INSTRUCTION MANUAL

ENC10/12, ENC12/14, ENC14/16, ENC16/18

10/06

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ENC10/12, ENC12/14, ENC14/16, ENC16/18

1. General Description

Environmental enclosures protect our dataloggers and peripherals from water and most pollutants. Our general use enclosures include the ENC10/12, ENC12/14, ENC14/16, and ENC16/18. For cable entry, Campbell Scientific offers a choice of one 1.25” diameter conduit, two 1.25" diameter conduits, or individual compression fittings (not available for the ENC14/16). Multiple cables can use the conduit(s) whereas each cable uses a separate compression fitting. The individual compression fittings provide a more water-tight seal.

Campbell Scientific enclosures are manufactured with non-corrosive polyester and reinforced with fiberglass. These white UV-stabilized enclosures reflect solar radiation reducing temperature gradients inside the enclosure without requiring a separate radiation shield. A door gasket, external grounding lug, stainless steel hinge, and lockable hasp are included. Our enclosures were rated NEMA 6P before being modified to include the conduit(s) or compression fittings. An internal backplate is punched with a grid of one-inch-on-center holes for mounting dataloggers, peripherals, and brackets.

2. Enclosure Supply Kit

Each of our enclosures is shipped with a sealed plastic bag containing an Enclosure Supply Kit. This kit provides the materials used to seal and desiccate the enclosures. Specifically, it includes:

(4) 4-unit desiccant packs
(1) humidity indicator card
(6) 4" cable ties
(6) 8" cable ties
(4) cable tie mounts
(1) 4 oz. sealing putty
(8) screws
(8) grommets
(1) Phillips screwdriver

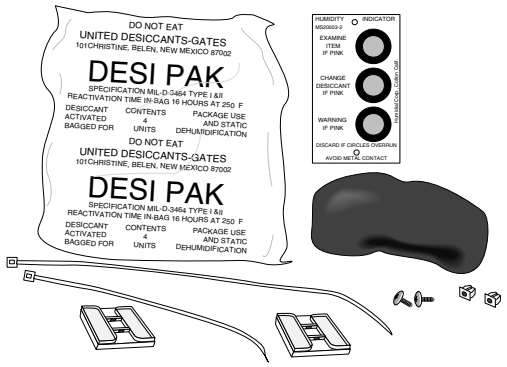

FIGURE 1. Components of the enclosure supply kit; screwdriver not shown.

3. Mounting Equipment Inside the Enclosure

3.1 Enclosures with one or two 1.25” conduits

1. If using the optional Door Switch Indicator, follow the procedure described in Appendix A.
2. Mount the datalogger, peripherals, and brackets onto the internal backplate.
3. Route sensor and peripheral leads through the conduit(s). Use the reducing plug if the conduit(s) is large enough to accommodate all wires.
4. Connect sensors and peripherals to the datalogger as described in the sensor and peripheral manuals.
5. Secure sensor and peripheral leads to the side of the enclosure and to the datalogger using cable ties and tabs.
6. Place two of the desiccant packs from the Enclosure Supply Kit inside of the enclosure.
7. Remove the backing from the humidity indicator card and attach the card to the right side of the enclosure.
8. Place a roll of putty around the sensor leads where they enter the enclosure.
9. Press the putty around the leads and into the coupling to form a tight seal.

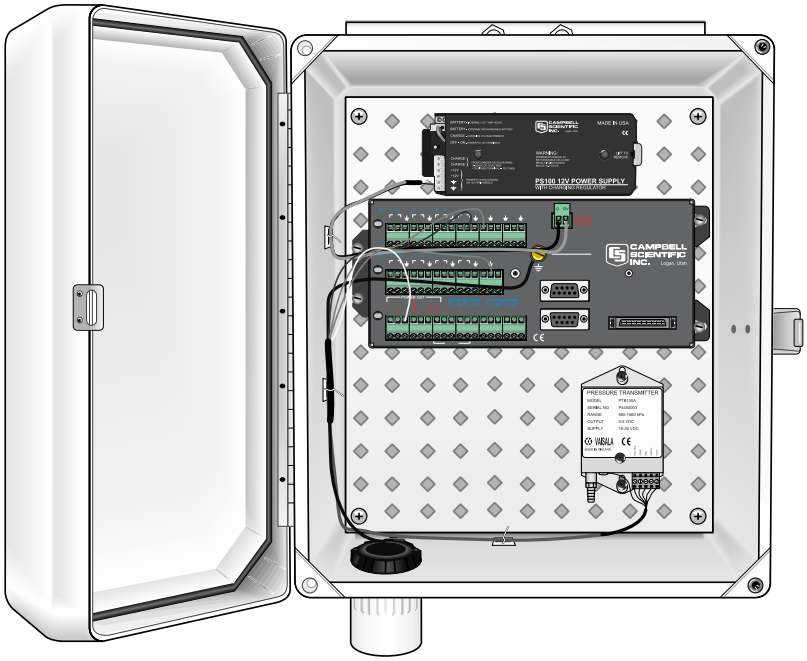

FIGURE 2. An ENC12/14 with one 1.25” conduit houses a CR1000 datalogger and the PS100 12 V rechargeable power supply. Desiccant and humidity indicator card not shown.

