



Tripod Installation

Models CM110, CM115, CM120



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Tripod Installation Manual

Models CM110, CM115, CM120

1. Introduction

The CM110 (3.1 m, 10.5 ft), CM115 (4.5 m, 15.2 ft), and CM120 (6 m, 20 ft) tripods are corrosion-resistant stainless steel instrument mounts that support the attachment of sensors, solar panels, and environmental enclosures (FIGURE 1-1). A guy kit is included with the CM115 and CM120 models and is an option for the CM110.

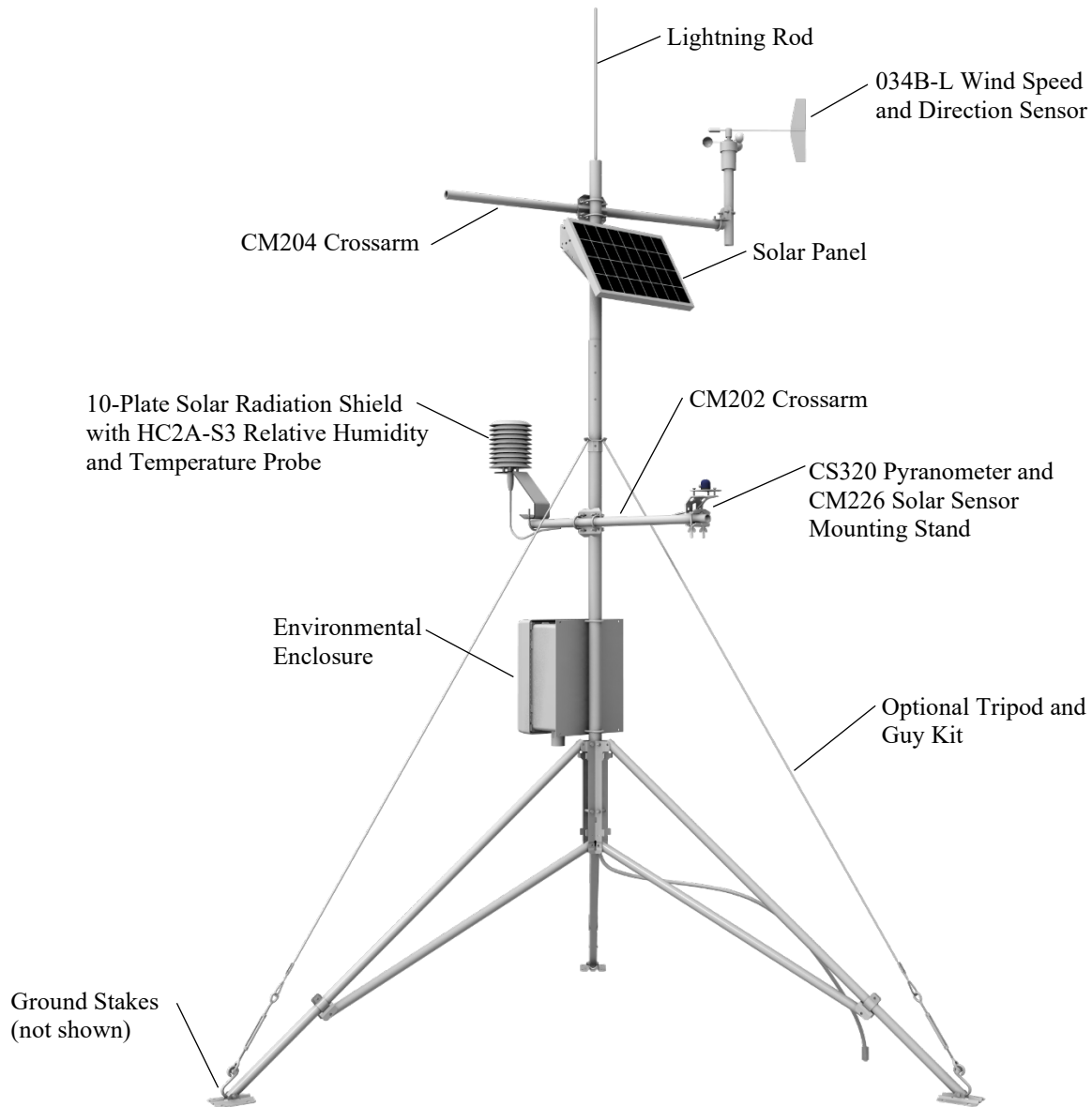


FIGURE 1-1. Typical tripod-based weather station

The Tripod Tote is an option for the CM110-series tripods. The tote is constructed of nylon, with a main compartment for the tripod base, and pockets for stowing the other components as shown in FIGURE 1-2.

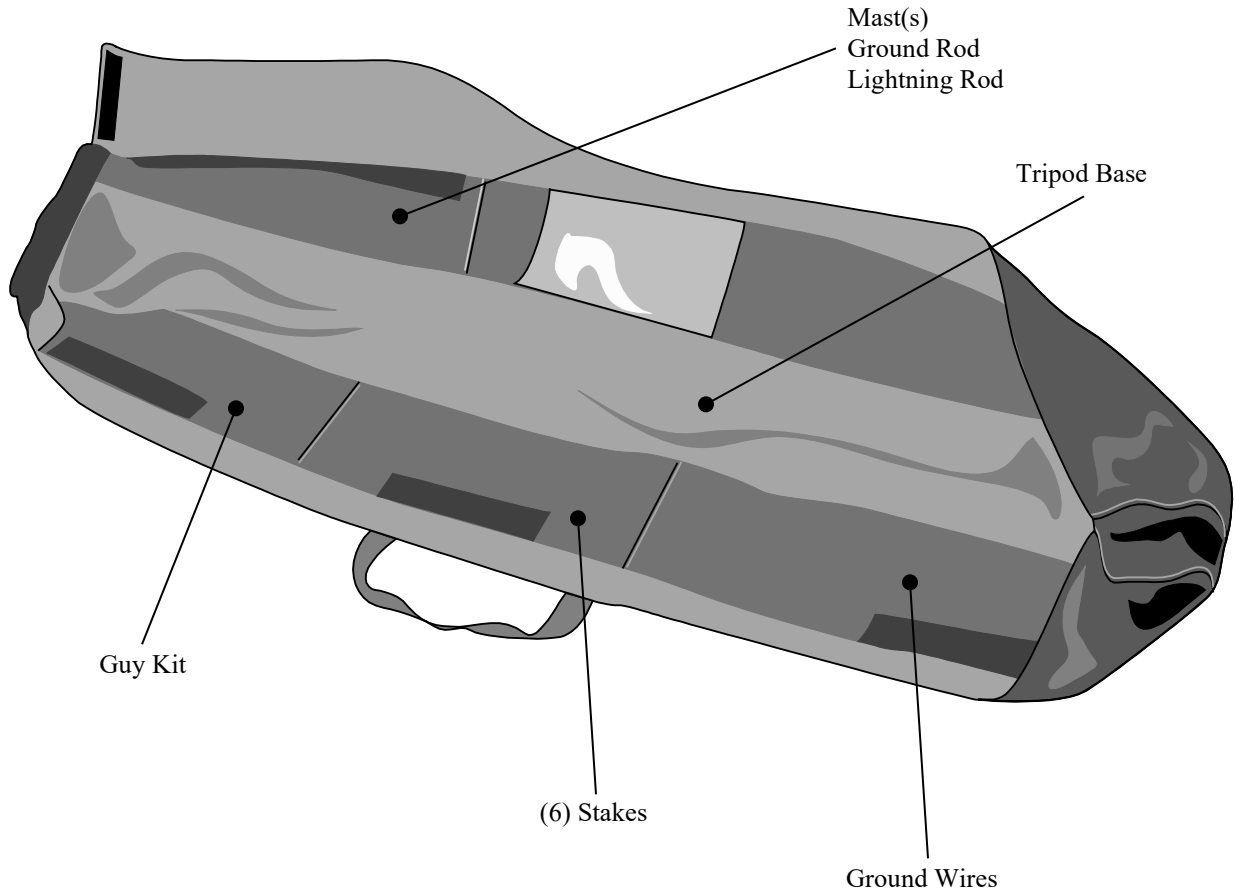


FIGURE 1-2. Tripod tote

2. Precautions

- READ AND UNDERSTAND the [Safety](#) section at the back of this manual.
- WARNING — Ensure structural integrity during setup and weather extremes to minimize the chance of damaging the tripod or instruments. Read all instructions carefully. Once the tripod is in full vertical position, securely fasten it to the ground using ground spikes.
- WARNING — For installations where soil structure is questionable or the tripod may experience high wind loads, concrete footings for the tripod feet and guy anchors should be considered.
- Keep the bottom of the tripod legs free of soil, ice, and debris to prevent trapping any moisture inside or around the legs.

3. Initial Inspection

3.1 Inspect Packaging

Upon receiving the tripod, inspect the packaging and contents for damage. Claims for shipping damage must be filed with the shipping company.

Locate the packing slip for the order and compare the items listed on the packing slip to the items that were actually shipped. Report any discrepancies to Campbell Scientific.

3.2 Tripod Components

FIGURE 3-1 shows the tripod components packaged for shipment. The tripod base is packaged with the mast, ground rod, lightning rod, and (6) stakes. The ground rod clamp, lightning rod, and ground wires are enclosed in a bag. The guy kit (optional for the CM110), and Tripod Tote (optional) are packaged separately. The CM115 and CM120 tripods include additional mast sections. FIGURE 1-2 shows how to stow the components inside the tripod tote.



FIGURE 3-1. Tripod components

3.3 Tools List (for tripod, mast and crossarm)

- 1/2-in and 7/16-in open end wrenches
- adjustable wrench
- socket wrench with 1/2-in and 7/16-in deep sockets (optional)
- Phillips head screwdriver (medium)
- flat-head screwdriver (large)
- magnetic torpedo level
- side-cut pliers
- pencil
- tape measure
- compass and site declination angle
- shovel
- sledgehammer (for driving ground rod and stakes)
- step ladder

4. Overview

The tripod (FIGURE 4-1) is constructed from galvanized steel, with individually adjustable legs that allow installation over uneven terrain.

The tripod includes lightning and ground rods, ground cables, UV resistant cable ties, and stakes for securing the tripod feet to the ground. A guy kit is included (optional for the CM110) for sites that experience high wind speeds (see Section 5, *Specifications* (p. 5)). Instrument enclosures can be purchased with mounting brackets that attach to either the mast or leg section as shown in Section 6.1.7, *Enclosure Attachment* (p. 21).

