

HydroLynx Systems, Inc.

**Model 5050P
Tipping Bucket Rain Sensor**

Instruction Manual



Document No: A102850
Document Revision Date: July, 2008

Receiving and Unpacking

Carefully unpack all components and compare to the packing list. Notify HydroLynx Systems 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. If the equipment was shipped via Parcel Post or UPS, contact HydroLynx Systems for instructions.

Returns

If equipment is to be returned to the factory for any reason, call HydroLynx 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 during the return shipment. Call HydroLynx 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 packaging. Please write the RA# on the outside of the box.

Warranty

HydroLynx Systems 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. HydroLynx Systems' obligations under this warranty are limited to, at HydroLynx's option: (i) replacing; or (ii) repairing; any product determined to be defective. In no case shall HydroLynx Systems' liability exceed product's original purchase price. This warranty does not apply to any equipment that has been repaired or altered, except by HydroLynx Systems, 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.

Address

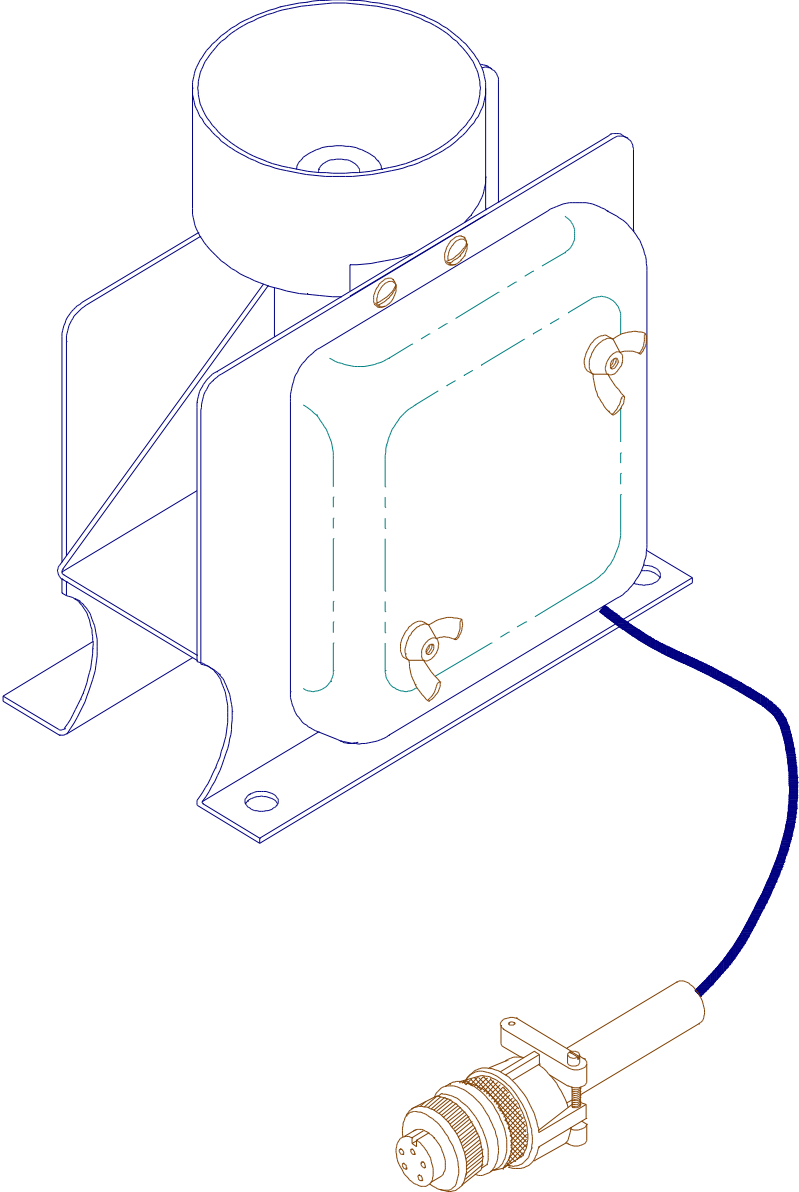
**HydroLynx Systems, Inc.
950 Riverside Pkwy., Suite 10
West Sacramento, CA 95605
Phone: (916) 374-1800
Fax: (916) 374-1877
E-mail: hydro@hydrolynx.com**

Copyright 8 2008 by HydroLynx Systems, Inc.

