

CS705

Snowfall Adapter



Table of contents

| | |
|--|-----------|
| 1. Introduction | 1 |
| 2. Precautions | 1 |
| 3. Initial inspection | 2 |
| 4. Overview | 2 |
| 4.1 Antifreeze | 2 |
| 4.1.1 Standard car or RV antifreeze is NOT recommended | 3 |
| 4.2 Tipping bucket compatibility | 3 |
| 5. Specifications | 3 |
| 6. Installation | 4 |
| 6.1 Siting | 4 |
| 6.2 Mounting pole | 5 |
| 6.3 CM270 installation | 6 |
| 6.4 CS705-to-tipping bucket installation procedure | 10 |
| 6.5 Data logger programming | 13 |
| 7. Maintenance | 13 |
| 8. References | 14 |
| Appendix A. MSDS for Campbell Scientific CS705 antifreeze | 15 |

1. Introduction

The CS705 Snowfall Adapter converts a TE525WS Texas Electronics Rain Gage to a rain and snow gage. It consists of an antifreeze reservoir, overflow tube, and catch tube. Snow captured in the catch tube dissolves into the antifreeze raising the overall level. The mixture flows through the overflow tube into the tipping bucket where it is measured. A slot in the top of the overflow tube prevents the tube from developing a siphon.

2. Precautions

- READ AND UNDERSTAND the [Safety](#) section at the back of this manual.
- The CS705 possesses inherent delays and is not suitable for real-time precipitation measurements (see [Overview](#) (p. 2)).
- Since regular maintenance is required, choose a site that is easily accessible throughout the winter.
- Wear safety glasses and rubber or neoprene gloves while handling and pouring antifreeze.
- Campbell Scientific strongly recommends using antifreeze consisting of a 1:1 mixture of propylene glycol and ethanol (PGE). [MSDS for Campbell Scientific CS705 antifreeze](#) (p. 15) provides MSDS information for the PGE antifreeze offered by Campbell Scientific.
- Avoid using the antifreeze commonly used in cars or RVs. This antifreeze, which consists of propylene glycol or ethylene glycol, increases the likelihood of ice bridging (see [Antifreeze](#) (p. 2)).
- The antifreeze/snowfall mixture needs to be captured from the tipping bucket gage and properly disposed of in accordance with local, state, and federal regulations.
- The CS705 should be removed and cleaned in the summer, and reinstalled before the winter season.

3. Initial inspection

- Upon receipt of the CS705, inspect the packaging and contents for damage. File damage claims with the shipping company.
- Immediately check package contents against the shipping documentation. Contact Campbell Scientific about any discrepancies.

4. Overview

The CS705 is manufactured by Campbell Scientific and is based on the paper “Measuring Winter Precipitation with an Antifreeze-Based Tipping Bucket System” presented at the 1996 Western Snow Conference (McCaughey and Farnes, 1996). The design possesses inherent delays and is not suitable for real time precipitation measurements. Three design factors contribute to measurement delays:

- air/antifreeze mixture temperature
- surface tension in the overflow tube
- precipitation form

All precipitation falling into the catch tube eventually flows through the overflow tube and is measured by the tipping bucket gage. A delay of minutes is expected for liquid precipitation so long as a minimum volume of water (≈ 0.03 inches) is reached. A delay of several hours (up to tens) is expected for snow. Lightest density snow at very cold temperatures has the longest delay.

The CS705 converts the TE525WS Texas Electronic Rain Gage, into a year- round precipitation gage. The CS705 is intended for use only during winter. Like any sensor, optimum performance is obtained by regular site visits. Any antifreeze-based precipitation gage orifice is susceptible to capping or snow bridging.

NOTE:

The CS705 is coated with a smooth black coating to minimize surface adhesion and maximize solar loading, but snow bridging may still not occur.

4.1 Antifreeze

Campbell Scientific recommends a 1:1 mixture of propylene glycol and ethanol (PGE). PGE is available from Campbell Scientific in a package of four, one-gallon containers. Antifreeze can

only be shipped in multiples of four gallons via UPS Ground and cannot be shipped outside of the continental United States.

4.1.1 Standard car or RV antifreeze is NOT recommended

Standard car or RV antifreeze consists of propylene glycol or ethylene glycol, which have a specific gravity >1. This allows a layer of water to sit on top of the antifreeze that may freeze and form an ice cap that prevents snowfall from being dissolved into the solution. Mixing the antifreeze with ethanol solves the specific gravity issue and prevents the ice cap. PGE is also more environmentally friendly.

4.2 Tipping bucket compatibility

The CS705 is equipped with a specially sized cylinder that allows it to nest within the 8-inch orifice of the TE525WS rain gage. The CS705 cannot be directly used with other Campbell Scientific rain gages. However, the TE525 and TE525MM gages can be converted to a TE525WS at Campbell Scientific. Refer to the [Assistance](#) section in this manual for the steps required to return equipment to Campbell Scientific.

5. Specifications

| | |
|---|--|
| Construction: | Black powder coated aluminum |
| Capacity: | 20.32 cm (8 in) of liquid @ -20 °C operating temperature (assuming 1:0 starting ratio of anti-freeze to water) |
| Recommended antifreeze: | 1:1 mixture of propylene glycol and ethanol (PGE) |
| Antifreeze capacity: | ≈9.5 L (2.5 gal) |
| Catch tube height: | 25.4 cm (10 in) |
| Catch tube orifice: | 20.3 cm (8 in) diameter |
| Antifreeze reservoir height: | 36 cm (14 in) |
| Antifreeze reservoir diameter: | 21 cm (8.25 in) |
| Total weight (CS705 + antifreeze): | ≈9 kg (20 lb) |

6. Installation

6.1 Siting

Choose a site that is easily accessible throughout the winter.

The CS705 Snowfall Adapter and associated rain gage should be mounted in a relatively level spot that is representative of the surrounding area. The lip of the funnel needs to be horizontal and 76 cm (30 in) above the ground or higher to prevent burial by snow. The ground cover around the gage should be natural vegetation or gravel. Avoid mounting the gage over concrete or paved surfaces.

The under catch of winter precipitation by antifreeze-based gages is directly related to wind speed. Errors due to wind can be minimized by properly siting the gage. The preferred gage site is in a natural well protected location. To ensure proper catch, an angle of 30° to 45° from a vertical line drawn through the center of the gage orifice to the surrounding obstructions should be maintained. [FIGURE 6-1](#) (p. 4) illustrates the proper siting of a gage.

