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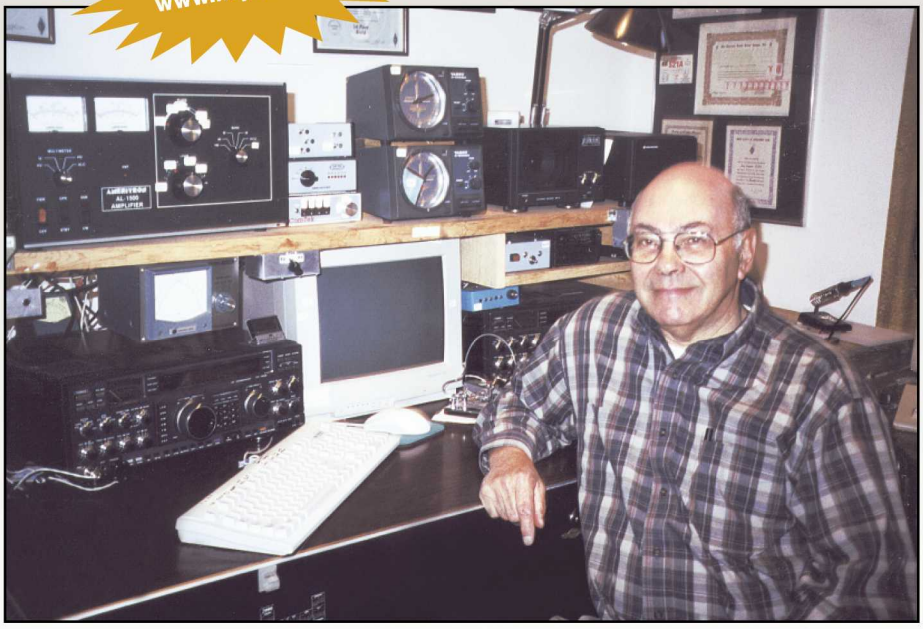

Jack Schuster, W1WEF, at the operating position of his Glastonbury Connecticut station.

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fax: 860-594-0259 (24-hour direct line)
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Editor
Dennis Motschenbacher, K7BV
4357 Appollonio Way, Carson City, NV 89704
editor@ncjweb.com

NCJ WWW Page
Bruce Horn, WA7BNM, Webmaster
www.ncjweb.com/

ARRL Officers
President: Jim Haynie, W5JBP

Executive Vice President:
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ARRL CAC Representative
Ned Stearns, AA7A
7038 E Aster Dr, Scottsdale, AZ 85254
aa7a@arrl.net
North American QSO Party, CW
Bob Selbrede, K6ZZ
6200 Natoma Ave, Mojave, CA 93501
cwnaqp@ncjweb.com
North American QSO Party, Phone
Bruce Horn, WA7BNM
4225 Farmdale Ave, Studio City, CA 91604
ssbnaqp@ncjweb.com
North American QSO Party, RTTY
Ron Stailey, K5DJ
504 Dove Haven Dr, Round Rock, TX 78664
rttynaqp@ncjweb.com
North American Sprint, CW
Boring Amateur Radio Club
15125 Bartell Rd, Boring, OR 97009
cwsprint@ncjweb.com
North American Sprint, Phone
Rick Niswander, K7GM
PO Box 2701, Greenville, NC 27836
ssbsprint@ncjweb.com
North American Sprint, RTTY
Wayne Matlock, K7WM
Rt 2, Box 102, Cibola, AZ 85328
rttysprint@ncjweb.com
Advertising Information Contact:
John Bee, N1GNV, ARRL; tel 860-594-0207;
fax 860-594-0259; *ads@arrl.org*

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Editorial

Dennis Motschenbacher, K7BV

With the majority of the winter contest season contest now behind us, we can take a brief time out to go for the big finish in the WPX blasts. Only time will tell if those contests we just operated occurred under the highest sunspot counts we will see for a long time.

I find it fascinating to watch the shift in geographic dominance occur as the sunspot count goes up and down. We certainly see the effect here in Nevada in the domestic contests. When 10 meters goes away, so do we! Similar things happen all around the world; one more reason to keep at it—as your day will come.

Is it *Really* Only a Hobby?

I have learned that I really like to mix "DXpedition mentality" with my "contest mentality"—an adrenaline replacement for some of the other more destructive things I did in years gone by. But even at that, few would classify "contest and DXpedition mentally" as reflections of bedrock mental stability. But I do so love the adventure of a DXpedition *on the edge!*

The more odd the place, the more likely the pileups—and/or points—will build into mountains. A recent DXpedition to East Timor (4W), although it didn't occur during a major contest, was such a trip. In the course of that particular adventure (I recently found myself pondering) perhaps I was getting too close to the edge. The words below—taken from a story I wrote for *DX Magazine*—expand on that thought.

"I am a follower of the ideology: *True Adventure Requires an Uncertain Outcome,* but I most certainly do not go on DXpeditions carrying a death wish. I do enjoy going to exotic places and encountering challenges radically different than what I might run into in my considerably more mundane 'normal' life.

"Months of planning—full of political and people tension—kept my DXpedition partner, Dick Wolf, N6FF, and I constantly on edge. [Just the right stuff to feed the need addressed above—right?]

"Fighting and killings in the region continued to grab international headlines as our departure date drew near. Only weeks before we were to arrive, two hams, Pero Simundza, 9A4SP/4W6SP, and Carlos Luis Caceres, KD4SYB—and four others working for the United Nations High Commissioner for Refugees—were savagely murdered. But, make no mistake; we very seriously assessed the risks we might place others and ourselves in by going on the trip.

"I personally expected to experience pileups during this trip that I selfishly hoped would enrich my personal treasure box of memories, already heaping with thrilling and satisfying DXpedition experiences. But as I operated deep into the night, working through the never-ending siege of eager callers wanting a low band contact, I found myself troubled.

"My acute awareness of the people and the living conditions that surrounded our operating site seemed to disparage our reason for being there—to operate ham radio. Although the fantastic pileups did in fact reach memorable proportions, those moments are not the most vivid memories I carry today.

"The richest memories that followed me home are full of the *Timor Lorosae children*—smiling, laughing, inquisitive children of the kind that might be found in any corner of the world. But these children are profoundly different than others I had shared time with on previous DXpeditions.

"The precious children in my memories (and now in my heart, for that matter) were clothed in unclean ill-fitting and usually tattered clothing. Their sweet faces and little hands were filthy. Many of these delightful little people lived in shelters with dirt floors, scrap wood and rusted corrugated sheet metal walls. The roofs are nothing more than leaves taken from the local vegetation. They live in a world with little readily available water (most certainly not potable), dirt everywhere, marginal sanitary conditions and dust filled air.

"Those older than one year have minds that are permanently scarred by searing memories of mindless atrocities committed in their presence. They will forever have memories of the smell of cordite and the cracking sound of gunfire coming from the hands of unmerciful strangers. What must a child feel when they look up into their parents' eyes for comfort, only to find the frightening look of raw terror?

"The children of Timor Lorosae have witnessed their homes, churches and schools deliberately set ablaze. The local kiosks that sold their favorite candy were reduced to charred ruins before their very eyes. All of those sights and pungent smells too will never leave them. And most terrible of all, some have seen the hideousness of brutal human maiming and killing—the ugliness which only one human can inflict on another.

"Yet, for me, these darling children offered only unabashed smiles and giggles as they crowded around me wherever I went in Baucau and the Timor Lorosae countryside. Their shyness was easily overcome by their curiosity about this man stranger who talked and looked so odd. I could not help having overwhelming urges to grab them all up in my arms and take them home to nutritious meals, a clean bed and the comfort of safe surroundings. Still today I am haunted with guilt from not doing exactly that. I do not expect that emptiness inside to ever go away…

"While there, I felt constant anxiety brought on by the ever-present possibility of violence, and from simply being in the presence of people whose hearts and souls had been ravaged by prolonged exposure to war and all its inherit inhumanities. An uncomfortable number of times I found myself asking the question "What am I doing here playing with my ham radio while people just outside the compound's barbed wire-topped fence are dealing with a much more deadly serious concern, that of basic survival?"

To the children of Timor Lorosae, thank you so much for putting life into perspective for me—this is indeed just a hobby…

And I now ask you to remember the same thing. It is just a hobby and the contesting piece we slice out of it to fulfill our inner needs hopefully provides you with a passion focus and satisfaction. But don't let it interfere with the more important aspects of life. If you do—and I know this from personal experience—the passion and satisfaction will fade away.

Our Cover

Jack Schuster, W1WEF, author of last issue's "Servicing the Yaesu G-1000SDX Rotator," at the operating position of his Glastonbury Connecticut station. ■

Some Facts of Life About Modeling 160-Meter Vertical Arrays—Part 2: Appreciating Conductivity and Permittivity

L. B. Cebik, W4RNL
1434 High Mesa Drive
Knoxville, TN 37938-4443
cebik@cebik.com

In the first installment of this series, we established a data baseline relative to 160-meter 1/4-λ vertical antennas, exploring the types of modeled radial systems and the number of radials used in each system. We concluded that, as a model of the typical buried radial system, only a model of a buried system appears to be sufficiently sensitive to changes occasioned by differences in soil quality. Other alternatives have, at best, only limited correlations to the physically buried system.