TABLE OF CONTENTS

SECTION NO.	PAGE NO.
Equipment Configuration and Parts Identification	4
1.0 INTRODUCTION	5
1.1 General Description	5
1.2 Specifications	5
2.0 INSTALLATION	5
2.1 Unpacking	5
2.2 Leveling	5
2.3 Switch Closure Adjustments	5
3.0 THEORY OF OPERATION	6
3.1 Mechanical Operation	6
3.2 Calibration	6
4.0 CALIBRATION, TESTING, AND MAINTENANCE	6
4.1 Calibration	6
4.2 Testing	7
4.3 Maintenance	7
4.3.1 Cleaning	7
4.3.2 Inspection	7
4.3.3 Field Verification of Calibration	7
4.3.4 Gauge Maintenance	7
5.0 FORMS AND DRAWINGS	8

Equipment Configuration and Parts Identification



Sensor: 5050P Tipping Bucket Assembly

1.0 INTRODUCTION

1.1 General Description

The Model 5050P Tipping Bucket Rain Sensor measures rainfall with an resolution of 1mm per tip. The sensor is constructed from hard-anodized aluminum; the bucket is a welded assembly and guaranteed not crack or deform during normal use. The 5050P is designed for use in the Model 5054TS Rain Gauge Top Section.

1.2 Specifications

Calibration:	1mm/tip
Accuracy:	$\pm 3\%$ for precipitation rate from 0 to 50 mm/hr. (0-2 in./hr.) $\pm 2\%$ for precipitation rate from 50 to 150 mm/hr. (2-6 in./hr.) $\pm 5\%$ for precipitation rate from 150 to 300 mm/hr. (6-12 in./hr.) Note: % error shown for calibration point of 128 mm/hr.
Output:	From "C" (SPDT). May be adjusted to momentary SPST NO pulse (See Section 4.2)

2.0 INSTALLATION

The 5050P is mounted to three leveling screws which are part of the 5054TS Rain Gauge Top Section. An optional mounting configuration is available using the centering plate from an earlier design. Refer to 5054TS Manual for gauge installation.

2.1 Unpacking

- ! Remove the tape that keeps the bucket from moving during transit.
- ! Verify that the bucket moves freely.
- ! Uncoil cable and check for shipping damage.
- ! Perform electrical test of cable, connector, and reed switch. Refer to section 4.2.

2.2 Leveling

The 5050P must be level to insure proper operation. Both types of mounting provide three leveling screws. Adjust leveling screws until bubble level is centered. The level is checked and adjusted after the 5054TS is installed.

2.3 Switch Closure Adjustments

An optional switch closure configuration is SPST NO (Single Pole Single Throw, Normally Open). To adjust the switch for a momentary SPST NO contact, loosen the nut on the magnet holder arm and rotate the arm until the magnet is centered directly over the reed switch when the bucket is level. Tighten the nut to secure the magnet arm onto the bucket shaft. Check that the switch is Normally Open across connector pins A and D whenever the buckets are at rest on either of the calibration screws.

3.0 THEORY OF OPERATION

As the name suggests, a tipping bucket measures rain by filling a bucket then tipping and emptying the bucket. To measure more than one bucket worth of rain requires the bucket to be replaced in the "fill" position. A bucket with two sides that pivot between the "fill" and "empty" positions allow these sensors to measure rain unattended.

3.1 Mechanical Operation

As rain is directed into the 5050P funnel an aluminum funnel tip insures that water fills one side of the tipping bucket. The weight of the water causes the bucket to become balanced and then tip into the other position, emptying out the collected water. Self-lubricating nylon bearings provide long term bucket operation.