The tripod can be used for a variety of applications. For meteorological stations, sensors are mounted to the tripod using mounting brackets appropriate for the model of sensor. For non-meteorological applications, the tripod can be used to mount instrument enclosures, solar panels, junction boxes, or antennas.

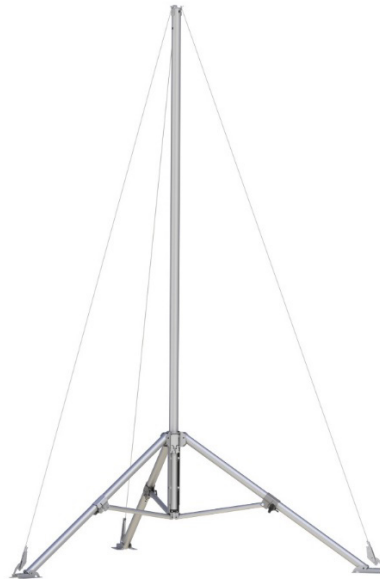


FIGURE 4-1. CM110 tripod with optional guy wires (guy wires included with CM115 and CM120)

5. Specifications

	<u>CM110</u>	<u>CM115</u>	<u>CM120</u>
Height w/mast insert:	3.1 m (10.5 ft)	4.5 m (15.2 ft)	6 m (20 ft)
Weight:	15 kg (34 lb)	18 kg (40 lb)	21 kg (46 lb)
Base diameter w/legs extended:	2 m (7 ft)	2 m (7 ft)	2 m (7 ft)
Dimensions of collapsed tripod:	15 x 15 x 145 cm (6 x 6 x 57 in)	15 x 15 x 145 cm (6 x 6 x 57 in)	15 x 15 x 145 cm (6 x 6 x 57 in)
Vertical load limit:	45 kg (100 lb)	45 kg (100 lb)	45 kg (100 lb)
Mast description			
Number of sections:	1	2	3
Length:	1.4 m (4.6 ft)	2.8 m (9.3 ft)	4.3 m (14.0 ft)
Length w/insert:	2.6 m (8.6 ft)	4.1 m (13.3 ft)	5.5 m (18.0 ft)
OD:	4.8 cm (1.9 in)	4.8 cm (1.9 in)	4.8 cm (1.9 in)
Insert OD:	4.45 cm (1.75 in)	4.45 cm (1.75 in)	4.45 cm (1.75 in)
Mounting hole in tripod foot:	0.75 in diameter hole for user-supplied 0.5 in J-bolts	0.75 in diameter hole for user-supplied 0.5 in J-bolts	0.75 in diameter hole for user-supplied 0.5 in J-bolts
Wind load recommendations¹			
Sustained wind (mph):	121 kph (75 mph) unguyed 129 kph (80 mph) guyed at feet	91 kph (56.25 mph) guyed at feet 121 kph (75 mph) guyed at 60°	68 kph (42.25 mph) guyed at feet 105 kph (65 mph) guyed at 60°
Gust tolerance (mph):	153 kph (95 mph) unguyed 161 kph (100 mph) guyed at feet	115 kph (71.25 mph) guyed at feet 153 kph (95 mph) guyed at 60°	89 kph (55.25 mph) guyed at feet 137 kph (85 mph) guyed at 60°
Tripod tote dimensions:	20 cm (8 in) diameter, 152 cm (60 in) length	20 cm (8 in) diameter, 152 cm (60 in) length	20 cm (8 in) diameter, 152 cm (60 in) length

¹The wind load recommendations for the CM115 and CM120 assume the guy wire anchors are able to hold at least 1.8 kN (400 lbf).

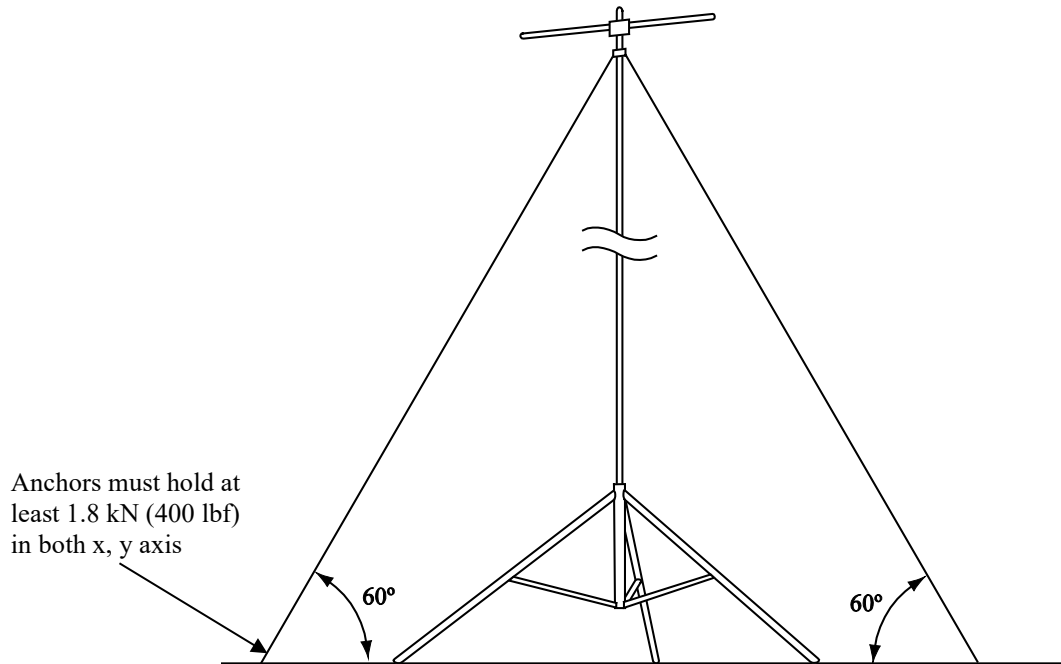


FIGURE 5-1. 60-degree guy angle

6. Installation

6.1 Tripod Installation

6.1.1 Tripod Base

WARNING

Tripod installation near power lines is dangerous. The minimum safe recommended distance from overhead power lines is two times the height of the tripod and mast combined. Contact local utility providers to locate any buried utilities prior to installation.

All three models use the same tripod base. Each leg is adjustable, allowing the tripod to be adjusted for non-level terrain.

Prepare the area where the tripod will be installed. The tripod requires an area approximately 7 feet in diameter. Remove any brush and tall weeds, while disturbing the ground surface and other natural vegetation as little as possible.

Stand the tripod base on end and rotate the feet perpendicular to the legs. Each leg has a slide collar and T-knob with a spring-loaded pin that locks into holes located on the underside of the leg as shown in [FIGURE 6-1](#).

Extend each leg until the pin engages in a hole (depress the tab to disengage the pin from a hole). With the legs extended, orient the tripod so one leg points away from the equator, or downhill if the tripod is being mounted on a hill. The tripod is typically plumbed after the mast has been installed, as described in [Section 6.1.2, Mast \(p. 7\)](#).

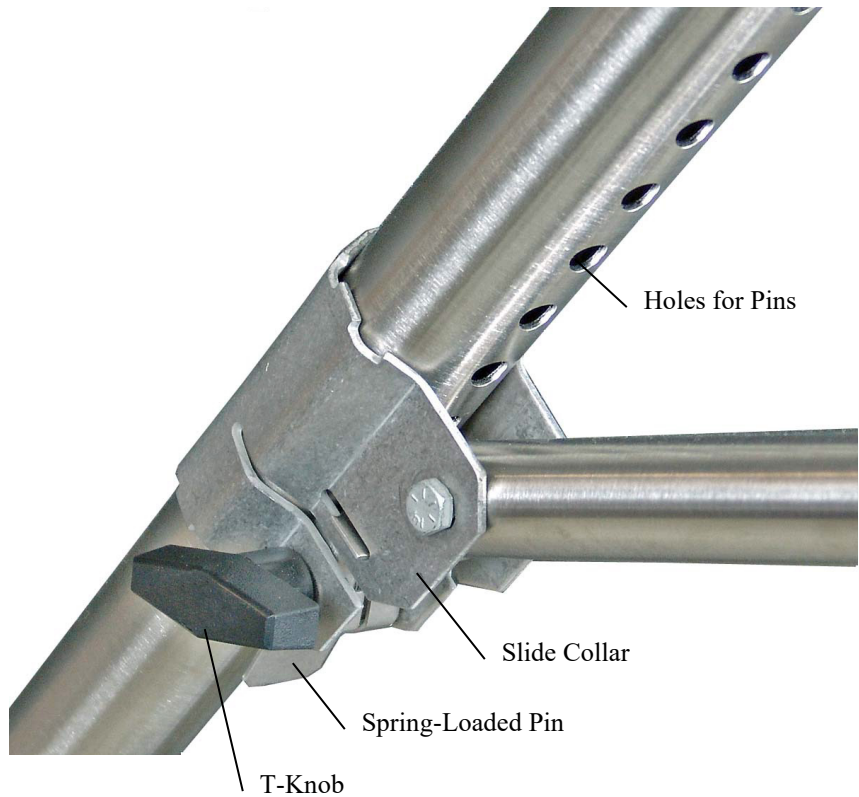


FIGURE 6-1. Tripod leg, slide collar components

6.1.2 Mast

The CM110, CM115, and CM120 tripods have one, two, or three mast sections respectively. The top mast section has a 142 cm (56 in) long insert with a series of holes that can be extended to lengthen the mast (FIGURE 6-2). Remove the bolt that secures the insert to the inside of the mast and slide the insert out from the mast to see the different hole locations. Slide the insert back into the mast, aligning the appropriate holes of the insert with holes in the mast, and replace the bolt.

Additional 142 cm (56 in) mast section(s) included with the CM115 and CM120 tripods have a 41 cm (16 in) long insert that is used to connect the mast sections together. Remove the bolt that secures the insert to the inside of the mast and extend the insert 20 cm (8 in); align the holes in the mast extension and insert, then replace the bolt. Attach additional mast sections by sliding the bottom of the next mast section over the insert of a lower section, aligning the holes and installing the bolt (see FIGURE 6-2 inset). Typically, the bottom mast section is attached to the tripod and tilted down to a horizontal position, and the additional mast sections bolted to the bottom section.

