INSTRUCTION MANUAL

52202 Electrically Heated Rain and Snow Gage

Revision: 12/11

WARRANTY AND ASSISTANCE

This equipment is warranted by CAMPBELL SCIENTIFIC (CANADA) CORP. ("CSC") 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 are not warranted.** ***** CSC's obligation under this warranty is limited to repairing or replacing (at CSC's option) defective products. The customer shall assume all costs of removing, reinstalling, and shipping defective products to CSC. CSC will return such products by surface carrier prepaid. This warranty shall not apply to any CSC 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. CSC is not liable for special, indirect, incidental, or consequential damages.

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PLEASE READ FIRST

About this manual

Please note that this manual was originally produced by Campbell Scientific Inc. (CSI) primarily for the US market. Some spellings, weights and measures may reflect this origin.

Some useful conversion factors:

Area:	1 in^2 (square inch) = 645 mm^2
Length:	1 in. (inch) = 25.4 mm 1 ft (foot) = 304.8 mm 1 yard = 0.914 m 1 mile = 1.609 km
Mass:	1 oz. (ounce) = 28.35 g 1 lb (pound weight) = 0.454 kg
Pressure:	1 psi (lb/in2) = 68.95 mb
Volume:	1 US gallon = 3.785 litres

In addition, part ordering numbers may vary. For example, the CABLE5CBL is a CSI part number and known as a FIN5COND at Campbell Scientific Canada (CSC). CSC Technical Support will be pleased to assist with any questions.

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52202 Electrically Heated Rain and Snow Gage

1. General Description

RM Young's Model 52202-L is an electrically heated precipitation gage that provides year-round measurement of rain or snow. This gage requires a reliable source of 24 Vac power. A power supply can be purchased from Campbell Scientific (p/n: C1676-L)

Output is a switch closure for each bucket tip.

A –L after the model number indicates that the cable length is specified when ordering. Throughout this manual, the rain gage will be referred to as the 52202.

The Alter Wind Screen can be used with the 52202 to minimize the effect of strong winds on the 52202's measurements.

2. Specifications

Sensor Type: Tipping bucket with magnetic reed switch

Accuracy: 2% up to 1 in. h^{-1} (25 mm h^{-1});
3% up to 2 in. h^{-1} (50 mm h^{-1})

Resolution: 0.004 in. (0.1 mm)

Orifice Diameter: 6.3 in. (16 cm)

Catchment Area: 31 $in.^2$ (200 cm^2)

Temperature Range: -20° to +50°C

Humidity Range: 0 to 100%

Power: 18 Watts @ 24 Vac

Contact Rating: 24 Vac/dc, 500 mA maximum

Dimensions
Diameter: 7.3 in (18.5 cm)
Height: 11.8 in. (30 cm)

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

NOTE The Alter Wind Screen's siting information and installation procedure are provided in the 260-953 manual.

3.1 Siting

The 52202 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 cm. above the ground. It should be high enough to be above the average snow depth. The ground surface around the rain gage should be natural vegetation or gravel. It should not be paved.

The gage should be placed away from objects that obstruct the wind. The distance should be two to four times the height of the obstruction.

3.2 Mounting

The 52202 precipitation gage uses a clamp to fasten onto a user-supplied 1-in. IPS pipe (see Figure 3-1).