Our exploration was limited by the use of four "standard" soil types, and we raised the question of whether these standards represented a fair sampling of conditions underlying a vertical antenna. This question is part of a larger one: how do the combined effects of soil conductivity and permittivity (relative dielectric constant) influence the performance of vertical antennas within the context of *NEC* modeling systems?

We might take a strictly mathematical approach to this question, since the ground effects are calculated (in the Sommerfeld-Norton ground system that is part of *NEC*) by standard engineering formulations. However, for many modelers, this approach fails to generate a set of reasonable expectations of antenna performance. Therefore, a second approach may be preferable: to take a standard antenna and ground radial system of varying numbers of radials and to model it using a wide span of combinations of conductivity and permittivity. We shall use this second approach in this episode, with the hope of eliciting some useful patterns of thought about ground effects on a vertical antenna system. Once more, the data tables will outweigh the text by a considerable margin.

Conductivity and Permittivity

Soil conductivity is measurable in units of Siemens (or "mhos") per meter (S/m), the inverse of resistivity in ohms per meter. Of the two relevant ground quality properties, it is the more intuitive. Measurements are relatively frequency specific so that a general dc or low frequency RF measurement may not be exact for a proposed antenna system in the MF or lower HF region. The calculation systems in which conductivity plays a role normally do not account for variations in the value by virtue of soil stratification, but instead presume an average value that characterizes a homogenous soil beneath the antenna.

Permittivity, or the relative dielectric constant, is less well understood by many amateurs. The main use of the dielectric constant with which most of us are familiar pertains to capacitors: a capacitor can become more compact by using a dielectric with a high value. Soils exhibit the same property. Some values of the relative dielectric constant for materials relevant to antennas installation appear in **Table 1**, which is derived from John D. Kraus, *Antennas*, 2nd edition, (1988), pages 665 and 851.

Soil qualities are categorized by combinations of values for both conductivity and permittivity. In Table 2 is a listing of the

Table 1
Some permittivity (relative dielectric constant) values (from Kraus, *Antennas*, 2nd Edition).

Material	*Dielectric Constant*
Vacuum	1.0
Dry air	1.0006
Fresh snow	1.5
Clay Soil	14
Sandy Soil	10
Slate stone	7
Urban ground	4

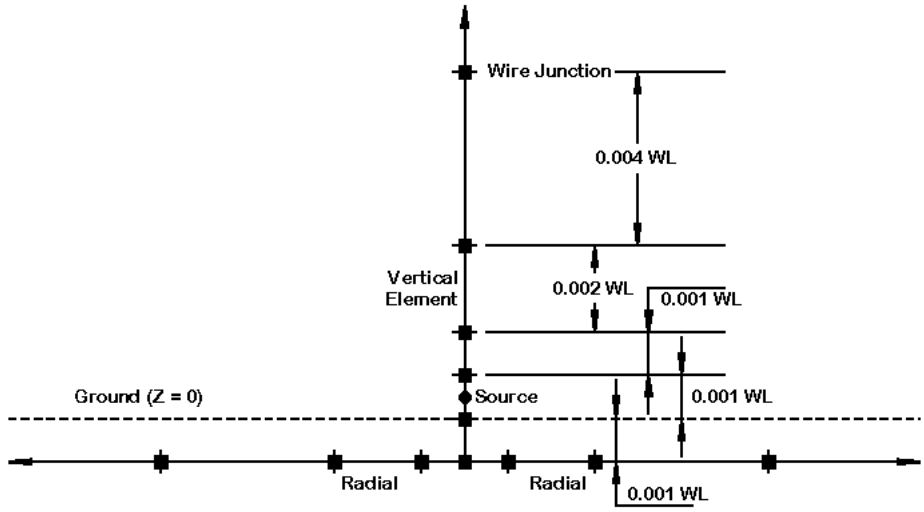


Figure 1—Basic techniques to construct the buried radial system vertical monopole used in developing the data in Tables 3-1, 3-2, 3-3, 3-4, 3-5, 3-6, 3-7, 3-8.

Table 2

Some soil types (from *The ARRL Antenna Book*).

Type	*Conductivity (S/m)*	*Permittivity*	*Category*
Pastoral 1	0.0303	20	Very Good
Pastoral 2	0.01	14	
Flat marshy	0.0075	12	
Pastoral 3	0.006	13	
Pastoral 4	0.005	13	Average (Good)
Rocky	0.002	12-14	Poor
Sandy	0.002	10	
City	0.001	5	Very Poor
Heavy Industrial	0.001	3	Extremely Poor

soil types found in the table on page 3-6 of *The ARRL Antenna Book*, with the type descriptions truncated. The ARRL table is taken from Terman's *Radio Engineer's Handbook* (page 709), which derives from "Standards of Good Engineering Practice Concerning Standard Broadcast Stations," *Federal Register* (July 8, 1939), page 2862. Immediately apparent in the Table 2 listing is the fact that there are many more soil quality types than the standard four that we used in Part 1.

However, there is a pattern of mutual increases in both conductivity and permittivity, and the range of each is finite. (I have omitted both fresh and salt water as too special to warrant inclusion here.) Conductivity ranges from 0.001 S/m to a bit over 0.03 S/m, with a greater degree of differentiation among lower values. Permittivity values tend to be more linearly arranged, with a maximum value of 20. The minimum "vacuum" or free space value would be 1. With these patterns in mind, we stand a chance of acquiring an appreciation for the relative effects of each of the two variables on vertical antenna performance over the full span of possibilities within a finite project.

The span of conductivity values lends itself to a Fibonacci sequence: 1, 2, 3, 5, 8, 13, 21, and 34 mS/m. A linear progression of dielectric constants (1, 5, 9, 13, 17, 21) covers this range well. Within the matrix of these values are combinations either exactly or very close to values in the standard soil quality chart. However, if we look at all of the values in the matrix, we might acquire a perspective on the relative effects of each component. Finding where the standard values fit within the overall matrix of possible values is the goal of our exercise.

All we need now is an antenna model to which we can apply these values. Let's use the 1/4-λ 40-meter tall vertical, 25 mm in diameter, that we employed in Part 1. We shall use a radial system buried 0.001-λ deep in the various soils. The model dictates the use of *NEC-4*, and the details of the fine structure of the tapered-length elements appear in **Figure 1**. The radials are 2 mm in diameter, and everything is copper.

The Results

The detailed results of the exercise in systematic modeling appear in **Tables 3-1**, **3-2**, **3-3**, **3-4**, **3-5**, **3-6**, **3-7**, **3-8**. Each table represents a different level of conductivity, with subtables for each level of dielectric constant in the progression. Each combination of conductivity and permittivity is carried through systems of 4, 8, 16, 32, and 64 radials to check the modeled effects of the radials system size. In the "Gain and Source Resistance" columns, I have identified the maximum and minimum values. The "Source Reactance" column identifies the minimum values of reactances for each radial system size as a measure of the nearest approach to resonance.

Before walking through the tables themselves to observe some interesting detailed phenomena, we might well show some summary results. For every combination of conductivity and permittivity value, there is a range of gain values and a range of source resistance values as we increase the number of radials from 4 to 64. These figures are indicative of certain important trends in the tables.

Figure 2 is a graph of the maximum and the average differential of gain values for changes in the radials system for all values of permittivity for each of the conductivity levels. The importance of showing both sets of numbers together is this: the higher the difference between maximum and average gain values, the greater difference that the value of dielectric constant makes to antenna performance. In contrast, the lower the differential between maximum and aver-

Tables 3-1 through 3-8

160-meter vertical monopole: 40 meters tall, 25 mm in diameter.

40.96-meter (1/4-λ) radials, 2 mm in diameter, tapered segmentation: 0.001- to 0.04-λ per wire. Radials 0.001-λ below ground.

NEC-4.

"TO Angle" = elevation angle of maximum radiation.

For each sub-table, a trailing "+" means the highest value in that category and a trailing "-" means the lowest value in that category, where category is the column parameter except for the values of source reactance, in which case the minimum values are shown for each level of radials.