3.2 Enclosures with Individual Compression Fittings

1. If using the optional Door Switch Indicator, follow the procedure described in Appendix A.
2. Mount the datalogger, peripherals, and brackets onto the internal backplate.
3. Route each sensor and peripheral lead through a unique compression fitting.
4. Connect sensors and peripherals to the datalogger as described in the sensor and peripheral manuals.
5. Secure sensor and peripheral leads to the side of the enclosure and to the datalogger using cable ties and tabs.
6. Place two of the desiccant packs from the Enclosure Supply Kit inside the enclosure.
7. Remove the backing from the humidity indicator card and attach the card to the right side of the enclosure.
8. Rotate each compression fitting so that the fitting clamps tightly against the sensor cable to provide a water-tight seal.

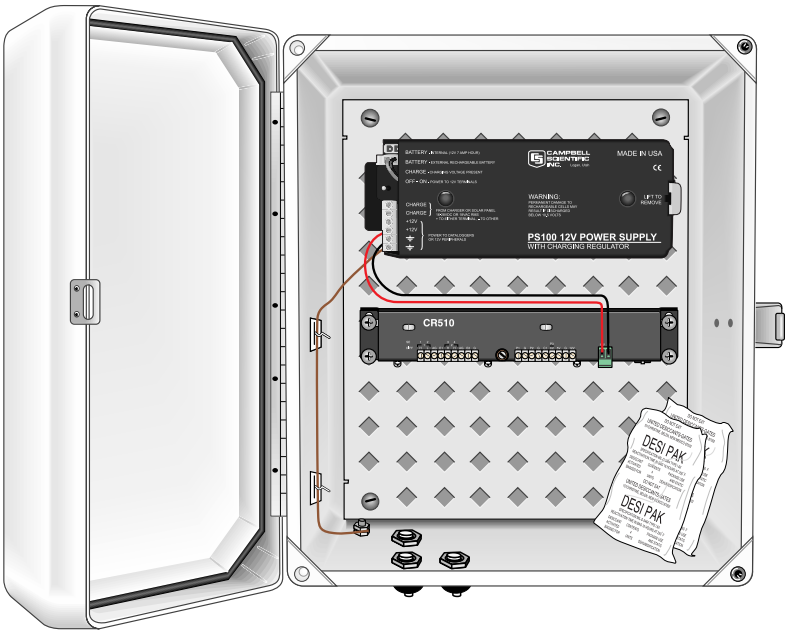

FIGURE 3. An ENC10/12 with three individual compression fittings houses a CR510 datalogger and the PS100 12 V power supply. The ENC12/14 and ENC16/18 enclosures have six compression fittings. Humidity indicator card not shown.

4. Attachment to an Instrument Mount

4.1 Tripod Mast

The "-MM" mount option is intended for mounting our enclosures to the mast of any of our tripods. An enclosure ordered with this option will be shipped with a three-piece bracket mounted to the top of the enclosure and an identical three-piece bracket mounted to the bottom of the enclosure (see Figures 4-1, 4-2, and 4-3).

Attach the enclosure to the mast as follows:

1. Position the enclosure on the north side of the mast.
2. Place the enclosure at the desired height. Please note that the recommended lead lengths for our sensors assume the bottom of the enclosure is mounted 3 ft from the ground.
3. Use the furnished 2" u-bolts to secure the enclosure to the tripod mast.
4. Route the 14 AWG wire from the brass tripod grounding clamp to the enclosure grounding lug. Strip one inch of insulation from each end of the wire and insert the end of the wire into the grounding lugs and tighten.

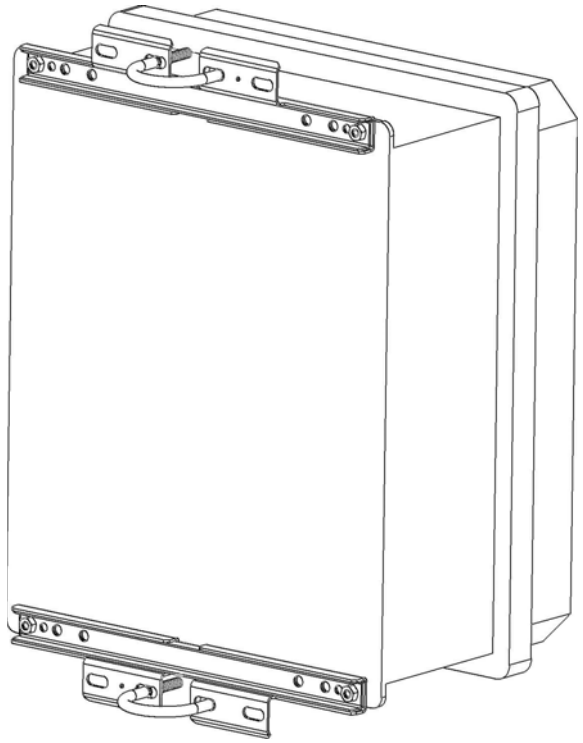

FIGURE 4-1. An enclosure with the "-MM" mounting option attaches to a tripod mast via u-bolts.