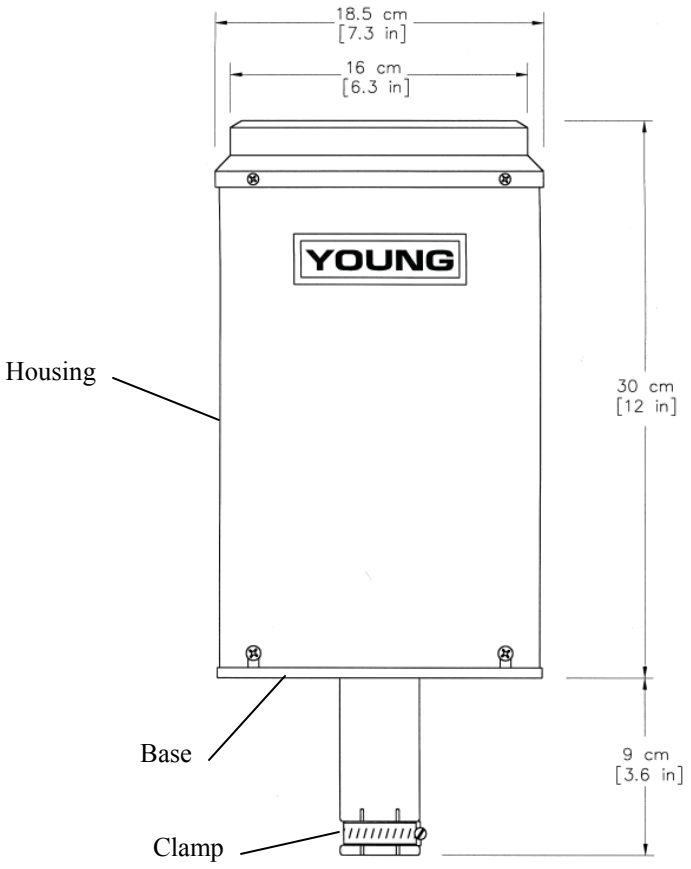

FIGURE 3-1. 52202 Precipitation Gage

The 52202 can also attach to a CM202, CM204, or CM206 crossarm via a CM220 Right Angle Mounting Bracket (see Figure 3-2). The crossarm attaches to a tripod mast, tower leg, CM300-series mounting pole, or a user-supplied vertical pipe (1.0-in. to 2.1-in. OD).

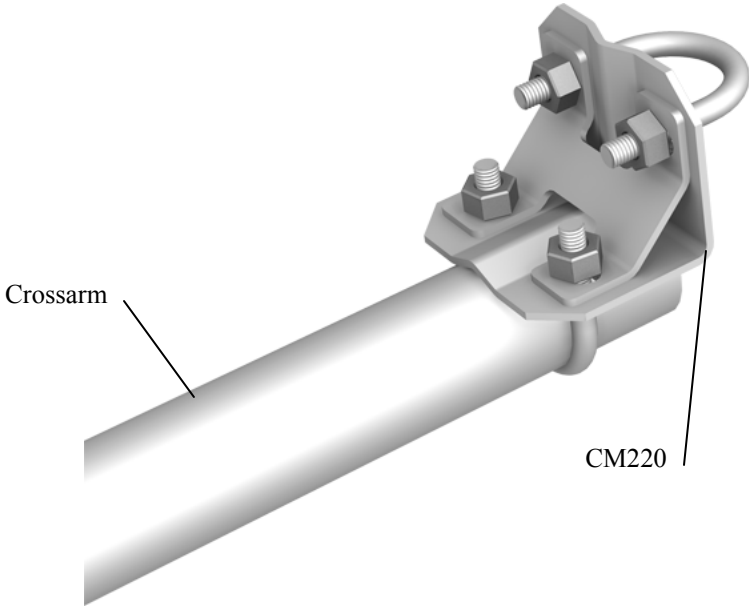

FIGURE 3-2. The CM220 Mounted to a Crossarm

Alternatively, the 52202 can be attached to the top of our stainless-steel tripods via the CM216 Sensor Mounting Kit. The CM216 extends 4-in. above the mast of a stainless-steel CM110, CM115, or CM120 tripod (see Figure 3-3).

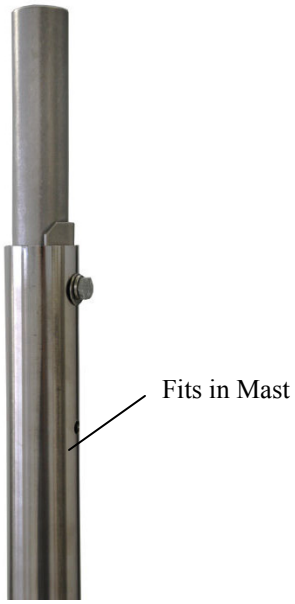

FIGURE 3-3. The CM216 Atop a Stainless-Steel Tripod

After mounting the 52202, level the gage and remove the shipping retainer by performing the following procedure:

1. Loosen the three screws that retain housing to base assembly (see Figure 3-1). Carefully lift housing free of base.
2. Remove shipping retainer from bucket. Verify that bucket tips freely.
3. Adjust leveling screws until bulls eye level is centered.
4. Replace housing and retighten screws.

4. Wiring

WARNING **Disconnect heater power before attempting to service or repair this equipment. Failure to do so may result in personal injury or death due to electrocution.**

4.1 Heater Wiring

When connecting the C1676-L power supply wiring, please note that polarity is not a concern. This gage requires an adequately grounded, reliable source of 24 Vac power.