Table 3-1

Conductivity = 0.001 S/m

Number of Radials	*Gain (dBi)*	*TO Angle (degrees)*	*Source R (Ω)*	*Source jX (Ω)*
Dielectric constant = 1				
4	-4.76-	28	86.13	34.14
8	-3.62	28	65.93	21.77
16	-2.84	27	53.89	13.57
32	-2.37	28	46.89	7.88
64	-2.13	28	42.93	4.28
Dielectric constant = 5				
4	-4.37	27	87.04+	25.31
8	-3.11	28	65.90	18.09
16	-2.18	28	52.71	12.43
32	-1.61	27	44.89	7.54-
64	-1.32	27	40.68	4.11-
Dielectric constant = 9				
4	-3.80	27	83.72	17.87
8	-3.56	27	64.66	14.62
16	-1.56	27	51.87	11.75
32	-0.88	27	43.49	8.12
64	-0.54	27	38.93	4.91
Dielectric constant = 13				
4	-3.28	27	79.27	14.23
8	-2.11	26	62.60	12.19
16	-1.13	26	51.36	10.94
32	-0.39	26	43.13	8.66
64	0.01	26	38.30	5.87
Dielectric constant = 17				
4	-2.91	25	76.43	12.50
8	-1.74	26	60.59	10.98
16	-0.79	26	50.59	10.24
32	-0.03	26	42.92	8.94
64	0.41	26	38.00	6.63
Dielectric constant = 21				
4	-2.59	25	74.33	10.32-
8	-1.45	26	59.13	10.24-
16	-0.52	25	49.82	9.83-
32	0.24	25	42.80	9.10
64	0.70+	25	37.93-	7.21

Table 3-2

Conductivity = 0.002 S/m

Number of Radials	*Gain* (*dBi*)	*TO Angle* (*degrees*)	*Source R* (Ω)	*Source* j*X* (Ω)	*Number of Radials*	*Gain* (*dBi*)	*TO Angle* (*degrees*)	*Source R* (Ω)	*Source* j*X* (Ω)
Dielectric constant = 1					Dielectric constant = 13				
4	-2.80-	25	72.68	29.22	4	-2.49	25	72.45	19.47
8	-1.90	26	59.18	20.31	8	-1.51	25	58.63	15.18
16	-1.26	25	50.59	14.44	16	-0.74	25	49.71	12.18
32	-0.83	25	44.92	10.17	32	-0.16	25	43.44	9.55
64	-0.58	26	41.35	7.11	64	0.17	25	39.43	7.08
Dielectric constant = 5					Dielectric constant = 17				
4	-2.79	26	73.51+	25.71	4	-2.29	25	71.39	17.11
8	-1.85	25	59.44	18.46	8	-1.31	25	58.05	13.93
16	-1.14	25	50.44	13.57	16	-0.54	25	49.43	11.63
32	-0.65	26	44.43	9.77	32	0.06	25	43.25	9.50-
64	-0.38	25	40.68	6.89	64	0.42	25	39.15	7.28
Dielectric constant = 9					Dielectric constant = 21				
4	-2.68	25	73.39	22.33	4	-2.06	25	70.02	15.30-
8	-1.70	25	59.27	16.69	8	-1.11	25	57.27	12.98-
16	-0.95	25	50.16	12.80	16	-0.34	25	49.03	11.21-
32	-0.42	25	43.95	9.58	32	0.27	25	43.03	9.52
64	-0.11	25	40.04	6.88-	64	0.65+	25	38.91-	7.55

Table 3-3

Conductivity = 0.003 S/m

Number of Radials	*Gain* (*dBi*)	*TO Angle* (*degrees*)	*Source R* (Ω)	*Source* j*X* (Ω)	*Number of Radials*	*Gain* (*dBi*)	*TO Angle* (*degrees*)	*Source R* (Ω)	*Source* j*X* (Ω)
Dielectric constant = 1					Dielectric constant = 13				
4	-1.77	24	66.44	26.48	4	-1.75	24	67.30	20.73
8	-1.01	23	55.74	19.15	8	-0.91	24	55.96	15.98
16	-0.44	24	48.79	14.29	16	-0.27	24	48.59	12.70
32	-0.04	24	43.94	10.72	32	0.22	24	43.36	10.09
64	0.19	23	40.72	8.04	64	0.52	24	39.82	7.83-
Dielectric constant = 5					Dielectric constant = 17				
4	-1.82-	24	67.10	24.55	4	-1.66	24	66.96	19.05
8	-1.02	24	56.00	18.07	8	-0.82	24	55.72	15.07
16	-0.42	24	48.79	13.73	16	-0.16	24	48.41	12.27
32	0.01	24	44.76	10.46	32	0.34	24	43.17	9.98
64	0.27	24	40.42	7.91	64	0.66	24	39.57	7.89
Dielectric constant = 9					Dielectric constant = 21				
4	-1.81	24	67.37+	22.58	4	-1.55	23	66.43	17.58-
8	-0.98	24	56.07	16.98	8	-0.71	24	55.39	14.28-
16	-0.36	24	48.73	13.18	16	-0.05	24	48.20	11.90-
32	0.10	24	43.56	10.24	32	0.47	24	43.00	9.90
64	0.38	24	40.11	7.83-	64	0.80+	23	39.37-	7.97

Table 3-4

Conductivity = 0.005 S/m

Number of Radials	*Gain* (*dBi*)	*TO Angle* (*degrees*)	*Source R* (Ω)	*Source* j*X* (Ω)	*Number of Radials*	*Gain* (*dBi*)	*TO Angle* (*degrees*)	*Source R* (Ω)	*Source* j*X* (Ω)
Dielectric constant = 1					Dielectric constant = 13				
4	-0.64	22	60.19	23.25	4	-0.71-	23	60.96	20.42
8	-0.01	22	52.16	17.60	8	-0.04	23	52.43	15.94
16	0.45	22	46.82	13.77	16	0.47	23	46.79	12.83
32	0.80	22	42.93	10.93	32	0.86	22	42.67	10.46
64	1.03	23	40.17	8.73	64	1.12	22	39.73	8.50-
Dielectric constant = 5					Dielectric constant = 17				
4	-0.68	23	60.59	22.36	4	-0.71-	23	61.15+	19.58
8	-0.04	22	52.34	17.09	8	-0.04	22	52.55	15.50
16	0.44	22	46.88	13.49	16	0.48	22	46.87	12.64
32	0.80	22	42.89	10.80	32	0.89	23	42.71	10.42
64	1.04	22	40.06	8.67	64	1.16	22	39.72	8.56
Dielectric constant = 9					Dielectric constant = 21				
4	-0.71-	22	60.88	21.43	4	-0.69	22	61.14	18.70-
8	-0.05	23	52.47	16.55	8	-0.01	22	52.52	15.01-
16	0.44	22	46.90	13.20	16	0.52	23	46.83	12.38-
32	0.82	22	42.84	10.66	32	0.93	22	42.65	10.33-
64	1.07	22	39.94	8.62	64	1.22+	23	39.62-	8.56

Table 3-5

Conductivity = 0.008 S/m

Number of Radials	*Gain* (*dBi*)	*TO Angle* (*degrees*)	*Source R* (Ω)	*Source* j*X* (Ω)	*Number of Radials*	*Gain* (*dBi*)	*TO Angle* (*degrees*)	*Source R* (Ω)	*Source* j*X* (Ω)
Dielectric constant = 1					Dielectric constant = 13				
4	0.26	21	55.68	20.58	4	0.17	21	56.42	19.20
8	0.77	21	49.51	16.19	8	0.71	21	49.81	15.37
16	1.15	20	45.32	13.14	16	1.12	21	45.43	12.67
32	1.45	21	42.17	10.84	32	1.44	21	42.15	10.60
64	1.66	21	39.81	9.01	64	1.67	21	39.68	8.92
Dielectric constant = 5					Dielectric constant = 17				
4	0.22	21	55.92	20.14	4	0.16	21	56.42	18.73
8	0.74	20	49.63	15.93	8	0.70	20	49.87	15.10
16	1.14	21	45.36	12.99	16	1.12	21	45.45	12.52
32	1.44	20	42.17	10.76	32	1.45	21	42.13	10.53
64	1.66	21	39.77	8.98	64	1.68	20	39.64	8.90
Dielectric constant = 9					Dielectric constant = 21				
4	0.19	20	56.12	19.67	4	0.15-	21	56.52+	18.26-
8	0.73	21	49.73	15.65	8	0.70	21	49.92	14.82-
16	1.13	21	45.40	12.83	16	1.12	21	45.46	12.36-
32	1.44	21	42.16	10.68	32	1.46	21	42.12	10.45-
64	1.66	20	39.73	8.95	64	1.70+	21	39.60-	8.88-

Table 3-6

Conductivity = 0.013 S/m

Number of Radials	*Gain* (*dBi*)	*TO Angle* (*degrees*)	*Source R* (Ω)	*Source* j*X* (Ω)	*Number of Radials*	*Gain* (*dBi*)	*TO Angle* (*degrees*)	*Source R* (Ω)	*Source* j*X* (Ω)
Dielectric constant = 1					Dielectric constant = 13				
4	1.04	19	51.99	18.19	4	0.98	19	52.34	17.51
8	1.45	19	47.28	14.85	8	1.41	19	47.48	14.43
16	1.77	20	44.02	12.47	16	1.73	19	44.10	12.21
32	2.01	19	41.51	10.63	32	2.00	20	41.52	10.49
64	2.20+	19	39.54	9.15	64	2.19	19	39.50	9.08
Dielectric constant = 5					Dielectric constant = 17				
4	1.02	19	52.12	17.96	4	0.97	20	52.44	17.27
8	1.44	19	47.35	14.71	8	1.40	19	47.53	14.29
16	1.75	19	44.05	12.38	16	1.73	20	44.13	12.13
32	2.01	19	41.51	10.58	32	1.99	19	41.52	10.44
64	2.20+	19	39.52	9.12	64	2.19	19	39.48	9.06
Dielectric constant = 9					Dielectric constant = 21				
4	1.00	19	52.24	17.74	4	0.95-	19	52.53+	17.03-
8	1.42	19	47.42	14.57	8	1.39	19	47.57	14.14-
16	1.74	19	44.08	12.30	16	1.72	19	44.15	12.04-
32	2.00	19	41.52	10.53	32	1.99	19	42.52	10.39-
64	2.20+	20	39.51	9.11	64	2.20+	20	39.37-	9.05-