Additional mast sections are also available to increase the height of the CM110 and CM115 to the height of the CM120. It is not recommended to increase the height beyond the height of the CM120. When increasing the height of the CM110, purchasing the guy kit available for the CM115 and CM120 is highly recommended to increase stability.

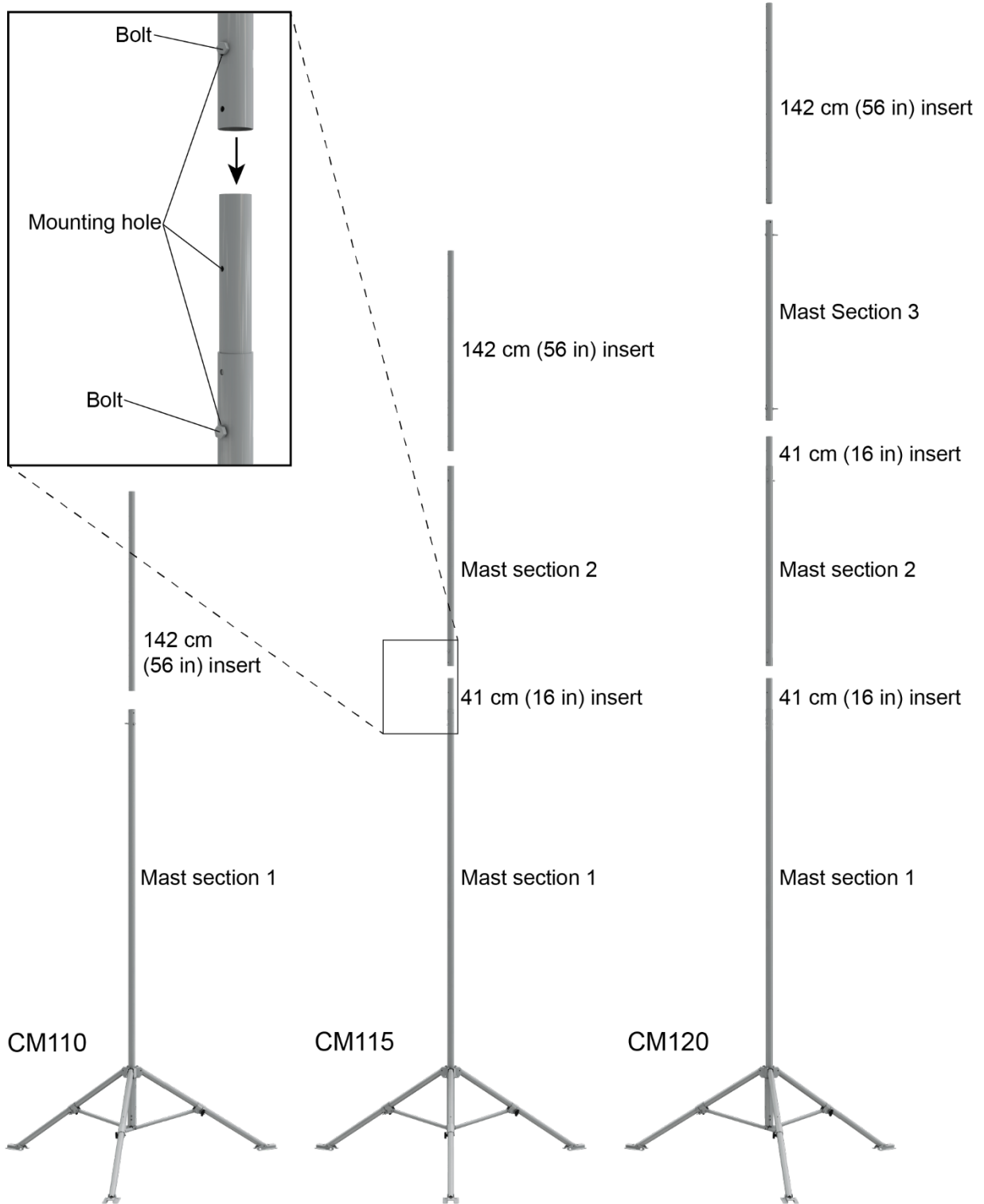


FIGURE 6-2. CM110, CM115, and CM120 assemblies

The tripod base has two sets of right-angled holes for attaching the mast; typically, the lower set is used (FIGURE 6-3A). The mast is attached to the base with a pin and secured in the upright position with a locking bracket. Both the pin and the locking bracket are secured with a lanyard.

To attach the lower mast section, hold the mast upright and align the hole in the bottom of the mast with the holes in the tripod base. Insert the pin through the holes, and rotate the wire retainer over the end of the pin as shown in FIGURE 6-3B. The pin should be seated in the bottom of the hole when the mast is upright. Lift the mast up so the pin is in the upper end of the hole to allow the mast to be tilted down to a horizontal position.

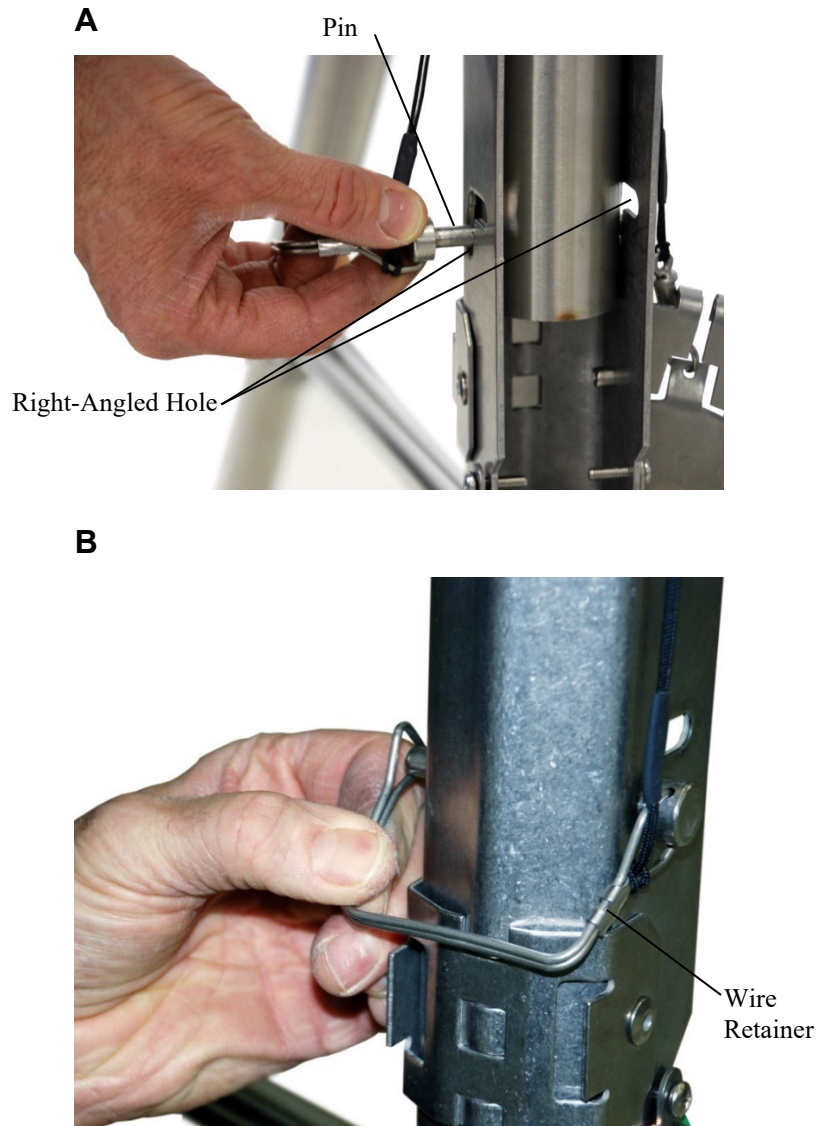


FIGURE 6-3. Mast attachment to tripod base

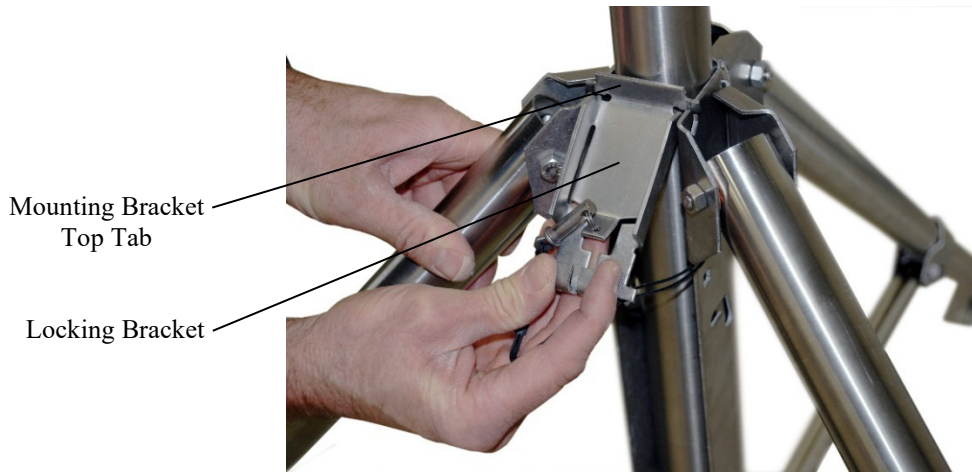
Secure the mast in the upright position by installing the locking bracket (FIGURE 6-4A). Insert the top of the bracket into the notches in the tripod base, and using both thumbs, press the bracket into the body of the base until the lower tabs lock into position (FIGURE 6-4B). Install the pin as shown in FIGURE 6-4C. To remove the bracket, remove the pin and squeeze the lower part of the bracket to disengage the tabs, then rotate the bracket out and up.

