

INSTRUCTION MANUAL



CM375 Portable 10-Meter Mast

Revision: 10/14



Copyright © 2009-2014
Campbell Scientific, Inc.

Limited Warranty

“Products manufactured by CSI are warranted by CSI 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 in the corresponding product manual. (Product manuals are available for review online at www.campbellsci.com.) Products not manufactured by CSI, but that are resold by CSI, are warranted only to the limits extended by the original manufacturer. Batteries, fine-wire thermocouples, desiccant, and other consumables have no warranty. CSI’s obligation under this warranty is limited to repairing or replacing (at CSI’s option) defective Products, which shall be the sole and exclusive remedy under this warranty. The Customer assumes all costs of removing, reinstalling, and shipping defective Products to CSI. CSI will return such Products by surface carrier prepaid within the continental United States of America. To all other locations, CSI will return such Products best way CIP (port of entry) per Incoterms ® 2010. This warranty shall not apply to any Products which have been subjected to modification, misuse, neglect, improper service, accidents of nature, or shipping damage. This warranty is in lieu of all other warranties, expressed or implied. The warranty for installation services performed by CSI such as programming to customer specifications, electrical connections to Products manufactured by CSI, and Product specific training, is part of CSI’s product warranty. **CSI EXPRESSLY DISCLAIMS AND EXCLUDES ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. CSI 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. The following contact information is for US and international customers residing in countries served by Campbell Scientific, Inc. directly. Affiliate companies handle repairs for customers within their territories. Please visit www.campbellsci.com to determine which Campbell Scientific company serves your country.

To obtain a Returned Materials Authorization (RMA), contact CAMPBELL SCIENTIFIC, INC., phone (435) 227-9000. After an application 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

For all returns, the customer must fill out a "Statement of Product Cleanliness and Decontamination" form and comply with the requirements specified in it. The form is available from our web site at www.campbellsci.com/repair. A completed form must be either emailed to repair@campbellsci.com or faxed to (435) 227-9106. Campbell Scientific is unable to process any returns until we receive this form. If the form 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.

Precautions

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 or by telephoning (435) 227-9000 (USA). 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

- Prior to performing site or installation work, obtain required approvals and permits. Comply with all governing structure-height regulations, such as those of the FAA in the USA.
- 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, 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.

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.

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.

Table of Contents

PDF viewers: These page numbers refer to the printed version of this document. Use the PDF reader bookmarks tab for links to specific sections.

1. Overview	1
1.1 Specifications	1
1.2 Guy Duckbill Anchor Kits	2
2. Tools List (for tripod, mast, enclosures, and crossarms)	3
3. CM375 Installation	3
3.1 Site Selection	3
3.2 Assembling Mast Sections	4
3.3 Lightning Rod Assembly and Mounting Instrumentation	12
3.4 Anchor Installation	13
3.5 Raise, Plumb Mast and Final Cable Tensioning	18
4. Maintenance	20

Figures

1-1. 21720 tote.....	1
3-1. Assembled CM375.....	3
3-2. CM375 in opened tote.....	4
3-3. Mast base, sections, and lightning rod kit	4
3-4. Mast Section 1 oriented on base.....	5
3-5. Spike installation.....	6
3-6. Coupler installed in top of mast Section 1	6
3-7. Bag containing hardware	7
3-8. Mast Section 2 and mast Section 3	7
3-9. Guy ring, mast Section 2 and mast Section 3	8
3-10. 21663 bottom guy kit	8
3-11. Guy cable inserted into guy ring	9
3-12. Mast Section 3 and guy ring/collar assembly.....	9
3-13. Mast Section 4 ready to be installed in mast Section 3	10
3-14. Mast Section 5.....	10
3-15. 21661 guy kit	11
3-16. Mast Section 5 and guy ring/collar assembly.....	11
3-17. Mast Section 6.....	12
3-18. Lightning rod assembly.....	12
3-19. Installed lightning rod	13
3-20. Tape measure in slot for South anchor.....	13
3-21. 19282 duckbill anchor and cable assembly (left). The 25699 has a threaded rod instead of the cable. The drive rod (right) is used for both the 19282 and 25699.....	14
3-22. Anchor driven into ground at 45° angle.....	14
3-23. Locking anchor	15
3-24. Tape measure in slot for Northeast anchor.....	15
3-25. Turnbuckle fastened to guy cable and anchor	16

3-26.	Top and bottom guy cables fastened to an anchor.....	16
3-27.	Rope ratchet assists assembly.....	17
3-28.	Adjusting cable through wedge clamp	17
3-29.	Raising the mast	18
3-30.	Post level ensures vertical mast.....	18
3-31.	Adjusting turnbuckles	19
3-32.	Guy cables with 100 lb of tension	19

CM375 Portable 10-Meter Mast

1. Overview

The CM375 is a corrosion-resistant 10 m (30 ft) mast for applications requiring a tall yet portable instrument mount. It consists of six galvanized pipes, a stainless-steel base, guy cables, 1 m crossarm and mount, and grounding kit. Duckbill anchor kits (required) and a guy-wire tensioning kit (recommended) are ordered separately. All of the components fit inside a 2 m (80 in) bag allowing the CM375 to be carried from site to site (see FIGURE 1-1).



