

# Diamond X6000A VHF/UHF Triband Antenna and MX3000N Triplexer

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Earlier this year, I got a new Icom IC-9700 all-mode home station transceiver for the 2-meter, 70-centimeter, and 23-centimeter bands (144 – 148, 435 – 450, and 1260 – 1300 MHz, respectively). I've been licensed for 28 years, but I had never operated on any frequencies above 450 MHz until I got the IC-9700.

Before I could enjoy my new transceiver to the fullest, I needed to replace my 20-year-old dual-band home station antenna with one that also covers the 23-centimeter band. I found the Diamond Antenna X6000A. The IC-9700 has three independent antenna ports, one for each band, which makes sense for operational flexibility. I wanted to use only one multi-band antenna with a single feed line, so I also needed a triplexer. The IC-9700 connects to three ports on a triplexer, and there is a single port for the antenna feed line.

For 2 meters, the IC-9700 antenna jack is an SO-239 UHF connector, and on the two other bands it's a female type-N connector. I wanted to avoid using PL-259 connectors or adapters on 70 and 23 centimeters because those connectors often perform poorly at UHF. Fortunately, Diamond offers the MX3000N triplexer with the connectors I was looking for installed on 12-inch coaxial cable pigtails attached to the device (see Figure 2).

## Bottom Line

Coupled with the MX3000N triplexer, the Diamond X6000A vertical antenna for 2 meters, and 70 and 23 centimeters, is a fine companion to the Icom IC-9700 for VHF and UHF operation on FM and D-STAR.



Figure 2 — The Diamond Antenna MX3000N triplexer.

I was ready to place the order, but I couldn't find the antenna or triplexer in stock at Amateur Radio dealers. My local dealer said that Diamond had stopped producing these a while ago, and they restarted production after the release of the new IC-9700. The new antenna and triplexer arrived in about 4 weeks.

I was worried about the performance in the 23-centimeter band if I kept my old RG-213 coaxial cable, so I ordered a new 110-foot run of LMR400 coaxial cable made by Times Microwave Systems, along with two type-N male connectors.

### Antenna and Triplexer Overview

The X6000A weighs about 4 pounds, is just over 10 feet long, and looks similar to a typical dual-band home station antenna. It's encased in a weatherproof fiberglass shell and has three short radials at the base.

**Figure 3** — The type-N connectors installed on the LMR400 with the heat shrink (after all the tests were completed).



**Figure 4** — Claude, VE2BUB, sweeping the cable for any problems.

The coax connector input is a type-N female, and antenna impedance is 50  $\Omega$ . The maximum power rating is 100 W on 2 meters and 70 centimeters, and 60 W on 23 centimeters — a good match for the IC-9700. The mounting hardware accommodates masts from 1.2 to 2.4 inches, and it fits correctly on my 2-inch-diameter mast.

According to the documentation, the X6000A antenna works as two  $\frac{3}{8}$ -wave phased elements on 2 meters, five  $\frac{3}{8}$ -wave phased elements on 70 centimeters, and six  $\frac{3}{8}$ -wave phased elements on 23 centimeters. The SWR charts in the instructions indicate an SWR less than 2:1 across the specified band segments.

The MX3000N connectors match the connectors on the IC-9700. The LPF port can be used from 1.6 to 160 MHz (HF/VHF), and it can handle 800 W PEP. The BPF port is for 350 to 500 MHz up to 400 W PEP, while the HPF port covers 850 to 1300 MHz up to 200 W PEP. The impedance is 50  $\Omega$ . The SWR rating is less than 1.2:1, and isolation within the amateur bands is rated at 55 dB. The insertion loss is very low, rated at less than 0.2 dB on 2 meters, less than 0.3 dB on 70 centimeters, and less than 0.4 dB on 23 centimeters.

