

Using the N5IA/N7GP 8-Circle Array in the CQ 160 Meter CW

My Top Band adventure began at a weekly breakfast in early January. A group of early risers from the Arizona Outlaws Contest Club (AOCC) meets Wednesday mornings at alternating restaurants in East Mesa and Tempe. One Wednesday, I learned that Milt Jensen, N5IA, was looking for an AOCC member to operate his remote station in the CQ 160 Meter CW contest at the end of January. Milt was going to be away on family business and would not be able to put in a full-time effort using his remote station. Suddenly, a number of people were looking at me, wondering if I might be interested. This was a totally unanticipated opportunity, and I was intrigued, to say the least. I tentatively agreed, realizing that I would need to make sure that family plans or other circumstances wouldn't preclude my participation. I also wanted to talk to Milt in order to find out what would be involved in a remote operation; this was something I had never done before.

Some Background on the 8-circle

By way of background, N5IA spent several years constructing an "8-circle array" of full-sized 160 meter vertical antennas (ie, 125-foot towers) at a site south of Safford, Arizona, near the New Mexico border. Milt has lived his entire life 3 miles east of the Arizona border in Virden, New Mexico, and for the past 2½ years operated this wondrous Top Band station remotely from his home. He uses the "contest" call sign of N7GP most of the time, but outside of contests he IDs as N5IA. In addition to the 8-circle, there are 16 one-wavelength Beverage receive antennas, switchable in 16 directions, every 22.5° of the compass. There is also an 80 meter 4-square antenna adjacent to the 8-circle.

The 8-circle uses an extremely sophisticated switching network that selects four of the eight towers to beam in one of eight 45° segments of the compass with a forward gain of ~7.4 dB and front to back of ~20 dB.

All eight azimuths exhibit near identical VSWR (below 1.4:1 from 1.8 to 2.0 MHz) and pattern. Each 160 meter tower is surrounded by 32 radials, which are common connected to the bisector wires and perimeter wire of the 8-circle's massive ground plane.

Preparing KY7M for Remote Operation

My initial conversations with Milt revealed one significant coincidence. Milt's on-site/remote station used an Elecraft K3 and a microHAM microKEYER II interfaced with his logging PC running *N1MM Logger+* at the control point. I have the same equipment complement at KY7M. The remote operation makes the home/control

radio act as a "dumb terminal," so when you turn the knob of the home/control radio, it is tuning the frequency of the on-site/remote radio. Every other function of the dumb-terminal home/control K3 is replicated at the on-site/remote K3. Milt also explained that he uses the "diversity receive" function of the K3, so that the operator hears the 8-circle antenna in one ear and the selected Beverage antenna in the other.



Figure 1 — The impressive 8-circle array at the N5IA/N7GP remote station.

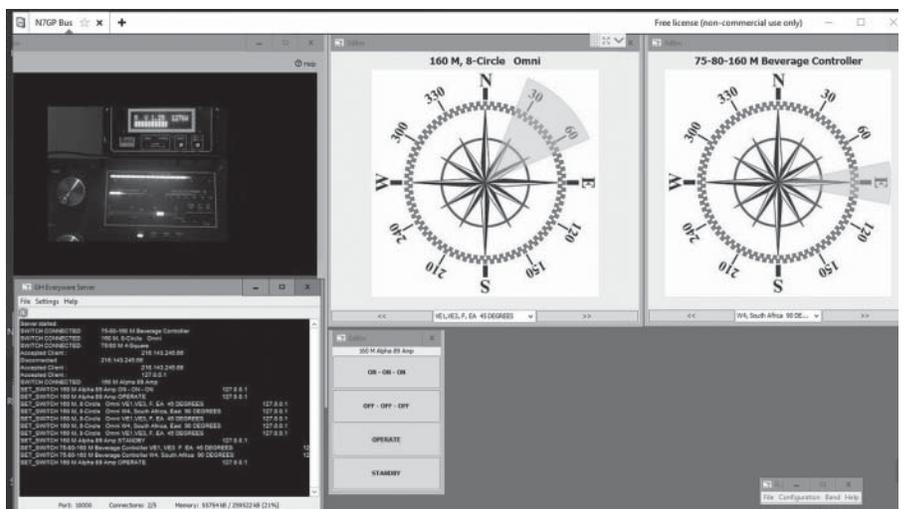


Figure 2 — A close-up of the *TeamViewer* screen.

Table 1 — Raw scores from the 3830 Archive

Call Sign Club	QSOs	S/P	DXCC Entities	Hours	Score
KY7M (@N5IA)	1129	59	43	32	360,570
AOCC					
K7CA	1189	58	28	32	354,406
AOCC					
N7DD	1069	57	32	24	278,570
AOCC					

The heart of the remote operation is a pair of black-box Microbit RRC-1258 MkII units, manufactured in Sweden and adapted by Elecraft to support the use of their radios for this very purpose (see www.elecraft.com and www.remoterig.com for details). Milt told me that he was preparing his spare control black box for me and would put it in the mail. The hope was for me to receive it at least 1 week before the contest, so I could get it operational and use it to get in some practice on Top Band — as well as to iron out any kinks ahead of time.