Table 3-7

Conductivity = 0.021 S/m

Number of Radials	*Gain* (*dBi*)	*TO Angle* (*degrees*)	*Source R* (Ω)	*Source* j*X* (Ω)	*Number of Radials*	*Gain* (*dBi*)	*TO Angle* (*degrees*)	*Source R* (Ω)	*Source* j*X* (Ω)
Dielectric constant = 1					Dielectric constant = 13				
4	1.70	18	49.04	16.17	4	1.66	18	49.24	15.82
8	2.03	18	45.45	13.65	8	2.00	18	45.57	13.42
16	2.28	17	42.91	11.81	16	2.26	18	42.97	11.67
32	2.49	18	40.90	10.36	32	2.47	18	40.92	10.27
64	2.65+	17	39.28	9.16	64	2.64	18	39.27	9.12
Dielectric constant = 5					Dielectric constant = 17				
4	1.69	18	49.11	16.05	4	1.65	18	49.30	15.71
8	2.02	18	45.49	13.58	8	1.99	18	45.60	13.36
16	2.28	18	42.93	11.76	16	2.25	18	42.98	11.63
32	2.48	17	40.91	10.33	32	2.47	18	40.93	10.25
64	2.65+	18	39.27	9.15	64	2.64	18	39.26-	9.11
Dielectric constant = 9					Dielectric constant = 21				
4	1.67	17	49.18	15.94	4	1.64-	18	49.35+	15.60-
8	2.01	18	45.53	13.50	8	1.99	18	45.63	13.28-
16	2.27	18	42.95	11.71	16	2.25	18	43.00	11.58-
32	2.48	18	40.92	10.30	32	2.46	18	40.93	10.22-
64	2.65+	18	39.27	9.13	64	2.64	18	39.26-	9.10-

Table 3-8

Conductivity = 0.034 S/m

Number of Radials	*Gain (dBi)*	*TO Angle (degrees)*	*Source R (Ω)*	*Source jX (Ω)*
Dielectric constant = 1				
4	2.26	16	46.62	14.44
8	2.53	16	43.87	12.56
16	2.73	16	41.91	11.15
32	2.90	17	40.32	10.01
64	3.04+	17	39.00	9.07
Dielectric constant = 5				
4	2.26	17	46.66	14.39
8	2.52	16	43.90	12.52
16	2.73	17	41.92	11.13
32	2.89	16	40.33	10.00
64	3.04+	17	39.00	9.06
Dielectric constant = 9				
4	2.25	16	46.69	14.34
8	2.52	17	43.92	12.49
16	2.72	16	41.93	11.11
32	2.89	16	40.33	9.99
64	3.03	16	39.00	9.06
Dielectric constant = 13				
4	2.24	16	46.72	14.28
8	2.51	16	43.94	12.45
16	2.72	17	41.94	11.08
32	2.89	17	40.34	9.97
64	3.03	16	39.00	9.04
Dielectric constant = 17				
4	2.24	17	46.76	14.23
8	2.51	17	43.96	12.41
16	2.71	16	41.95	11.06
32	2.88	16	40.34	9.96
64	3.03	17	39.00	9.04
Dielectric constant = 21				
4	2.23-	17	46.79+	14.16-
8	2.50	16	43.98	12.37-
16	2.71	17	41.97	11.03-
32	2.88	17	40.35	9.94-
64	3.02	16	39.00-	9.03-

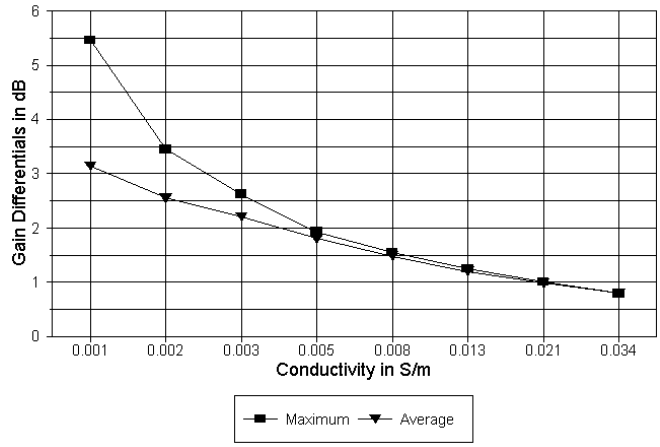


Figure 2—Maximum and average gain differentials for 4 to 64 radial systems and dielectric constant between 1 and 21 plotted against conductivities of 0.001 to 0.34 S/m.

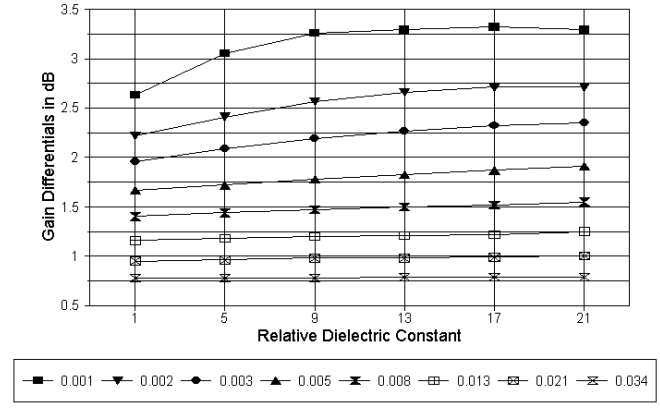


Figure 3—Maximum and average gain differentials for 4 to 64 radial systems and conductivities of 0.001 to 0.34 S/m plotted against dielectric constant between 1 and 21.

age values, the less the importance of the dielectric constant to antenna performance.

Two aspects of the graph are of special note. First, as the conductivity value rises above about 0.005 S/m, the difference between the maximum and the average values becomes insignificant. For soils with a conductivity of about 0.008 S/m, the value of permittivity makes no significant difference to antenna performance. Below a conductivity value of about 0.005 S/m, permittivity can make a considerable difference in performance. Second, at the highest values of conductivity explored, the overall change in gain between 4 and 64 radials falls well under 1 dB, regardless of the permittivity value.

Figure 3 illustrates the same point from the opposing perspective of permittivity. The graph plots gain differentials for the span of 4 to 64 radials for each level of conductivity against dielectric constant. This graph replicates the conclusion that wide changes in the dielectric constant make little difference to soils with conductivities above the 0.005 S/m level. However, the chart adds another conclusion to our list. Changes in the dielectric constant value in the region from 1 to 9 makes a far greater difference in performance than values above that level.

Similar conclusions derive from examining the source resistance data in the same manner. **Figure 4** plots maximum and average differentials of source resistance, with the lines beginning to merge at the 0.005 S/m level. Above that level of conductivity, differences in permittivity have little effect on the source resistance. To take the obverse perspective, Fig. 5 plots the source resistance as a function of the relative dielectric constant for each sampled level of conductivity. Except to repeat the initial conclusion, one might well ignore the lines for conductivity values above 0.005 S/m. The curves for lower values of conductivity show an interesting pattern of effects from changing values of permittivity. Differentials do not peak at the lowest combination of conductivity and permittivity. Instead, peaks occur at different levels of permittivity for each of the lower values of conductivity.

The upshot is that higher levels of conductivity show great regularity in gain and source resistance values as they vary while we increase the number of radials in the system. However, at lower levels of conductivity, permittivity plays a more variable role in setting maximum and minimum values of gain and gain differential, as well as source resistance and resistance differentials. To explore this a bit further, let's take a short walk through some of the tables.

A Short Look at the Tables

In **Table 3-1**, we have the lowest value of conductivity examined: 0.001 S/m. Lower values of conductivity have been measured for some antenna sites. However, this table includes

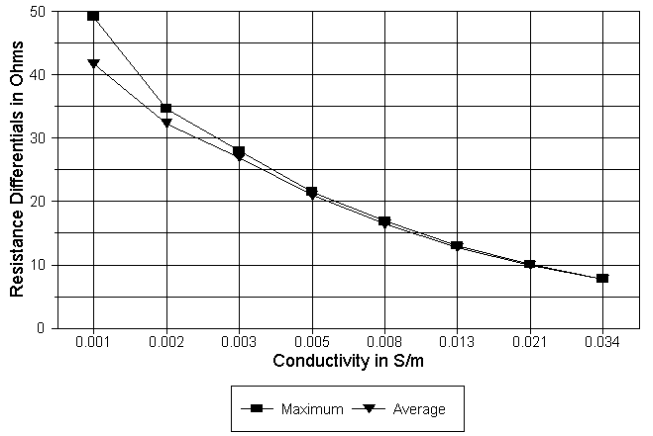


Figure 4—Maximum and average source resistance differentials for 4 to 64 radials systems and dielectric constant between 1 and 21 plotted against conductivities of 0.001 to 0.34 S/m.