FIGURE 1-1. 21720 tote

1.1 Specifications

Weight:	30 kg (66 lb)
Mast:	9.2 m (30 ft) total length; consists of five 1.82 m (6 ft) and one 1 m (39 in) sections
Main Mast Diameter:	48.26 mm (1.9 in)
Top Section Mast Diameter:	44.2 mm (1.74 in)
Base Radius:	6 m (20 ft) to each of three guy points, 120 degrees apart
Guy Configuration:	Three guy cables at two levels; guyed at 3.6 m (12 ft) and at 7.2 m (24 ft)
Recommended Guy Wire Pretension:	100 lb each; check and adjust guy wire tension at least once a month, and after wind gusts exceeding 50 mph
Maximum Weight of Mounted Equipment:	34 kg (75 lb)

Maximum Allowable Wind Gustⁱ: 136 kmh⁻¹ (85 mph)

The wind gust value assumes:

- Proper installation
- Proper anchoring:
 - Adequate soil (guy anchors/base support)
 - Guy anchors at 20-ft from base with 120 degrees of separation
 - Proper guy tension (100 lb each)
- No ice buildup
- Standard air quality or wind assessment configuration (see Table below)

Standard Air Quality Configuration		Standard Wind Assessment Configuration	
Height	Component	Height	Component
9.1 m	CM204 crossarm with a Wind Monitor and a 43502/43347 Aspirated Shield & RTD attached	9.1 m	Two CM202 crossarms with a 03101 Wind Sentry Anemometer attached to each crossarm
		8.5 m	CM202 with 03301 Wind Sentry Wind Vane attached
3 m	41003-5 Radiation Shield housing an HMP45C Temperature/RH Probe; Antenna; CM202 crossarm with a 43502/43347 Aspirated Shield & RTD attached	3 m	41003-5 Radiation Shield housing an HMP45C Temperature RH Probe; Antenna; CM202 crossarm with a 03101 Wind Sentry Anemometer attached
1.5 m	SP20 20-W Solar Panel	1.5 m	SP20 20-W Solar Panel
1 m	ENC16/18 Enclosure housing a CR1000 datalogger and PS100 Power Supply	1 m	ENC12/14 Enclosure housing a CR1000 datalogger and PS100 Power Supply

1.2 Guy Duckbill Anchor Kits

A choice of duckbill anchor kits is offered for the CM375. The 19282 Guy Duckbill Standard Anchor Kit is adequate for most sandy and loamy soils. Clay soils and other soils with higher corrosive properties will require the 25699 Guy Duckbill Heavy Duty Anchor Kit. These corrosive soils, also known as aggressive soils, have one or more of the following properties:

- High electrical conductivity (>0.33 dS m⁻¹)
- High acidity (pH <5)
- High chloride concentration (>1000 ppm)
- High sulfate concentration (>500 ppm)
- Poor aeration

Both the 19282 and 25699 have one drive rod. The 19282 also has three duckbill anchors with a cable attached to each of them; at the end of the cable is a loop for connecting the guy wires. The 25699 has a threaded rod attached to each of the three duckbill anchors instead of the cable; at the end of the threaded rod is a metal ring for connecting the guy wires.

ⁱ The amount of wind gust that this mount can withstand is affected by quality of anchoring and installation, guy wire tension, soil type, guy angle, and the number, type, and location of instruments fastened to the CM375.

2. Tools List (for tripod, mast, enclosures, and crossarms)

- 1/2-in. and 7/16-in. open end wrenches
- adjustable wrench
- Phillips head screw drivers (medium, small)
- Straight bit screwdrivers (large, medium)
- 12-in. torpedo level
- side-cut pliers
- pencil
- tape measure
- compass and site declination angle
- shovel
- sledge hammer (for driving ground rod and stakes)
- step ladder

3. CM375 Installation

3.1 Site Selection

Select a site free from overhead power lines, and 30 m (100 ft) in any direction from trees, buildings, and other obstructions (see FIGURE 3-1).



FIGURE 3-1. Assembled CM375

3.2 Assembling Mast Sections

Step 1: Remove mast sections and other bundled hardware from tote; unzip and loosen straps (see FIGURE 3-2).

NOTE Sections are numbered for sequential assembly (see FIGURE 3-3).