As the bucket moves it causes a magnet to pass in front of or away from the switch. The 5050P uses a Single Pole, Double Throw (SPDT) reed switch that produces a Form "C" (complimentary) output. Refer to drawing AC102426. Form "C" is a three wire output with two signal lines and a common. The switch signal lines are labeled "NO"-Normally Open, and "NC"-Normally Closed. As the magnet passes in front of the reed switch, the "NO" switch closes and the "NC" switch opens. The next tip moves the magnet away from the reed switch allowing the switch contacts to return to the normal positions.

A bull-s-eye level is mounted onto the sensor frame to ensure accurate leveling.

3.2 Calibration

The 5050P's resolution of the 1 mm/ tip requires a volume of 72.97 milliliters of water per bucket tip. The bucket volume is based upon the 5054TS's 12-inch diameter collection orifice. See the 2595 manual.

4.0 CALIBRATION, TESTING, AND MAINTENANCE

4.1 Calibration

HydroLynx recommends using the Model 2595 Rain Gauge Calibration Bottle for field verification and bench calibration of the 5050P. See attached 2595 Manual for calibration procedures. HydroLynx can provide calibration services for users that do not have the necessary resources to calibrate their rain gauges.

When adjusting the bucket calibration screws - rotating the screw out (counter-clock wise) will decrease the amount of water needed to tip the bucket (increased number of counts); rotating the screw in (clock wise) rotation increases the amount of water (decreased counts).

4.2 Testing

Refer to wiring diagram AC102426. The Form "C" output can be tested while the 5050P is connected to the Data Transmitter with a volt meter, or when it's not connected to the Data Transmitter with an ohmmeter. The switch signal lines change whenever the bucket tips: 0 or 5 Vdc; 0 or 4 ohms.

- ! Attach meter to one side of the switch (pins A and D).
- ! Check the switch operation by tipping bucket.
- ! Attach meter to other side of the switch (pins C and D).
- ! Check the switch operation by tipping bucket.
- ! Check that switch operation is complimentary (signal at pin A is opposite pin C)
- ! Check that pins D and E are wired together.
- ! Check that pin B is not used.

4.3 Maintenance

Failure to maintain the rain gauge will cause errors in the rain data.
--

4.3.1 Cleaning

Tipping bucket maintenance includes a through cleaning to remove insects, dust, and plant debris that may have been blown into the gauge. Cleaning should be done just before the onset of the rainy season. Some sites may require more frequent visits for cleaning due to local conditions.

4.3.2 Inspection

- ! Inspect bucket assembly for cracks or deformation. This is especially necessary on older soldered stainless steel buckets.
- ! Check bucket assembly for easy tipping motion.
- ! Inspect the under side of the gray PVC funnel for evidence of water travel. The aluminum funnel tip eliminates this problem and should be added to older 5050P-s.
- ! Inspect cable and connector assembly for damage or excessive wear.