NOTE

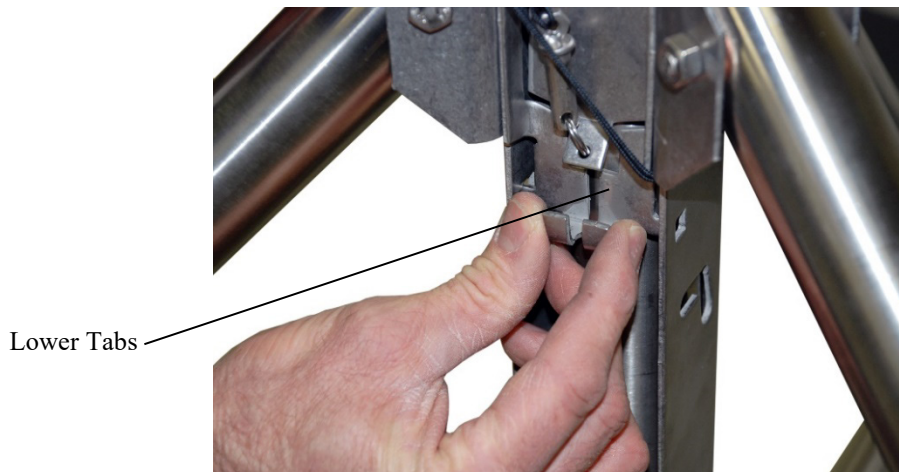
The mounting bracket is designed to be under tension when pressing it into place. If it is not possible to press the bracket into place, the amount of tension can be reduced by flattening the bend on the top tab on the bracket by approximately 5° (FIGURE 6-4A).

Plumb the tripod by adjusting the leg pointing away from the equator and either of the two remaining legs. With the level on the South side of the mast, adjust the leg pointing away from the equator for plumb. With the level on the East side of the mast, adjust one of the other legs for plumb.

A



B



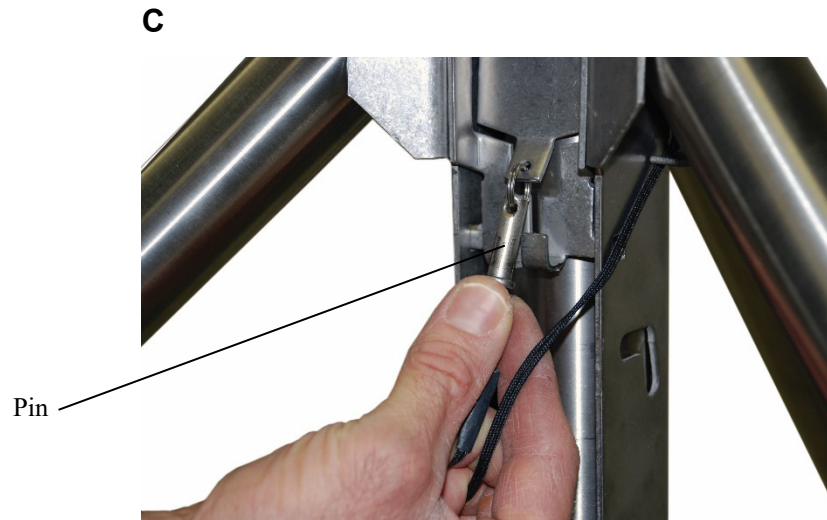


FIGURE 6-4. Mast lock bracket

6.1.3 Installing the Guy Kit

The CM115 and CM120 tripods include a guy kit; the guy kit is an option for the CM110. With the mast tilted down in the horizontal position, install the guy ring over the mast insert, and attach the guy wires as shown in FIGURE 6-5. Return the mast to the upright position and install the locking bracket.

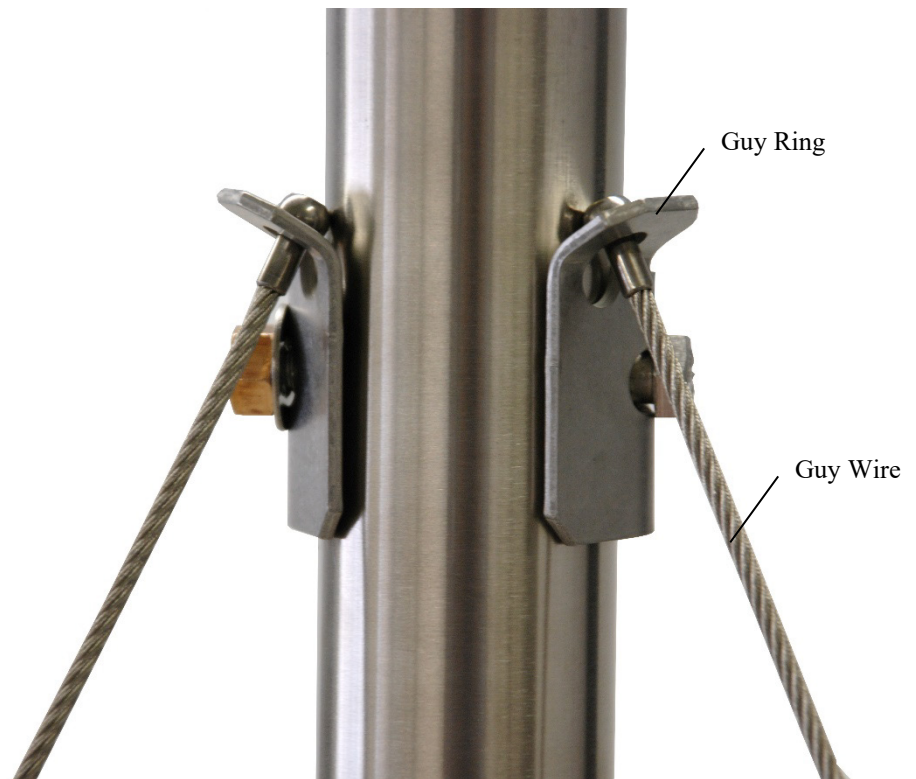


FIGURE 6-5. Guy kit

On the end of each guy wire is a case consisting of a hook, clamp, and lever arm. Rotate the lever arm to the “open” position and attach the hook to the tripod leg as shown in FIGURE 6-6. Loosen the Phillips screw, and remove the slack in the guy wire by feeding the load end of the guy wire through the wedge while pulling up on the dead end (FIGURE 6-7).

NOTE

If the guy line binds inside the case, insert a flat screwdriver into the window on the case (shown in FIGURE 6-6) and apply pressure to the guy cinch wedge to free the guy line.

After the slack has been removed from the guy wires, tighten the Phillips screws and rotate the lever arms to “closed” position to tension the guy wires (FIGURE 6-6). A locking pin is inserted through the hole in the lever arm to lock the arm in place (FIGURE 6-6).

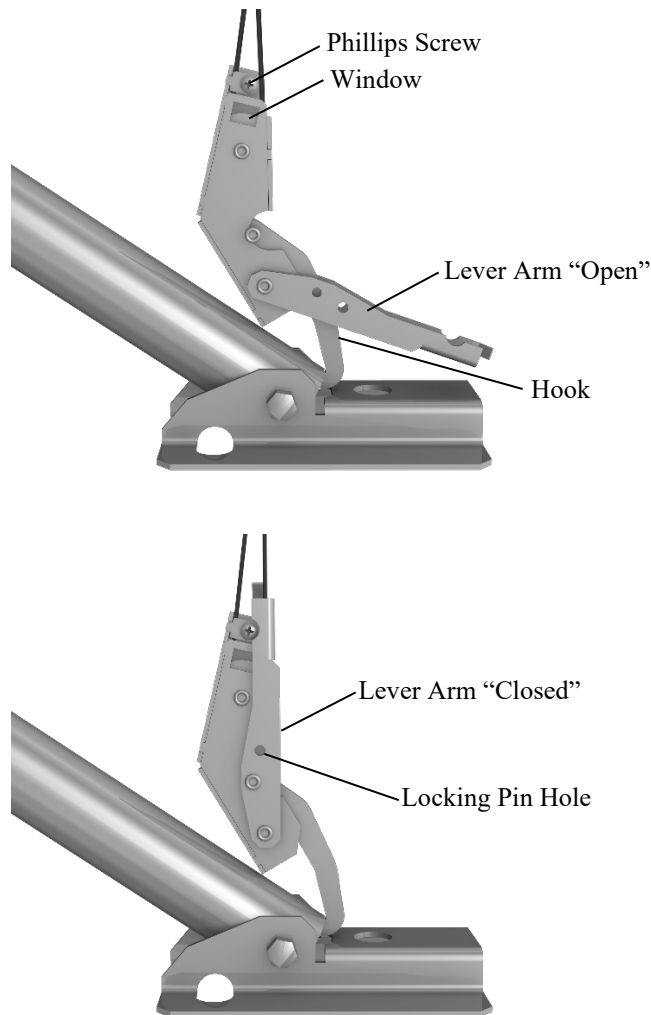


FIGURE 6-6. Guy cinch and lever arm

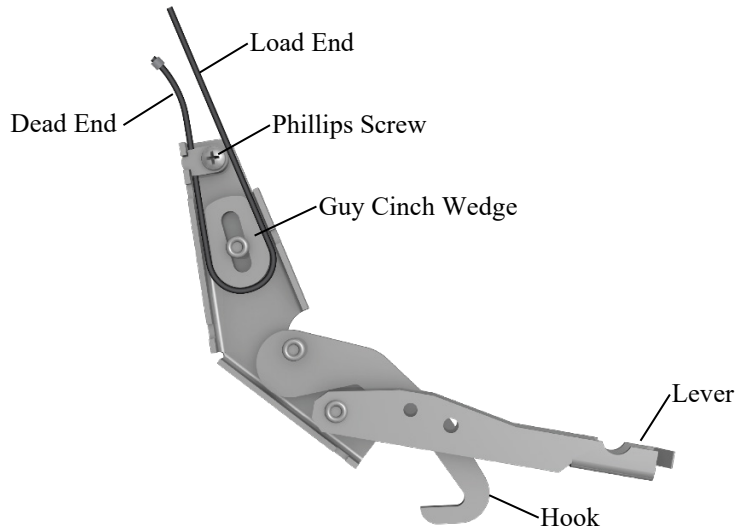


FIGURE 6-7. Guy hook and case

6.1.3.1 Guy Duckbill Anchor Kits

Duckbill anchors are recommended for areas subjected to higher winds. They allow the guy wires to be anchored at points beyond the feet, thereby increasing the rating of the tripod for higher winds.

Three duckbill anchor kits are offered for these lightweight tripods. The duckbill standard anchor kit is for standard soils, the duckbill heavy-duty anchor kit is for aggressive soils, and the center duckbill anchor kit is used when additional stability is desired but not required to the same extent as a full duckbill anchor kit. Aggressive soils have:

- Resistivity less than 3000 ohm-cm
- pH less than 5
- Chloride greater than 1000 ppm
- Sulfate greater than 500 ppm
- Poor aeration

The standard and heavy-duty kits include a drive bar. The center duckbill kit uses a user-supplied drive bar. The standard anchor kit 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 heavy-duty anchor kit 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. The center duckbill anchor has a single anchor with a cable.