### A New Feed Line

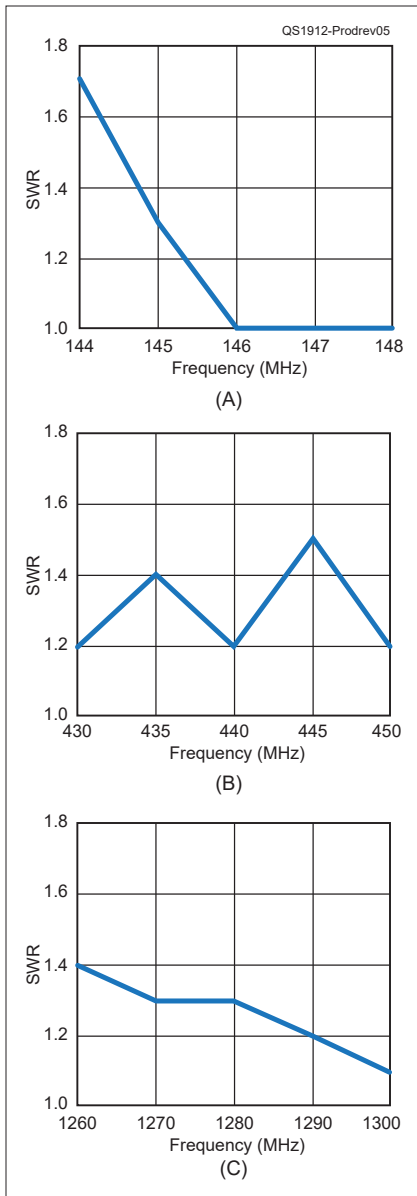
My previous dual-band (VHF/UHF) antenna was fed with 110 feet of RG-213 coaxial cable that was as old as my antenna (20 years). The coax still seemed to be okay, but according to the Times Microwave Systems coaxial cable calculator ([www.timesmicrowave.com/Calculator](http://www.timesmicrowave.com/Calculator)) the loss for that cable when new was about 10 dB for 110 feet at 1206 MHz, so the 10 W output from my radio would only be 1 W at the antenna (or maybe less because the cable is so old).

I decided to replace the old RG-213 with a run of Times Microwave LMR400 coax. That reduces the loss to a calculated maximum of 5.8 dB on 23 centimeters. I could have gone with the larger LMR600 with even lower loss (3.8 dB), but it is quite a bit more expensive and was not in stock at my local dealer at the time. I also bought a pair of matching TC-400-NMC male type-N connectors. These are the classic type with a clamp for the braid and soldered center pin (see Figure 3). Note that other manufacturers offer cable and connectors with similar construction and specifications.

### Preparation for Installation

All these items together added up, and I wanted to do the job right the first time. I read the manuals and studied how to install the connectors properly on the coax. Then, in early August, Robin, VA2NRJ, and Claude, VE2BUB, helped me to put it all together. Robin is my rigger and Claude my test engineer. Claude brought a spectrum analyzer to make some measurements prior to installing the antenna on my tower.

I installed a connector on the outdoors end of the LMR400 and passed the other end through the conduit going into my station. Then I installed the second connector indoors. (It's easier to pass the cable without the connector, plus it could be damaged if preinstalled.)



**Figure 5** — Diamond X6000A SWR measurements at the station end of the feed line, using the SWR meter in the IC-9700.

We passed the other end of the LMR400 temporarily into the station window, so we could sweep the cable end-to-end with the connectors installed to see if there were any problems with my connector installation (see Figure 4). Claude measured 2 dB loss on 2 meters, 4 dB loss on 70 centimeters, and 5 dB loss on 23 centimeters, close to the manufacturer specifications. After testing the cable, we tested the triplexer, and



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measured the insertion loss at 0.1 dB on 2 meters, and 0.5 dB on 70 and 23 centimeters, again close to manufacturer specifications.

### Antenna Assembly and Installation

After testing the coax and triplexer, we assembled the antenna. It went together easily. Just follow the instructions, and no adjustment is needed. We installed the antenna temporarily on an aluminum tripod about 6 feet above the ground to verify the SWR using the meter in the IC-9700, and everything was within the manufacturer's specifications. (Watch out for your eyes with the ground plane rods installed at a low height. Safety glasses are highly recommended.)

The next thing was to install the antenna on top of my 56-foot tower, above my SteppIR UrbanBeam for 40 through 6 meters. Always keep safety in mind when working on antennas and towers. Anyone working on the tower needs a proper safety harness, and those on the ground need to pay attention, wear hard hats, and stay clear of areas where tools or other parts might fall if dropped.

After the installation, we again tested the antenna with results similar to testing at a low height (see Figure 5).

### On-the-Air Test

With this new installation I'm able to reach all the repeaters that I used to in the past, but the signals are a bit stronger. On 23 centimeters, I can reach three D-STAR repeaters. One of them, VA2REX, is 43 miles away and the signal is fairly good with a very usable +7 dB signal-to-noise ratio. The strongest repeater on 23 centimeters is about 28 miles away, and the signal is +10 dB.

I'm very happy with my new setup. The addition of 23-centimeter operation is great, and I can't wait to do more on that band. I may have gone a little bit far with testing the coax and triplexer, but I wanted to make sure I got the most from my investment. I'm pretty confident that this installation will be reliable and that it will provide many years of enjoyment.

*Manufacturer:* Diamond Antenna, 312 Swanson Dr. Suite B, Lawrenceville, GA 30043; [www.diamondantenna.net](http://www.diamondantenna.net). Price: X6000A, \$170; MX3000N, \$86. Coax and connectors, Times Microwave Systems, 358 Hall Ave., Wallingford, CT 06492; [www.timesmicrowave.com](http://www.timesmicrowave.com). Price: LMR400, \$1.25 per foot; TC-400-NMC connectors, \$13 each.