Gages sited improperly and subjected to high winds will under catch winter precipitation generating erroneous data. An improperly sited gage subjected to high winds can be damaged by the wind.

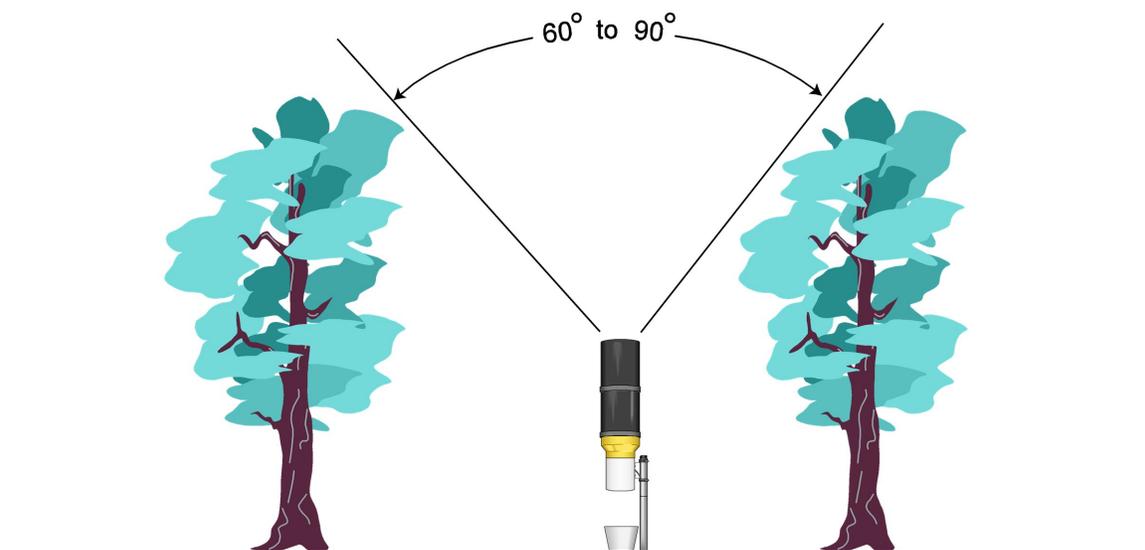


FIGURE 6-1. Proper gage siting

6.2 Mounting pole

A user-supplied mounting pole or Campbell Scientific CM300-series stainless-steel mounting pole can be used to mount the CS705 away from the tripod or tower.

CM300-series poles can be embedded directly into a concrete foundation (FIGURE 6-2 (p. 5)) or used with a pedestal kit. Campbell Scientific offers a j-bolt pedestal kit, a short-leg (23 in) pedestal kit, and a long-leg (39 in) pedestal kit (see FIGURE 6-3 (p. 6)).