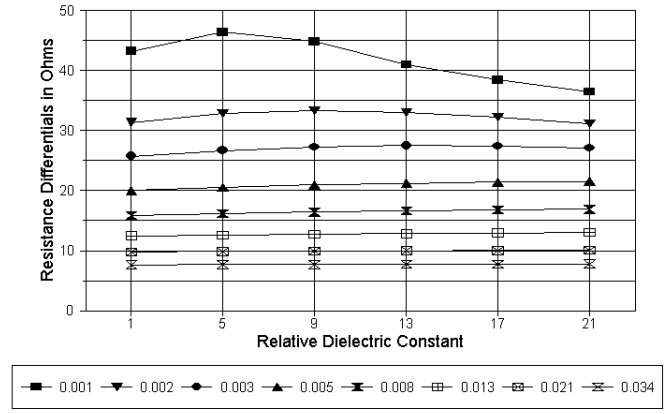


Figure 5—Maximum and average source resistance differentials for 4 to 64 radials systems and conductivities of 0.001 to 0.34 S/m plotted against dielectric constant between 1 and 21.

the lowest value on the ARRL chart. In fact, the value 0.001 S/m with a dielectric constant of 5 is the Very Poor category. Interestingly, this combination yields the highest source resistance, even though the lowest gain occurs at a conductivity of 0.001 S/m and a dielectric constant of 1. Although soils with very low conductivity and very high dielectric constant are improbable, the lowest values of reactance occur with the highest values of permittivity for radial systems between 4 and 16 radials. However, for larger radial systems, the lowest reactance values occur with a dielectric constant of 5. (Contrast this variability with Tables 3-5, 3-6, 3-7, 3-8, where the lowest reactance values for all sizes of radial systems occurs with the highest values of permittivity.)

A change in conductivity from 0.001 S/m to 0.002 S/m makes a large difference on the modeled gain performance of the test antenna at lower levels of permittivity, as shown in Table 3-2. However, when we reach a permittivity of 9 (close to the standard of Poor soil), the differences from a conductivity of 0.001 S/m have shrunk considerably. Nevertheless, at this dielectric constant level, differentials between 4 and 64 radial systems level off in the 2.6 dB region—which is still sufficient reason to increase a radial system to the maximum feasible size.

In both **Tables 3-2** and **3-3** (for conductivities of 0.002 and 0.003 S/m, respectively), we continue to find that the minimum gain values and that maximum source resistance values do not occur at the extremes of the chart. Indeed, minimum gain shows a progression toward a higher values of dielectric constant with increases in conductivity. Maximum source resistance shows the same trend, but does not wind up in the same dielectric constant box as minimum gain.

Table 3-4, for a conductivity of 0.005 S/m represents a broad middle set of grounds with charted dielectric constants in the 12 to 14 range. In the table, minimum gain covers a broad range of permittivity—9 to 17, with the peak source resistance appearing at a permittivity of 17. However, for any size radial system, the curves are beginning to broaden. With 64 radials, the modeled gain varies only by 0.19 dB over the entire range of dielectric constants. Nonetheless, considerable variation remains in both the gain and source resistance columns for small to large radial systems.

With **Table 3-5**, we enter the region of greatest regularity in phenomena, indicating the reduced influence of dielectric constant—or, what amounts to the same thing, the domination of conductivity as the major ground factor affecting antenna performance. Both gain and source resistance maximums and minimums occur with a dielectric constant of 21. **Tables 3-6**, **3-7**, **3-8** reflect similar trends. With Very Good soil, or its nearest tabular counterpart (0.034 S/m and 21), the difference between 4 and 64 radials models out at under a 0.8 dB difference in gain—at least for the particular model of a monopole and radial system used in this exercise.

Our quick stroll through the tables should be somewhat of a revelation, especially when set against the standard soil quality values displayed in Table 2. In most instances, for a given value of conductivity, the associated value of dielectric constant in the standard listing reflects one of the minimums or maximums, as relevant from the broader modeled Tables 3-1, 3-2, 3-3, 3-4, 3-5, 3-6, 3-7, 3-8. At the lower values of conductivity, the dielectric constant not only plays a larger role in determining modeled antenna performance, but as well, that influence varies from one value to the next of conductivity. The standard listing in Table 2 tends to capture the maximum combined influence of both factors.

As a consequence, the use of the "short" list of four values (Very Poor, Poor, Good, and Very Good) tends to be a fair sampling of the soil quality properties as they influence modeled vertical antenna performance. The large stretch between the values associated with Good soil (0.005 S/m and 13) and those associated with Very Good soil (0.0303 S/m and 20) becomes quite reasonable in view of two factors. First, as conductivity increases greatly, the amount of change in antenna performance for any given size radial system between conductivity steps decreases significantly. Second, variations in the dielectric constant become relatively insignificant. Hence, the seemingly odd values associated with Very Good soil become as good as any other figures for conductivities above 0.02 S/m.

There are, of course, very good mathematical reasons for the patterns that we have observed. However, by presenting the calculations in combination with a standardized vertical antenna model, the consequences of those calculations become perhaps a bit more vivid—and perhaps even a bit more useful in establishing patterns of reasonable expectation for antenna models. Of course, the results given here apply to 160 meters and to a $^1/_4$-λ monopole with a buried radial system. Rather than extrapolate the results too far from the situation modeled, one should develop a comparable systematic modeling study for such other antenna system structures and frequencies as may be of greatest interest.

We have so far limited ourselves to single radial systems and single element vertical arrays. In the next episode, we shall look at ways to develop models of more complex situations, along with some limitations of using the *MININEC* ground as a substitute for actually modeling radials. ■

Blazing Rotators

Bob Brown, NM7M

In my article on band planning for a contest that appeared in the September/October 1998 issue of the *NCJ*, I made mention of my effort to do it by computer modeling. I used my little contest game, *SOLAR MAX*, and put in some artificial intelligence (*AI*) to make it more impersonal, moving it away from whatever bias I might have. While I was able to make the AI focus on contacts, multipliers or score, the printout included another item, the beam heading for each 30-minute period. I put that in on purpose, going back to a phrase, "Blazing Rotators" that was often used by an old QRP friend, W5LXS. My idea was to see the degree to which changes in beam headings were involved in the DX contest results.

The answer was simple: "Not much." The AI would focus on the region of greatest potential and stay there until it was exhausted. Only then did it move to another heading to start the quest over again. But some changes were dictated by propagation considerations, depending on the time of the last change in beam heading. Of course, all of this is organized around the idea of a single operator in the USA working on one band at a time and with 2 points per contact. Therefore, it would be useful for the classical "hunt and pounce" technique, essentially for a "slave" in the "master/slave" relationship that one notes during contests.

Of course, there are other ways of operating in a contest and, on occasion, different ways of scoring maximum contacts. The biggest differentiation has to do with location and the matter of "call recognition." The possibility of operating from different QTHs that will raise one's score is really a propagation matter (exploring the ionospheric aspects of various locations to gain some degree of advantage). In that regard, let's look at some of the matters that come up—location and distance to centers of amateur activity, atmospheric and man-made noise as well as propagation. That done, it then becomes considerations that would be settled by the trade-offs that go with contest rules about scoring, any forms of assistance, logistics and, last of all, finances and facilities.

Having said all that, let me put my nomination on the table for the best DX contest location—the Cape Verde Islands (D4). To me, selecting D4 for an operating location during a contest has merit because it is close to the major centers of Amateur Radio activity, as can be seen from the orthographic projection centered on it as depicted in **Figure 1**. By way of contrast, "splendid isolation" would be Western Samoa, surrounded by nothing but ocean for thousands of kilometers. But a better view of the location of the Cape Verde Islands is shown by the azimuthal equidistant map in **Figure 2**. In that figure, the distance out to the edge of the dark half of the Earth is 10000 km, putting Europe and North America within "easy reach," but Japan and Oceania would be at "arms length."

Another advantage to the Cape Verde Islands is that they are also "iono-

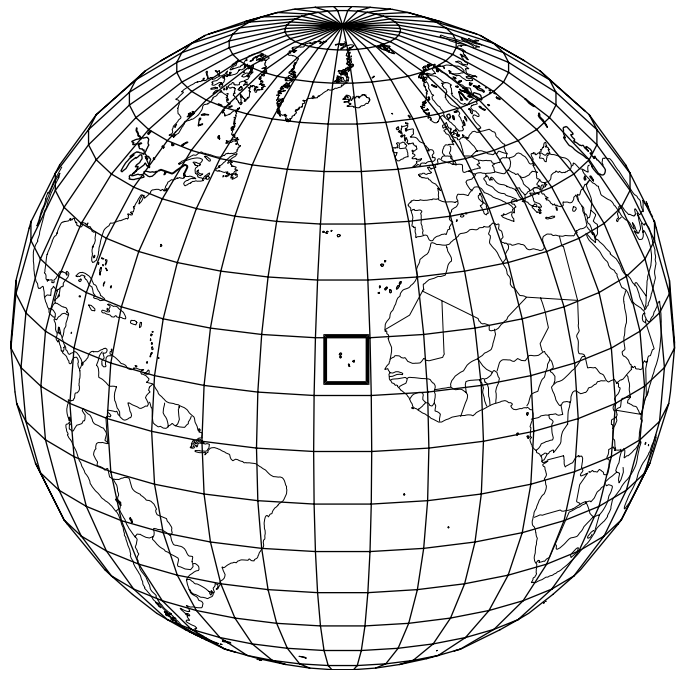


Figure 1—Orthographic map projection centered on Cape Verde Islands (16N, 24W).