FIGURE 3-2. CM375 in opened tote

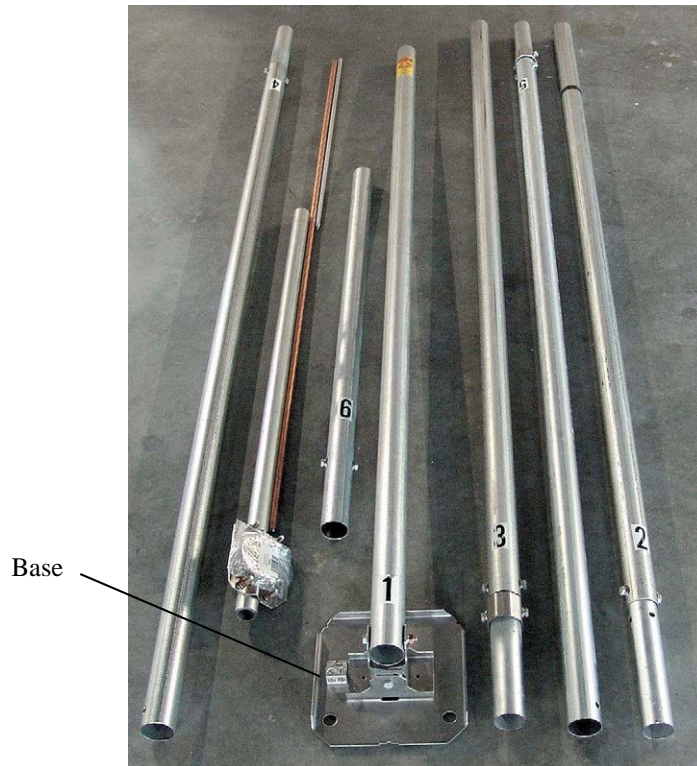


FIGURE 3-3. Mast base, sections, and lightning rod kit

Step 2: Place Section 1 at deployment location with base oriented, as shown in FIGURE 3-4 and mast pointing NORTH.

NOTE

A compass is included in the optional “Tensioning Kit” for your use.



FIGURE 3-4. Mast Section 1 oriented on base

Step 3: Use spikes provided (3 each) to anchor base to site (see FIGURE 3-5).

WARNING

Always maintain a safe distance between the mast and any overhead power lines. Contact local utilities prior to assembling the mast to locate any buried utility lines in the area the mast is to be installed.

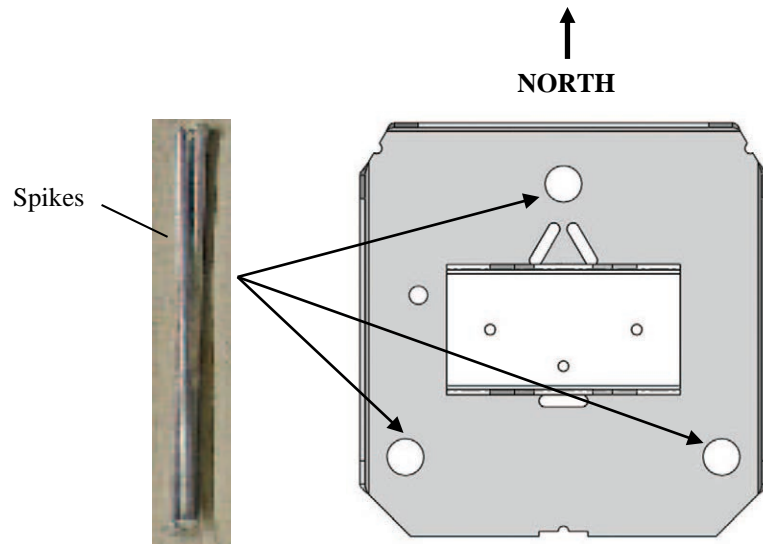


FIGURE 3-5. Spike installation

Step 4: Insert the Section 2 coupler into the top of Section 1 (see FIGURE 3-6).

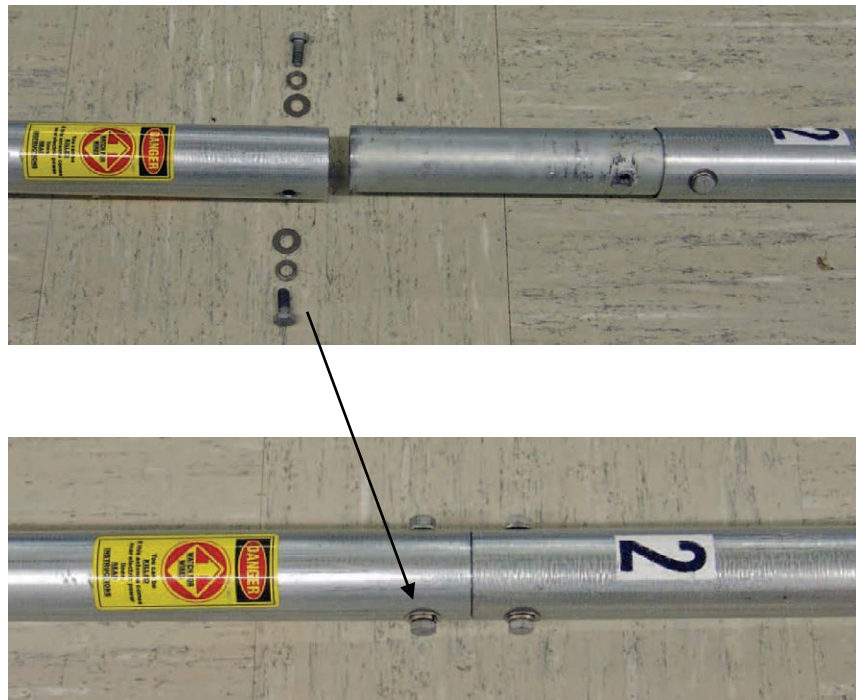


FIGURE 3-6. Coupler installed in top of mast Section 1

Step 5: Secure joint with 2 flat washers, 2 lock washers and 2 bolts from the hardware bag (see FIGURE 3-7).



FIGURE 3-7. Bag containing hardware

Step 6: Assemble Section 3 to the top of Section 2 (see FIGURE 3-8).