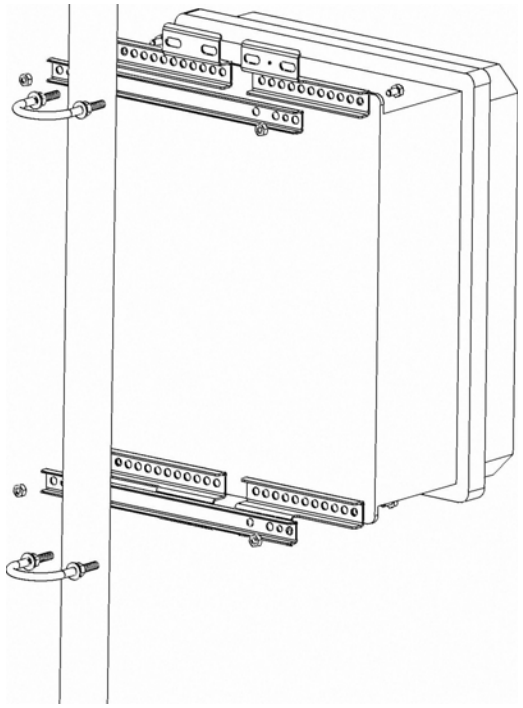

FIGURE 4-2. This exploded view shows the components of a “-MM” bracket.

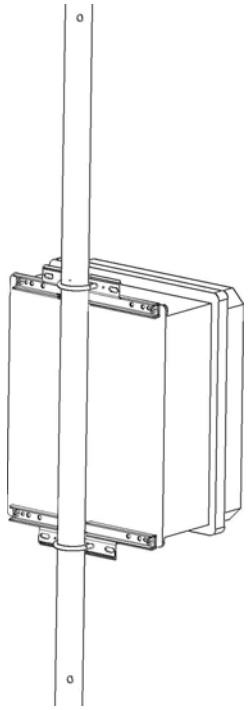

FIGURE 4-3. An enclosure attached to a tripod mast.

4.2 UT10 10 ft Tower

The “-TM” option is used to attach our enclosures to a UT10 tower. An enclosure ordered with the “-TM” option will be shipped with a three-piece bracket mounted to the top of the enclosure and an identical three-piece bracket mounted to the bottom of the enclosure. This mounting bracket option uses the same three-piece brackets as the "-MM" option, except the pieces are rearranged so that the flanges are on the side of the bracket instead of in the middle. The distance between the centers of each flange needs to be 10.25” (see Figures 4-4, 4-5, and 4-6).

Attach the enclosure to the UT10’s tower legs as follows:

1. Position the enclosure on the north side of the tower.
2. Place the enclosure at the desired height. Please note that the recommended lead lengths for our sensors assume the bottom of the enclosure is mounted 3 ft from the ground.
3. Use the furnished 1.5” u-bolts to secure the enclosure to the tower legs.
4. Route the 14 AWG wire from the brass tower grounding clamp to the enclosure grounding lug. Strip one inch of insulation from each end of the wire and insert the end of the wire into the grounding lugs and tighten

4.3 UT20 or UT30 Tower

The “-TM” option is used to attach our enclosures to a UT20 or UT30 tower. An enclosure ordered with the “-TM” option will be shipped with a three-piece bracket mounted to the top of the enclosure and an identical three-piece bracket mounted to the bottom of the enclosure. This mounting bracket option uses the same three-piece brackets as the "-MM" option, except the pieces are rearranged so that the flanges are on the side of the bracket instead of in the middle. The distance between the centers of each flange needs to be 17” (see Figures 4-4, 4-5, and 4-6).

NOTE Enclosures with the "-TM" option are shipped configured for the UT10 tower. Steps 1 through 3 of the following procedure are for configuring the bracket for attachment to a UT20 or UT30 tower.

Attach the enclosure to a UT20 or UT30 tower as follows:

1. Remove the bolts and nuts connecting the bracket to the enclosure.
2. Slide out the flange sections so that the distance between the centers of each flange is 17" (see Figure 4-4).
3. Reattach the bracket to the enclosure using the original bolts and nuts.
4. Position the enclosure on the north side of the mast.
5. Place the enclosure at the desired height. Please note that the recommended lead lengths for our sensors assume the bottom of the enclosure is 3 ft from the ground.
6. Use the furnished 1.5” u-bolts to secure the enclosure to the tower legs.
7. Route the 14 AWG wire from the brass tower grounding clamp to the enclosure grounding lug. Strip one inch of insulation from each end of the wire and insert the end of the wire into the grounding lugs and tighten.

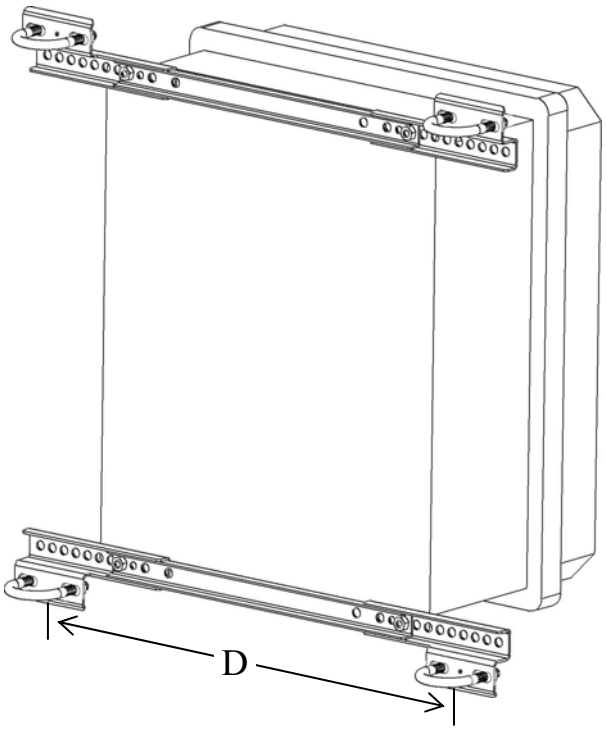

FIGURE 4-4. Enclosure brackets configured for a tower mount.