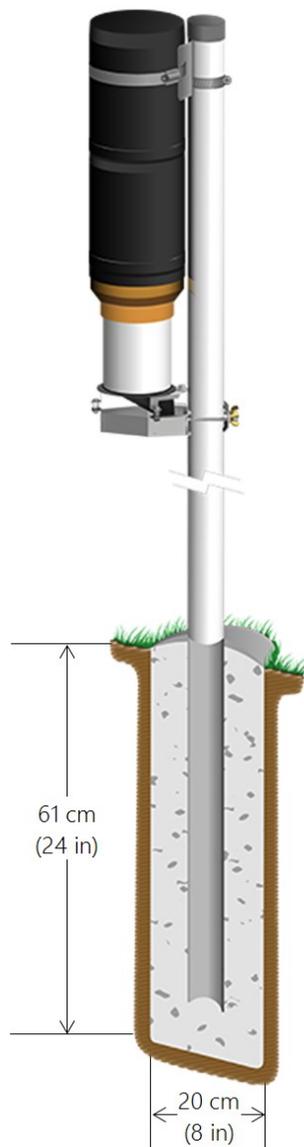


FIGURE 6-2. CM310 56-inch pole embedded in a concrete foundation

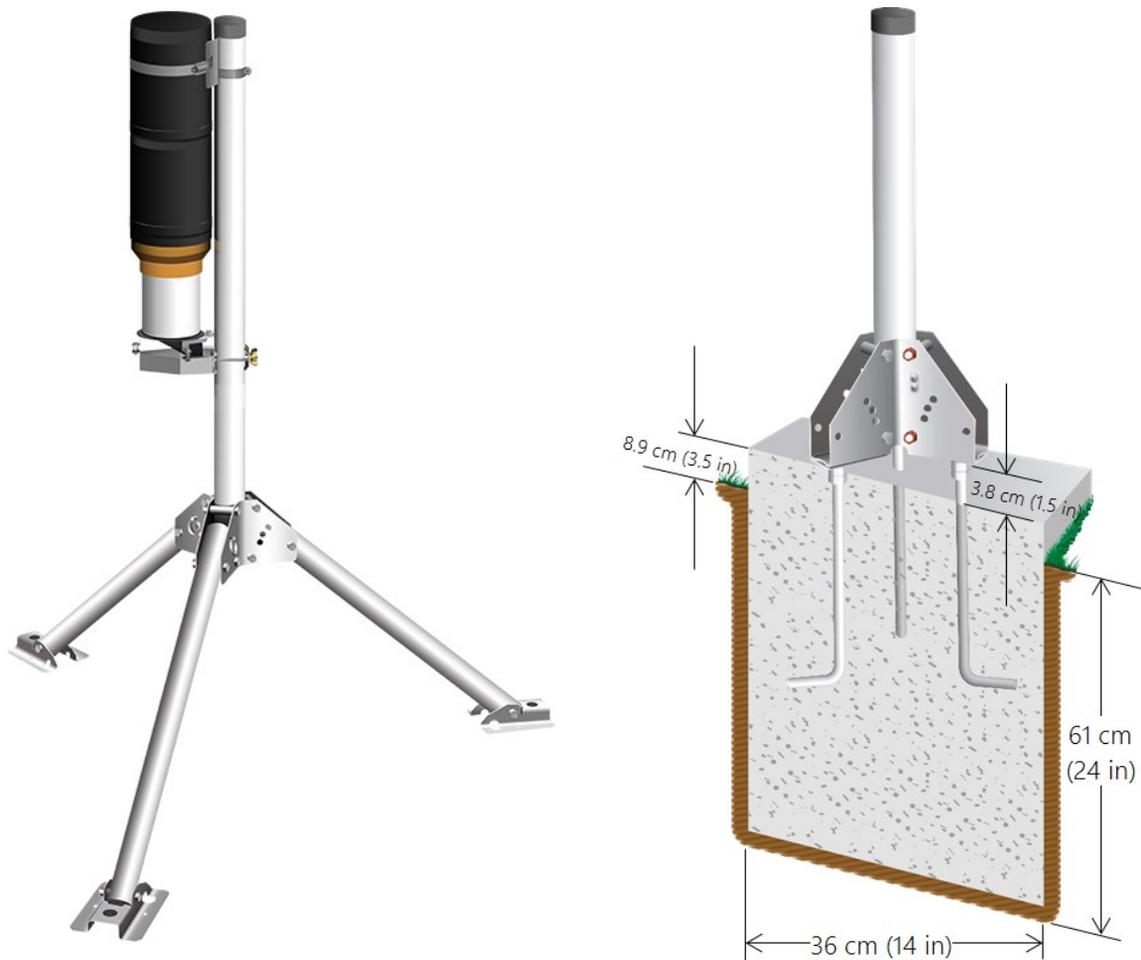


FIGURE 6-3. Pedestal kit options

6.3 CM270 installation

Tools needed:

- Open end wrench, 7/16 inch open-ended wrench, or 7/16 inch socket wrench.
- Long #2 Phillips Screwdriver

Remove manufacturer's mounting hardware:

1. Remove the three feet mounted on the bottom of the rain gage.
2. Remove the side bracket, but keep the screws.
3. Place the side bracket screws into the rain gage and tighten. This keeps debris out of the threaded holes.

Do the following to assemble the mounting bracket. [FIGURE 6-4](#) (p. 8) and [FIGURE 6-5](#) (p. 8) show the bracket components and the proper assembly.

1. Remove the components from the shipping bag. To assemble the bracket, you will need the bottom plate, V-shaped plate, S-shaped plate, three bolts, two leveling springs, and cylindrical spacer. The bottom plate should come with three black nylon grommets mounted into it, and the pole mounting hardware attached to it.
2. Place the leveling springs over the bottom plate's side grommets.
3. Place the V-shaped plate onto the bottom plate. The V-shaped plate's legs should be on the leveling springs and the bubble level should be next to the pole-mounting hardware.
4. Use two bolts to secure the V-plate legs to the bottom plate (with the springs sandwiched between the two plates). Initially finger tighten the bolts and then use a wrench to further tighten them.

CAUTION:

Do not compress the springs at this time.

5. Place the cylindrical spacer on the bottom plate's front grommet.
6. Place the S-shaped plate on the spacer and use the bolt to secure it to the bottom plate. Initially finger tighten the bolt and then use a wrench to further tighten. Leave it a bit loose.