The duckbill anchors are driven to the ground at a 60-degree guy angle as shown in FIGURE 6-8, except for the center duckbill anchor kit, which is driven straight into the ground directly below the tripod mast. Locate the other anchor kits on a 2.7 m (8.7 ft) radius for the CM115, or an 3.5 m (11.5 ft) radius for the CM120 as shown in FIGURE 6-9. Specifications for sustained wind speed and gust tolerance are given based on guy angle, and the ability of the anchors to hold at least 1.8 kN (400 lbf).

NOTE

Duckbill anchors are not suitable for rocky or sandy soils; UTEYE anchors should be considered for these types of soils.

It is important that the anchors be driven at the same angle as the guy wires. Insert the drive bar into the anchor body and drive the anchor into the ground using a sledgehammer until only the top half of the loop or metal ring remains above the ground. Place a bar or high-lift jack through the loop or metal ring and jack the anchor up about four inches to rotate the anchor into the load-lock position.

WARNING

Failure to install and lock the anchor at the correct angle will result in the anchor cable cutting through the soil until the angles equalize, causing slack.

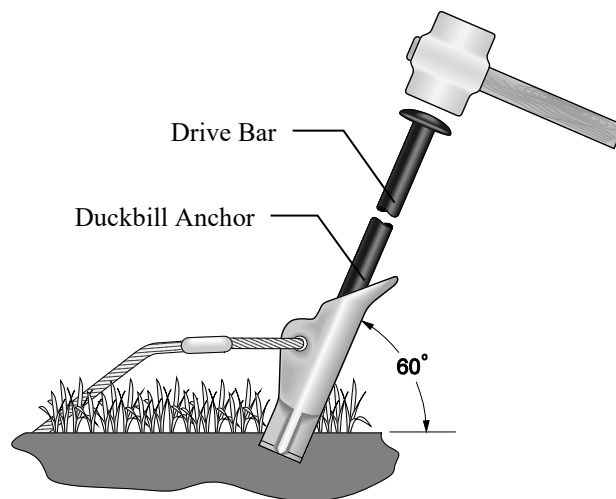
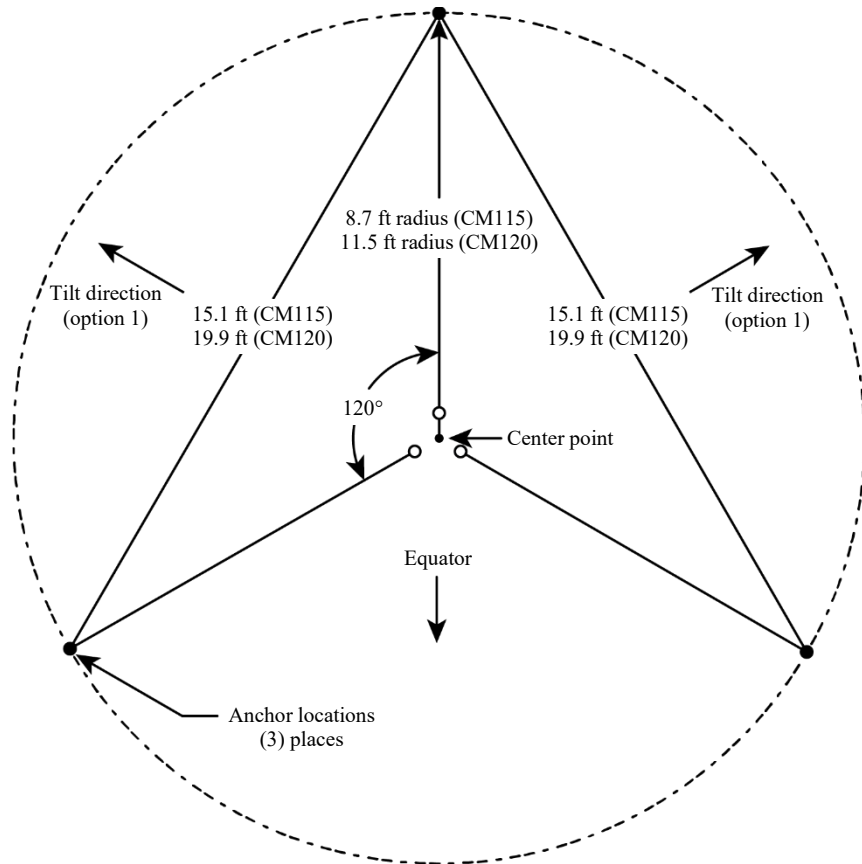


FIGURE 6-8. Duckbill guy anchor



	Radius	Distance Between Anchors
CM115	2.7 m (8.7 ft)	4.6 m (15.1 ft)
CM120	3.5 m (11.5 ft)	6.1 m (19.9 ft)

FIGURE 6-9. Top view and guy anchor layout

6.1.3.2 Lowering Mast after Attaching Guy Wires

Once the guy wires have been adjusted, the lever arms can be “opened” (FIGURE 6-7) and the guy hooks removed to allow the mast to be lowered to the horizontal position.

6.1.3.3 Center Duckbill Anchor Kit

The Center Duckbill Anchor Kit is used to provide additional stability to the tripod. By providing an anchor directly under the center of the tripod, it can be firmly secured to the ground.

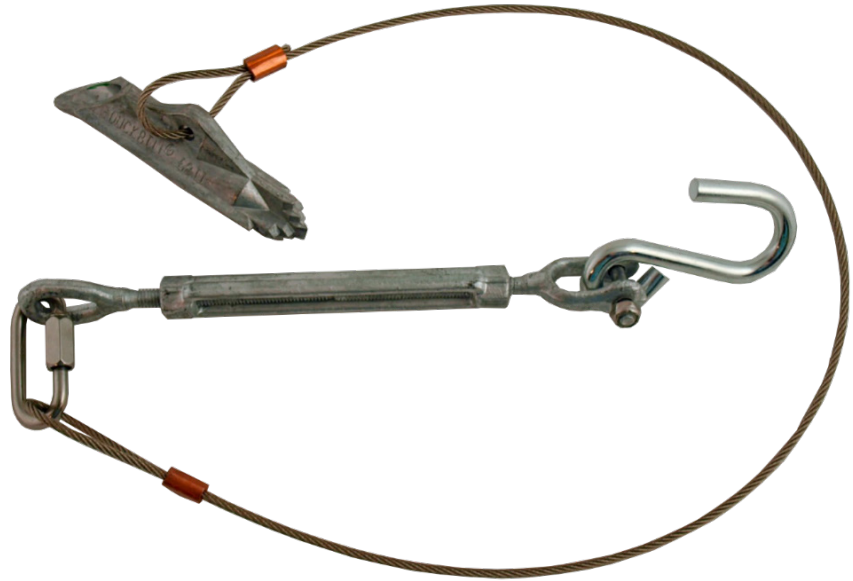
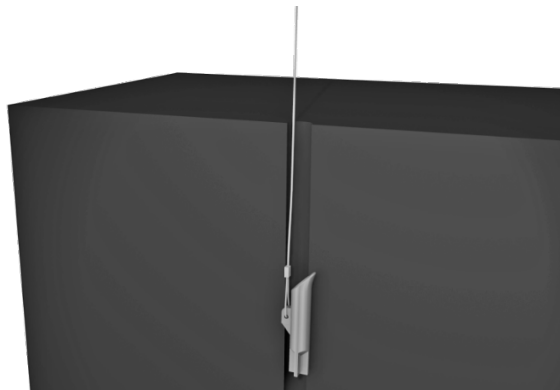


FIGURE 6-10. Center Duckbill Anchor Kit

1. Locate the position on the ground directly below the tripod mast. It is recommended to perform this procedure prior to driving the ground stakes through the tripod feet. This allows the tripod to be moved to one side to provide clearance when driving the duckbill anchor into the ground.
2. Insert a steel drive rod into the duckbill and drive the anchor straight down into the ground using a fence post pounder or sledgehammer until only the top half of the cable loop remains above ground.



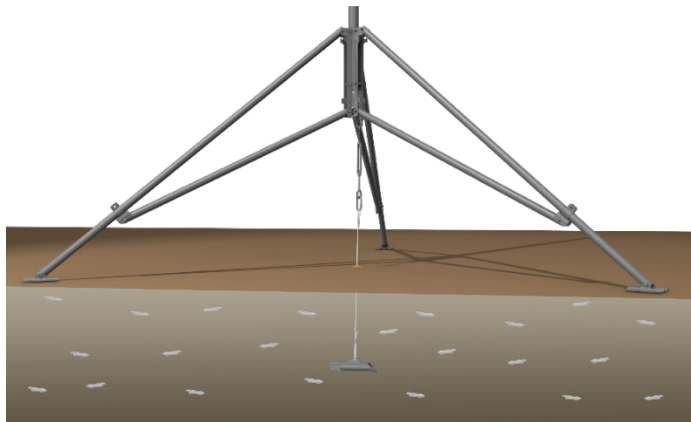
3. Attach a high-lift jack to the loop and jack the anchor up about 6 inches to rotate the anchor into the load-lock position.



4. Move the tripod back into position. Loosen the turnbuckle evenly at both ends until the hook at the top end can be slipped over one of the leg mounting bolts at the bottom of the tripod base.



5. Tighten the turnbuckle until the tripod is firmly secured to the anchor.



6. Install the ground spikes in the tripod feet as described in Section [6.1.4](#), *Staking the Tripod Feet* (p. 18).

6.1.4 Staking the Tripod Feet

Six stakes are provided for securing the tripod feet to the ground. Drive two stakes through holes in each foot at an angle as shown in FIGURE 6-11.

Stakes may not be adequate depending on soil structure, maximum wind speeds experienced at the site, mast height, or wind load from the instrumentation. For questionable situations, additional stakes or even concrete footings for the tripod feet and guy anchors should be considered.

Keep the bottom of the tripod legs free of soil, ice, and debris to prevent trapping any moisture inside or around the legs.



FIGURE 6-11. Staking the tripod feet

6.1.5 Tripod Grounding

Place the clamp over the ground rod and drive the rod (close to the center of the tripod) using a sledgehammer or fence post driver. Strip 1.25 cm (0.5 in) of insulation from both ends of the black 4 AWG ground wire. Insert one end of the ground wire between the clamp and ground rod and tighten the bolt on the clamp. Attach the other end of the ground wire to the lug on the tripod base as shown in FIGURE 6-13.