NOTE

The BLACK tape around Section 2 is a reference (11 foot level) for optional sensor mounts.



FIGURE 3-8. Mast Section 2 and mast Section 3

Step 7: Remove the collars from Section 3 and place next to the mounting holes in Section 2 (see FIGURE 3-8 and FIGURE 3-9).

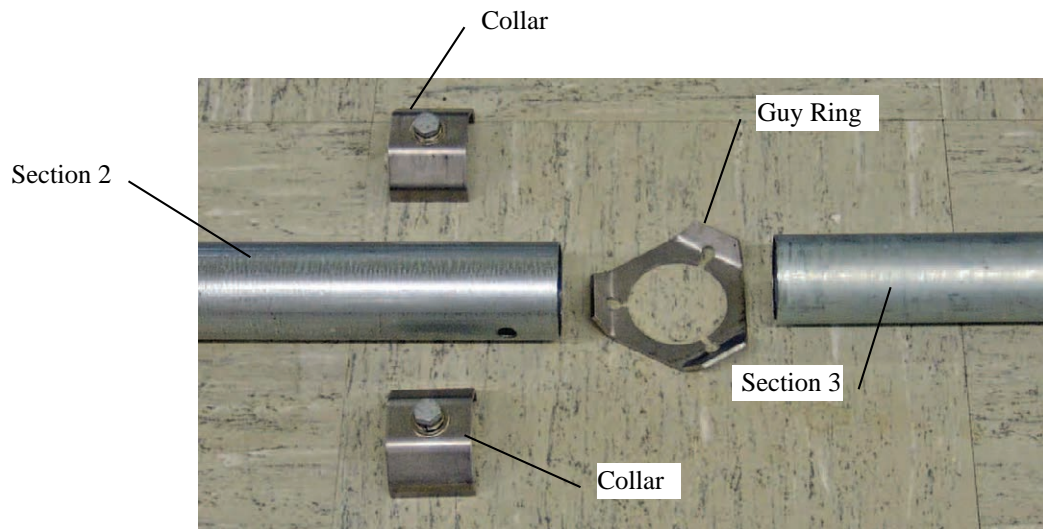


FIGURE 3-9. Guy ring, mast Section 2 and mast Section 3

Step 8: Remove guy ring from bottom guy kit, pn 21663 (see FIGURE 3-9 and FIGURE 3-10).



FIGURE 3-10. 21663 bottom guy kit

Step 9: Place ball end of each guy cable into its slot in the guy ring and place guy ring onto coupler of Section 3 (see FIGURE 3-11).

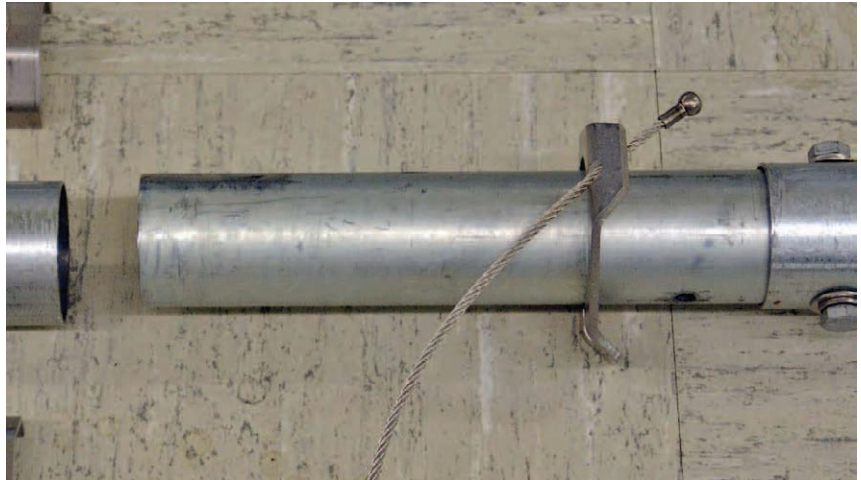


FIGURE 3-11. Guy cable inserted into guy ring

NOTE

Only one of the three cable ends is shown.

Step 10: Slide coupler into Section 2 mast and assemble collars, as shown in FIGURE 3-12.

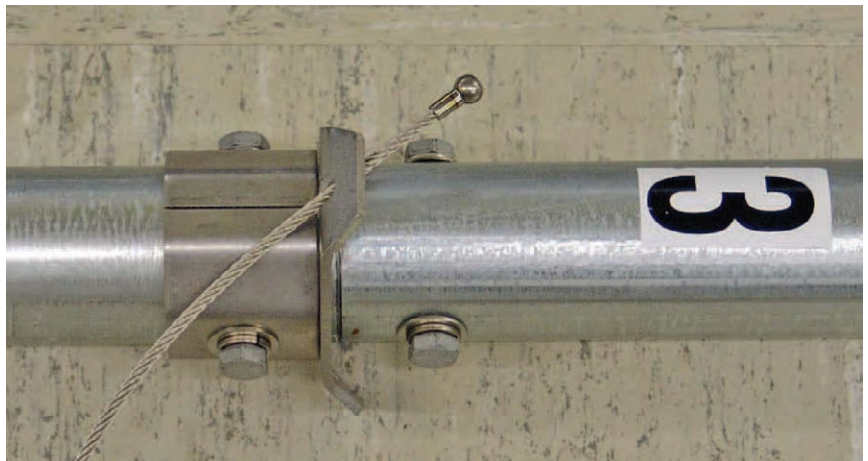


FIGURE 3-12. Mast Section 3 and guy ring/collar assembly

Step 11: Slide coupler end of Section 4 into the top of Section 3, and secure with remaining components from hardware bag (see FIGURE 3-13).