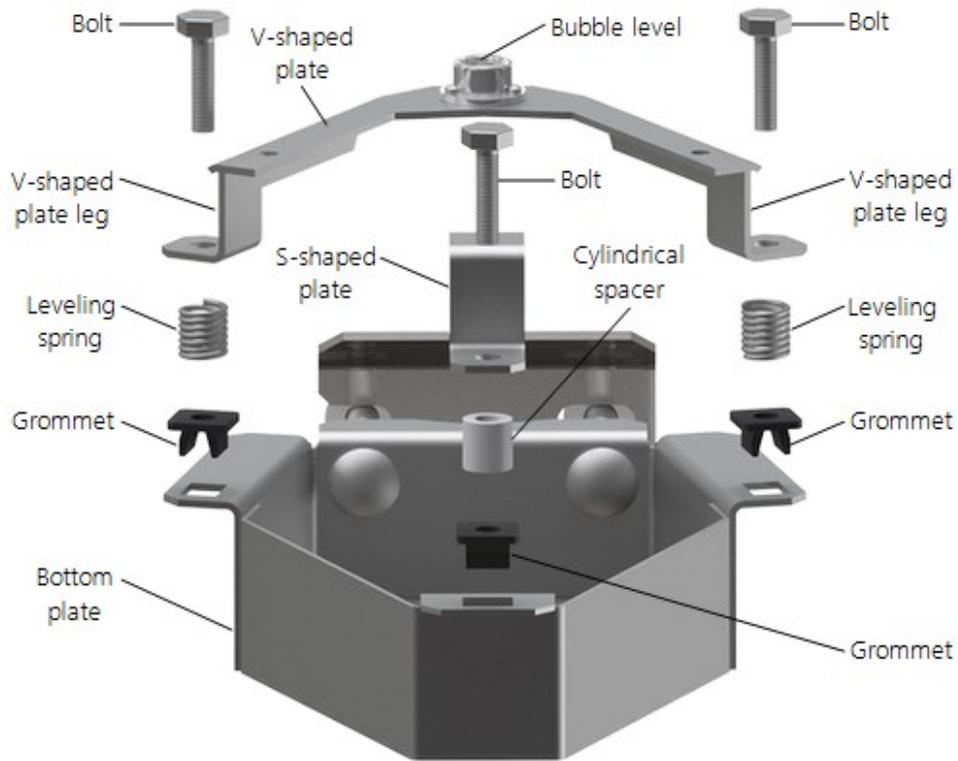


FIGURE 6-4. Exploded view of the CM270 Mounting Bracket Kit

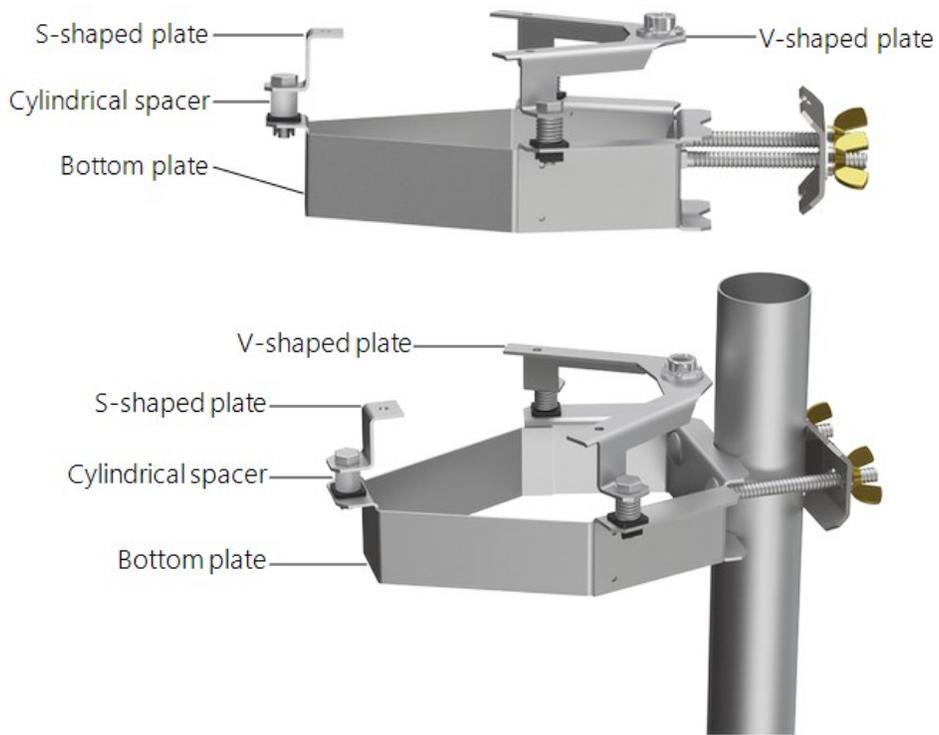


FIGURE 6-5. Two views of an assembled CM270

Do the following to mount the tipping bucket rain gage to the CM270 bracket (FIGURE 6-6 (p. 9)):

NOTE:

Follow this procedure to ensure that the tipping bucket is mounted correctly. The adjustment screws for the tipping mechanism will not be accessible if it is mounted incorrectly.

1. Turn the rain gage upside down and set it on a hard surface such as a table top.
2. Place the drain funnel on the bottom of the bucket. Line up the small holes on the drain funnel with the three holes used for the mounting feet. The larger holes on the drain funnel should fit over the round bolt heads.
3. Place the mounting bracket on the funnel. Line up the three holes in the mounting bracket with the three small holes on the funnel. When positioned correctly, the tipping bucket's cable will be near the bubble level and pole mounting hardware.
4. Use the three self-tapping screws and a long Phillips screwdriver to securely fasten the mounting bracket to the funnel and tipping bucket.
5. Flip the assembly over and tighten the bolt that uses the cylindrical spacer. The bolts securing the leveling springs need to remain loose to allow leveling when the bracket is mounted to the pole or mast.



FIGURE 6-6. Mounting CM270 to the rain gage

Attach the mounting bracket/tipping bucket assembly to the mounting pipe or mast:

1. Install and level the mounting pipe or mast.
2. Loosen the mounting bracket's wingnuts and slide the assembly over the pipe. If necessary, the pole mounting hardware can be removed to get the bolts around the pipe. If this is necessary, to reassemble, put the mast clamp on first followed by the flat washer, lock washer, and wingnut. See [FIGURE 6-7](#) (p. 10).
3. Tighten the assembly onto the pipe, while ensuring that nothing is blocking the top of the rain gage.
4. Adjust the two bolts on the leveling springs until the bubble in the level is inside the bullseye.

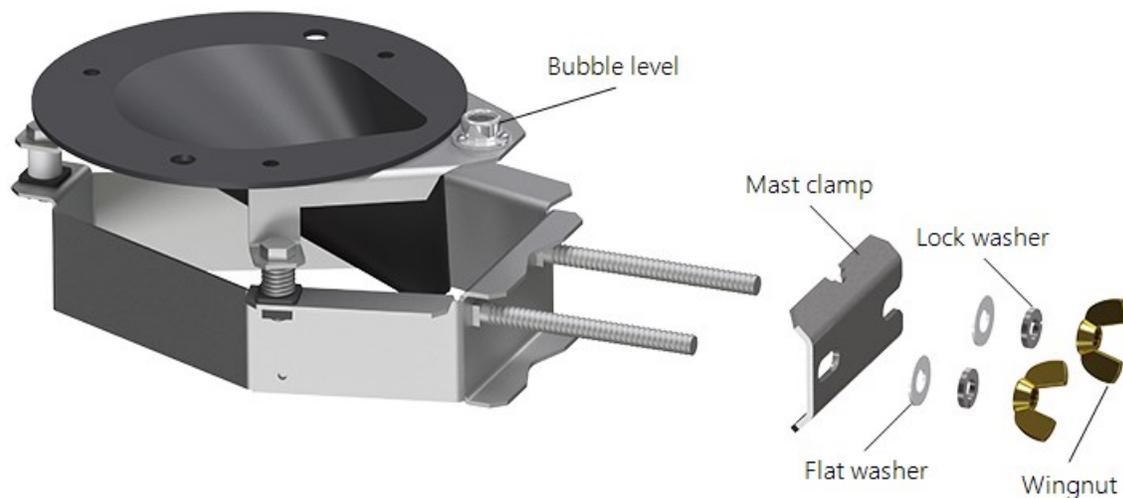


FIGURE 6-7. Exploded view of CM270 mounting hardware (TE525WS not shown)

6.4 CS705-to-tipping bucket installation procedure

Equipment required:

- User-supplied 0.5-inch (inner diameter) vinyl or Tygon tubing
- Pail
- TE525WS Texas Electronics Rain Gage
- CS705 Snowfall Adapter
- PGE antifreeze
- Small band clamp