FIGURE 6-12. Ground rod and clamp

Strip 1.25 cm (0.5 in) of insulation from the ends of the green 12 AWG wire. Attach one end of the wire to the tripod ground lug, and the other end to the enclosure ground lug as shown in FIGURE 6-13.

Mount the lightning rod and clamp to the tripod mast as shown in FIGURE 6-13.

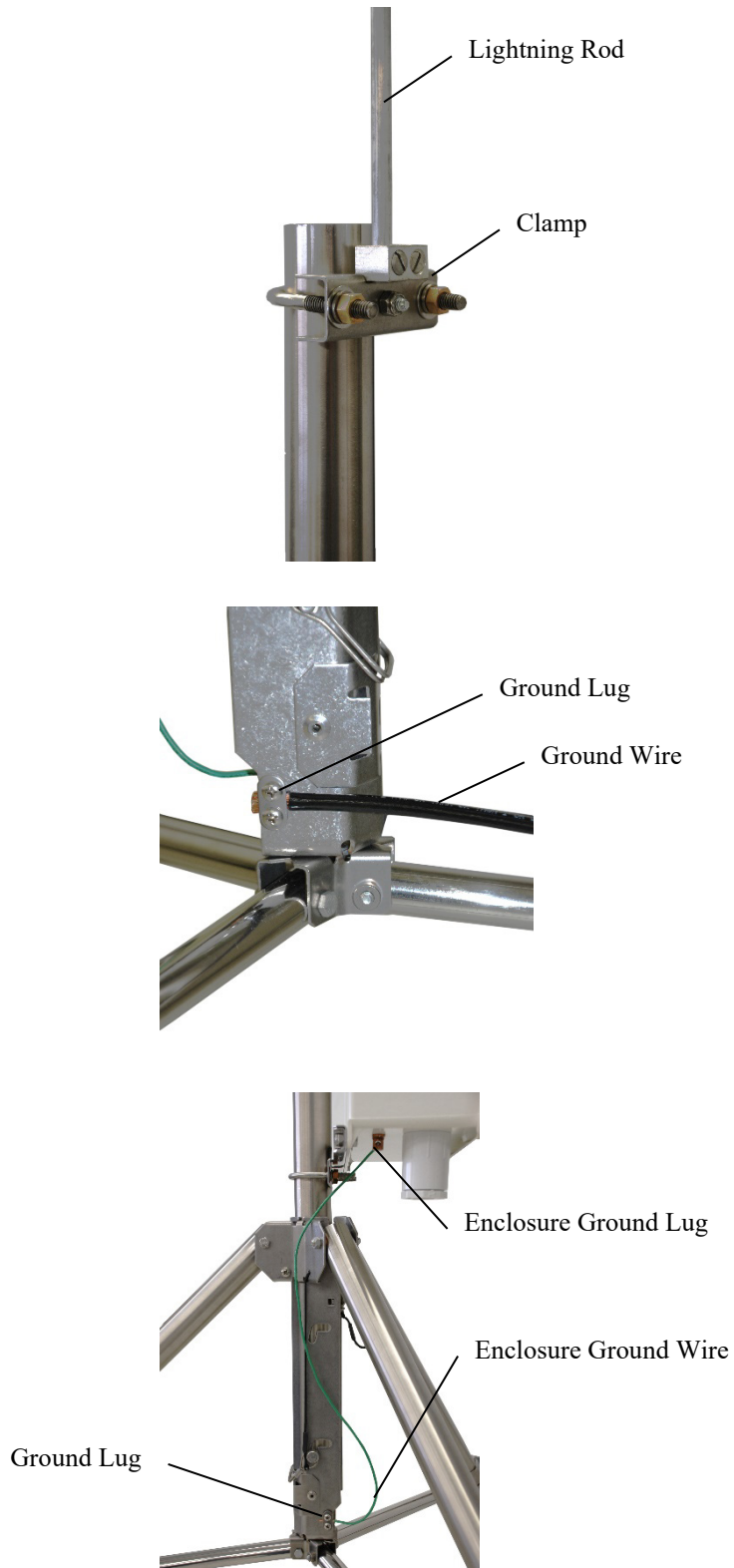



FIGURE 6-13. Lightning rod and tripod ground lug

6.1.6 Crossarm Attachment

For a video demonstrating how to attach a crossarm to a tripod, see www.campbellsci.com/videos/tripod5 .

Attach the CM202 (0.6 m, 2 ft), CM204 (1.2 m, 4 ft), or CM206 (1.8 m, 6 ft) crossarm to the tripod mast as shown in FIGURE 6-14. For wind sensors, the crossarm should be approximately 2.6 m (103 in) above the ground for a 3 m mounting height, or 1.6 m (64 in) for a 2 m mounting height. Typically, the crossarm is oriented East/West for wind sensors, North/South for pyranometers.

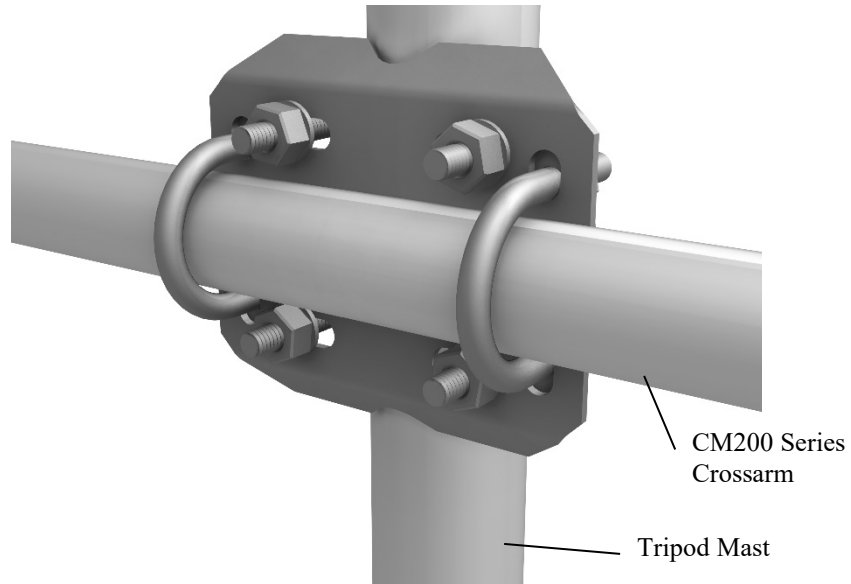



FIGURE 6-14. CM204 Crossarm

6.1.7 Enclosure Attachment

The ENC10/12, ENC12/14, ENC14/16, and ENC16/18 enclosures can be ordered with mounting brackets for the CM106B tripod. All enclosure models can be mounted to the tripod mast (above the legs) with the –MM Mast Mount bracket option. The –LM Leg Mount bracket option allows all enclosure models to be mounted to the tripod base. Two enclosures with the –LM brackets can be mounted in a “back to back” configuration.

6.1.7.1 Enclosure Mounting to Tripod Mast

For a video showing how to mount an enclosure to the tripod mast, see www.campbellsci.com/videos/tripod4 .

An enclosure ordered with the –MM option has a bracket at the top and bottom of the enclosure with a U-bolt for each bracket.

Attach an enclosure with the –MM mounting bracket to the tripod mast as follows:

Remove the U-bolts, washers, and nuts from the brackets.

Position the enclosure against the tripod mast (North side recommended).

Install the U-bolts, flat washers, lock washers, and nuts (FIGURE 6-15). Tighten the nuts until the lock washers are compressed.

Route the 14 AWG wire from the ground lug on the bottom side of the enclosure to the ground lug on the base of the tripod (FIGURE 6-12). Strip 1.25 cm (0.5 in) of insulation from each end of the wire. Insert wire ends into the ground lugs and tighten.

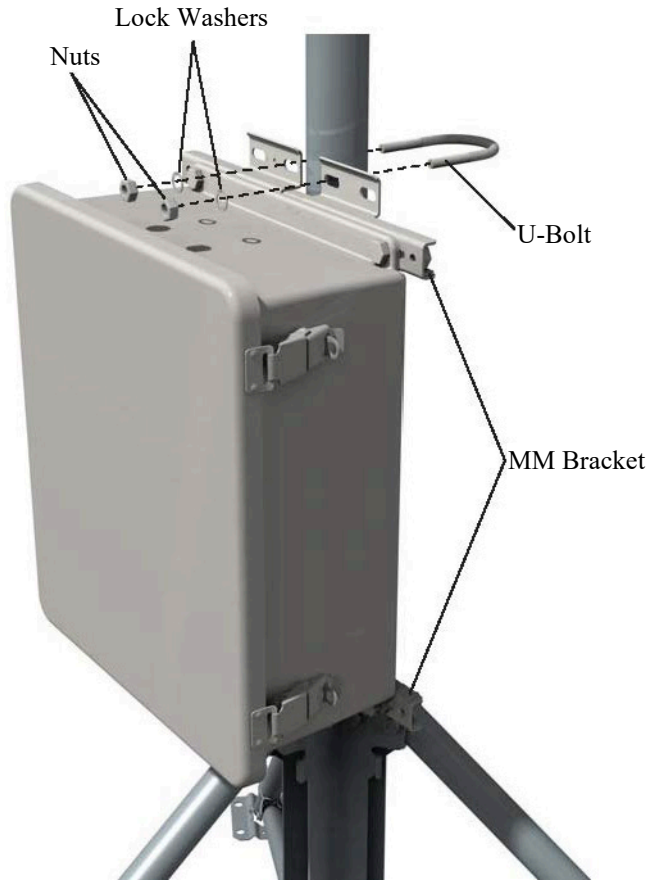



FIGURE 6-15. Enclosure with the –MM bracket

6.1.7.2 Enclosure Mounting to Tripod Leg

For a video showing how to mount an enclosure to a tripod leg, see www.campbellsci.com/videos/tripod9 .

An enclosure ordered with the –LM bracket has a bracket on each side of the enclosure, and a U-bolt bracket for securing the enclosure to a tripod leg.

Attach an enclosure with the –LM mounting bracket to the tripod base as follows:

Slide the keyhole notch in upper corner of the –LM bracket over the extended hook located on the tripod base as shown in FIGURE 6-16, and engage the notch in the lower corner of the –LM bracket with the enclosure tab. There are six places on the tripod base with provisions for mounting enclosures with the –LM brackets.

Remove the washers, nuts, and U-bolt from the U-bolt bracket. Install the bracket as shown in FIGURE 6-16 (top). Tighten the nuts on the U-bolt until the lock washers are compressed.