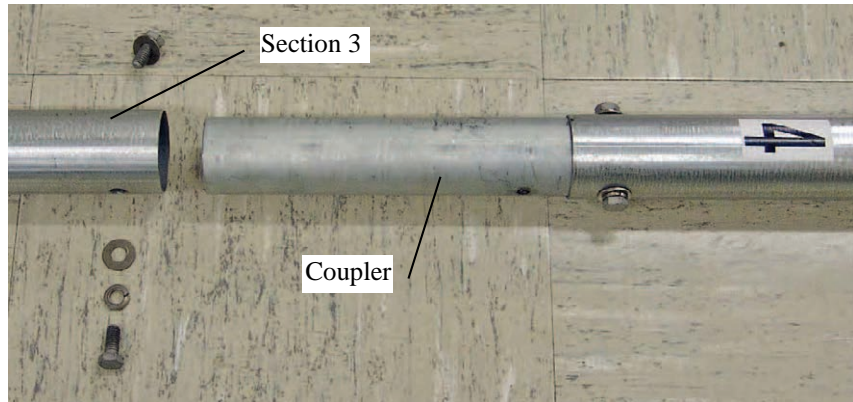


FIGURE 3-13. Mast Section 4 ready to be installed in mast Section 3

Step 12: Remove collars from Section 5 (see FIGURE 3-14).

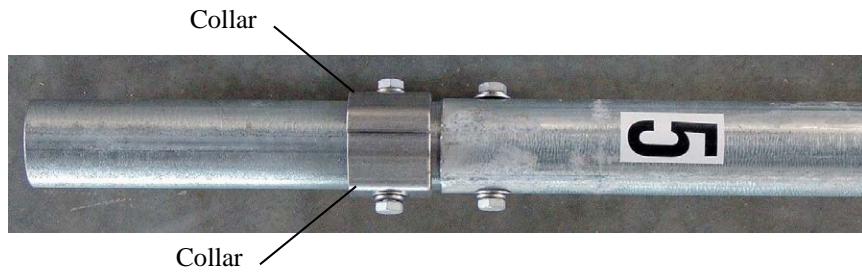


FIGURE 3-14. Mast Section 5

Step 13: Remove the guy collar from the 21661 guy kit (FIGURE 3-15).



FIGURE 3-15. 21661 guy kit

Step 14: Place the guy cable ball ends into the guy ring, and then slide the guy ring onto the bottom end of Section 5 oriented as shown in FIGURE 3-16. Align the holes in Section 4 and Section 5, and reassemble the collars.



FIGURE 3-16. Mast Section 5 and guy ring/collar assembly

Step 15: Remove the hardware from Section 6. Insert Section 6 into the top of Section 5 and secure with hardware (FIGURE 3-17).

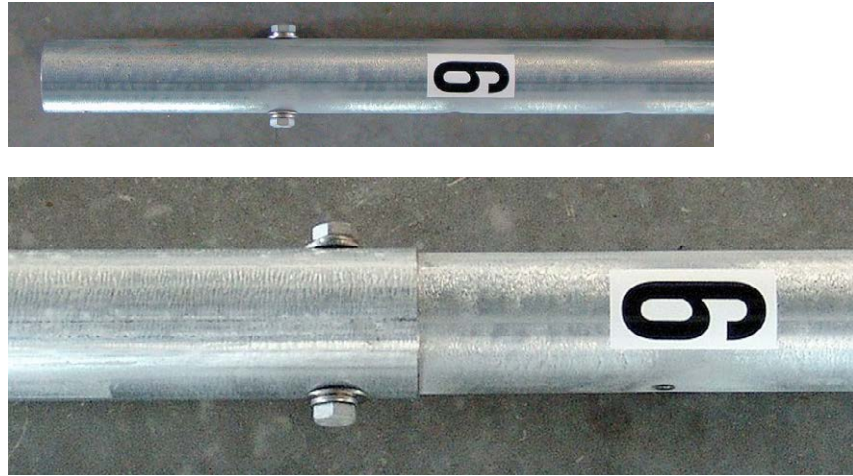


FIGURE 3-17. Mast Section 6

3.3 Lightning Rod Assembly and Mounting Instrumentation

Step 1: Fit lightning rod assembly (from pn 21660) to top of Section 6 mast (see FIGURE 3-18).



FIGURE 3-18. Lightning rod assembly

Step 2: Place clamp onto top of mast Section 6 and tighten (see FIGURE 3-19).

Step 3: Insert rod into clamp and tighten (see FIGURE 3-19).