4.3.3 Field Verification of Calibration

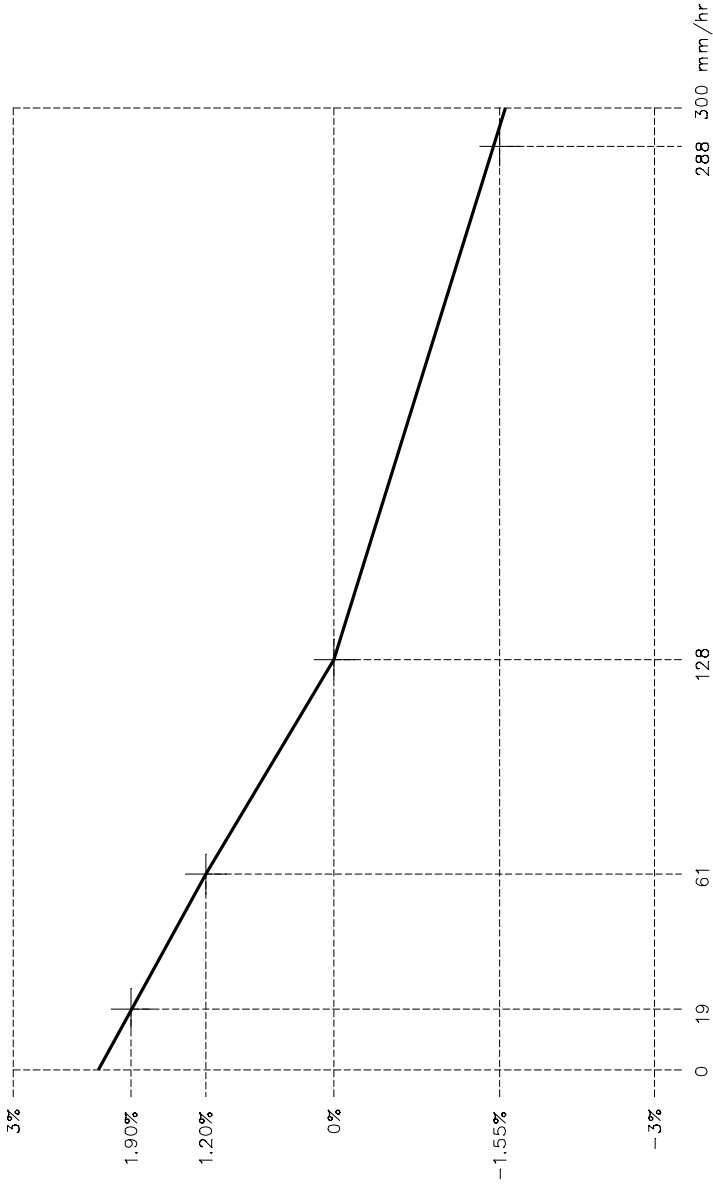
Refer to the 2595 Manual for Field Verification procedure. Performing this test also tests the output.

4.3.4 Gauge Maintenance

Refer to the 5054TS Manual

5.0 FORMS AND DRAWINGS

AC108024	Curve - Typical Calibration
AC108023	Outline - 5050P Tipping Bucket
AC102426	Wiring Diagram and Cable Assembly - 5050P Connector and Cable
AC108021	Wiring Diagram - 5096N Wiring
A100900	5050P Calibration and Testing Certificate



MODEL USAGE

MODEL NO.

5050P

TITLE

TYPICAL CALIBRATION CURVE

DWG TYPE

DATE

M. MALONEY

2-9-99

J. JOHNSON

DATE

2-9-99

CURVE

SIZE

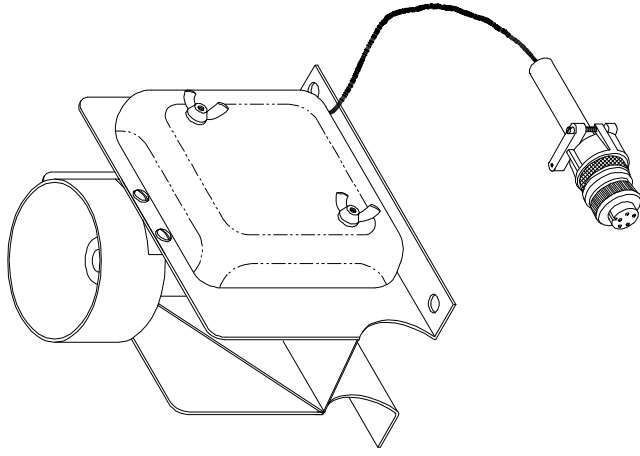
A

DWG NO.

