CSI MODEL TB4-L RAIN GAGE
INSTRUCTION MANUAL

REVISION: 1/03

Warranty and Assistance

The **CSI MODEL TB4-L RAIN GAGE** is warranted by CAMPBELL SCIENTIFIC, INC. to be free from defects in materials and workmanship under normal use and service for twelve (12) months from date of shipment unless specified otherwise. Batteries have no warranty. CAMPBELL SCIENTIFIC, INC.'s obligation under this warranty is limited to repairing or replacing (at CAMPBELL SCIENTIFIC, INC.'s option) defective products. The customer shall assume all costs of removing, reinstalling, and shipping defective products to CAMPBELL SCIENTIFIC, INC. CAMPBELL SCIENTIFIC, INC. will return such products by surface carrier prepaid. This warranty shall not apply to any CAMPBELL SCIENTIFIC, INC. products which have been subjected to modification, misuse, neglect, accidents of nature, or shipping damage. This warranty is in lieu of all other warranties, expressed or implied, including warranties of merchantability or fitness for a particular purpose. CAMPBELL SCIENTIFIC, INC. is not liable for special, indirect, incidental, or consequential damages.

Products may not be returned without prior authorization. To obtain a Returned Materials Authorization (RMA), contact CAMPBELL SCIENTIFIC, INC., phone (435) 753-2342. After an applications engineer determines the nature of the problem, an RMA number will be issued. Please write this number clearly on the outside of the shipping container. CAMPBELL SCIENTIFIC's shipping address is:

CAMPBELL SCIENTIFIC, INC.
RMA#_____
815 West 1800 North
Logan, Utah 84321-1784

CAMPBELL SCIENTIFIC, INC. does not accept collect calls.

Non-warranty products returned for repair should be accompanied by a purchase order to cover the repair.

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CSI Model TB4-L Rain Gage

1. Introduction

The TB4-L tipping bucket rain gage is manufactured by Hydrological Services Pty. Ltd. (Model TB4) and modified for use with Campbell Scientific dataloggers.

The TB4-L rain gage catches rainfall in the 7.87" (200 mm) collection funnel. When 0.01" of rainfall are collected, the tipping bucket assembly tips and activates a reed switch. The switch closure is recorded by the datalogger pulse channel. When the bucket tips, the water drains out the screened fittings in the base of the gage.

2. Specifications

MODEL TB4-L RAIN GAGE

Funnel:	7.87" (200 mm)
Drain Fittings:	Accept 12 mm ID tubing
Measurement Range:	0 to 27.6 in/hr (0 to 700 mm/hr)
Accuracy:	Better than +2% @ 19.7in/hr (500mm/hr)
Resolution:	0.01" (0.254 mm)
Environmental Conditions:	
Temperature:	0°C to +70°C
Humidity:	0 to 100%
Temperature Specifications:	-20 to +70°C
Siphon Capacity:	.012" (0.3mm)
Contact:	Dual Reed Switch
Capacity:	12VA (0.5 amp max.)
Dimensions:	
Weight:	4.41 pounds (2 kg)
Height:	13" (330 mm)
Diameter:	7.9" (200 mm)

NOTE

The black outer jacket of the cable is Santoprene® rubber. This compound was chosen for its resistance to temperature extremes, moisture, and UV degradation. However, this jacket will support combustion in air. It is rated as slow burning when tested according to U.L. 94 H.B. and will pass FMVSS302. Local fire codes may preclude its use inside buildings.

3. Installation

3.1 Location

The rain gage should be mounted in a relatively level spot which is representative of the surrounding area. The lip of the funnel should be horizontal and at least 30 inches above the ground. The ground surface around the rain gage should be natural vegetation or gravel. The gage should not be installed over a paved or concrete surface.

For accurate measurements, the rain gage must be placed away from objects that obstruct wind. The minimum distance should be 2 times the height of the obstruction or more.