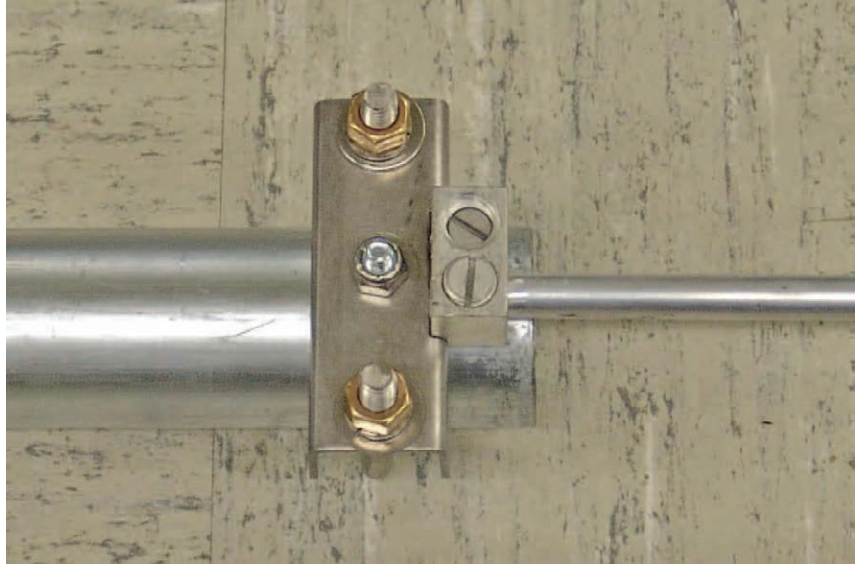


FIGURE 3-19. Installed lightning rod

Step 4: Assemble enclosures, sensors and tie cables to mast, as required.

3.4 Anchor Installation



FIGURE 3-20. Tape measure in slot for South anchor

Step 1: For the South anchor, place tape measure into slot in base centering tape within notch on edge of base. Measure to 20 ft (see FIGURE 3-20).

Step 2: At 20 ft, install the duckbill anchor with drive rod (see FIGURE 3-21). The anchor needs to be driven into the ground at a 45° angle (see FIGURE 3-22). Drive anchor until the loop or metal ring is several inches above the ground.

WARNING

Always maintain a safe distance between the mast and any overhead power lines. Contact local utilities prior to assembling the mast to locate any buried utility lines in the area the mast is to be installed.

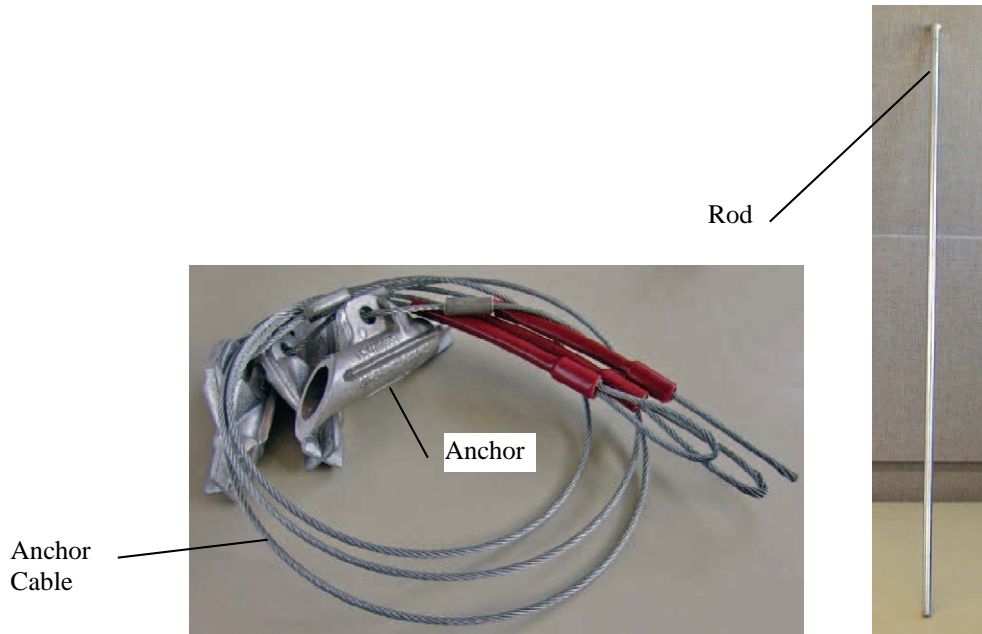


FIGURE 3-21. 19282 duckbill anchor and cable assembly (left). The 25699 has a threaded rod instead of the cable. The drive rod (right) is used for both the 19282 and 25699.