The default configuration is for attaching to a UT10 tower (i.e., D = 10.25”). To attach to a UT20 or UT30 tower, move the flange sections of the bracket so that D = 17”.

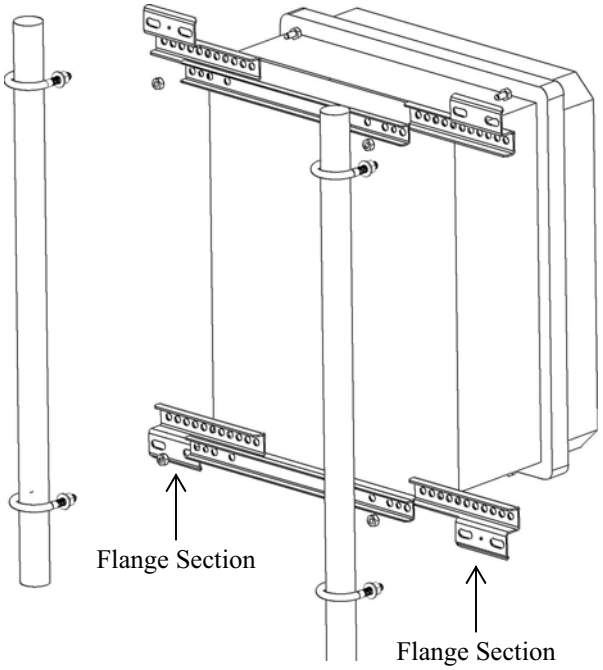

FIGURE 4-5. This exploded view shows the components of a “-TM” bracket option.

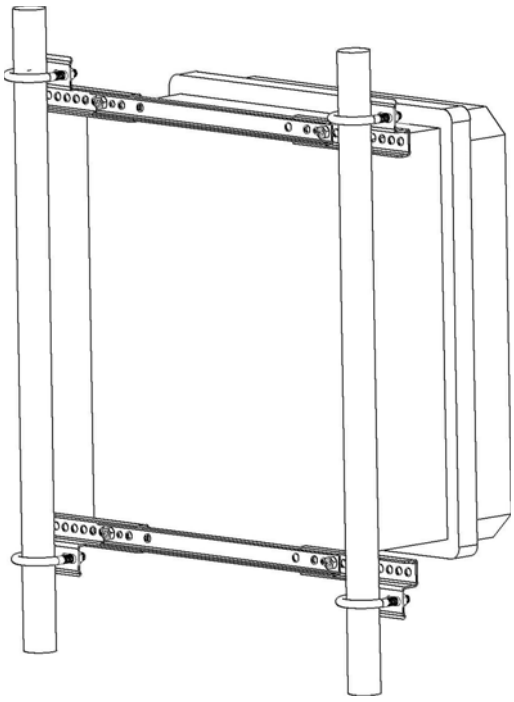

FIGURE 4-6. An enclosure attached to two tower legs.

4.4 Leg Base of a CM110, CM115, CM120 Tower

The "-LM" mount option is intended for attaching an ENC10/12, ENC12/14, or ENC14/16 enclosure to the leg base of a CM110, CM115, or CM120 tower. An enclosure ordered with this option will be shipped with a bracket attached to each side of the enclosure and a u-bolt bracket. A 19124 bracket must also be attached to the tripod (see Figure 4-7).

NOTES

(1) For some tripods, the 19124 bracket may not be pre-installed on the tripod at the factory. In this situation, the 19124 bracket and mounting hardware will be shipped with the tripod and will need to be installed as shown in Figure 4-7.

(2) An ENC16/18 cannot be mounted to the leg base.

Attach the enclosure to the leg base as follows:

1. Place the flange of the tripod's bracket into a notch in one of the enclosure's bracket (see Figures 4-7, 4-8, and 4-10).
2. Attach the u-bolt bracket on the other enclosure bracket (see Figure 4-9).
3. Use the furnished 2" u-bolt to secure the enclosure bracket to a tripod leg (see Figures 4-9 and 4-10).
4. Route the 14 AWG wire from the brass tripod grounding clamp to the enclosure grounding lug. Strip one inch of insulation from each end of the wire and insert the end of the wire into the grounding lugs and tighten.