- Large band clamp
- Storage mount

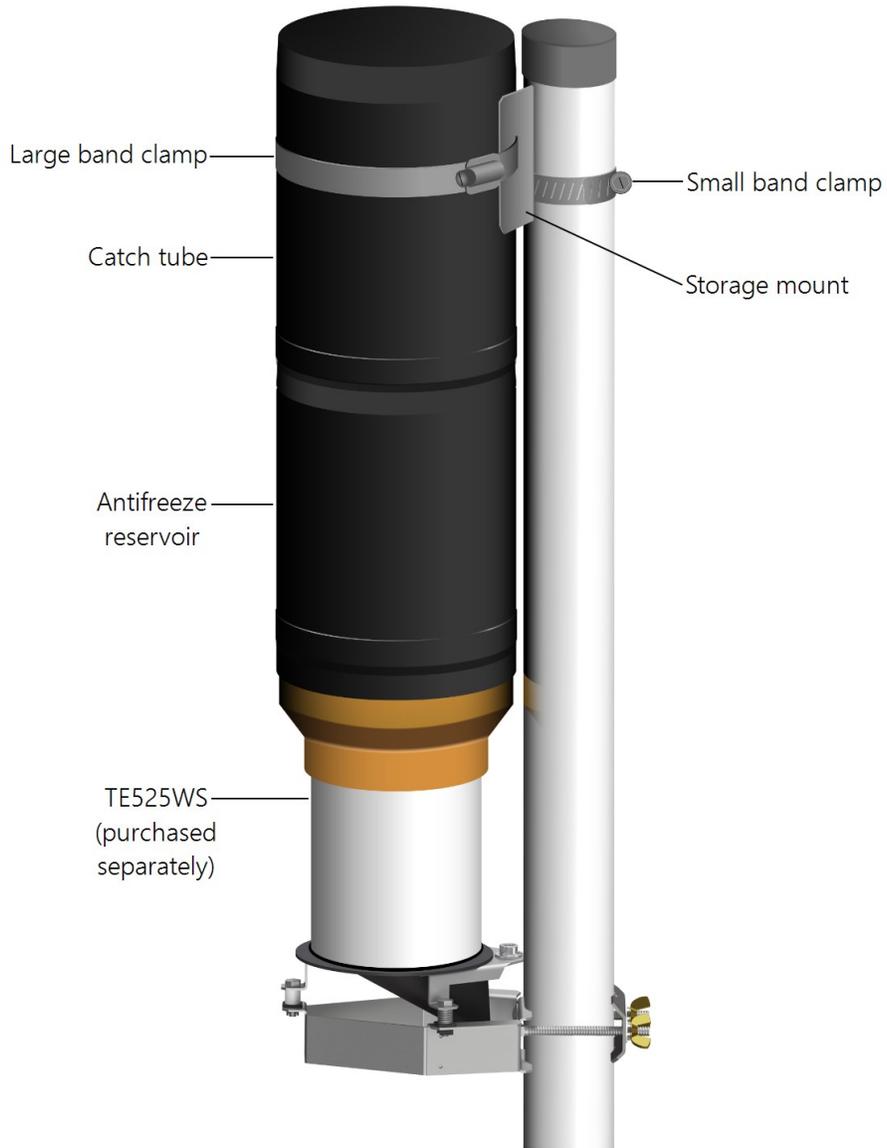


FIGURE 6-8. CS705 mounted to pole using the CM270 Mounting Kit

1. Take one of the black bands supplied with the CS705 and stretch over the TE525WS funnel (see [FIGURE 6-8](#) (p. 11) and [FIGURE 6-9](#) (p. 12)).

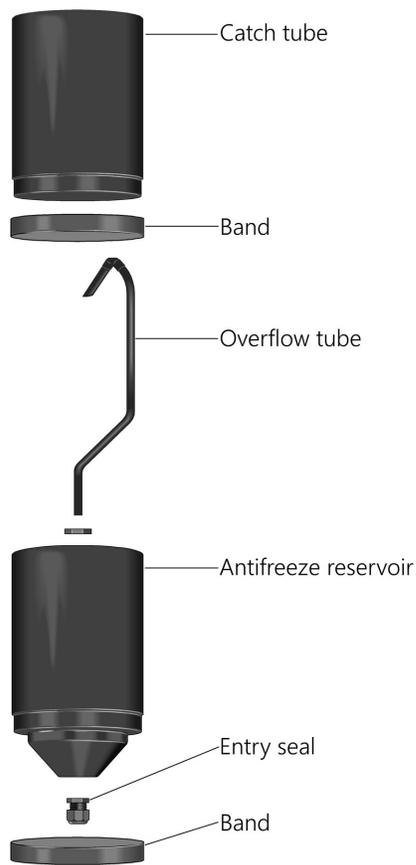


FIGURE 6-9. CS705 exploded view

2. Insert the CS705 antifreeze reservoir into the rain gage funnel.

CAUTION:

Wear safety glasses during handling and pouring of antifreeze.

3. Fill the reservoir with PGE antifreeze until a small amount flows out the overflow tube. The reservoir holds ≈ 2.5 gallons.
4. Add ≈ 8 ounces of a low-freezing-point, environmentally-safe oil to the antifreeze reservoir. This oil prevents the antifreeze solution from evaporating. The oil should cover the entire liquid surface. Some unscented baby oils (lightweight mineral oil) work well.
5. Stretch the second black band over the lip of the antifreeze reservoir.
6. Insert the catch tube into the antifreeze reservoir.
7. Reposition the two black bands to cover the joints between the catch tube and the antifreeze reservoir and between the reservoir and the rain gage funnel.

8. Fasten the catch tube of the CS705 to the mounting pole using the band clamps and storage mount (see [FIGURE 6-8](#) (p. 11)).
9. Place the pail below the rain gage.
10. Connect one end of the tubing onto the funnel and place the other end of tubing in the pail.

6.5 Data logger programming

Refer to the manual supplied with the TE525WS Texas Electronics Rain Gage. The manual is also available at www.campbellsci.com/te525ws-l .

7. Maintenance

The CS705 requires regular site visits. The number of required visits mainly depends on snowfall. Frequent or heavy snows require more site visits. During site visits, verify the slot in the top of the overflow tube is free from ice or debris and remove any debris from the catch orifice. If the slot in the overflow tube becomes plugged, the overflow tube may create a siphon and draw down the antifreeze level.

The PGE solution gets diluted as precipitation is captured and mixed. Initially, the CS705 is charged with a pure antifreeze mixture giving it a 1:0 antifreeze to water ratio. The ratio increases to 1:1 with the equivalent of 8 inches of liquid, 1:2 with about 12.5 inches, and 1:3 with 16 inches. The 1:1 solution becomes slushy at a temperature of $\approx -35^{\circ}\text{C}$, the 1:2 solution becomes slushy at $\approx -20^{\circ}\text{C}$, and the 1:3 solution at $\approx -10^{\circ}\text{C}$ (McGurk, 1992). Ratios greater than 1:3 are not recommended. Refer to [FIGURE 7-1](#) (p. 14) to determine the amount of remaining antifreeze based on precipitation (water equivalent) recorded.