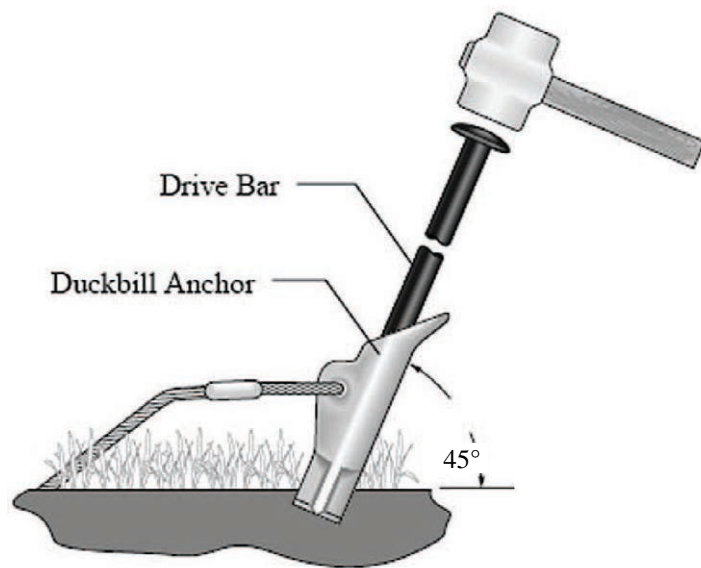


FIGURE 3-22. Anchor driven into ground at 45° angle

Step 3: With a rod through the loop or metal ring, pull up on the cable or threaded rod until the anchor rotates and locks (see FIGURE 3-23).

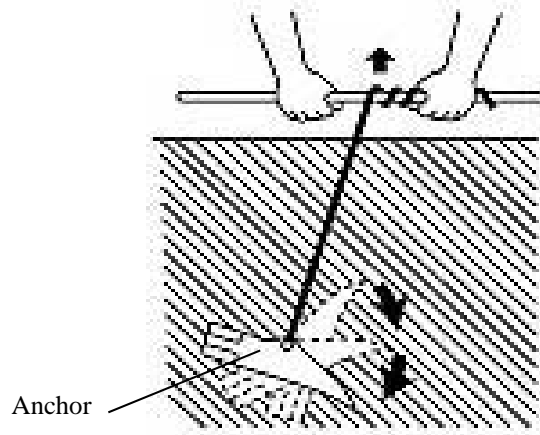


FIGURE 3-23. Locking anchor

Step 4: Fill-in the hole around the cable or threaded rod with loose dirt and tamp firm.

Step 5: Repeat process for the NE (FIGURE 3-24) and NW anchors.

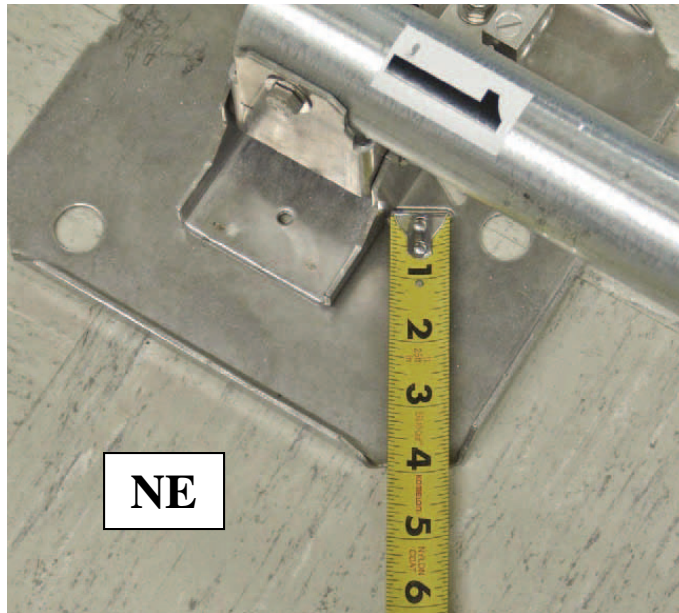


FIGURE 3-24. Tape measure in slot for Northeast anchor

Step 6: Attach guy wires to anchors by first opening the turnbuckle to the widest setting. Attach turnbuckle to wedge end of the guy cable, and then attach the other end of the turnbuckle to an anchor (see FIGURE 3-25).

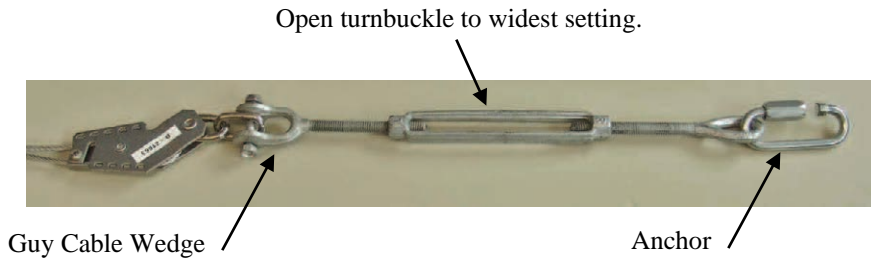


FIGURE 3-25. Turnbuckle fastened to guy cable and anchor

Step 7: If using rope ratchet to assist assembly, set to 7 feet and attach to tension clamp on cable and to anchor end. Do this for both NE and NW anchors and top and bottom guy cables (see FIGURE 3-26 and FIGURE 3-27).

NOTE

Do not connect the SOUTH cables at this time.



FIGURE 3-26. Top and bottom guy cables fastened to an anchor



FIGURE 3-27. Rope ratchet assists assembly

Step 8: Course adjustments to cable length are made by loosening screw clamp and then releasing wedge with a blade screwdriver (see FIGURE 3-28). This allows the cable to be adjusted through the wedge clamp.

NOTE

Retighten screw when adjustment is complete.



