

# Military Mast Problems and Solutions

Stabilize your portable mast with these simple steps.

## Bob Dixon, W8ERD

Many of us use military surplus masts and tripods to hold up antennas, especially in portable situations. They work very well, but these masts have potential stability problems, because the adjacent mast sections and tripod are held together by their weight and by friction alone. If the mast is tilted by the wind or pulled by a wire, the mast joints and tripod can separate, and the entire structure can fall down catastrophically. Also, if you have a rotatable antenna on the mast, the mast sections can slip and rotate the antenna, or make it difficult to turn.

These problems can be fixed by pinning all the mast sections and the tripod together at their joints and fastening the tripod firmly to the ground. See [p1k.arrl.org/pubs\\_archive/138962](http://p1k.arrl.org/pubs_archive/138962) and [www.arrl.org/files/file/QST%20Binaries/Jun2011/QS0611Dixon.mp4](http://www.arrl.org/files/file/QST%20Binaries/Jun2011/QS0611Dixon.mp4) for more background on this.

## How to Pin the Joints Together

I used  $\frac{5}{16}$ -inch hitch pins, available on [amazon.com](http://amazon.com). To use these pins, you must drill holes through both ends of all the mast sections, and all three legs of the tripod.

You should not just drill the holes at random, because then the various joints might not fit together. Instead, drill all the holes carefully so that all the mast sections and the tripod are interchangeable and will fit together, regardless of which ones you choose. To allow for flexibility and to make inserting the pins easier, make the holes slightly oversized at  $\frac{3}{8}$  inches. The holes in the female ends must all be at exactly the same distance from the end, and they must be exactly straight through, not at an angle. I used a drill press with a jig to hold the mast or tripod precisely in place while drilling. You can make your own jig, but I chose to buy mine, so it was extremely accurate. The jig comprises a V block and an end block, which controls how far the hole is from the end. Both pieces can be found online.

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Bolt the V block and the end block to the drill press table. The various holes in my jig and block did not line up neatly, but I was able to jiggle them around to find a few mating holes. I used  $\frac{1}{4}$ -inch bolts, nuts, and flat washers. Secure the bolts very tightly, because these blocks are the master standard for all the holes to be drilled, and they must be all the same.

Position the drill press table so that when the drill bit is lowered, it fits neatly into the bottom of the V block. That will ensure that the holes will be through the center of the masts (see Figure 1). Lock the table into place.

The tripod is the most complicated and difficult component to drill, so I drilled it first. It then serves as the standard for the masts. Position one leg of the tripod into the V block, and up against the end block. Drill the hole as far from the end as possible, with the drill just clearing the vertical leg of the tripod. I used Bullet drill bits, which make drilling much easier because they have a tip that acts as a center punch and pilot hole driller. Alternatively, I suggest drilling a small pilot hole first (see Figure 2).



Figure 1 — The V block and end block.



Figure 2 — Positioning a tripod leg for drilling.

For the first set of holes, I suggest using a procedure that is self-checking to be sure you are on the right track before proceeding with all the holes. Drill the hole all the way through the tripod leg. Remove the tripod from the jig. Position the female end of a mast section into the jig. This not easy, because the other end of the mast section hangs out onto the air, making it very difficult to operate the drill press while holding the mast. Have a helper hold up the far end of the mast. To make that accurate, be sure the drill press is level. Your helper should use a small level to keep the mast exactly horizontal.

Next, drill the hole all the way through the mast section. Remove the mast from the jig. Insert the male end of another mast section into the end of the female end you just drilled. Tape the joint temporarily (see Figure 3), so it does not move during the flip below.

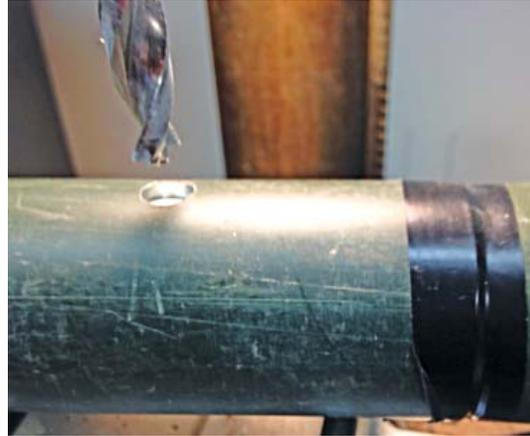


Figure 3 — Drill the hole through the female end of the mast by drilling through the existing hole in the male end.

Set the joint loosely on top of the jig. Drill passing through the outer mast hole to make a hole in the inner mast. Do not go all the way through to the other side of the mast, as this might not be straight through. Now flip the mast joint over and drill the hole through the other side. Remove the tape.

Now is the time for the crucial test. Put the male end of the mast you just drilled into the tripod leg that was drilled previously. The holes should line up almost exactly. If not, something is wrong, and you need to investigate your procedure. If the holes line up, you are ready to drill all the holes through all the tripod legs and masts in a more production-like manner.

If the holes do not line up exactly, but the pin still goes in, there is no problem. If the pin does not go in, you may need to drill a bigger hole. The end result looks like Figure 4.



Figure 4 — The mast after holes are drilled and the hitch pins inserted.



**Figure 5** — Threaded eye bolt is screwed into a threaded hole in the vertical leg of the tripod.



**Figure 6** — A view of how the tripod rope tightener and ground anchor are connected together using paracord.

## Tripod Improvements

Drill and tap three ¼-20 holes around the tripod (see Figure 5). Screw in the eye bolts, which will prevent rotation of the mast, and they provide a place to loop around the tie-down cord.

Obtain an orange spiral screw ground anchor (available on [amazon.com](https://www.amazon.com); see Figure 6). This is screwed into the ground below the tripod and tied above to the eye bolts with a cord. I recommend 550-pound paracord. The anchor prevents the tripod from lifting up or tipping over, whereas a typical tent stake does not resist vertical force.

Use a cord tightener to make it as tight as possible. I recommend the “Nite Ize Figure 9 Rope Tightener,” which can be purchased online. Nite Ize also has a video on how to use the cord tightener, which can be found at [www.youtube.com/watch?v=hCIHlj62t7A&feature=youtu.be](https://www.youtube.com/watch?v=hCIHlj62t7A&feature=youtu.be).

Figure 6 shows a view of how the tripod, cord tightener, and ground anchor are interconnected by the cord. Screw the anchor into the ground below the tripod. String the cord through the tripod, tightener, and anchor. Pull on the free end of cord as strongly as possible to tighten everything. Clamp the cord in the serrated teeth of the tightener.

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