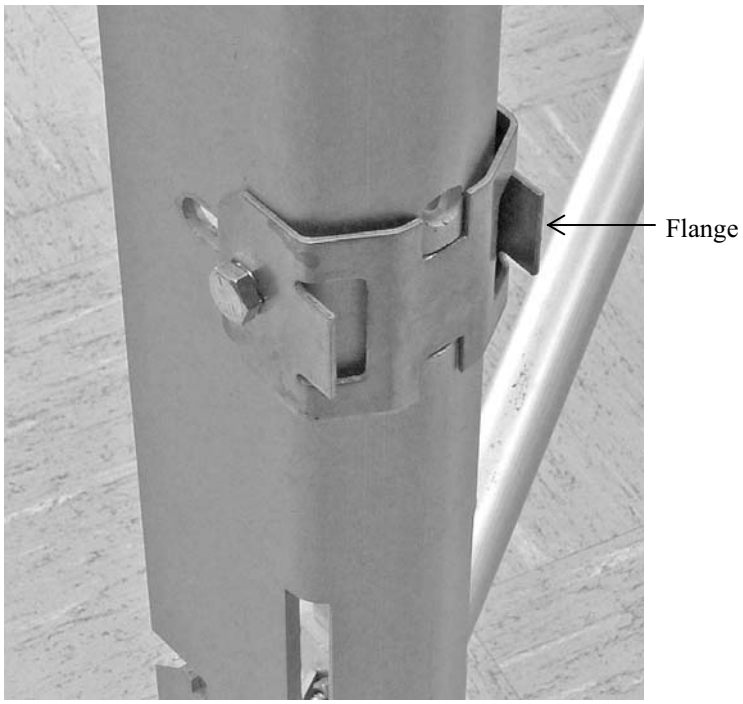

FIGURE 4-7. The 19124 bracket attached to a CM110 tripod.

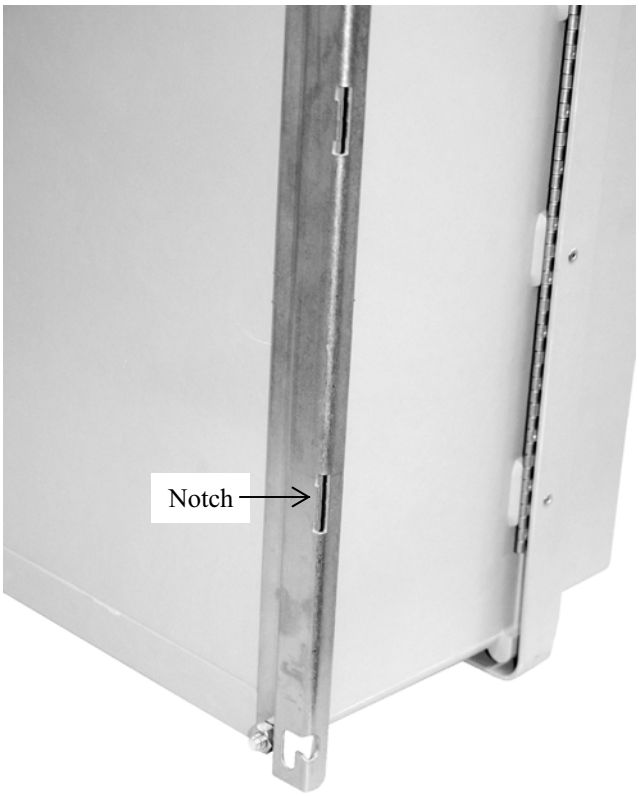

FIGURE 4-8. An ENC14/16 enclosure with a "-LM" Bracket.

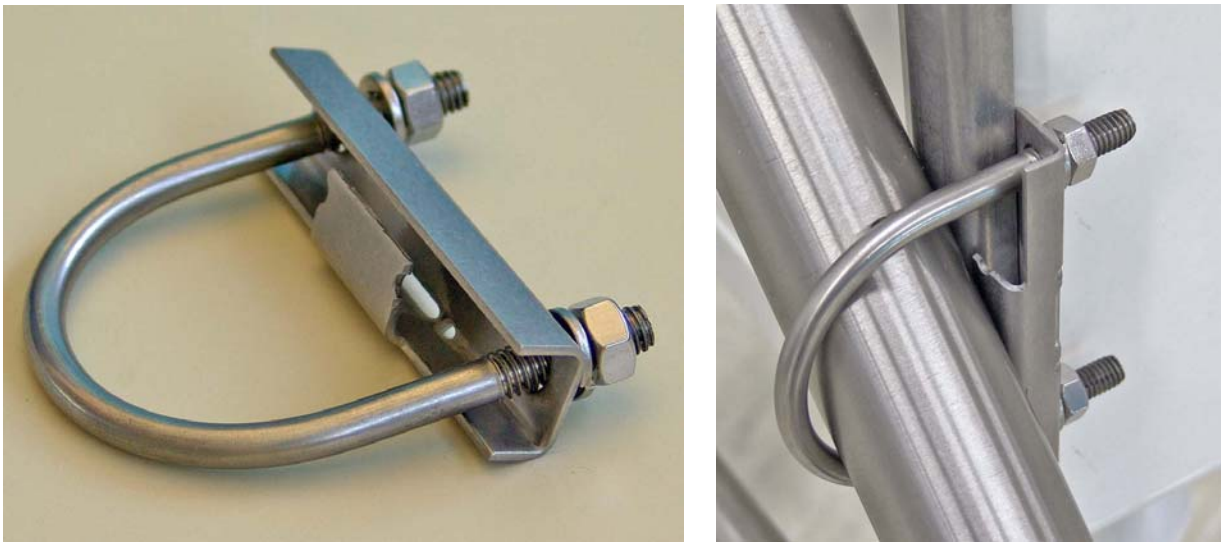

FIGURE 4-9. The u-bolt bracket.