A

REV

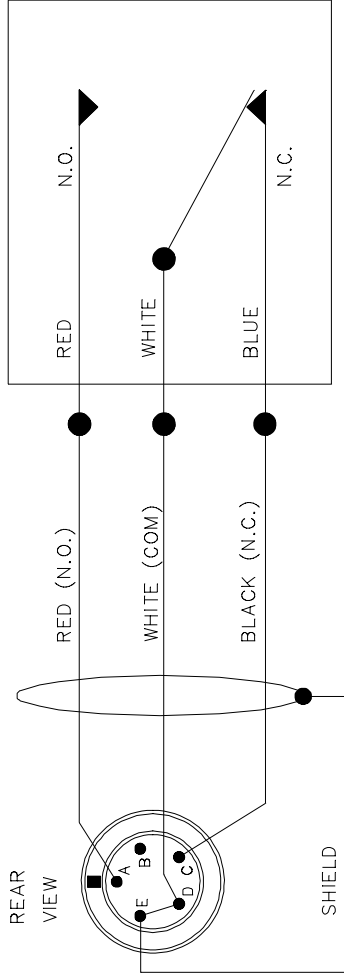
A



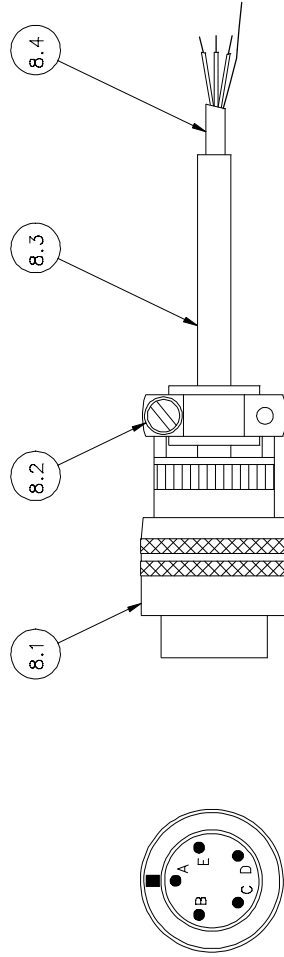
ECN #	DESCRIPTION	DATE
MODEL USAGE	HydroLynx	
MODEL NO.	5050P	
TITLE	TIPPING BUCKET	
DRAWN BY	CJS	DATE 02/10/99
CHECKED BY		DATE
SIZE	A	DWG NO. AC108023
		REV A

NOTES:

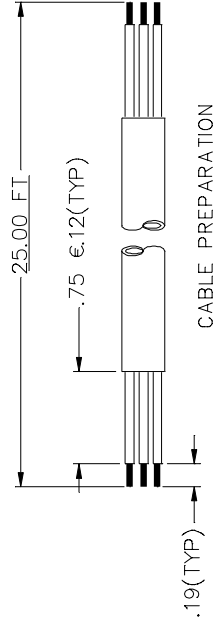
1. PREPARE ENDS OF CABLE AS SHOWN.
2. SOLDER ONE END TO FIVE PIN CONNECTOR.
3. CABLE IS 25 FT OF BELDEN 9533.
4. NUMBER IN BUBBLE (8.3) IS 5050P BM REF. NO.
5. TOP BM REF. NO. IS X.2.2.0.



