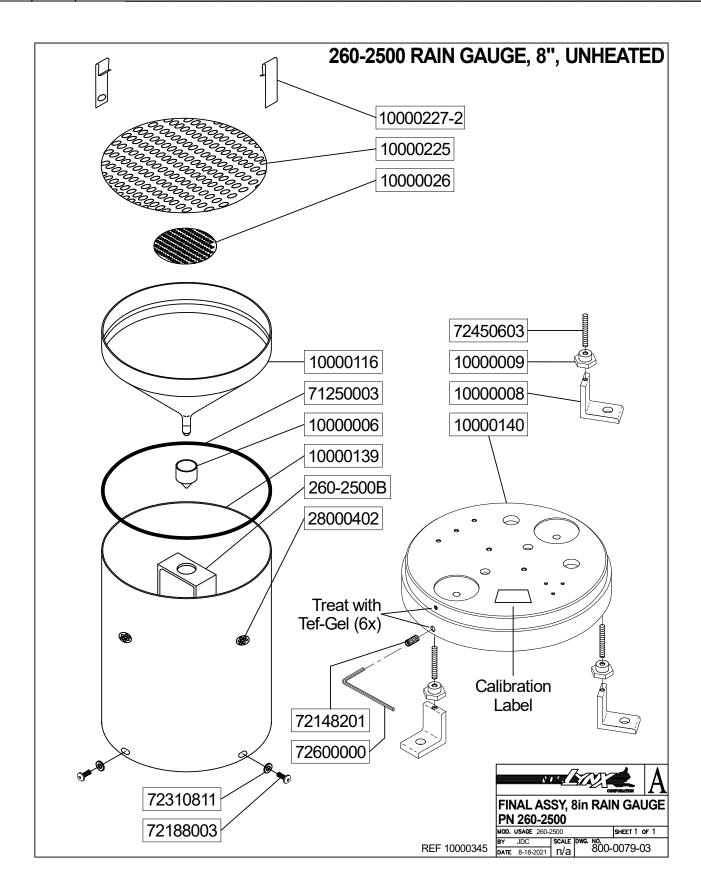


APPENDIX C PARTS LIST (8")