3.2 Mounting

The rain gage is designed to mount on a flat surface. Three equally spaced mounting pads are provided. The mounting pads are pre-drilled for three 3/8" (M8) bolts on a 9.21" (234 mm) diameter bolt circle. The CM100 mounting bracket is available from Campbell Scientific for installing the TB4-L on a 1-1/4" threaded pipe. The mounting bracket provides adjustment for leveling the TB4-L.

Mount the TB4-L to either a user-supplied bracket or CM100. Remove the TB4-L funnel from the base by removing the three screws and lifting upward. Adjust the three nuts on the CM100 bracket to level the rain gage. On user-supplied brackets, shims or washers can be used to level the rain gage. A bubble level is mounted on the TB4-L base to facilitate leveling.

Remove the rubber shipping band and cardboard packing securing the tipping bucket assembly. Tip the bucket several times to insure the tipping mechanism is moving freely. Replace the housing assembly and tighten the three screws to secure the housing to the base.

3.3 Wiring

3.3.1 Datalogger Wiring

CR10(X), 21X, and CR7:

BLACK (+5 V) ---------- Pulse Channel

WHITE (Ground)---------- GND

CLEAR (Shield) ---------- GND

The BLACK (+5 V Signal) lead connects to a pulse channel. The WHITE (Power Ground) connects to any ground channel (G). The CLEAR (shield) lead connects to any ground channel (G). The purpose of the shield wire is to drain any charges built up in the cable due to transients, etc.

NOTE If a pulse channel is not available, Control Port 7 or 8 can be used to record switch closures from a rain gage with the CR10(X) datalogger. Refer to the datalogger manual, section 8.5, for additional information or contact Campbell Scientific for assistance when using control ports to count switch closures on other datalogger models.

BLACK (+5 V) ---------- P1

WHITE (Ground)---------- GND

CLEAR (Shield) ---------- GND

3.4 Datalogger Instructions

CR10(X), 21X, CR7 Programming:

The TB4-L rain gage is measured using Instruction 3 configured for a switch closure (option code 2).

In the following example, the datalogger continuously measures rainfall and outputs the time, date, and total rainfall every 60 minutes:

Input Location Labels:

1. Rain (in)

```
Table Programs
   01:          60          Sec. Execution Interval

01:  Pulse (P3)
   1:   1                    Rep
   2:   1                    Pulse Input Channel
   3:   2                    Switch Closure
   4:   1                    Loc [:Rain (in)]
   5:   0.01                 Mult
   6:   0                    Offset

02:  If time is (P92)
   1:   0                    minutes into a
   2:   60                   minute interval
   3:   10                   Set high Flag 0

03:  Real Time (P77)
   1:   110                  Day,Hour-Minute

04:  Totalize (P72)
   1:   1                    Repetitions
   2:   1                    Starting Input Location

05:  End Table 1 (P)
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A multiplier of 0.01 converts the output to inches and a multiplier of 0.254 converts the output to millimeters.

4. Maintenance

During each site visit, remove any debris, insects, sediment, etc. from the collection funnel, debris screen, siphoning mechanism, or tipping bucket assembly.

Verify the tipping bucket assembly moves freely, and that the datalogger records 0.01 inches for each bucket tip.

5. Calibration

The sensor is factory calibrated; recalibration is not required unless damage has occurred or the adjustment screws have loosened. Nevertheless, the following calibration check is recommended once every 12 months:

a. Remove the housing assembly from the base by removing the three screws and lifting upward on the housing.

b. Check the bubble level to verify the rain gage is level.

c. Pour water through the inner funnel to wet the two bucket surfaces. Using a graduated cylinder, slowly pour 314 cc (19.16 in^3) of water, over a 15 minute period, into the collection funnel. This volume of water is equal to .39 inches of rainfall (10 mm).

d. After the water has passed through the rain gage, the tipping bucket should have tipped 39 times.

e. If the rain gage fails to record the correct number of tips, return the unit to Campbell Scientific for recalibration.