As Milt expected a full effort from my station, and because I do not have the stamina to stay up all night, I decided to make this a multioperator effort. My partner for multiop in the ARRL November CW Sweepstakes for the past 2 years has been my friend Fred Hoffert, NA2U, who lives a short drive from me. Fred readily agreed to this “kid in a candy store stuff,” as he called it. Since moving from his antenna farm in New Jersey several years ago, Fred has lived in a Phoenix subdivision with strict CC&Rs and is limited to backyard stealth antennas. To compensate, he has operated many times from Big Gun stations, including K2TTT, K8IA, KH7M, and PJ2T. Needless to say, we were both very excited about using Milt’s remote station for this contest.

Milt told me that I would need two computers — one for the normal *N1MM+* contest logging function interfaced with the microHAM microKEYER II, and a second to handle antenna switching and other control functions plus monitoring at the remote site near Safford. After some upgrading, I used an Acer netbook for my second computer, and it worked flawlessly.

In addition to the second computer, Milt also told me that I’d need an Ethernet adapter to plug into the black box for its required Internet connection. I settled on a Netgear model WNCE3001 Universal Dual Band WiFi Internet Adapter. It received the Internet signal from my home WiFi router and converted it through a CAT cable to plug into the Ethernet jack on the black box. That Internet connection was critical for operating the K3 at the remote site.

Antenna switching and control of the Alpha 89 amplifier paired with the K3 at the remote site was handled on the second computer using a program called *TeamViewer*. After logging into *TeamViewer*, the second computer screen became my view of the remote station near Safford, just as if I were sitting there. A camera was focused on the Alpha 89 and the Power Master SWR/power meter on top. A box on the screen below the 8-circle compass had four control positions for the amplifier — On, Off, Operate, and Standby. A click of the mouse on any of those controlled the amplifier, which is dedicated to 160 meters. Also on the screen were two Green Heron compass controls — one for the 8-circle array and one for the 16 Beverages. A click on a direction on either compass immediately switched the respective antenna to the chosen azimuth.

A Once-in-a-Lifetime 160 Meter Opening — or “Right Time, Right Place”

Once I had the black box installed, I had no difficulty connecting to the Safford station. The first two nights and the following mornings, I got on 160 meters and called CQ with the 8-circle and worked a few DX stations — nothing too exciting, and we didn’t hear any Europeans. But, on Thursday night, January 28, beginning at 0514 UTC, Top Band provided a treat like I had never experienced before. It was a spotlight opening from Arizona to Europe that was absolutely *incredible!* It started slowly when I heard a weak OK2RRR and got a report from him after several calls. Then I tuned up the band and heard HA8RM calling CQ with a booming signal that sounded like a local, and I worked him easily. The band sounded promising, so I found a clear spot and called CQ.

You have to understand that, after 25 years of sporadic 160 meter operation, I had rarely worked Europe. It is *very, very* difficult from the West Coast with an average antenna. Most of my 124 confirmed countries on Top Band were in North/South America and Asia/Pacific. Well, my first CQ was answered by S51YI, and



Figure 3 — Lee, KY7M, searches for a mult. Three computer screens were used: Left for *N1MM+*, center for *TeamViewer*, and right for *DXAtlas*, to watch the grayline.

then, after being spotted, I had all of EU calling me. Between 0525 and 0757 UTC, I logged more than 100 EU stations in 21 countries — almost all of them new ones for me on Top Band. It turned out that Milt was eavesdropping, listening on a friend’s remote 160 meter station, and he was just as excited by the opening. *Wow!* Did that 8-circle work when the band was open! About a week later, Milt asked me, “So, why didn’t you go split when you had that opening? *You were the DX!*” I had no answer for him, since I was totally unprepared for the event, and it wasn’t as if I had been on a DXpedition. I just ran stations as fast as I could. I promised Milt that I would go split the *next* time it happened, though.

I looked for EU stations again the next night and worked eight more, but the band never opened as it has the previous night, nor did it do so again during the contest. That last morning before the contest provided a better-than-average opening to Asia, and I ran 24 JAs and one HL. I was increasingly optimistic that the contest was going to be a lot of fun with a great score possible. Milt told me he was fine with my using KY7M for the contest, as long as the log we submitted showed “@N5IA.”

Fred came by one afternoon before the contest so I could show him the setup. He was already familiar with my station’s layout, but the remote station added a layer of complexity that neither of us had dealt with before. We talked about an operating schedule and split up the time pretty evenly, with me finishing up both mornings.