260-2500 RAIN GAUGE, 8", UNHEATED

QTY	PART#	DESCRIPTION	
1	10000006	INNER FUNNEL 2500 2501	
1	10000007	TIPPING BUCKET SHAFT 2500	
3	10000008	LEVELING FOOT 2500	
3	10000009	LEVELING KNOB 2500	
1	10000011	BUCKET SUPPORT BRACKET 2500	
1	10000024	TIPPING BUCKET ASSY 8" 2500	
3	10000026	LOWER SCREEN 2" 2500 2501	
1	10000027	MAGNET HOLDER 2500	
1	10000028	MAGNET ARM COVER 2500	
2	10000029	DRAIN TUBE 2500 & 2500-12	
2	10000030	CALIBRATION POST TUBE 2500	
1	10000116	FUNNEL 8" 2500 2501	
1	10000139	OUTER COVER 2500 8"	
1	10000140	RAIN GAUGE BASE 2500 8"	
1	10000160	REED SWITCH ASSY WITH DIODE	
1	10000225	UPPER SCREEN 8" 2500 2501	
2	10000227-2	HOLD DOWN CLIP NO PEM NUT	FOR 8" FUNNEL
1	21051401	BARRIER TERM BLOCK 2-141	
1	25000002	MAGNET DISC 3/8X1/4 CERAMIC	
4	28000402	LOCKING VENT PLUG .875 BLACK	FOR ROLLING CARLE
1	41500305	STRAIN RELIEF .500 STRAIGHT	FOR ROUND CABLE
4	41900610	FLANGED SPADE TERM RED #6	
1	46311502	DIODE P6KE27CA DO-15 TVS	
1	51001802	REED SWITCH HAMLIN BARREL	
1 2	64802001 71010000	SPIRIT BUBBLE LEVEL CHROME BEARING .250 X .375 X .12	
2	71131102	E-RING 1/4 X .210 X .029	
1	71131102	BUNA-N O-RING #163 6X3/32	
2	72040410	SCREW 1/4-20X1/2 HEX CAP	
2	72082004	SCREW 6-32X1/2 PAN PH SS	
2	72121036	SCREW 10-32X1/21 ARTH 35 SCREW 10-32X5/8 RD PH SS	
3	72122003	SCREW 2-56X1/4 SOC CAP SS	
2	72146301	SET SCREW 8-32X3/16 SOC SS	
3	72148201	SET SCREW 1/4-20X1/4 SOC	
3	72188003	SCREW 10-32X3/8 HEXWSH SL	
4	72211401	NUT 6-32 SS	
2	72225201	NUT 8-32 SS	
2	72246302	ACORN NUT 8-32 HEX NYLON	
2	72302110	WASHER #10 FLAT SS	
2	72307040	SHIM SPACER 251 ID.010 THICK	
3	72310811	WASHER #10 RETAINING NYLON	
1	72310814	WASHER FLAT NYLON 1/4	.252 ID X .472 OD X .070
1	72310814-1	WASHER FLAT NYLON 1/4	.250 ID X .375 OD X .032
4	72342106	LOCK WASHER #6 SS	
2	72342110	LOCK WASHER #10 SS	
2	72342125	LOCK WASHER 1/4 SS	
1	72450601-2.5	STUD 6-32X2-1/2 SS THREAD	
2	72450602	STUD 8-32X2 SS THREADED	
3	72450603	STUD 10-32X1-1/2 SS THREADED	
1	72600000	ALLEN WRENCH 1/8"	
25'	330-0220	CABLE 2C 20AWG UNSHIELDED	