FIGURE 4-10. An enclosure attached to the leg base of a CM110 tripod.

5. When to Replace Desiccant

The humidity indicator card or optional CS210 Humidity Sensor indicate when the desiccant needs to be replaced.

5.1 Humidity Indicator Card

The humidity indicator card has three colored circles that indicate the percentage of humidity. Desiccant packets inside the enclosure should be replaced with fresh packets when the upper dot on the indicator begins to turn pink. The indicator card does not need to be replaced unless the colored circles overrun.

5.2 Optional CS210 Humidity Sensor

The CS210 Enclosure Humidity Sensor contains an Elan HM2000 series precision bulkpolymer relative humidity sensor to measure relative humidity inside an enclosure. When the measurements exceed 35% relative humidity, replace the desiccant packets. Refer to the CS210 manual for sensor specifications, installation procedures, and programming information.

6. Resistance to Weathering

The combination of rain, wind, and UV rays can erode the outer surface of our enclosures so that glass fibers become apparent. The depth of the erosion is superficial and only affects the aesthetic appeal. It does not reduce the effectiveness of the enclosure to protect the equipment. To reduce the erosion, periodically rub the enclosure surface with petroleum jelly (e.g., Vaseline). You can improve the appearance of an enclosure that has already been eroded by gently sanding the enclosure surface with fine grain sandpaper then rubbing the surface with petroleum jelly.

CAUTION Wear safety goggles, mask, and gloves while sanding enclosure surface to improve enclosure appearance.

Appendix A. Door Switch

A.1 Installation Procedure

A.1.1 Newer ENC16/18 (see Figure A.1-1)

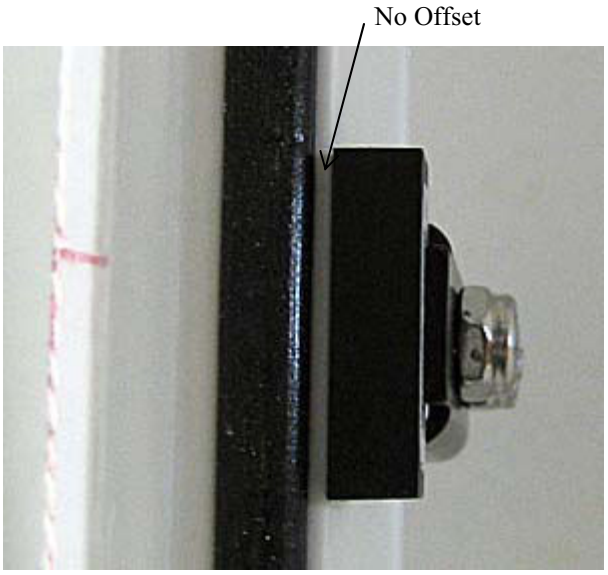

FIGURE A.1-1. This procedure is for ENC16/18 enclosures that do NOT have an offset near the edge of the enclosure door. Follow the procedure provided in section A.1.2 if your ENC16/18 has an offset.

1. Mark locations to drill on the upper right side of the enclosure as shown in Figure A.1-2.

FIGURE A.1-2. The proper placement of the screw holes are shown in a close-up (left photo) and distant view. Ensure that the screw holes for both brackets are aligned with each other.

2. Using a #22 (.157) drill, drill pilot hole from inside of case and final hole from the outside so that enclosure finish does not crack.

3. Attach switch to enclosure case using #6-32 screws and nuts (see Figure A.1-3).

FIGURE A.1-3. Switch installed in the enclosure case.

4. Attach actuator to door using #6-32 screws and nuts (see Figure A.1-4).

FIGURE A.1-4. Actuator installed in the enclosure door.

A.1.2 ENC14/16 and Older ENC16/18 (see Figure A.1-5)

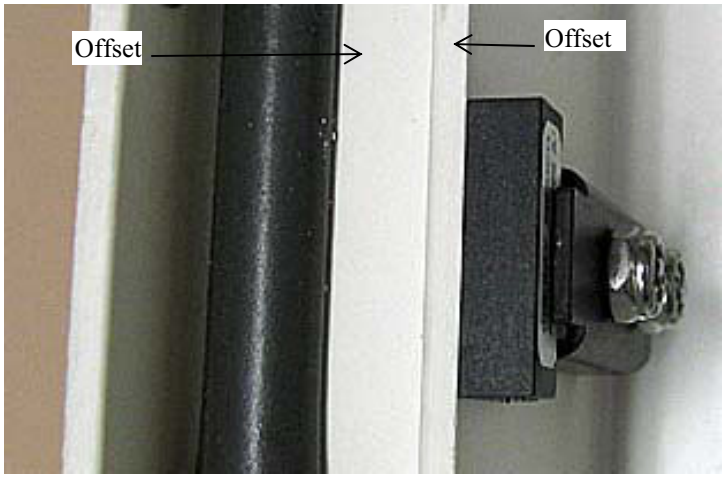

FIGURE A.1-5. Customers with ENC16/18 enclosures should use this procedure if their enclosure has an offset near the edge of the enclosure door as shown in the photograph.

1. Mark locations to drill on the upper right side of the enclosure as shown in Figure A.1-6.

2. Using a #22 (.157) drill, drill pilot hole from inside of case and final hole from outside of case so that enclosure finish does not crack.