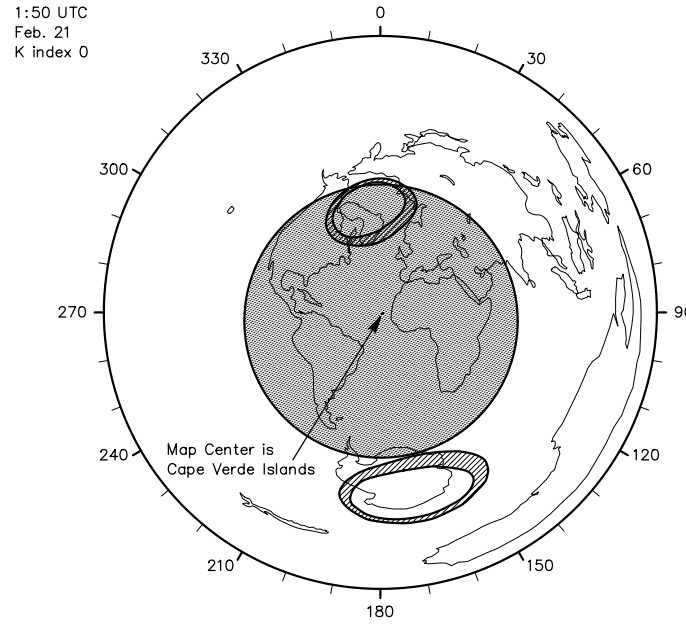


Figure 2—Azimuthal equidistant map projection centered on Cape Verde Islands. The map shows both auroral zones and distance is linear on the map, the outer boundary is located 20000 km from the center.

spherically correct." The "correctness" has to do with the fact these islands are at a low latitude, where the F-region is robust and largely immune to the magnetic disturbances that the solar wind can trigger in the distant Polar Regions. Those negative factors would lower the critical frequencies at the high latitude ends of paths; thus, the result would be a lowering of MUFs on paths toward the auroral zone(s).

It's clear from the figure that a "strategic retrenchment" to shorter paths or lower frequencies would enable a contest operator to keep going, hardly missing a QSO in the log. But that would depend on him having a sense of what kind of propagation or contest level would be expected in normal conditions. Any time the QSO rate falls below expectations, it would be good to have an alternative band in mind so a quick QSY could pick up the slack.

Beyond its "correctness," around the end of the year when DX contests are scheduled, centers of major thunderstorm activity will have migrated away from the Cape Verde Islands. They move down toward South Africa and Madagascar. Such considerations (the distance from centers of thunderstorm activity) are vital to contest operations from low latitudes. After all, QRN propagates just like other RF signals and has known variations, geographically and in time.

There is one major difference, however. The propagation of man-made signals on the bands is governed by the motion of the terminator that divides sunlit regions from those that are in darkness and not something subject to statistical variations. Signals of atmospheric origin, though, come from weather systems that are far more variable and with statistical fluctuations of noise power to match.

The human condition being what it is, we tend to make plans more on known certainties or wishful thinking with regard to the possibilities than probabilities. Thus, beyond the allure of an exotic attention-getting call sign, contest plans for locations are made more often using the features of the terminator than average noise conditions. If the source of QRN seems more remote due to seasonal migration of thunderstorm activity, so much the better, but that factor is not the one that everything should hinge on. Put another way, statistical probabilities for QRN affecting operations are less likely to be the dominating factors in making contest location choices. Generally, the decision is more a matter of MUFs and signal absorption and little thought is given to the third factor that makes all the contacts possible; low noise.

Therefore, some risks are taken which are greater the closer the location is to the centers of thunderstorm activity (South America, South Africa and Indonesia). However, abnormal weather patterns on a global scale and just at contest time can serve to make the risks even worse.

But, enough of this digression. After those early laudatory phrases about the Cape Verde Islands, I should qualify my praise a bit, particularly with regard to trying for contacts on the lowest band—160 meters. Typically, contest DXpeditioners make use of vertical antennas for a variety of reasons, the most important being that it is well-nigh impossible to get a half-wave dipole up to a height where it is not a "cloud warmer." But at the latitude in question, the earth's field is not far from being parallel to the earth's surface. This fact puts the E-field of waves from a vertical antenna at a disadvantage because of its poor O-wave coupling into the ionosphere.

With that in mind, it doesn't take much thought to take the results into consideration for the situation that will exist at equatorial latitudes where magnetic field lines are running N-S and essentially parallel to the earth's surface. Now horizontal antennas become important, at least in trying to propagate signals in the E-W direction.

There, the E-field of the horizontal antenna is parallel to the magnetic field and, again, no magnetic forces come into play when the RF E-field drives the motions of ionospheric electrons. That is another case of 100% coupling of RF wave energy into the ionosphere. By the same token, a vertical antenna is a lost cause for E-W propagation at the magnetic equator, just like the horizontal one at the poles.

But there's a rub in this discussion—how high a horizontal antenna can be raised. Put another way, the classic dipole up at $^1/_2$-λ is out of the question on 160 meters. The best situation I am aware of was the XZ1N DXpedition where the horizontal antennas were atop their hotel at heights of 100 feet or 0.18-λ.

So that is another parameter to be folded into the discussion in planning a DXpedition for contest time—how tall is the hotel? In addition, an inquiry ought to be made about what can be strung up on the roof. The 5V7A DXpedition to Togo a few years back had a $^1/_4$-λ balloon-supported vertical starting 20 feet above their hotel roof complete with elevated radials. That hotel had a very considerate management, I'm sure! But would they have tolerated a dipole too? Even at only 80 feet, it would be better than the vertical for E-W propagation and would have added to the DXpedition.

This discussion has wandered away from the original thought—changing beam headings and such during contests and DXpeditions. But no matter, it is all of the ideas that count, not just the first one that started the discussion. An interesting thought to end on is that a contest will be the final summing point of a contest DXpedition's hard work. This intense energy period that tops off all the work resulted from the long planning and hard work that went into it. It has been said by the many who make these long and frequently difficult contest DXpeditions that the actual short contest operating time makes it all worthwhile, and I believe that is truly the case. The operators that stay at home benefit from the discussion of the factors that must be taken into consideration because they will be there waiting at the opposite end of the path the DXpedition is attempting to maximize.

73, Bob, NM7M ■

A Guest Spot on the Desert Radio Contesters Team

Henryk Kotowski, SM0JHF/K6JHF
sm0jhf@arrl.net

I took a trip to California in the spring of 2000, and I was very anxious to meet some of the famous characters behind those big signals that I've encountered so many times from so many places. I had sent several e-mails out in advance of my visit, but frankly I was a bit disappointed that I received only one invitation to participate as a guest operator on a contest team during my visit. This came from Don Doughty, W6EEN.

I'm confident that Don needs no introduction to the readers of the *NCJ*—or any other serious contesters for that matter. He's been around for a long time. Even though in recent years Don does less of the contest operating himself, his W6EEN call sign is still heard in most major events, both on CW and SSB.

I wish to commend his philosophy—which I, by the way, share—that if you are going to build a contest station and put in lots of hard work and effort maintaining it, then make sure it's active. I myself have reached the age where working contests full time is not as much fun as it once was.

My visit was late in March, and the Desert Radio Contesters, NE6N—which is the group that uses Don's QTH for multi-op sessions—planned some modest participation in the CQ WW WPX Contest. I was scheduled to arrive on Saturday.

On my way out to Don's place, I decided to avoid traveling the freeways. I wanted to do some sightseeing and take a few photographs along the way, so I drove the scenic routes through the mountains. By the time I reached Palm Desert, I was quite exhausted.

Finding Bermuda Dunes, where his station is located, was more difficult than I had anticipated. I could plainly see it on my map, but I simply *could not* find it. I spotted some antennas and I thought I'd finally located it. No, just one tower, that couldn't be it!

Some advice to prospective visitors: get a really good map with lots of detail—Bermuda Dunes is a small place between Indio and Indian Wells.

When I eventually stumbled upon the station I was instantly impressed. While not much grows in this desert climate, this antenna farm is definitely an exception! How about a 3-element 80-meter rotatable Yagi, *and* a 4-element 40-meter Yagi, *and* a 3-Yagi selectable stack for 10 (just to name a few)?