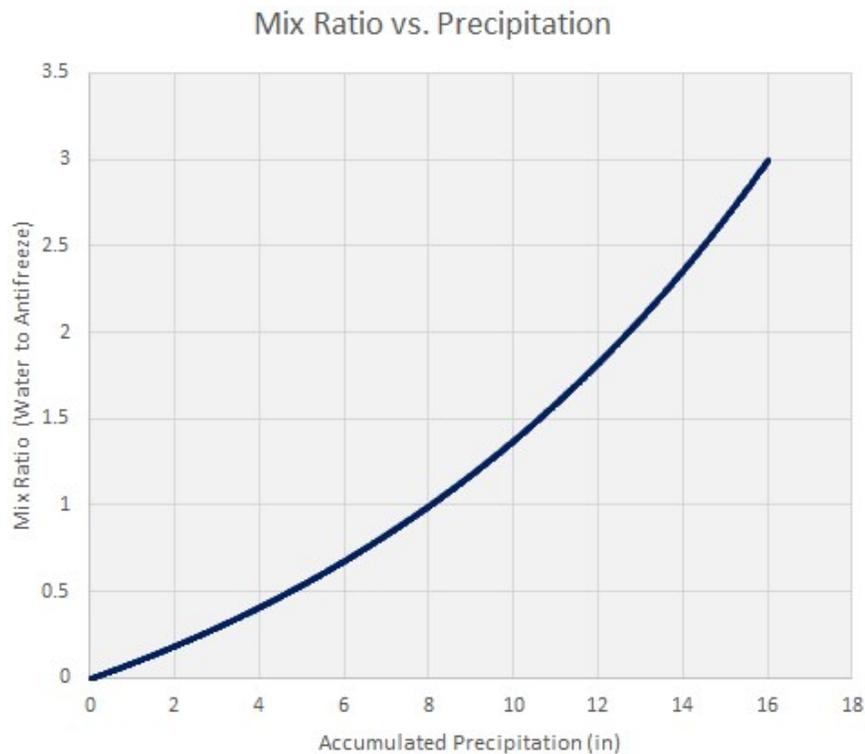


FIGURE 7-1. Mix ratio versus precipitation received

The PGE antifreeze used in the CS705 is biodegradable and generally considered to be environmentally safe. However, local laws, regulations, or policies may require the collection and safe disposal of all antifreeze used in the CS705. The 14087 funnel should be installed with the CM270 mounting kit and attached to user-supplied 0.5-inch (I.D.) vinyl or Tygon tubing that drains into a user-supplied pail. Please dispose of all spent antifreeze solution in accordance with local, state, and federal regulations.

The CS705 is recommended only for use during winter. It should be removed, cleaned, and carefully stored after the last snowfall, then reinstalled prior to the first snowfall of the coming winter.

8. References

- McCaughey, W. and Farnes, P.: 1996, "Measuring Winter Precipitation with an Antifreeze-Based Tipping Bucket System", *Proceedings 64th Western Snow Conference*, 130-136.
- McGurk, B.J.: 1992, "Propylene Glycol and Ethanol as a Replacement Antifreeze for Precipitation Gauges: Dilution, Disposal, and Safety", *Proceedings 60th Western Snow Conference*, 56-65.

Appendix A. MSDS for Campbell Scientific CS705 antifreeze

Date Printed: 09-26-1997 Page 1

Interstate Chemical Co.

MSDS for CAMPBELL SCIENTIFIC CS705 ANTIFREEZE

1899--

1 — Site Specific Information

Customer:

2 — Section I – General Information

MANUFACTURER'S NAME: Interstate Chemical Co.

EMERGENCY TELEPHONE NUMBER: (412) 981-3771

CHEMTREC EMERGENCY TELEPHONE NUMBER: (800) 424-9300

ADDRESS (NUMBER, STREET, CITY, STATE, ZIP): 2797 Freedland Rd.

Hermitage, Pa. 16148

CHEMICAL NAME AND SYNONYMS: CAMPBELL SCIENTIFIC CS705 ANTIFREEZE

TRADE NAME AND SYNONYMS: Same as above.

CHEMICAL FAMILY: Solvent blend.

FORMULA: Mixture

DATE OF PREPARATION: 09/26/97

REVISION DATE: N/A

PREPARED BY: Erik S. Bielata, Chemist

ICC MSDS #: IC-00891

DISCLAIMER: All information contained in this data sheet is believed to be true and accurate at this time. However, there is no guarantee expressed or implied. The physical data has been calculated from available information.

3 — Section II – Hazardous Ingredients

| COMPONENT: | CAS #: | VOL % | TLV (units) |
|---------------------|---------|-------|-------------|
| INTERSOL 84 200 PF. | MIXTURE | <55% | 1000 ppm |
| 1, 2 – PROPANEDIOL | 57-55-6 | <55% | N/A |

Interstate Chemical Co.

MSDS for CAMPBELL SCIENTIFIC CS705 ANTIFREEZE

1899--

4 — Section III – Physical Data

BOILING POINT (INDICATE IF "F" OR "C"): 174-212 F

VAPOR PRESSURE (mm Hg): 23 @ R.T.

VAPOR DENSITY (AIR = 1): 2.1

SPECIFIC GRAVITY (H₂O=1): 0.9164

PERCENT VOLATILE BY VOLUME (%): 100%

EVAPORATION RATE (But Ac = 1): 1.7

SOLUBILITY IN WATER: Complete

APPEARANCE AND ODOR: Clear, colorless, liquid; mild odor.

5 — Section IV – HMIS Rating

HEALTH

2

FLAMMABILITY

4

REACTIVITY

0

0 = Minimal

1 = Slight

2 = Moderate

3 = Serious

4 = Severe

6 — Section V – Figure and Explosion Hazard Data

FLASH POINT (METHOD USED): 68 F (TCC)

FLAMMABLE LIMITS: Volume % in Air

LEL: 3.0

UEL: 15.8

EXTINGUISHING MEDIA:

Use water spray, carbon dioxide, dry chemical, or alcohol-type foam applied to manufacturer's recommended techniques.

SPECIAL FIRE FIGHTING PROCEDURES:

Use self-contained breathing apparatus and protective clothing.

Interstate Chemical Co.

MSDS for CAMPBELL SCIENTIFIC CS705 ANTIFREEZE

1899--

6 — Section V – Fire and Explosion Hazard Data (continued)

UNUSUAL FIRE AND EXPLOSION HAZARDS:

Vapors form from this product and may travel or be moved by air currents and ignited by pilot lights or other ignition sources.

7 — Section VI – Health Hazard Data

THRESHOLD LIMIT VALUE: See sect. II.

EFFECTS OF ACUTE OVEREXPOSURE:

EYE CONTACT: Liquid may cause discomfort w/ slight excess redness and possible swelling of the conjunctiva; corneal injury may occur.

SKIN CONTACT: Frequent or prolonged contact may cause discomfort and local redness.

INHALATION: May cause drowsiness, dizziness, disturbances of vision; tingling, numbness, and shooting pains in the hands and forearms.

INGESTION: May cause nausea, abdominal pain, vomiting, headache, dizziness, shortness of breath, weakness, fatigue, leg cramps, confusion, restlessness, visual disturbances, drunken behavior, drowsiness, coma, and death (THERE MAY BE A DELAY OF SEVERAL HOURS BETWEEN SWALLOWING METHANOL AND THE ONSET OF SIGNS OF ANY SYMPTOMS).