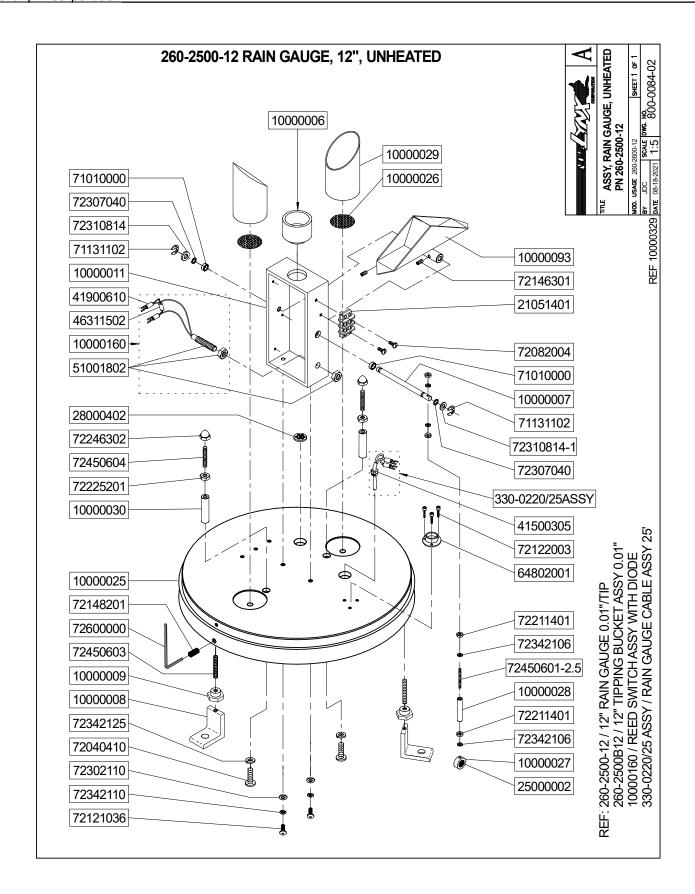


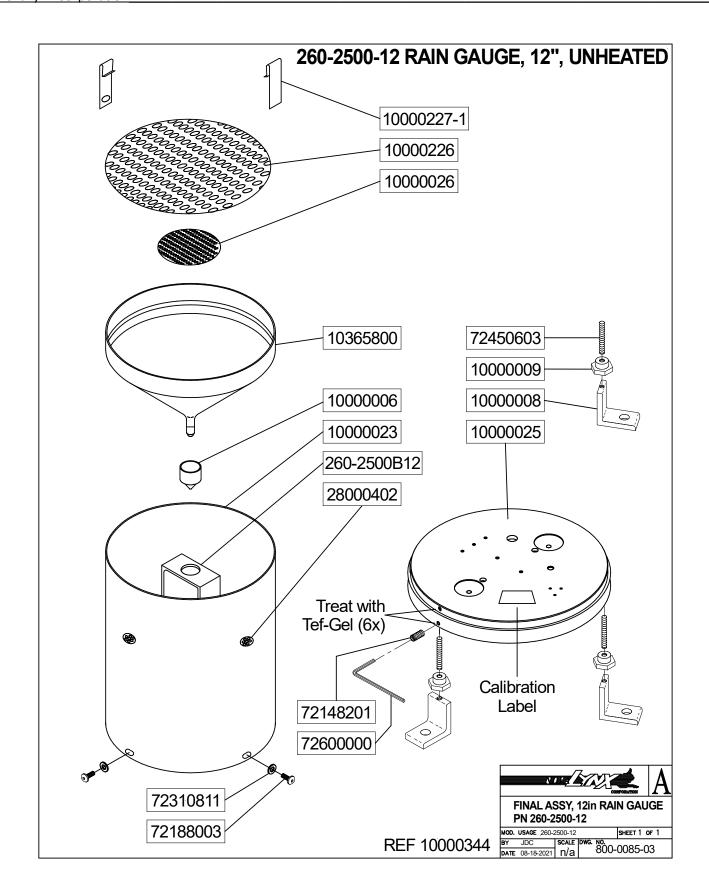


APPENDIX D PARTS LIST (12")