FIGURE A.1-6. The proper placement of the screw holes are shown in a close-up (left photo) and distant view. Ensure that the screw holes for both brackets are aligned with each other.

3. Assemble the switch as shown in Figures A.1-7 and A.1-8.

FIGURE A.1-7. Place the #18431 switch on the #18176 bracket with the holes of switch located over the bracket tabs.

FIGURE A.1-8. Secure the #18431 switch with the #18177 back bracket.

4. Mount the switch to the enclosure case using two #17909 screws and two #8548 nuts (see Figure A.1-9).

FIGURE A.1-9. The switch mounts inside the enclosure case. Line up the switch so that the screws fit in the holes previously drilled.

5. As shown in Figure A.1-10, assemble the actuator and mount it in the enclosure door.

FIGURE A.1-10. The actuator mounts inside the enclosure lid. Line up the actuator so that the screws fit in the holes previously drilled.

A.1.3 ENC12/14 and ENC10/12

1. Mark locations to drill on the upper right side of the enclosure as shown in Figure A.1-11.

2. Using a #22 (.157) drill, drill pilot hole from inside of case and final hole from outside of case so that enclosure finish does not crack.

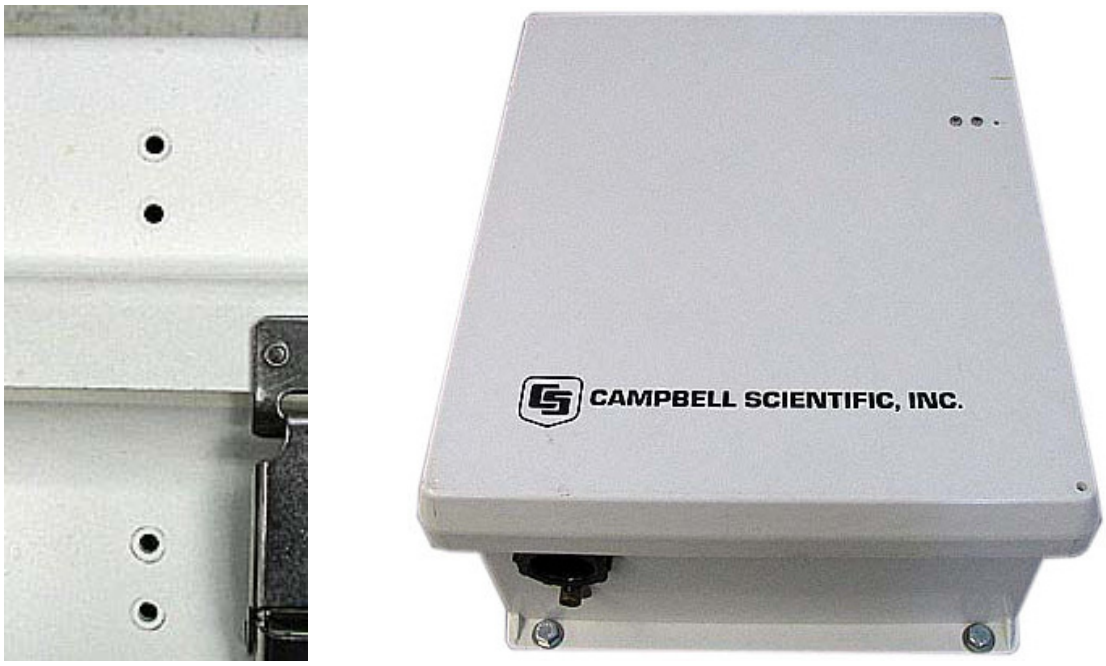

FIGURE A.1-11. The proper placement of the screw holes are shown. Ensure both brackets are aligned with each other.

3. Assemble the mounting bracket as shown in Figure A.1-12.

FIGURE A.1-12. Assemble the mounting bracket as shown.

4. Place PN 18175 actuator in bracket with holes of actuator located over bracket tabs. Slide inner bracket in the direction shown in Figure A.1-13 to secure in place.

FIGURE A.1-13. Securing the actuator

5. Attach actuator to door using two #17909 screws and two #8548 nuts (see Figure A.1-14).

FIGURE A.1-14. The actuator attached to the enclosure door.

6. Attach PN 18431 switch to enclosure case using PN 18178 mount with two #17909 screws and two #8548 nuts (see Figure A.1-15).

FIGURE A.1-15. The switch attached to the enclosure case.