The house, surrounded by trees, at first looks quite small (perhaps this illusion is due to the 100-foot towers near by). It isn't—it's spacious. Guest operators will find the accommodations there better than those in many expensive hotels.

Soon after I arrived, another guest operator showed up—Ulli, PA5AT (of the PI4COM team). I consider this further evidence that it is not easy to find a host for an impromptu contest gig in Southern California. Kudos to Don and the Desert Radio Contesters!

The backbone operator of the DRC team is Doug, N6RT, who commutes all the way from Los Angeles. Doug has been very successful in the single op category and is a real fighter. Some of the other regular team members that I met that weekend were Ron, K6XC, and Norm, W6ORD. (And Murphy, of course.)

The operating position is configured for both single and multi-single operation, which is not a trivial matter consid-

The section of Don's house where the radio room is located. The tower in the background holds the 80-meter Yagi and the 10-meter stack.

Norm Friedman, W6ORD (in the foreground), and Doug Brandon, N6RT, in the heat of the battle during the 2000 WPX Contest.

ering the number of rotator controls and antenna switches that must be readily accessible in both instances.

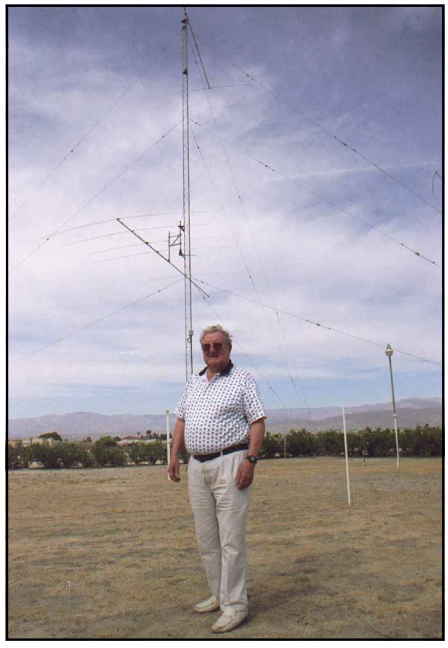
I'm a firm believer of the old cliché "one picture is worth a thousand words," so I've packed in a few thousand more words here by including a collection of pictures. I think they do a fine job of showing the details of this station. Don's hospitality and generosity are impossible to capture on film, but rest assured, they are as praiseworthy as the hardware.

While in California I also got the chance to attend the DX Convention in Visalia. Seeing the names and call signs on the badges of hundreds of people was a bit overwhelming. I felt as if I was being confronted with a huge West Coast pileup—and hopelessly hobbled by the lack of a computer to log them all and check for dupes... Perhaps long-term exposure to contesting has resulted in subconscious reflexes in my brain, but I doubt I'm unique in this respect.

Traveling and meeting hams all over the world has taught me that many consider you only as a point in a contest or as a source for a QSL card for an award credit, but the idea of real friendships through Amateur Radio does not seem to be flourishing.

For me, a radio contact is equivalent to meeting someone in person. And face to face encounters just serve to verify that there *are* actually real people behind the call signs, the contest exchanges, the points and the multipliers. ■

A view of W6EEN's impressive antenna farm.



Don Doughty, W6EEN. The tower behind him supports a stack of 20-meter Yagis.

Ulli Grunow, PA5AT (in the foreground), and Ron Luttringer, K6XC, take their turns at the operating positions.

DX Spotting and Networking in Contesting—Past, Present and Future

David Robbins, K1TTT
k1ttt@berkshire.net

In the beginning...
Long ago and far away...
Back in the good ole days...

Well anyway, let's take a look back. Many years ago (and in some areas still today) voice repeaters were used for passing information about DX stations during contests or just for plain DX chasing. This was adequate for a small area (as it was only limited by the repeater coverage) but it required the operator to listen to a radio tuned to the repeater in addition to the radio he was operating. You could request repeats, but only at the expense of having to pick up another microphone and interrupt the other operator. Even then, you had to hope that they remembered what they had just said—sometimes no small feat by late in the contest.

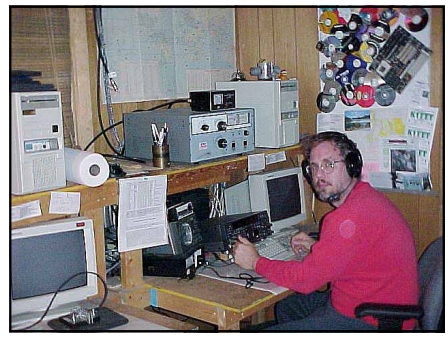
Then along came packet radio. The first attempt at using packet radio in contesting that I know of was in the 1986 ARRL DX CW Contest. Spots were typed by hand and broadcast using the UNPROTO mode via a string of digipeaters from Albany, New York through Massachusetts, and into southern New Hampshire. This was limited to a relatively small number of digipeaters (3 or 4 in the first couple of tests—if I remember correctly).

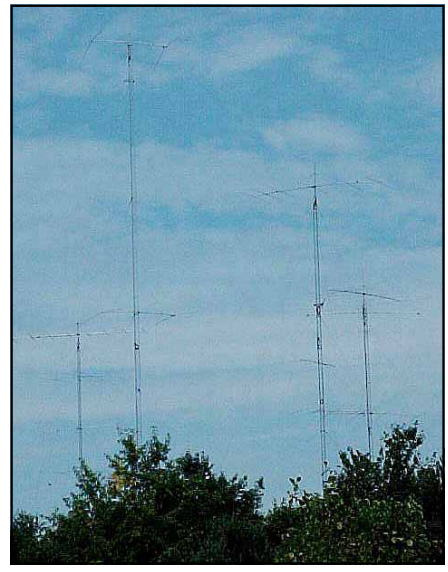
The big advantage was that you didn't have to listen for spots or pick up a mike to report them. You could just type in your information and post it to the group. You could also look back through a short history of recent spots on your screen. Depending on the capabilities of your dumb terminal, and how much other junk you received while monitoring the frequency, you could view 10 to 20 spots at a time.

Enter Richard Newell, AK1A. The *PacketCluster* program first appeared shortly after those initial tests. This provided a way for the distribution of spots to multiple stations using real connections with a capability that assured that you didn't miss spots due to collisions. It also provided a standard format for entering and viewing data that survives to this day. Shortly after that I wrote a program that amounted to the first "spot sucker." It ran on a RadioShack Model 4p computer and allowed a group of locally connected users in western Massachusetts and eastern New York to receive and send spots through a single connection I maintained to K1EA on 2 meters. Before long (and with much assistance from K1EA donating the proceeds from the sale of his *CT* contest logging software to the YCCC packet network), additional PacketCluster nodes were added in New England. The new nodes were linked on 220 and 440 MHz to remove the node-to-node traffic from the user frequencies—primarily located on 2 meters.

At the same time, K1EA added "DX Spot" capability to *CT* to make it even easier to gather and send the spots.

Several times over the years there have been various attempts to extend the packet spotting network. There were (and may still be in some areas) HF links. HF links were typically slow and hard to maintain as the connection had to be run continuously and was limited by the baud rates allowed on HF. Some Caribbean expeditions tried linking back to their home club networks via HF—with limited success.





There were various routes through the North East Digital Association (*NEDA*) and similar VHF packet networks that had grown up mostly for linking mail-type bulletin boards. These were met at times with bans on spotting traffic, automatic timeouts on connections, and local user complaints that resulted from the occasionally high volume of real-time traffic.

The time sensitivity and high volume of traffic were, and still are, the biggest problems faced by DX spotting networks. Delays on the order of just a few minutes may mean that you jump in after the pileup is already building and have to fight your way through all of the other users who got there first. Delays of 10s of minutes—which can occur on long links—often mean that the DX station is gone or that propagation has changed. Delayed spots may be useless.

This need to deliver spots quickly provoked many of the larger contest clubs to build their own independent backbone systems that could handle their real-time traffic. These networks were planned mostly around large stations that could support the antennas at the heights needed to maintain the relatively long VHF/UHF links between nodes. But even then, the links often broke—sometimes due to weather—and a single link failure could split the network into several pieces.

Most of the links were operated at 1200 baud, although some were upgraded to 9600 baud to help reduce delays. The 1200-baud links were slow, and prone to backing up during contests. The 9600-baud links required modified radios and special TNCs, and were more likely to fail due to equipment problems or poor propagation.

Enter the Internet...

There were several experiments with linking PacketCluster nodes via telnet connections. My *DOS*-based *Telnetx* program (now *WinTelnetx* and available on my Web site free of charge) and some other packages like KA9Q's *NOS* programs could be used to connect nodes via the Internet. These links were often through Internet to RF gateways. This limited the speed to that of the RF link, but this did allow bypassing of large parts of the RF network. The result was improved reliability. As more and more users gained access to the Internet, these gateways expanded and added

capacity. Many of these gateways are still being used to connect smaller networks together.

Eventually Internet-capable node software was developed that allowed users to connect directly to the node without having to go through other gateways. Even more importantly, this allowed nodes to connect to each other directly via high speed Internet connections.

