Caring for your Antenna:

We've designed the MinuteMan 20™ to be virtually maintenance-free. The telescoping whip is the most fragile part of the system. If you let the antenna fall over, or are careless while extending or retracting it, it can be bent or broken. Note that our guarantee does not cover whips damaged by abuse, misuse, accident, etc. Should you need a replacement, whips are available from us on a cost-plus basis.

You may need to periodically tighten the aircraft nut that secures the whip. It should be just snug — remember that the supplied Hook and Loop strap is what keeps the whip vertical when in use.

The mast and leg sections can be cleaned with a damp cloth and, if you wish, mild soap. It's possible that the alligator-type clip on the Lower Element will oxidize over time. Just clean up the contact area with an emery board, nail file, or similar.

Experimenting and Modifying:

Experimenting and modifying is, for many of us, the essence of Ham Radio tradition. While we may not have the skills, knowledge, and equipment to deal with a modern rig, antennas can be an endless source of interest and education. Try adding more, or different length, radials to your MinuteMan 20™. Try suspending it so that the feedpoint is about 11 1/2 feet above ground, so that you can slope the radials at 45 degrees. Get the feedpoint up about 17 feet and use it as a vertical dipole. You may find that using a right-angle coax adapter is helpful when doing this, and we'd suggest using feedline no heavier than RG-58 -- and even then, supporting the coax is a good idea.

The MinuteMan 20™ fits in a standard briefcase, backpack, or carry-on. If for some reason you need to shorten the sections, they cut easily with a hacksaw. After you cut them, make sure to remove any burrs so that the sections still fit easily into one another.

We're happy to supply any replacement parts on a cost-plus basis (subject to availability). If you have any special needs or requests, please let us know. Our design and engineering team will try to accommodate you.

Most importantly, have fun, be safe, make contacts, and learn.

Thanks for purchasing our antenna. We hope to work you on the air soon!

73,

John Bee N1GNV

Quicksilver Radio Products

www.qsradio.com

MinuteMan 20™ Portable HF Antenna Owners Manual

Manufactured in the USA by

Quicksilver Radio Products

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Antenna Safety:

Watch out for power lines!

Be careful of power lines!

Never set up your antenna near power lines!

Can we be any clearer? The MinuteMan 20™ can be over 13 feet tall when fully extended. Be double dang sure that there are no power lines either overhead or anywhere that the antenna could come in contact with in the event that it falls over. Electricity can kill you **– never, ever take a chance**.

This is not a mobile antenna! Don't even *think* about putting this on your car, truck, van, SUV, pickup, mobile home, motorcycle, moped, golf cart, bicycle, tricycle, scooter, skateboard, little red wagon, wheelchair or any other vehicle!

We designed the MinuteMan 20™ to be light, quick and portable -- not to withstand the rigors of mobile operation. Operating while on the road is a great deal of fun. We use, and recommend, High Sierra Antennas for use on your vehicle. The quality is superb, the company is a pleasure to deal with, and they work great! If we made mobile antennas, this is how we'd make them. See them at www.cq73.com.

Treat lightning with the respect it deserves. If there's a chance of a lightning strike, take down your antenna **immediately**. Lightning is electricity, and can kill you. Radios don't like it either.

The counterpoise wires can present a tripping hazard. Make sure to deploy them in such a way that you and others are protected. **Never lay the ground radials where people will walk.**

In windy conditions, your MinuteMan 20™ may tend to fall over unless you provide some support on the legs. Just put some weight on them – rocks, logs, or whatever else is handy. We've buried them about 3" deep in sand on a windy day at the beach and had no problem.

6. Attach the counterpoise radials to the screw just behind the coaxial cable connector. At the factory we install an "Aircraft Nut" at the end of this screw. This has a nylon insert so that it won't unscrew with vibration. Its only purpose is to prevent the wing nut from falling off and getting lost. Remember that you do not need a tool to assemble the MinuteMan 20™. Ideally the ground radials should extend at right angles to each other and as straight as possible, but make sure never to place them where others could trip on them. It's okay to bend them, run them all to one side of the antenna, etc. Your efficiency may suffer just a bit, and your radiation pattern may not be perfectly omnidirectional, but you'll still make plenty of contacts!
7. Attach your feedline to the coaxial connector. ***Hand-tighten only!*** The connector is treated at the factory to stay in place under normal use. Overtightening your feedline connector could damage it.
8. With very little practice, the MinuteMan 20™ can be assembled in less than 3 minutes. We suggest doing a dry run at home before taking it out in the field.

Tuning and Pruning:

Electrically, the MinuteMan 20™ is a full ¼ Wavelength Ground Plane antenna on 10, 12, and 15 Meters. For 17 and 20 Meters a small loading coil is placed in series with the vertical element. Because each different place you set up your antenna will be somewhat different in its electrical environment, you'll need to experiment a little bit to get the best impedance match (lowest SWR). You may find that several different coil tap/whip length positions on 17 and 20 Meters will yield acceptable matches. For best efficiency, always use the least amount of coil and the most amount of whip extension that provides a good match. If the whip is too high for you to reach, adjust the antenna with one Mast/Leg section left out, then put that section back in to operate.