Route the 14 AWG wire from the ground lug on the bottom side of the enclosure to the ground lug on the base of the tripod (FIGURE 6-12). Strip 1.25 cm (0.5 in) of insulation from each end of the wire. Insert wire ends into the ground lugs and tighten.

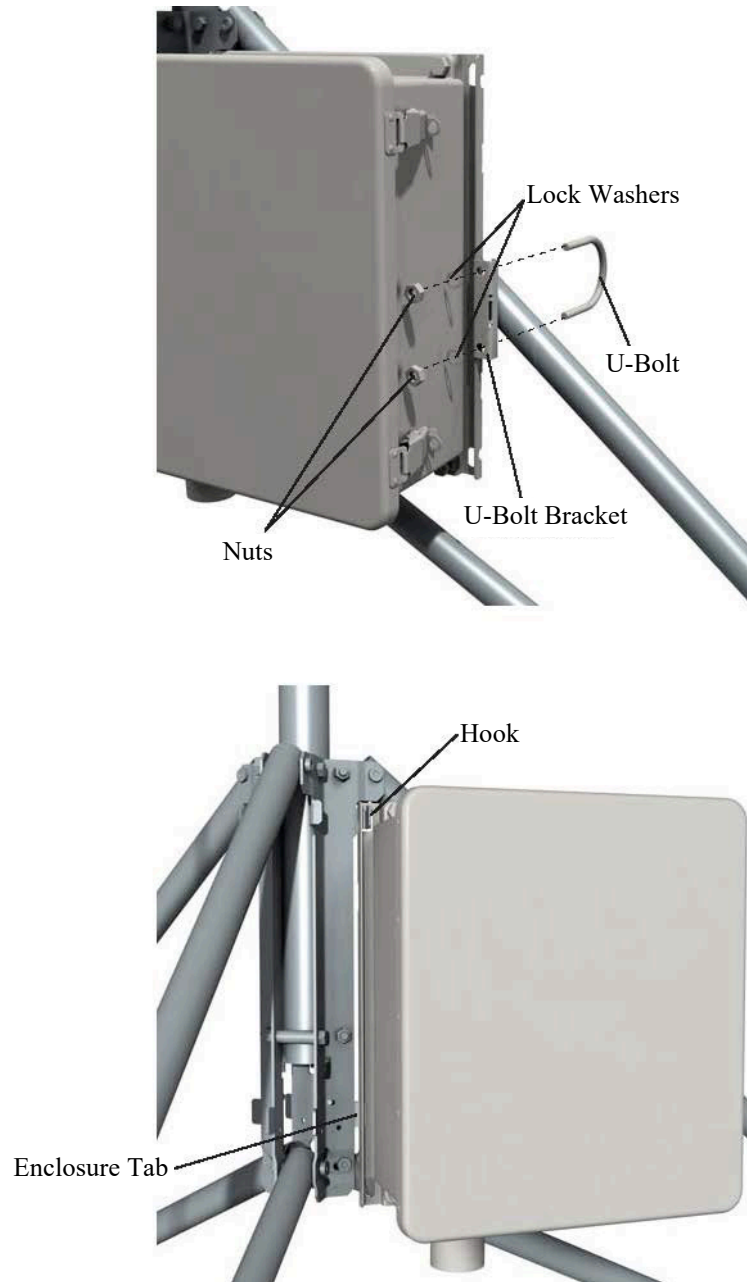


FIGURE 6-16. Enclosure with the -LM bracket

6.2 Mounting Brackets

NOTE See FIGURE 1-1 to view typical placement locations of mounting brackets on a tripod.

Mounting brackets covered in this section have U-bolts that attach to vertical and/or horizontal pipes with the following ranges of outside diameters:

	inches	mm	Nominal Pipe Size (inches)
3.8 cm (1.5 in) U-bolt	1.0 – 1.5	25.4 – 38.1	3/4 – 1
5.1 cm (2 in) U-bolt	1.3 – 2.1	33.0 – 53.3	1 – 1 1/2
5.1 cm (2 in) U-bolt with plastic V-block	1.0 – 2.1	25.4 – 53.3	3/4 – 1 1/2

Some of the brackets (for example, the CM210) include 3.8 cm and 5.1 cm (1.5 in and 2 in) U-bolts to extend the range of pipe diameters that the bracket can accommodate. Brackets with holes for a 3.8 cm (1.5 in) U-bolt will accept a user-supplied 4.4 cm (1.75 in) U-bolt.

6.2.1 CM210 Crossarm Mounting Kit

CM200 series crossarms include a CM210 bracket as shown in FIGURE 6-17. The CM210 can be ordered separately to attach a user-supplied pipe (2.5 to 3.8 cm (1.0 to 1.5 in) OD) to a mast or tower leg (2.5 to 5.3 cm (1.0 to 2.1 in) OD), or to attach a crossarm to two tower legs.

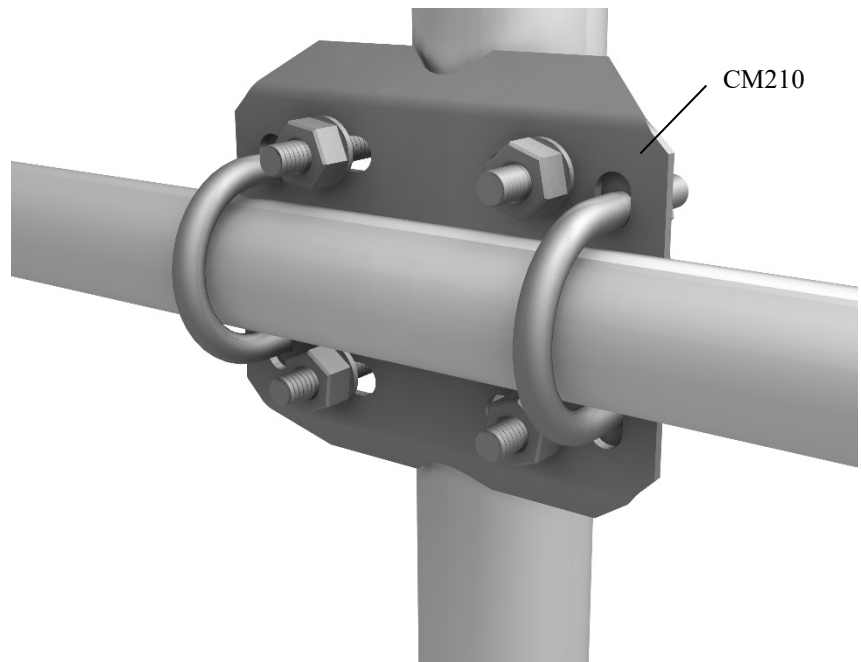


FIGURE 6-17. CM210 Crossarm Mounting Kit (shown with user-supplied pipe)

6.2.2 CM216 Mast Mounting Kit

The CM216 attaches to the top of the mast, and provides a 1.9 cm (0.75 in) or 2.5 cm (1 in) mounting pipe (2.7 cm or 3.4 cm (1.05 in or 1.32 in) OD) that extends 10 cm (4 in) above the mast, as shown in FIGURE 6-18.



FIGURE 6-18. CM216 Mast Mounting Kit

6.2.3 CM220 Right Angle Mounting Kit

The CM220 attaches a vertical pipe (2.5 to 3.8 cm (1.0 to 1.5 in) OD) to the CM200-series crossarms or horizontal pipe (2.5 to 3.8 cm (1.0 to 1.5 in) OD) as shown in FIGURE 6-19.

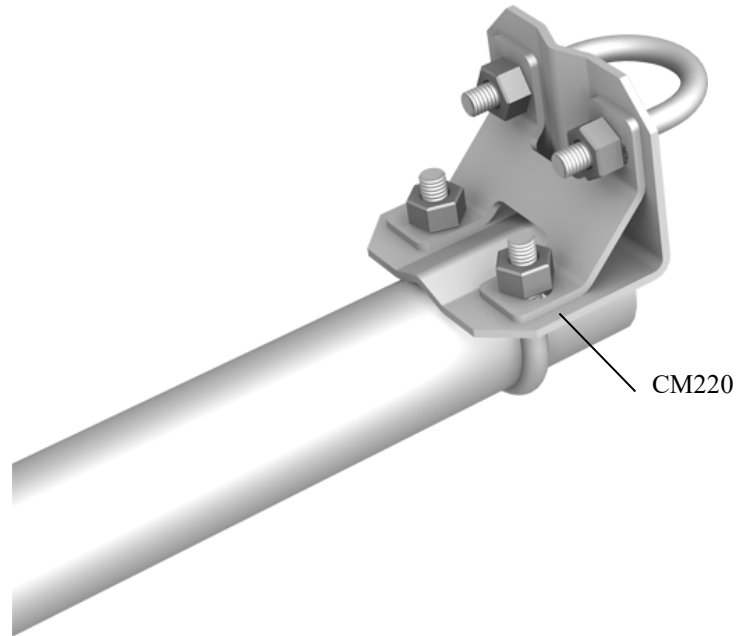


FIGURE 6-19. CM220 Right Angle Mounting Kit

6.2.4 CM230, CM230XL Adjustable Angle Mounting Kits

The CM230 and CM230XL adjustable angle mounting kits (FIGURE 6-20) allow the user to attach an antenna or sensor and change its mounting angle from horizontal to vertical. This allows the component being mounted to be aimed at a specific location. The CM230 is used when mounting the component close to the mast or tower while the CM230XL extends the component away from the mast or tower.

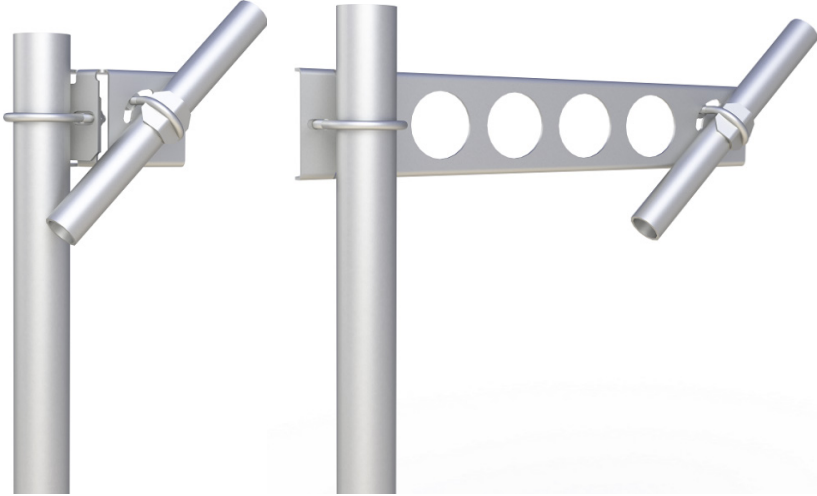


FIGURE 6-20. CM230 and CM230XL adjustable angle mounting kits

The CM230 and CM230XL will accept antennas and sensors with an outer diameter of 2.54 cm to 3.81 cm (1.0 in to 1.5 in). The bracket can be attached to a mast or pipe with an outer diameter of 3.30 cm to 5.33 cm (1.3 in to 2.1 in). The declination of the antenna or sensor is fixed when the U-bolt attached to the mast or tower is tightened; the inclination of the antenna or sensor is then adjusted with the other U-bolt and nuts.