FIGURE 3-28. Adjusting cable through wedge clamp

3.5 Raise, Plumb Mast and Final Cable Tensioning

Step 1: With NW and NE cables attached to anchors have one person lift mast, while another person pulls on the SOUTH cables to bring mast to an upright position (see FIGURE 3-29). If using rope ratchets, adjust them to allow further steps.



FIGURE 3-29. Raising the mast

Step 2: Attach SOUTH cables to anchor. While first person holds mast and uses a post level (available at most hardware stores or online), the second person adjusts each of the bottom guy cable wedge clamps, maintaining level in all directions (see FIGURE 3-30). The rope ratchet can be used to temporarily remove the load from the wedge assembly during wedge adjustments.



FIGURE 3-30. Post level ensures vertical mast

Step 3: Repeat process with the top guy cables to establish a straight mast.

Step 4: Apply further tensioning using the turnbuckles (see FIGURE 3-31).



FIGURE 3-31. Adjusting turnbuckles

Step 5: Adjust each cable turnbuckle to maintain plumb and increase cable tension. A deflection of 3 inches when using a 4.4 pound (20 Newton) perpendicular force, 68 inches from the duckbill anchor loop equates to 100 pounds of tension in the cables (see FIGURE 3-32).

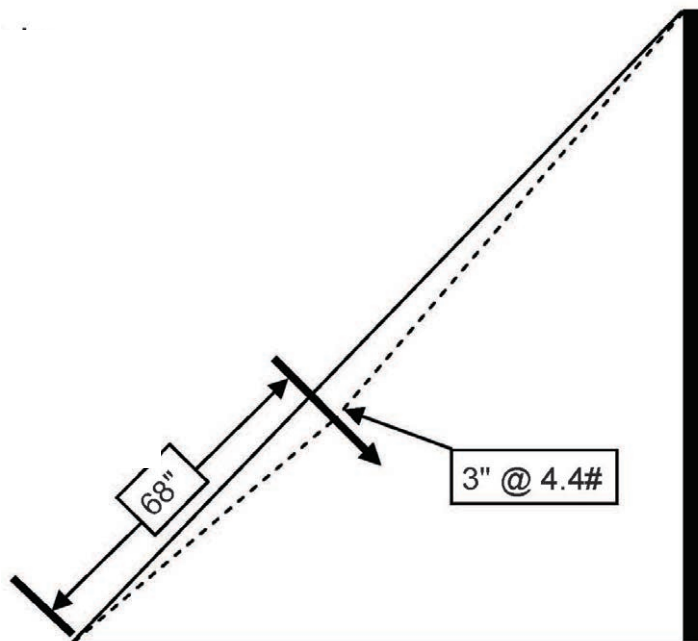


FIGURE 3-32. Guy cables with 100 lb of tension

Step 6: After tensioning the top guy cables, recheck the bottom guy cables.

Adjust, as necessary.

4. Maintenance

Check and adjust guy cable tension at least once a month, and after wind gusts exceeding 50 mph.

Campbell Scientific Companies

Campbell Scientific, Inc. (CSI)

815 West 1800 North
Logan, Utah 84321
UNITED STATES

www.campbellsci.com • info@campbellsci.com

Campbell Scientific Africa Pty. Ltd. (CSAf)

PO Box 2450
Somerset West 7129
SOUTH AFRICA

www.csafrica.co.za • cleroux@csafrica.co.za

Campbell Scientific Australia Pty. Ltd. (CSA)

PO Box 8108
Garbutt Post Shop QLD 4814
AUSTRALIA

www.campbellsci.com.au • info@campbellsci.com.au

Campbell Scientific (Beijing) Co., Ltd.

8B16, Floor 8 Tower B, Hanwei Plaza
7 Guanghua Road
Chaoyang, Beijing 100004
P.R. CHINA

www.campbellsci.com • info@campbellsci.com.cn

Campbell Scientific do Brasil Ltda. (CSB)

Rua Apinagés, nbr. 2018 — Perdizes
CEP: 01258-00 — São Paulo — SP
BRASIL

www.campbellsci.com.br • vendas@campbellsci.com.br

Campbell Scientific Canada Corp. (CSC)

14532 – 131 Avenue NW
Edmonton AB T5L 4X4
CANADA

www.campbellsci.ca • dataloggers@campbellsci.ca

Campbell Scientific Centro Caribe S.A. (CSCC)

300 N Cementerio, Edificio Breller
Santo Domingo, Heredia 40305
COSTA RICA

www.campbellsci.cc • info@campbellsci.cc

Campbell Scientific Ltd. (CSL)

Campbell Park
80 Hathern Road
Shepshed, Loughborough LE12 9GX
UNITED KINGDOM

www.campbellsci.co.uk • sales@campbellsci.co.uk

Campbell Scientific Ltd. (CSL France)

3 Avenue de la Division Leclerc
92160 ANTONY
FRANCE

www.campbellsci.fr • info@campbellsci.fr

Campbell Scientific Ltd. (CSL Germany)

Fahrenheitstraße 13
28359 Bremen
GERMANY

www.campbellsci.de • info@campbellsci.de

Campbell Scientific Spain, S. L. (CSL Spain)

Avda. Pompeu Fabra 7-9, local 1
08024 Barcelona
SPAIN

www.campbellsci.es • info@campbellsci.es

Please visit www.campbellsci.com to obtain contact information for your local US or international representative.