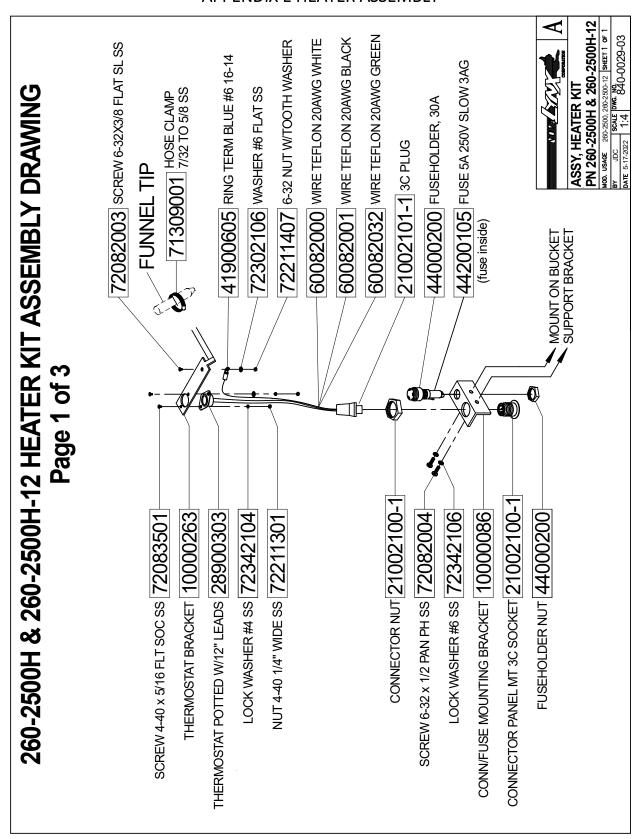
260-2500-12 RAIN GAUGE, 12", UNHEATED

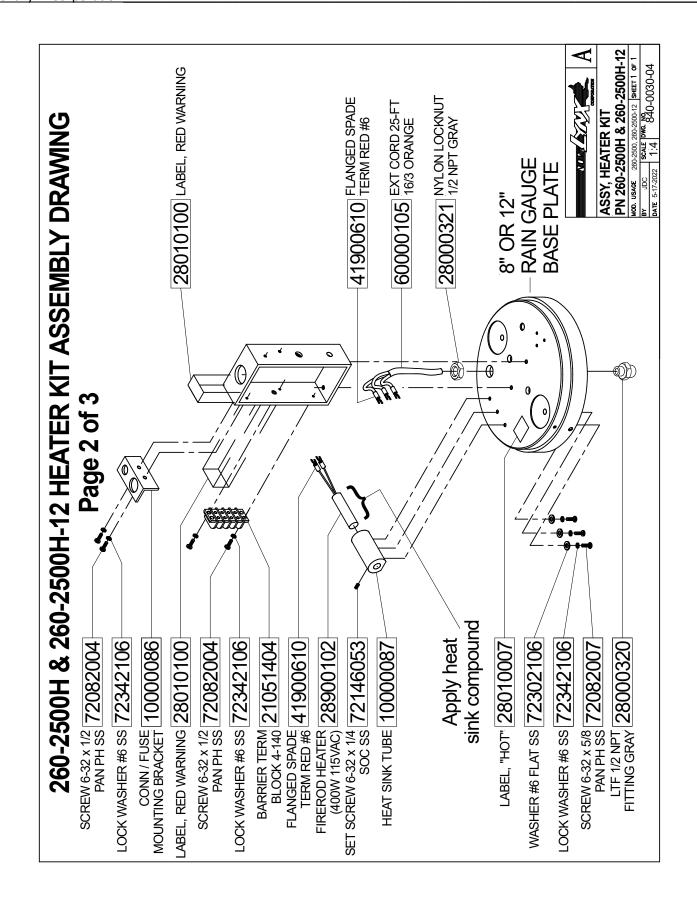
QTY	PART #	DESCRIPTION	
1	1000006	INNER FUNNEL 2500 2501	
1	10000007	TIPPING BUCKET SHAFT 2500	
3	10000008	LEVELING FOOT 2500	
3	10000009	LEVELING KNOB 2500	
1	10000011	BUCKET SUPPORT BRACKET 2500	
1	10000023	COVER 2500-12 17" LENGTH	POWDER COAT WHITE
1	10000025	RAIN GAUGE BASE 12" 2500-12	
3	10000026	LOWER SCREEN 2" 2500 2501	
1	10000027	MAGNET HOLDER 2500	
1	10000028	MAGNET ARM COVER 2500	
2	10000029	DRAIN TUBE 2500 & 2500-12	
2	10000030	CALIBRATION POST TUBE 2500	
1	10000093	TIPPING BUCKET ASSY 2500-12	
1	10000160	REED SWITCH ASSY WITH DIODE	
1	10000226	UPPER SCREEN 12" 2500-12	
2	10000227-1	FUNNEL HOLD DOWN CLIP	
1	10365800	FUNNEL 12" 2500-12	
1	21051401	BARRIER TERM BLOCK 2-141	
1	25000002	MAGNET DISC 3/8X1/4 CERAMIC	
4	28000402	LOCKING VENT PLUG .875 BLACK	
1	41500305	STRAIN RELIEF .500 STRAIGHT	FOR ROUND CABLE
4	41900610	FLANGED SPADE TERM RED #6	
1	46311502	DIODE P6KE27CA DO-15 TVS	
1	51001802	REED SWITCH HAMLIN BARREL	
1	64802001	SPIRIT BUBBLE LEVEL CHROME	
2	71010000	BEARING .250 X .375 X .12	
2	71131102	E-RING 1/4 X .210 X .029	
2	72040410	SCREW 1/4-20X1/2 HEX CAP	
2	72082004	SCREW 6-32X1/2 PAN PH SS	
2	72121036	SCREW 10-32X5/8 RD PH SS	
3	72122003	SCREW 2-56X1/4 SOC CAP SS	
2	72146301	SET SCREW 8-32X3/16 SOC S	
3	72148201	SET SCREW 1/4-20X1/4 SOC	
3	72188003	SCREW 10-32X3/8 HEXWSH SL	
4	72211401	NUT 6-32 SS	
2	72225201	NUT 8-32 SS	
2	72246302	ACORN NUT 8-32 HEX NYLON	
2	72302110	WASHER #10 FLAT SS	
2	72307040	SHIM SPACER 251 ID.010 THICK	
3	72310811	WASHER #10 RETAINING NYLON	252 ID V 472 OD V 070
1	72310814	WASHER FLAT NYLON 1/4	.252 ID X .472 OD X .070 .250 ID X .375 OD X .032
1	72310814-1	WASHER FLAT NYLON 1/4	.250 ID A .575 OD A .052
4	72342106	LOCK WASHER #6 SS	
2 2	72342110	LOCK WASHER #10 SS LOCK WASHER 1/4 SS	
1	72342125 72450601-2.5	STUD 6-32X2-1/2 SS THREAD	
3	72450601-2.5	STUD 10-32X1-1/2 SS THREAD	
2	72450603	STUD 8-32X1-1/2 SS THREAD	
1	72600000	ALLEN WRENCH 1/8"	
25'	330-0220	CABLE 2C 20AWG UNSHIELDED	

