

## GPS/GNSS Antenna Mounts: Tribrach, Tripod, and Others

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*This is a general guide to the multitude of mounting options available for GNSS antennas and other equipment. This is accumulated from multiple sources at UNAVCO including the UNAVCO Knowledge Base (<http://kb.unavco.org/kb/>). The Tribrach and several other mounts listed here are openly available designs that can be obtained from the UNAVCO Knowledge Base and made at a local machining shop.*

### Tripods, Bipods, and Range poles

#### Tripods

Tripods are the most recognizable and commonly available antenna mounts. They are stable, provide good clearance from obstructions near the ground, and provide multiple mounting points for equipment such as receivers, radios, and antennas to keep them off the ground. The downside is they are only moderately stable in inclement conditions unless anchored, may induce small errors in positioning, and take more time and

skill than average to center and level. They require the addition of a tri-bracket mounting assembly on top to precisely level the top surface.

To level a tripod with the “UNAVCO” method, imagine partitioning the tripod into two planes, one parallel to two legs and the other perpendicular to the first plane and passing through the third leg. The same method can be used to precisely level the tribrach on top.

<http://kb.unavco.org/kb/assets/60/tripod.pdf>



Bipod range pole. [UNAVCO]



Figure 1. Typical surveying tripod. [UNAVCO]

#### Bipods and Range Poles

Range Poles with or without bipod support are the common mounts for rover antenna setups. They are light and portable, which is ideal for packing around to multiple sites. The antenna typically mounts directly to a 5/8-inch thread on top. Range poles are typical for rovers where occupation times are less than 30 seconds and the pole can be held steady by hand for the full duration. If you cannot maintain a steady, level platform, the inclusion of an attachable bipod connection will allow the pole to be self-supported for times up to 15 minutes. Any longer of an occupation may warrant a true tripod mount setup, although these are much heavier.

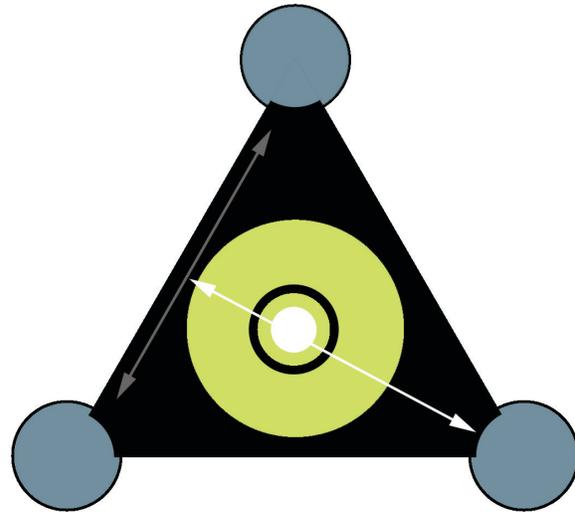
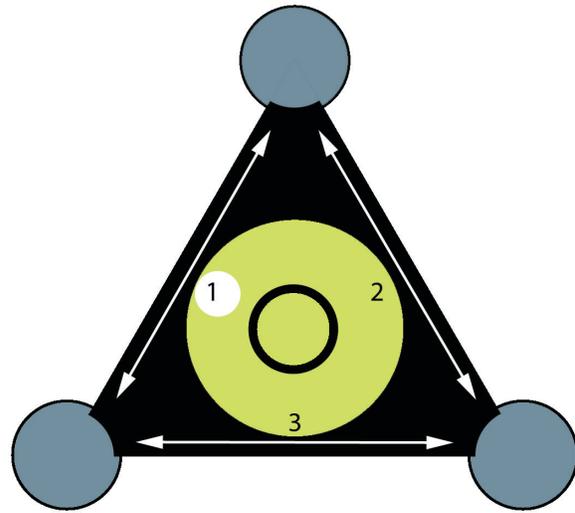
To use a range pole and bipod, center the spike on the monument pin or point to be collected and either level and stabilize pole with your body or extend the bipod legs, level, and then set locking cams.

### Tribrach

Commonly used in conjunction with a tripod to provide a precision mounting surface with better leveling capabilities than the tripod alone. Mounts on top of the tripod and has a tri-foot leveling system.

To level a tribrach:

1. Divide the bracket into two leveling planes, one connecting two of the feet, and the second perpendicular to the first and crossing the center to the last foot. Before starting, reset the bracket by bottoming out all three feet.
2. Use two of the feet to center the bubble between them, using one of the three positions shown.
3. Once the bubble is centered on one of the sides, use the foot opposite the bubble to center the bubble in the center mark.
4. Small adjustments with the other feet may be needed to finalize the position.