For starting points, we suggest the following settings:

10 Meters: About 3 feet of whip extension with the lower element clipped above the top of the coil.

12 Meters: About 4-½ feet of whip extension with the lower element clipped above the top of the coil.

15 Meters: Whip fully extended with the lower element clipped above the top of the coil.

17 Meters: Whip fully extended with the lower element clipped ½-way up the coil.

20 Meters: Whip fully extended with the lower element clipped near the bottom of the coil.

Getting your counterpoise wires off the ground will help somewhat with efficiency. You'll also find it easier to achieve a good match if the wires angle down a bit. You may also get *slightly* better performance by shortening the radials to 1/4 wavelength on 12, 15, and 17 Meters (that's about 9-1/2 feet on 12M, 11 feet on 15M, and 13 feet on 17M). To do this, just roll the end up in a small coil and hold it with a rubber band, wire tie, or similar.

If you are able to raise the antenna (onto a picnic table, for example) more of the radiating element will be clear of nearby fences, cars, and other metal objects. This will also get more of the radials off the ground, which will help performance. **Again, make sure not to place radials where you or others could trip on them.**

Assembling your MinuteMan 20™

Tools required:

None. The MinuteMan 20™ is ready to set up, right out of the box.

Packing List:

6 Mast/Leg Sections with coupling attached (left in Fig. 1)

3 Base Sections with Tee fitting attached (2nd from left in Fig. 1)

1 Upper Assembly, with whip and loading coil attached (3rd from left in Fig. 1)

1 Lower Assembly, with coaxial cable connector, counterpoise connector, and lower element wire attached (right in Fig.1)

2 Counterpoise cables, each with 2 radials and with terminal attached (not shown)

Figure 1 – only 4 different parts!

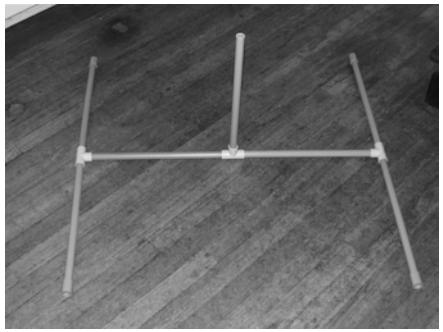

Figure 2 – Completed Base Assembly

Assembly:

When fitting sections together, slip them in just enough to stay in place. Make sure that the ends are clean and dry. Note that one fitting on each piece (and the entire coil assembly) is solvent welded in place at our factory and you should not attempt to remove it.

1. Insert 2 Mast/Leg Sections into the Tee of a Base Section. Repeat so that you have 2 Leg Assemblies.
2. Insert the Leg Assemblies into the Tee of the remaining Base section. Swivel the Leg Assemblies so that all four legs are parallel and the Base Section is at a 90-degree angle to them. Your assembly should look like a letter "H" lying flat on the floor with a vertical Base Section at the center – see figure 2.
3. Attach the Lower Assembly (with coaxial cable connector) to the vertical Base Section
4. Attach two Mast/Leg Sections to the Lower Assembly.
5. **Check carefully around and above you for power lines!** Swivel the telescoping whip up, hold it in place with the Hook and Loop strap, extend it, and attach the Upper assembly to the top of the mast.. Don't worry if the whip is not perfectly vertical, but do try to get it as straight up as possible.

Our Company:

Like you, we're active Ham Radio operators. We wanted a good portable antenna -- something easy to set up and take down, lightweight, simple, and most of all something that works! We looked at available commercial antennas, and found nothing that met our needs (see the section on "Those Pesky Laws of Physics"). After lots of experimenting, research, engineering and plain old fiddling and tweaking, we came up with the MinuteMan 20™. We started to get requests from friends to build more, and began to think that maybe some other folks might want to try them, too.

We make our antennas one at a time. They're handmade and individually tested in our Connecticut manufacturing facility. Like New England craftsmen of old, we use the best possible materials we can find, and then take extra steps to ensure maximum performance and enjoyment. Our electrical connectors are both crimped *and* soldered for strength and reliability. The hardware is all stainless steel, the tubing is UV resistant for better durability. All fittings are solvent welded at our factory for ease of assembly with no easily lost small parts.

Don't look to us for extravagant marketing hype -- we leave that to others. We tell the plain, unvarnished truth about our products and hope that you recognize their quality, dependability, and utility. Our budget does not have a line for advertising-type weenies, consultants, spin doctors, and their ilk. We like that. A lot.