4.2 Wiring to a Pulse Channel

NOTE When Short Cut software is used to generate the datalogger program, the sensor should be wired to the channels shown on the wiring diagram created by Short Cut.

The 52202 is typically wired to a datalogger's pulse channel (see Table 4-1).

TABLE 4-1. Wiring for Pulse Channel Input

Color	Description	CR800 CR1000 CR3000 CR5000	CR500 CR510, CR10(X)	21X, CR7, CR23X	CR200(X) Series
Black	Signal	Pulse Channel	Pulse Channel	Pulse Channel	P_SW
White	Signal Return	⏚	G	⏚	⏚
Clear	Shield	⏚	G	⏚	⏚

4.3 Wiring to a Control Port

Dataloggers listed in Table 4-2 have the capability of counting switch closures on some of their control ports. When a control port is used, the return from the rain gage switch must be connected to +5 volts on the datalogger.

TABLE 4-2. Wiring for Control Port Input

Color	Description	CR800 CR1000 CR3000	CR500 CR510	CR10X	CR23X
Black	Signal	Control Port	C2/P3	Control Port	Control Port
White	Signal Return	5 V	5 V	5 V	5 V
Clear	Shield	⏚	⏚	G	⏚

The CR10 does not support the use of control port inputs with the Pulse Count instruction.

5. Datalogger Programming

NOTE This section is for users who write their own programs. A datalogger program to measure this sensor can be generated using Campbell Scientific's Short Cut Program Builder software. You do not need to read this section to use Short Cut.

Precipitation is measured using a Pulse Count with a switch closure configuration code. The multiplier used in the Pulse Count instruction determines the units in which rainfall is reported (see Table 5-1).

TABLE 5-1. Multipliers

Rain Gage	0.01 in.	1 in.	0.1 mm	1 mm
52202	0.394	0.00394	1.0	0.1

5.1 Pulse Channel Example Programs

The following example programs use a pulse channel to read the output from the precipitation gage. The CR1000 example will also work with the CR800, CR850, CR3000, and CR5000. CR9000(X) programming is similar to the CR1000 except it has an additional parameter in the PulseCount instruction to specify the pulse module's slot.

The CR10X program will also work with the CR500, CR510, CR10, 21X or CR23X. CR7 programming is similar to the CR10X but has an additional parameter in the PulseCount instruction to specify the slot that the Pulse Card is in.

5.1.1 CR1000 Example Program

```
'CR1000

'RM_Young Tipping   Blk > P1
'                   Wht > ground
'Cabling for heater goes to 24VAC power supply

Public Rain_mm
Units Rain_mm=mm
DataTable(Rain,True,-1)
    DataInterval(0,60,Min,0)
    Totalize(1,Rain_mm,FP2,0)
EndTable

BeginProg
    Scan(1,Sec,1,0)
        PulseCount(Rain_mm,1,1,2,0,0.1,0)
        CallTable(Rain)
    NextScan
EndProg
```

5.1.2 CR200(X) Series Example Program

```
'CR200(X) Series

'RM_Young Tipping   Blk > P_SW
'                   Wht > ground
'Cabling for heater goes to 24VAC power supply

'Declare Variables and Units

Public Rain_mm

Units Rain_mm=mm

'Define Data Tables
DataTable(Rain,True,-1)
    DataInterval(0,60,Min)
    Totalize(1,Rain_mm,0)
EndTable

'Main Program
BeginProg
    Scan(1,Sec)

        '52202 Rain Gage measurement Rain_mm:
        PulseCount(Rain_mm,P_SW,2,0,0.1,0)

        'Call Data Tables and Store Data
        CallTable(Rain)
    NextScan
EndProg
```

5.1.3 CR10X Example Program

```
;{CR10X}
*Table 1 Program
  01:  1.0000          Execution Interval (seconds)

1: Pulse (P3)
   1:   1              Reps
   2:   1              Pulse Channel 1
   3:   2              Switch Closure, All Counts
   4:   3              Loc [ Rain_mm ]
   5:   0.1            Multiplier
   6:   0              Offset

2: If time is (P92)
   1:   0              Minutes (Seconds --) into a
   2:   60             Interval (same units as above)
   3:   10             Set Output Flag High (Flag 0)

3: Set Active Storage Area (P80)
   1:   1              Final Storage Area 1
   2:   101            Array ID

4: Real Time (P77)
   1:   1220           Year,Day,Hour/Minute (midnight = 2400)

5: Totalize (P72)
   1:   1              Reps
   2:   3              Loc [ Rain_mm ]

*Table 2 Program
  01:  0               Execution Interval (seconds)

*Table 3 Subroutines

End Program
```

5.2 Control Port Example

The following example programs use a control port to read the output from the precipitation gage. The CR1000 example will also work with the CR800, CR850, and CR3000. The CR10X program will also work with the CR500, CR510, or CR23X.