- Visual effects include blurred vision, diplopia, changes in color perception, restriction of visual fields, and complete blindness.
- Ingestion of moderate quantities of methanol also produces metabolic acidosis; onset of symptoms may be delayed up to 48 hrs.
- ❖ 60 – 200 mL OF METHANOL IS A FATAL DOSE FOR MOST ADULTS. INGESTION OF AS LITTLE AS 10 mL HAS CAUSED BLINDNESS.
- With massive overdoses, liver, kidney, and heart muscle injuries have been described.

Interstate Chemical Co.

MSDS for CAMPBELL SCIENTIFIC CS705 ANTIFREEZE

1899--

7 — Section VI – Health Hazard Data (continued)

EFFECTS OF REPEATED OVEREXPOSURE:

- Long-term repeated overexposure to methanol vapor concentrations of 3000 ppm or greater may allow a cumulative effect to occur w/ resulting nausea, vomiting, headache, ringing in the ears, insomnia, trembling, unsteady gait, vertigo, clouded double vision.
- Liver and kidney damage may occur, especially when overexposed to ethanol, which may cause liver injury w/ fibrosis.
- Due to its defatting properties, methanol may aggravate an existing skin condition, e.g. eczema; methanol may also aggravate existing liver and kidney diseases.

OTHER HEALTH HAZARDS:

- Repeated ingestion of ethanol by pregnant mothers has been shown to adversely effect the CNS of the fetus, producing a collection of effects which together constitute the fetal alcohol syndrome. Symptoms include mental and physical retardation, learning disorders, motor and language deficiencies, behavioral disorders, and small size head.

EMERGENCY AND FIRST AID PROCEDURES:

- EYE CONTACT:** Flush eyes with large amounts of water until irritation subsides. If irritation persists, get medical attention.
- SKIN CONTACT:** Immediately flush with large amounts of water; use soap if available. Remove contaminated clothing, including shoes, after flushing has begun.
- INHALATION:** Using proper respiratory protection, immediately remove the affected victim to fresh air. Administer artificial respiration if breathing has stopped. Keep at rest, Call for prompt medical attention.
- INGESTION:** If swallowed, DO NOT induce vomiting. Keep at rest. Get prompt medical attention. Small amounts which accidentally enter the mouth should be rinsed until taste is gone.

Interstate Chemical Co.

MSDS for CAMPBELL SCIENTIFIC CS705 ANTIFREEZE

1899--

8 — Section VII – Reactivity Data

STABILITY (choose one): UNSTABLE STABLE

* CONDITIONS TO AVOID: None.

INCOMPATIBILITY (MATERIALS TO AVOID): Strong oxidizers, strong inorganic acids.

HAZARDOUS DECOMPOSITION PRODUCTS: CO AND CO₂HAZARDOUS POLYMERIZATION (choose one): MAY OCCUR WILL NOT OCCUR* CONDITIONS TO AVOID: None.

9 — Section VIII – Spill or Leak Procedures

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Contain spill; provide adequate ventilation; keep people away; EXTINGUISH ALL IGNITION SOURCES; keep material out of public waters; use dry absorbent on small spills.

WASTE DISPOSAL METHOD: Dispose of according to all federal, state and local regulations.

10 — Section IX – Special Protection Information

RESPIRATORY PROTECTION (SPECIFY TYPE): NIOSH approved organic vapor cartridge.

VENTILATION:

LOCAL EXHAUST: preferred

MECHANICAL (GENERAL): acceptable

SPECIAL: N/A

OTHER: N/A

PROTECTIVE GLOVES: Rubber or neoprene.

EYE PROTECTION: Safety glasses or goggles.

OTHER PROTECTIVE EQUIPMENT: Rubber apron and boots; eye bath, safety shower.

Interstate Chemical Co.

MSDS for CAMPBELL SCIENTIFIC CS705 ANTIFREEZE

1899--

11 — Section X – Shipping Data

D.O.T. SHIPPING NAME: FLAMMABLE LIQUIDS, N.O.S.
(contains Ethanol)

PRODUCT NAME: CAMPBELL SCIENTIFIC CS705 ANTIFREEZE

D.O.T. HAZARD CLASS: 3

U.N./N.A. NUMBER: UN-1993 (PG II)

PRODUCT RQ: N/A/

D.O.T. LABEL: FLAMMABLE

D.O.T. SUBSIDIARY LABEL: N/A

D.O.T. PLACARD: FLAMMABLE

12 — Section XI – Special Precautions

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING:

***DANGER!!! May cause eye damage and blindness if swallowed.

- | | |
|-------------------------------------|--------------------------------------|
| • FLAMMABLE | • DO NOT SWALLOW |
| • Harmful if inhaled | • Keep away from heat, sparks, flame |
| • Harmful if absorbed through skin | • Avoid breathing vapor |
| • Causes eye irritation | • DO NOT get on skin, on clothing |
| • May cause drowsiness, dizziness | • Avoid contact w/ eyes |
| • May cause heart muscle damage | • Keep container closed |
| • May cause liver and kidney damage | • Use w/ adequate ventilation |
| | • Wash thoroughly after handling |

OTHER PRECAUTIONS: FLAMMABLE LIQUID – Clean equipment thoroughly prior to maintenance and/or repair.
PROCESS HAZARD – Sudden release of hot organic chemical vapors or mists from equipment operating at elevated temperature and pressure, or sudden ingress of air into vacuum equipment, may result in ignitions w/ out the presence of obvious ignition sources. ANY USE OF THIS PRODUCT IN ELEVATED-TEMPERATURE PROCESSES SHOULD BE THOROUGHLY EVALUATED TO ESTABLISH AND MAINTAIN SAFE OPERATING CONDITIONS.

Interstate Chemical Co.

MSDS for CAMPBELL SCIENTIFIC CS705 ANTIFREEZE

1899--

12 — Section XI – Special Precautions (continued)

TRANSFER HAZARD – Vapors of this product may be ignited by static sparks.

13 — Section XII – SARA Title III

This product contains the following toxic chemical that is claimed as a trade secret, but disclosed as an upper bound concentration to comply with the reporting requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 and of 40 CFR Part 372.