We anticipated two multiop competitors in Zone 3 — N7DD and K7CA. Both have done well in past 160 meter events, and we knew that K7CA had built an impressive antenna farm in Utah for 160. We would have to make every minute count and hope that many of the mults would come to us.

The CQ 160 Meter CW Contest

We still had more than 2 hours of daylight remaining in Arizona when I started the contest at 2200 UTC, so the rate was pretty low for the first couple of hours. I warmed up the band as much as possible until Fred arrived at 0000 UTC, just as sunset approached. The rate picked up as soon as he took over. We expected to work mostly North America until after 0300. The first DX mults in the log (worked by Fred) were XE, C6, and PJ2, followed by HK, NP2, ZF, HI, KP4, and FY. It was not until 0422, when I was back in the operating chair, that I was called by the first European, PA3FYM. Over the next few hours I was called by OK5W, CR5T, DKØWRTC, IKØYUT, 9A1P, OMØM, UA2F, OH2BO, S51V, and OZ7YY. Several other OK and DL stations called me as well. I moved down the band to catch CW5W, and then I was called by HC2AO as we passed the 500 QSO mark before 0600. I caught PJ4LS and 4V1TL down the band and was called by EA2OT before chasing after KH7M and CE3CT for new mults. F5CQ called in at 0637 for a new one, and then I moved to work V31YN. At 0704 I was called by OT6M, followed by a struggle to get LX7I's call sign in the log while battling the QRN. I caught PW2D and CS2C, before turning the reins back to Fred at 0800.

Fred worked a few more HK, XE, and KH6 stations as he resorted to some S&P when the run rate dropped off. He also caught up with 160 stalwart KV4FZ. When Fred called CQ again, JA8EAT responded at 0830, an indication that Asia was active, but we only logged a handful of JAs over the next few hours, suggesting that conditions were not very good. Fred found RMØF, YV1KK, and KL7KY for new mults as we passed 700 Qs by the time I took over again at 1100, a few hours before sunrise. I caught VK3EGN as soon as I sat down, and then I alternated between trying to run and S&P. By the time the sun came up at 1410, I had another 47 JAs in the log along with HL5IVL plus a few more HL stations. We finished the first day with 789 contacts in the log.

We knew day two would be a slog, since the number of new stations to work in US and VE would be limited, but, conditions sounded much better to me as sunset approached. I heard the East Coast much louder earlier than on the first day. I was optimistic that we might get a better open-



Figure 4 — Fred, NA2U, operating in the “candy store.”

ing to Europe. We worked no new DX mults until after Fred took over at 0200. He was happily surprised to work ZS6EZ and ZS4TX in succession at 0333. But only one OM and one EA called in from Europe, a big disappointment after the band had sounded so promising. Fred passed 1000 Qs just before 0500.

I took over again at 0600 and found EIØR, CO2JD, and G5W for our last new DX mults. I added four more JAs before giving the chair back to Fred at 0900. He logged another four JAs and a couple of KH6s as things really slowed down to a crawl. After I picked it up again at 1200, not much was left to work. I found 10 more JAs plus RTØF, XE2ST, and one big surprise — VK6LW in Zone 29, just before the sun came up. I stayed on the band past sunrise to pick up any new stations waking up on the West Coast.

We finished the contest with 1129 QSOs in 59 states and provinces, 43 countries, and 32 zones for a raw score of 360,570. It seemed like a decent number based on conditions, but we had to wait a few days before we saw the numbers from N7DD and K7CA. Our AOCC friends to the north in Utah made 60 more Qs than we did, and they worked more JAs, but we had more European mults in our log, and that made all the difference. Our raw score gave us the lead by 6164 points, a mere 1.7 percent difference. How close is *that*? We will wait and see what the log checkers determine to be the final results.

Conclusions about the 8-Circle and Operating Remote

It was fun! Milt has built an amazing 160 meter remote station. The ability to hear on 160 meters is everything, but being able to transmit a loud signal from the US Southwest made us a station for European stations to chase. Using the 8-circle for just a few weeks before and after the contest allowed me to increase my 160 meter totals from 124 to 156 DXCC entities worked, including VP8SGI and VP8IDX.

Milt warned us in advance of a noise problem to the northwest of the remote station that is in the direction of Safford, Arizona, and of Japan. The noise did impact our ability to work the weakest JA and HL stations. There is also an issue of latency during prime time Internet usage hours at night, impacted by the infrastructure in rural Arizona. This caused the CW keying to be distorted at times, and we heard more than a few reports about that problem.

At the end of the contest, both Fred and I were impressed by how well the remote connection worked and how it made us competitive with the biggest stations around. We never ran more than 1300 W, per Milt's strict instructions, and we had no difficulty working anyone we heard. We loved every minute of it, even the slog on day two.

Our thanks to Milt for the unique opportunity to operate his remote station in this contest! We commend him on the construction and implementation of this Top Band engineering feat.