We're glad you've selected our antenna, and we're sure you'll be happy with it. We back that up with a one-year guarantee against defects in materials and workmanship

Those Pesky Laws of Physics:

Fans of the original Star Trek series will remember Chief Engineer Scott telling Captain Kirk "Ya canna change the Laws o' Physics, Cap'n." Scotty would no doubt be shaking his head over some of the antennas on the market today. We'll explore just a very little bit of how antennas work. If you'd like to know more on the subject, the ARRL Antenna Book is a great overall resource, tutorial, and reference. **Antennas are not magic. They obey the laws of physics, despite the wishes of some designers and manufacturers.**

Transmitters are designed to operate into a specific load -- typically 50 ohms. When they are connected to a 50-ohm load, they deliver their rated power efficiently. For this reason, most feed lines used with today's rigs are also designed with a 50-ohm impedance. When the feed line is connected to a 50-ohm load (the antenna), all of the power going into the feed line is delivered to the antenna, minus a small amount of loss in the feed line. If the feed line and load impedances are not the same, some of that power is reflected back down the feed line. This creates a "standing wave" of voltage and current peaks and nulls on the feed line and increases its losses. The ratio between the voltage or current maximum and minimum points is known as the standing-wave ratio (SWR). If the line is matched to the load, there are no peaks or nulls, so the SWR of that line is 1:1. Older transmitters with vacuum tube final amplifiers had a series of controls to match their output circuit to whatever impedance was presented by the antenna system. Modern rigs have solid state final stages, designed to operate into a 50-ohm impedance. Operating into a serious mismatch can cause heat to build up in the final transistors, possibly damaging or destroying them. For this reason, most modern transmitters employ a "foldback" circuit that will (hopefully) reduce output power to a safe level before damage occurs. When an antenna presents something other than a 50-ohm load, therefore, some type of matching network is necessary to keep the transmitter "happy". This is accomplished by putting some combination of inductance and capacitance between the source and the load. To further complicate matters, the impedance of a given antenna varies as the frequency changes. Enter the antenna tuner, sometimes called a transmatch or matchbox. Tuners provide a wide range of combinations of inductance and capacitance, allowing your transmitter to see a 50-ohm impedance with an antenna that may be quite a bit higher or lower.

The MinuteMan 20™ allows you to adjust the antenna itself for the best match at your operating frequency -- in seconds. Changing the whip length and coil tap positions will allow a wide range of adjustment. Rather than using a matching circuit in the transmitter, or an external tuner, you're able to adjust your antenna for best efficiency.

Designing a load that presents a 50-ohm impedance to your transmitter over great excursions in frequency is actually easy. Several companies make exactly that. They're called dummy loads, and are useful for many tasks in the shack. But of course, they make poor antennas. Simply put, nearly all of your power is dissipated as heat by the load and almost none is radiated as RF. Sure, the SWR is great, by definition. But now you should understand that a low SWR, by itself, is not necessarily indicative of good performance. You must also consider an antenna's *efficiency*. Some so-called portable antennas on the market are little more than portable, nicely manufactured dummy loads.

In simple terms, antenna efficiency is the ratio of the power actually radiated as RF by the antenna divided by the total power applied to it. If you apply 100 Watts of RF energy to an antenna and 95 Watts is radiated as signal then 5 Watts is dissipated as heat in either the antenna itself or in ground loss. The efficiency is then 95%. According to those pesky Laws of Physics, there's just no other place for that energy to go. As heat loss increases, though, efficiency goes down, until the antenna becomes, in effect, a dummy load.

At Radio Frequencies, loading coils act in part like resistors, converting some percentage of your transmitted power to heat -- power that, of course, adds nothing to your signal. When designing compact antennas, some type of loading is necessary. Therefore the properties of the loading coil are of paramount importance. Since any loading coil presents at least some degree of loss, we designed the MinuteMan 20™ to use as little coil as possible. And we designed our coil to maximize its efficiency.

The efficiency of a coil increases greatly as its diameter increases with respect to length. Ideally, a coil should be "oversquare" -- that is, greater in diameter than it is in length. The MinuteMan 20™ coil is a full 2 inches in diameter, and only about an inch in length. This 2:1 "aspect ratio" is one of the factors that makes our antenna so much more *efficient* than other designs. Long thin coils, on the other hand, degrade efficiency. Your transmitter will still see an acceptable impedance (low SWR) but a lot more of your signal will be lost as heat rather than being heard by that rare DX station.

So do you need a tuner with the MinuteMan 20™? In most cases, you'll be able to get better than a 2:1 SWR on the 20, 17, 15, 12, and 10 meter bands using combinations of whip length and coil tap positions. In some instances, especially when there are nearby metal objects, you may wish to use a small tuner. These are available from several manufacturers. A tuner may also allow you to operate on lower HF bands. Since each installation is different, we won't guarantee it -- but give 30, 40, and even 80 meters a try. With the right conditions and tuner, you may have many enjoyable QSOs there.