**METHANOL (CAS #67-56-1) ---- <5%

14 — Section XIII – Section Revisions

Revisions have been made to the following sections:

Limited warranty

Products manufactured by Campbell Scientific are warranted by Campbell Scientific to be free from defects in materials and workmanship under normal use and service for twelve months from the date of shipment unless otherwise specified on the corresponding product webpage. See Product Details on the Ordering Information pages at www.campbellsci.com[↗]. Other manufacturer's products, that are resold by Campbell Scientific, are warranted only to the limits extended by the original manufacturer.

Refer to www.campbellsci.com/terms#warranty[↗] for more information.

CAMPBELL SCIENTIFIC EXPRESSLY DISCLAIMS AND EXCLUDES ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Campbell Scientific hereby disclaims, to the fullest extent allowed by applicable law, any and all warranties and conditions with respect to the Products, whether express, implied or statutory, other than those expressly provided herein.

Assistance

Products may not be returned without prior authorization.

Products shipped to Campbell Scientific require a Returned Materials Authorization (RMA) or Repair Reference number and must be clean and uncontaminated by harmful substances, such as hazardous materials, chemicals, insects, and pests. Please complete the required forms prior to shipping equipment.

Campbell Scientific regional offices handle repairs for customers within their territories. Please see the back page for the Global Sales and Support Network or visit www.campbellsci.com/contact  to determine which Campbell Scientific office serves your country.

To obtain a Returned Materials Authorization or Repair Reference number, contact your CAMPBELL SCIENTIFIC regional office. Please write the issued number clearly on the outside of the shipping container and ship as directed.

For all returns, the customer must provide a "Statement of Product Cleanliness and Decontamination" or "Declaration of Hazardous Material and Decontamination" form and comply with the requirements specified in it. The form is available from your CAMPBELL SCIENTIFIC regional office. Campbell Scientific is unable to process any returns until we receive this statement. If the statement is not received within three days of product receipt or is incomplete, the product will be returned to the customer at the customer's expense. Campbell Scientific reserves the right to refuse service on products that were exposed to contaminants that may cause health or safety concerns for our employees.

Safety

DANGER — MANY HAZARDS ARE ASSOCIATED WITH INSTALLING, USING, MAINTAINING, AND WORKING ON OR AROUND TRIPODS, TOWERS, AND ANY ATTACHMENTS TO TRIPODS AND TOWERS SUCH AS SENSORS, CROSSARMS, ENCLOSURES, ANTENNAS, ETC. FAILURE TO PROPERLY AND COMPLETELY ASSEMBLE, INSTALL, OPERATE, USE, AND MAINTAIN TRIPODS, TOWERS, AND ATTACHMENTS, AND FAILURE TO HEED WARNINGS, INCREASES THE RISK OF DEATH, ACCIDENT, SERIOUS INJURY, PROPERTY DAMAGE, AND PRODUCT FAILURE. TAKE ALL REASONABLE PRECAUTIONS TO AVOID THESE HAZARDS. CHECK WITH YOUR ORGANIZATION'S SAFETY COORDINATOR (OR POLICY) FOR PROCEDURES AND REQUIRED PROTECTIVE EQUIPMENT PRIOR TO PERFORMING ANY WORK.

Use tripods, towers, and attachments to tripods and towers only for purposes for which they are designed. Do not exceed design limits. Be familiar and comply with all instructions provided in product manuals. Manuals are available at www.campbellsci.com. You are responsible for conformance with governing codes and regulations, including safety regulations, and the integrity and location of structures or land to which towers, tripods, and any attachments are attached. Installation sites should be evaluated and approved by a qualified engineer. If questions or concerns arise regarding installation, use, or maintenance of tripods, towers, attachments, or electrical connections, consult with a licensed and qualified engineer or electrician.

General

- Protect from over-voltage.
- Protect electrical equipment from water.
- Protect from electrostatic discharge (ESD).
- Protect from lightning.
- Prior to performing site or installation work, obtain required approvals and permits. Comply with all governing structure-height regulations.
- Use only qualified personnel for installation, use, and maintenance of tripods and towers, and any attachments to tripods and towers. The use of licensed and qualified contractors is highly recommended.
- Read all applicable instructions carefully and understand procedures thoroughly before beginning work.
- Wear a **hardhat** and **eye protection**, and take **other appropriate safety precautions** while working on or around tripods and towers.
- **Do not climb** tripods or towers at any time, and prohibit climbing by other persons. Take reasonable precautions to secure tripod and tower sites from trespassers.
- Use only manufacturer recommended parts, materials, and tools.

Utility and Electrical

- **You can be killed** or sustain serious bodily injury if the tripod, tower, or attachments you are installing, constructing, using, or maintaining, or a tool, stake, or anchor, come in **contact with overhead or underground utility lines**.
- Maintain a distance of at least one-and-one-half times structure height, 6 meters (20 feet), or the distance required by applicable law, **whichever is greater**, between overhead utility lines and the structure (tripod, tower, attachments, or tools).
- Prior to performing site or installation work, inform all utility companies and have all underground utilities marked.
- Comply with all electrical codes. Electrical equipment and related grounding devices should be installed by a licensed and qualified electrician.
- Only use power sources approved for use in the country of installation to power Campbell Scientific devices.

Elevated Work and Weather

- Exercise extreme caution when performing elevated work.
- Use appropriate equipment and safety practices.
- During installation and maintenance, keep tower and tripod sites clear of un-trained or non-essential personnel. Take precautions to prevent elevated tools and objects from dropping.
- Do not perform any work in inclement weather, including wind, rain, snow, lightning, etc.

Maintenance

- Periodically (at least yearly) check for wear and damage, including corrosion, stress cracks, frayed cables, loose cable clamps, cable tightness, etc. and take necessary corrective actions.
- Periodically (at least yearly) check electrical ground connections.

Internal Battery

- Be aware of fire, explosion, and severe-burn hazards.
- Misuse or improper installation of the internal lithium battery can cause severe injury.
- Do not recharge, disassemble, heat above 100 °C (212 °F), solder directly to the cell, incinerate, or expose contents to water. Dispose of spent batteries properly.

WHILE EVERY ATTEMPT IS MADE TO EMBODY THE HIGHEST DEGREE OF SAFETY IN ALL CAMPBELL SCIENTIFIC PRODUCTS, THE CUSTOMER ASSUMES ALL RISK FROM ANY INJURY RESULTING FROM IMPROPER INSTALLATION, USE, OR MAINTENANCE OF TRIPODS, TOWERS, OR ATTACHMENTS TO TRIPODS AND TOWERS SUCH AS SENSORS, CROSSARMS, ENCLOSURES, ANTENNAS, ETC.



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