FIGURE 6-21 is an exploded diagram of the CM230XL showing all the included hardware as well as the curved slots at the end of the bracket used to adjust the angle of the antenna or sensor.

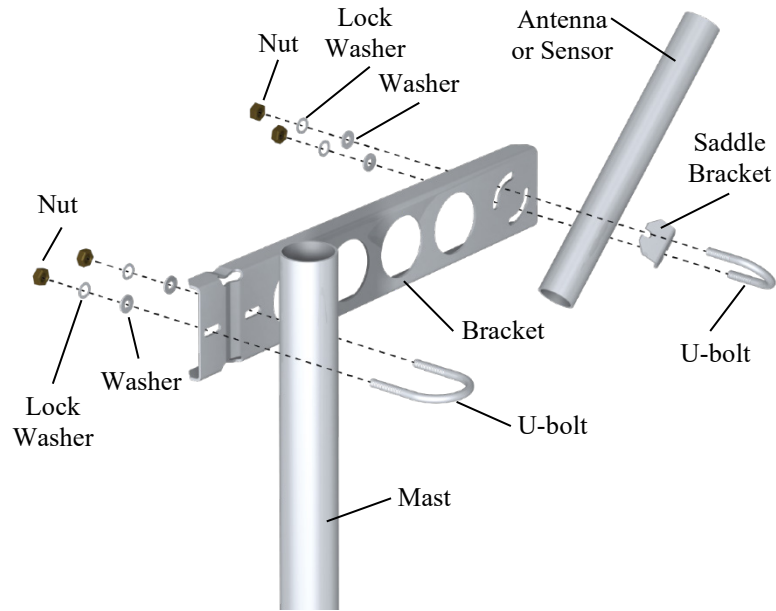


FIGURE 6-21. CM230XL exploded diagram

6.2.5 CMB200 Crossarm Brace Kit

The CMB200 Crossarm Brace Kit (FIGURE 6-22) is designed to provide additional stability to crossarms mounted on Campbell Scientific tripods and towers. It provides additional support for crossarms with heavier sensor loads, and added stability in high winds.

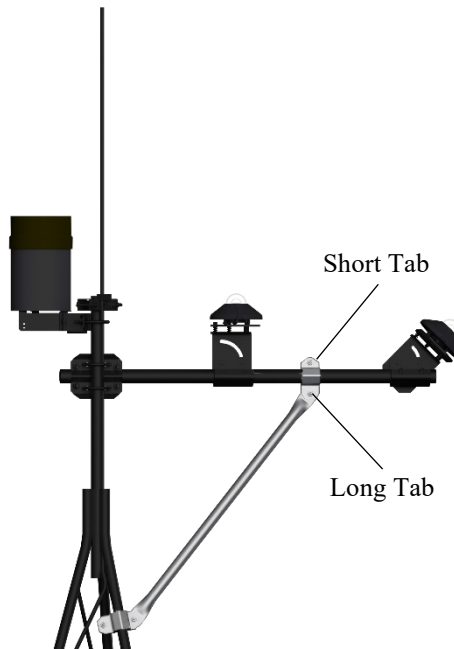


FIGURE 6-22. CMB200 Crossarm Brace Kit

6.2.5.1 Components

The CMB200 ships with the following components (FIGURE 6-23):

- (1) Brace Arm
- (2) Small bracket
- (2) Medium bracket
- (2) Large bracket
- (4) 5/16-18 x 1-inch bolt
- (8) 5/16 flat washer
- (4) 5/16 lock washer
- (4) 5/16-18 nut

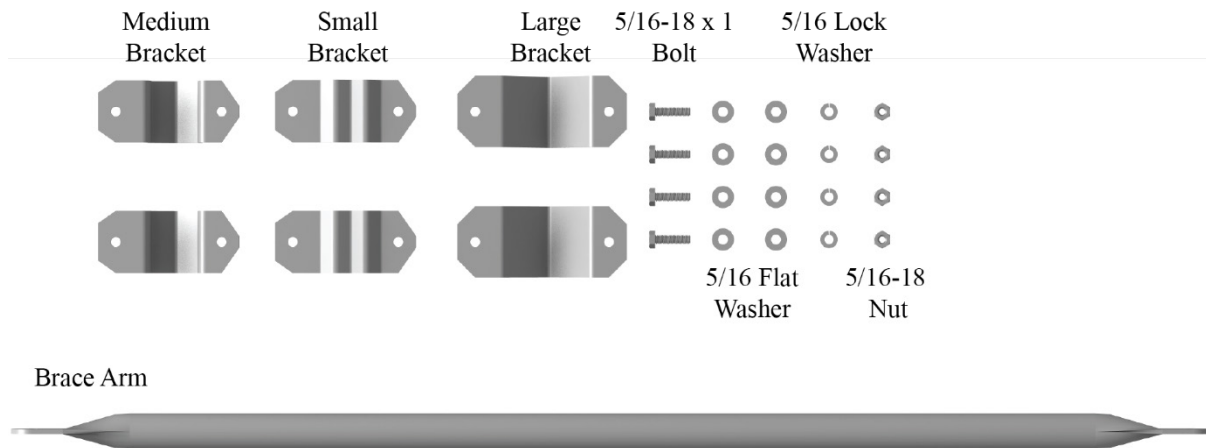


FIGURE 6-23. CMB200 components

6.2.5.2 Assembly

1. Consult FIGURE 6-24 and TABLE 6-1 to determine which brackets are needed at either end of the brace to attach it to the crossarm and tripod mast or tower. The figure also indicates what orientation is needed when the small bracket is used.

NOTE

Each bracket has a long tab and short tab where the bolts are attached. The brace arm must be attached to the end with the long tab.

2. Attach one end of the brace arm to the tripod mast or tower below the crossarm. Leave the bolts finger-tight.
3. Lift the free end of the brace arm to the crossarm and attach it to the crossarm. Again, only finger-tighten the bolts.
4. Adjust the position of the brace arm as needed.
5. Fully tighten the two bolts directly connected to the brace arm, and then tighten the remaining two bolts to clamp the brace arm to the crossarm and tower or tripod mast.

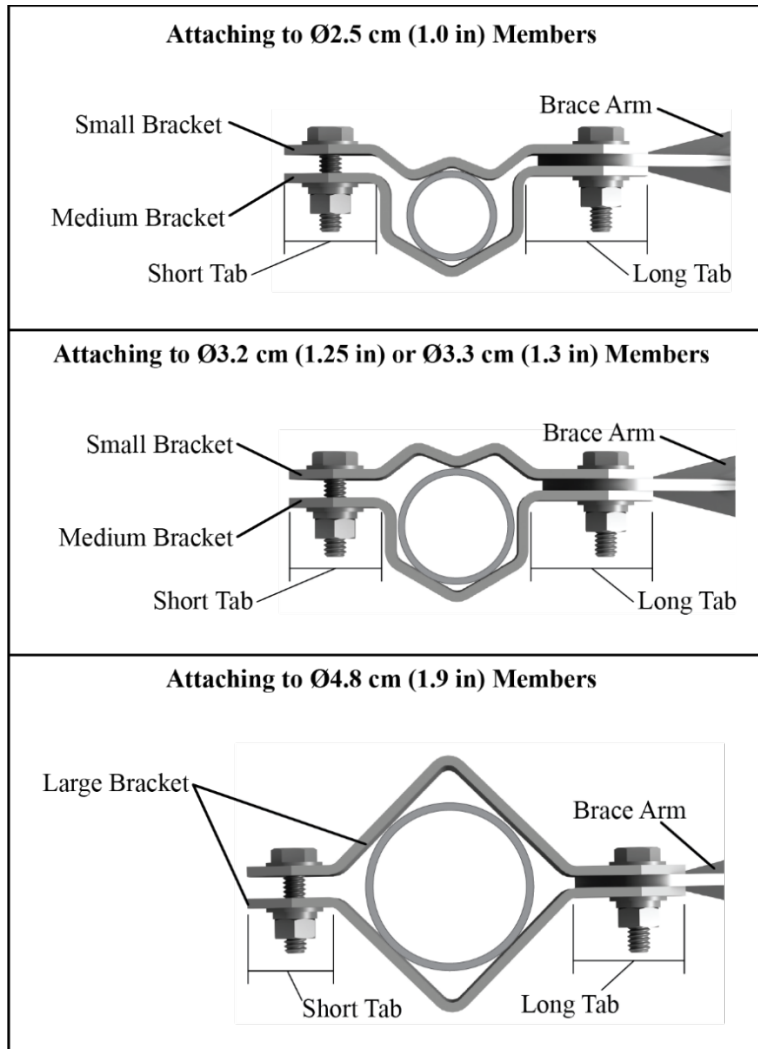


FIGURE 6-24. Bracket selection

TABLE 6-1. Bracket Requirements			
Mast/Crossarm/ Tower Diameter	Example Mast/Crossarm/Tower	Brackets Needed	Small Bracket Orientation
2.5 cm (1 in)	UT10/20/30 Tower Leg (excludes bottom section of UT20/30)	(1) Small Bracket (1) Medium Bracket	Angled toward mast/tripod
3.2 cm (1.25 in) or 3.3 cm (1.31 in)	CM202/3/4/6 Crossarm, UT20/30 Tower Mast, UT20/30 Tower Leg (bottom section only)	(1) Small Bracket (1) Medium Bracket	Angled away from mast/tripod
4.8 cm (1.9 in)	CM110/106B Tripod Mast, UT10 Tower Mast	(2) Large Bracket	N/A

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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.

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