CONNECT WIRES:
 RED TO A
 BLACK TO C
 WHITE TO D
 SHIELD TO E
 JUMPER E & D



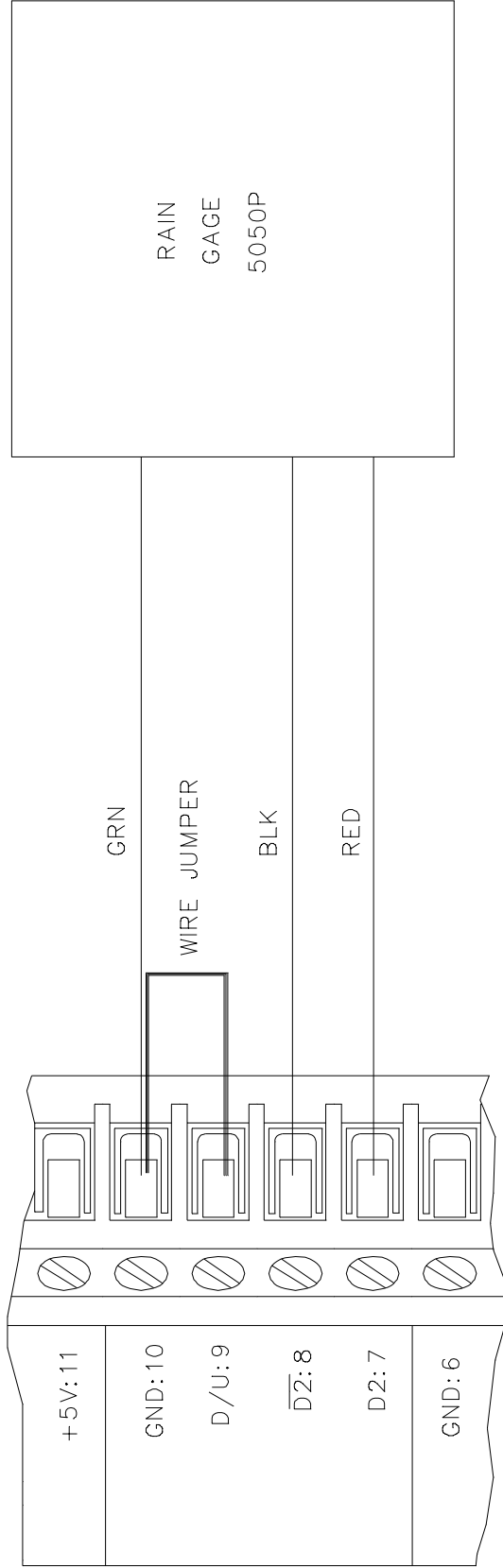
FRONT VIEW




CABLE PREPARATION

N/A	REDRAWN ON NEW BORDER	3/12/99
980107	CHANGE WIRE LENGTH	01/30/98
ECN#	DESCRIPTION	DATE
MODEL USAGE		
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES		
FRACTIONS = ϵ N/A		
.XX = ϵ .01		
.XXX = ϵ .005		
MATL		
FINISH		
DRAWN BY	DATE	DWG TYPE
R. BROWN	3/12/99	WIRING DIAGRAM / ASSEMBLY
CHECKED BY	DATE	SIZE
		B
	REV	C
	MODEL NO.	5050P
	TITLE	CONNECTOR & CABLE
HydroLynx		
AC102426		

TB 2



ECN#	DESCRIPTION	DATE
MODEL USAGE		
5096N		
MODEL NO.	5050P	
TITLE	5096N WIRING	
DRAWN BY	CJS	DATE 02/10/99
CHECKED BY		DATE
DWG TYPE	WIRING DIAGRAM	SIZE A
DWG NO.	AC108021	REV A



5050P CALIBRATION AND TESTING CERTIFICATE

Document Number A100900-1

Date:	Job number:
Inspector:	Serial number:

TEST PERFORMED:

Set the static operating points of the two tipping buckets. Measure dynamic operation accuracy. Static tipping point is measured using 30 cc and 10 cc syringes, accuracy +/- 1 ml. Dynamic test requires a measured amount of water applied at a known flow rate. Tested accuracy of the gauge should fall within the shaded area of the graph at bottom of page. Test starts with left bucket tipping first for consistency.

CALIBRATION EQUIPMENT:

- Model 260-2595 Calibration Bottle With 5 in/hr NOZZLE
- Electronic Counter
- 100 cc Calibrated Cylinder
- 30 cc Syringe
- 10 cc Syringe
- Digital Scale

CALCULATED VALUES:

- 1 Bucket Tip = 1 mm (72.96 ml) of rain
- Test Flow Rate Is at 128 mm/hr (5 in/hr)
- Flow Test Volume of Water = 946 ml
- Calculated Results: Total Tips = 12.96
- Desired Dynamic Test Results: Total Tips = 12.75 to 12.85

MEASURED RESULTS: Adjusted Bucket Tipping Points:

Left Bucket:	ml	Right Bucket:	ml
Dynamic Test:	counts	Accuracy:	%