5.2.1 CR1000 Example Program

```
'CR1000

'RM_Young Tipping   Blk > C4
'                   Wht > 5v
'Cabling for heater goes to 24VAC power supply

'Declare Variables and Units
Public BattV
Public RM_Young

Units BattV = Volts
Units RM_Young =inch

DataTable(OneMin,True,-1)
    DataInterval(0,1,Min,10)
    Totalize (1,RM_Young,FP2,False)
EndTable

'Define Data Tables
DataTable(OneDay,True,-1)
DataInterval(0,1440,Min,10)
    Minimum(1,BattV,FP2,False,False)
    Totalize (1,RM_Young,FP2,False)          'RM Young tipping bucket
EndTable

'Main Program
BeginProg
    Scan(5,Sec,1,0)
        'Default Datalogger Battery Voltage measurement BattV
        PanelTemp (PTemp,_60Hz)
        Battery(BattV)

        'RM Young Heated Rain Gage measurement Rain_in
        PulseCount(RM_Young,1,14,2,0,0.0039,0)

        'Call Data Tables and Store Data
        CallTable(OneMin)
        CallTable(OneDay)
    NextScan
EndProg
```

5.2.2 CR10X Example Program

```
;{CR10X}
;
*Table 1 Program
  01:  1              Execution Interval (seconds)

1: Pulse (P3)
   1:   1             Reps
   2:   8             Control Port 8 (switch closure only)   ;Black wire connect to C8
   3:   2             Switch Closure, All Counts
   4:   1             Loc [ Rain_mm ]
   5.   0.1           Multiplier
   6:   0             Offset

2: If time is (P92)
   1:   0             Minutes (Seconds --) into a
   2:   60            Interval (same units as above)
   3:   10            Set Output Flag High (Flag 0)

3: Set Active Storage Area (P80)
   1:   1             Final Storage Area 1
   2:   101           Array ID

4: Real Time (P77)
   1:   1220          Year,Day,Hour/Minute (midnight = 2400)

5: Totalize (P72)
   1:   1             Reps
   2:   1             Loc [ Rain_mm ]

*Table 2 Program
  02:  0.0000         Execution Interval (seconds)

*Table 3 Subroutines

End Program
```

Output Instruction 72, Totalize, is used in the output section of the program to output the total rainfall over the output interval. This section should be executed every scan and not placed in a subroutine or conditional statement.

6. Troubleshooting

6.1 Precipitation

Symptom: No Precipitation

1. Check that the sensor is wired to the pulse channel or control port specified by the pulse count instruction.

2. Verify that the Configuration Code (Switch Closure), and Multiplier and Offset parameters for the Pulse Count instruction are correct for the datalogger type.

3. Disconnect the sensor from the datalogger and use an ohm meter to do a continuity check of the switch. The resistance measured at the terminal block on the inside of the bucket between the black and white leads should vary from infinite (switch open) when the bucket is tipped, to less than an ohm when the bucket is balanced.

7. Maintenance

The rain gage should be inspected periodically. Accumulated dirt and debris should be cleaned from funnel, screen and bucket assembly. Electrical connections should be inspected and cleaned. Leveling screws may be readjusted at this time.

Periodic recalibration may be desirable to ensure measurement accuracy. The following calibration check is advised every 12 months.

1. With the rain gage properly leveled, slowly pour a measured volume of water into the collection funnel. The rate should be about 10 ml per minute which is approximately 1-in. per hour. The bucket should tip five times for each 10 ml of water. For example, 100 ml should give a count of 50 ±1. Bucket tips may be counted manually or with a counter connected to the rain gage terminals.

2. If the count shows an error of more than 2%, adjust the calibrating screws to correct the error. Raise the screws if the count is low, lower the screws if the count is high. Always adjust both screws equally.

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