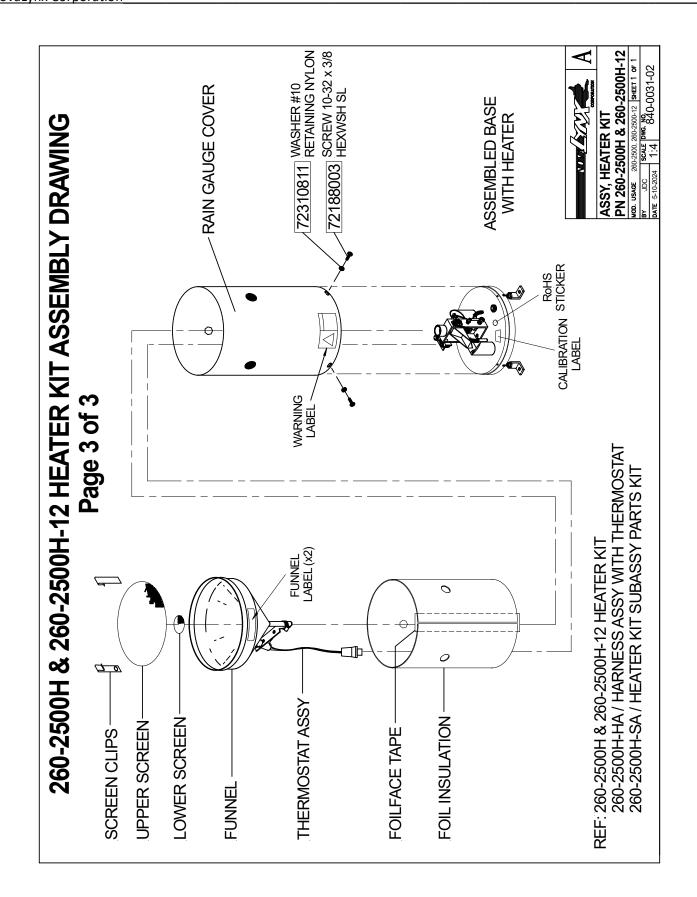




APPENDIX E HEATER ASSEMBLY







APPENDIX F DUAL SWITCH ASSEMBLY