A.2 Example Programs

A.2.1 CRBasic

```
'Program name: DOOR SWITCH CR1000.CR1
'Date written: 11/7/2005
'
' Door Switch Wiring
'  +5V  black   -  power to door switch
'  C1   black   -  signal to control port 3

'\\\\\\\\\\\\\\\\\\\\\\\\ DECLARATIONS ////////////////////////
Public DOOR_open_1
Public DOOR_output

'\\\\\\\\\\\\\\\\\\\\\\\\ OUTPUT SECTION ////////////////////////
DataTable(Table101,true,-1)
   OpenInterval
   DataInterval(0,5,Min,10)
   Sample(1, DOOR_output, FP2)
EndTable

DataTable(Table102,true,-1)
   OpenInterval
   DataInterval(0,5,Min,10)
   Histogram(DOOR_open_1, FP2, 0, 1,001, 1 , 0.5, 1.5)
EndTable
```

```
'\\\\\\\\\\\\\\\\\\\\\\\\\\\\ PROGRAM ////////////////////////////
BeginProg
  Scan(1,Sec, 3, 0)
' Configure control ports as inputs or outputs
  PortsConfig (&B11111111,&B00000000)

' Measure Door switch
' (0=low=closed, 1=high=open)
  If  CheckPort(1) = true then
    DOOR_open_1 = 1
  Else
    DOOR_open_1 = 0
  EndIf

' Two of many possible methods to output the status of the door open switch
' - assumes 5 minute data:

' Method #1:  If the door is open even one reading during the output interval,
' output a 1 for the Door variable
' If (DOOR_open_1 = 1)
  Then
    DOOR_output = 1
  EndIf
    CallTable Table101
' Reset door status after output interval
  If TimeInToInterval(0,5,Min) Then
    DOOR_output = 0
  EndIf

' Method #2:  Door open status may be recorded as a fraction of the output
' interval (between 0 and 1) using the Histogram instruction.
  CallTable Table102

  NextScan
EndProg
```

A.2.2 Edlog

```
;{CR10X}

; File name = Door Switch CR10X.csi  7Nov2005

; Door Switch Wiring
;  +5V  black    - power to door switch
;  C1    black    - signal to control port 3

*Table 1 Program
  01:  1              Execution Interval (seconds)

1:  Set Port(s) (P20)                              ; Configure control ports as inputs or outputs
  1:    9999          C8..C5 = nc/nc/nc/nc
  2:    9998          C4..C1 = nc/nc/nc/input
```

```
; Measure Door switch

2:  If Flag/Port (P91)                          ; (0=low=closed, 1=high=open)
   1:   41          Do if Port 1 is High
   2:   30          Then Do

      3:  Z=F x 10^n (P30)
         1:   1          F
         2:   00         n, Exponent of 10
         3:   1          Z Loc [ DOORopen1 ]

4:  Else (P94)

      5:  Z=F x 10^n (P30)
         1:   0          F
         2:   00         n, Exponent of 10
         3:   1          Z Loc [ DOORopen1 ]

6:  End (P95)

; Two of many possible methods to output the status of the door open switch
; - assumes 5 minute data:
; Method #1:  If the door is open even one reading during the output interval, output a 1
; for the Door variable
; Method #2:  Door open status may be recorded as a fraction of the output interval
; (between 0 and 1) using the Histogram instruction.

; Method #1  ==================================

7:  If (X<=>F) (P89)
   1:               X Loc [ DOORopen1 ]
   2:   1           =
   3:   1           F
   4:   30          Then Do

      8:  Z=F x 10^n (P30)
         1:   1          F
         2:   00         n, Exponent of 10
         3:   2          Z Loc [ DOOR_out  ]

9:  End (P95)

10:  If time is (P92)
   1:   0           Minutes (Seconds --) into a
   2:   5           Interval (same units as above)
   3:   10          Set Output Flag High (Flag 0)

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

12:  Sample (P70)
   1:   1           Reps
   2:   2           Loc [ DOOR_out  ]
```

```
; Reset door status after output interval
13:  If time is (P92)
   1:   0              Minutes (Seconds --) into a
   2:   5              Interval (same units as above)
   3:   30             Then Do

      14:  Z=F x 10^n (P30)
         1:   0.0            F
         2:   00             n, Exponent of 10
         3:   2              Z Loc [ DOOR_out  ]

15:  End (P95)

; Method #2  ==================================

16:  If time is (P92)
   1:   0              Minutes (Seconds --) into a
   2:   5              Interval (same units as above)
   3:   10             Set Output Flag High (Flag 0)

17:  Set Active Storage Area (P80)
   1:   1              Final Storage Area 1
   2:   102            Array ID

18:  Histogram (P75)
   1:   1              Reps
   2:   1              No. of Bins
   3:   1              Closed Form
   4:   1              Bin Select Value Loc [ DOORopen1 ]
   5:   0              Frequency Distribution
   6:   0.5            Low Limit
   7:   1.5            High Limit

*Table 2 Program
   02:  0              Execution Interval (seconds)

*Table 3 Subroutines

End Program
```

Appendix B. Reusing Desiccant

Because desiccant is inexpensive, most users replace the desiccant instead of reactivating saturated desiccant. However some customers wish to reactivate saturated desiccant. To do this, care must be taken to prevent the desiccant packets from exploding during the reactivation process. This problem is caused by using too rapid of a heating process. If the heating process is too rapid, water vapor is released too quickly causing too much pressure to build up inside the packets so that the packets burst. The following methods will prevent this from happening:

B.1 Recirculating Oven Method

The optimum situation for reactivation is to use a recirculating oven that has a ramping temperature. The desiccant should bake for 16 hours, and the final temperature should be 250°F.

B.2 Standard Oven Method

1. Bake at an oven temperature of 125°F for a couple of hours.
2. Increase the oven temperature to 175°F and bake at this temperature for a couple of hours.
3. Increase the oven temperature to 245° to 250°F and bake at this temperature for 12 hours.

B.3 Baby Food Jar Method

1. Open the desiccant packets and empty the desiccant granules onto a cookie sheet.
2. Bake at 245° to 250°F for 16 hours.
3. Pour the desiccant granules into an empty baby food jar.
4. Place the open jar inside the enclosure.

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