Tribrach leveling [Ian Lauer]

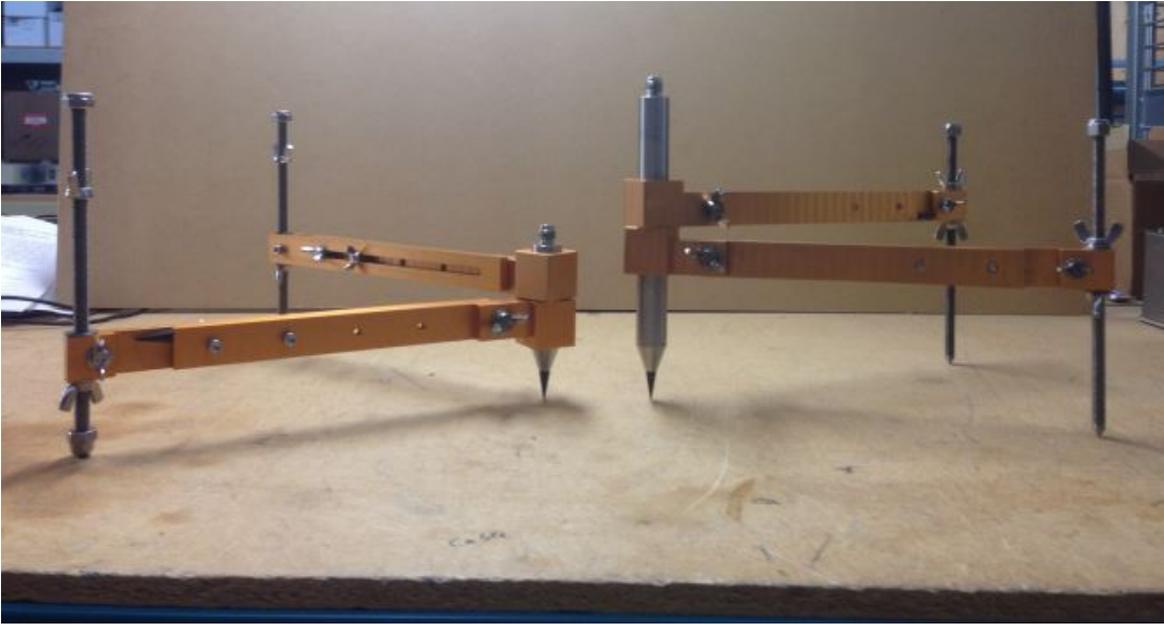
### Spike Mount

The spike mount is the bipod-style mounting bracket designed by engineers at UNAVCO and freely distributed through the UNAVCO Knowledge Base (<http://kb.unavco.org/kb/>). The spike mount was developed as a solution to minimize setup time and inconsistencies in antenna leveling and placement. They have the advantage of having a known, fixed, short offset to the antenna mount therefore minimizing error in placement for repeat occupations. Spike mount setup is significantly faster than other methods as well. Repeat occupations should be able to place the antenna with sub-mm accuracy. The disadvantage is that the short offset does not provide clearance above ground for obstacles or vegetation. Additionally, no mounts are available for other equipment such as receivers.

Leveling a spike mount:

First note the antenna offset from the side of the mount. To level, place the mounting spike in the center hole of the benchmark or monument. Then rotate the legs so that they form a near 90° angle to each other. Release the screws on the legs and adjust leg length for optimal foot

placement. Then adjust the vertical screws on either leg to level the mount. Levels may be placed along the two legs or on the center hub. Once the legs are level, set the nuts on either screw to fix the legs in place. Once the mount is stable, affix the antenna to the top.



Spike mounts designed and constructed by UNAVCO. Plans are at <http://kb.unavco.org/kb/article/unavco-fixed-height-spike-mounts-photograph-and-diagrams-199.html>. [UNAVCO]

### Fixed Mounts

Fixed Mounts are similar to spike mounts in that they are of fixed height and have minimal setup time and error. They are used only on monuments that have 5/8" threads on top. They are essentially a tri-bracket mounted directly to a monument post.

### Other Mounts

Many mounts are custom designed based on necessity for various applications and terrains. The mounts listed above are generally designed for monuments placed directly into bedrock with a pin divot on top. Some other monuments such as those in the snow, tundra, or soils necessitate designs such that various types of analysis can be extracted from the data. For example, glacial surveys require deep-seated monuments that account for changes in snow depth and accumulation over several years. These are sometimes constructed of large pipes driven deep into the ice, frozen, and left in place. They are designed with a custom tri-bracket mount on top to level and mount antennas.

For various other mounts, manuals, and additional information, see the UNAVCO Knowledge Base, search for Antenna Mounts, or find it at <http://kb.unavco.org/kb/article/unavco-resources-gnss-antenna-mounts-394.html>.