AR-Cluster is a program that is being used in many of the newer nodes in the US. It is an *MS-Windows* program and provides direct node-to-node links via the Internet and also user access via telnet. It also supports packet radio access via third party KISS mode TNC drivers.

CLX is a free package that runs under *Linux*. It is popular in Europe and other parts of the world and provides many of the same services as the *DOS*-based *PacketCluster* program and *AR-Cluster*. There are a few other programs (*Clusse*, *DXCluster*, and maybe a couple more) but I believe *PacketCluster*, *AR-Cluster* and *CLX* probably account for those programs being used in 99% of the nodes presently worldwide.

All of the existing programs share a backbone protocol that was designed by AK1A for the initial RF linking of PacketCluster nodes. This protocol allows for the exchange of DX spots, announcements, "Talk," "Conferences," "Mail," "User Data" and housekeeping-type information between the nodes. The protocol has a limited capability to control the distribution of data—basically all it can do is limit the number of "hops" that the information can make as it travels between the nodes. This forces the network configuration to be linear or "star" connected so that loops are not formed where DX spots and other traffic ends up traveling around in circles.

Unfortunately, this arrangement limits the network by preventing the use of redundant links that could improve speed and reliability.

With the advent of the World Wide Web, various sites started linking Web pages to spotting nodes so that users could view what was happening around the world without having to connect to a particular node. There are also links between nodes and Internet Relay Chat (*IRC*) servers that distribute the spots. These can be accessed by either generic IRC client programs or by programs like *DXTelnet*, *WinTelnetx* and by node software like *AR-Cluster*. When it's all working correctly, these nodes and other Internet sources provide a worldwide network of DX information.

So What Good Is It?

There have been many discussions over the years about the usefulness of some of this information. Some node sysops say it is too much information for the network to handle. It is true that some of the old RF-linked nodes with lots of 1200-baud users are overwhelmed by the volume of spots that are available. This is why many new nodes are being set up using Internet connected backbones and are accepting users via telnet in addition to RF.

As an example, my dialup line at 26.4 kbps can support 15 to 20 telnet users and various node connections, and still leave me enough bandwidth to surf the Web, upload WebCam pictures to my Web site and download e-mail messages at the same time.

The newer node software also has improved filtering capability so that each user can tailor the spots that are sent to them from the node. This can further reduce the RF traffic by limiting the spots that are transmitted to those that the operator wants to see.

Some operators say it is too much information for their brains to handle. For those folks, I usually recommend setting filters to see only the spots from users in their local region. In many cases this can reduce the number of spots seen by 90% or more. Here in New England typically 80 to 90% of the spots distributed come from outside of the first call area.

Other users feel that a great deal of the information is useless as, in many cases, stations that have different propagation are generating it. I have made several tests where I have compared spots from only US nodes to spots coming in from European nodes. Granted, there are times when Europeans are spotting stuff that I couldn't hear or work. But then again—why would I be listening for JAs on 80 meters at noon local time when the Europeans are starting to work Asia at their sunset?

What I was amazed at were some of the things that were spotted by European users that were never spotted stateside even though the stations were plenty loud enough to be worked here. On non-contest weekends I have many times listened to relatively rare African stations sitting there running Europe after having been spotted several times on their nodes. After 10 or 15 minutes I would spot them on the YCCC network and immediately the pileup would switch to stateside. I have seen similar results out of the Pacific area, but have not had enough access to the JA cluster information (until recently) to do specific tests. *The more ears the better*—I say!

For those users who can't handle the

A Glossary of Selected Terms

Telnet—Can refer either to the program by that name or the simple protocol used to transfer simple text data over a network. The program is essentially a dumb terminal program that is available under *Unix*, *DOS* or *Windows*. Many *Windows* users don't know that they have one or two telnet programs that come free with *Windows*. There is normally a c:\windows\telnet.exe program that is rather crude and the *HyperTerminal* program often found under the Start Menu/Accessories program group that is a bit better. *DXTelnet*, *WinTelnetx* and many other programs are available that provide more features.

Spot Sucker—A program that allows you to monitor one or more sources of DX spots for your own station or for distribution via another spotting node. *DXTelnet* and *WinTelnetx* are a couple of programs that are commonly used. Some node software also has built in spot sucking capability. *AR-Cluster* can suck spots from the OH2AQ Web site; *CLX* can establish multiple links to get spots from other nodes.

Internet Relay Chat (IRC)—This is the generic term for the various groups of servers that are linked together to make Internet discussion channels. Think of it as an Internet-based digital roundtable. These allow for various combinations of one-on-one chats or group broadcasts. Some client software also allows for audio and video clips or program transfers between users. A simple *Java*-based client program is available on the #CQDX IRC Web page, **dx.qsl.net/cqdx/**.

Web Resources

K1TTT *WinTelnetx* software: **www.berkshire.net/~robbins/software.html**
IK4VYX *DXTelnet* software: **www.qsl.net/wd4ngb/telnet.htm**
AR-Technology node and logging software: **www.ab5k.net/**
The *CLX* home page: **www.lurpac.lancs.ac.uk/~clx/clx.html**
The XX-Towers PacketCluster page: **www.cestro.com/pcluster/pclusoft.html**
The DX Summit Web site by OH2AQ: **oh2aq.kolumbus.com/**
A listing of nodes available via telnet: **www.cestro.com/pcluster/telnet.html**
Information about the #CQDX IRC network: **dx.qsl.net/cqdx/**
More node software info: **www.cestro.com/pcluster/**

volume, each of the different node programs offer capabilities to filter spots. These filters can filter out spots based on the originating node or user, country, band, mode and various other factors. The *PacketCluster* software lets the users set some filters, but requires the sysop to set other filters for each user. *AR-Cluster* now provides a user interface for setting all the filters. *CLX* has sysop-configurable commands (that the end-user can select from) to get a limited number of different combinations of filters.

Some of the logging programs also provide different ways to sort and filter DX spots. For instance, in *CT* you can select to see spots only for the band you are on, and only if they are for multipliers or QSOs that you need. It also has a "Band Map" feature that lets you view the spots near your current operating frequency so you can tell who is QRMing you.

But, *What Good is It?*

The biggest advantage I have seen during contest operations is in the morning on the East Coast. At this time the Europeans are spotting African and Middle East stations that we can't hear on 10 and 15 meters. But by collecting those spots, we can be there listening as the band starts to open and know who is where on those bands before anyone else stateside can copy them. This is even more fun using the Band Map feature of *CT*, you can let it fill up and then just dial up the band and see who you can hear, and you'll know where the bands are opening up to. Having this 5- or 10-minute advantage before those stations are spotted on the stateside networks can often result in working several multipliers quickly that otherwise may have huge pileups to wade through later in the day.

These spots can also provide several reference stations on the band to use to monitor propagation. For instance, the Europeans will frequently spot several of the larger stations that are known to have good signals here. If they are real weak here, then we know the band is not open very well yet. If they have good signals, however, we'll know it's time to stake out a run frequency—even if the band doesn't sound particularly open. We can also use those spots to determine if the bands are open via the southeast skewed path or northeast via the direct path.

Similar use can be made of the early morning 40- and 80-meter spots that originate from the West Coast. They are often helpful in determining who is under the large morning pileups. From that we can figure out if we have a chance at working the station without having to listen through the pileup to identify who it is first. This can save quite a bit of time in that short morning gray line opening. It allows us to bypass the pileups we don't need to be in.

In addition, overnight spots from the West Coast can land us multipliers along the Pacific sunset gray line that other stations miss or have to wait in pileups for later. It is often much easier to work KH6, ZL, VK, KH0 and many of the other islands at their sunset than at our sunrise, when everyone on the East Coast is waking up. Having spots from the West Coast, VK or JA networks can find them for us without requiring us to sacrifice valuable time running Europe.

Fun and Games

There is additional fun you can have with worldwide spotting networks as well. Watching yourself get spotted in Europe or Asia is interesting. Having a station spot you who you haven't worked—and then calling them and having them come back—is a funny way to make a QSO. Seeing a multiplier you haven't worked posting DX spots on a band is a good indicator that if you want to work them you should call CQ. Spotting a European with a comment of "deaf"' when they are running Asia, then hearing them come up several S units and "listening for stateside" is a good indication that they saw your spot and changed antennas. This may not be a good way to make friends though.

Spotting a group of VKs ragchewing on 10 meters—and seconds later having one of them comment that they have just been spotted—can be a good laugh. You do have to remember now that when you make a DX spot, there is a good chance that it will make it around the world, even if you don't know how it gets there.

Where Do We Go from Here?

Worldwide Spots

The infrastructure is mostly there now to support a world-wide network, and indeed much of the world is already sharing real-time DX information. Some additional work needs to be done to get reliable sources and distribution methods. It would really be nice to have a couple of very reliable high-bandwidth servers that could serve as redundant world-wide clearing houses for DX spots and other information. This would give other nodes good places to go to get all the available information without having to rely on spot suckers or relaying of spots through other nodes that may filter or otherwise limit them.

At the present time I can suck spots from several areas of the world and combine them into one stream with *WinTelnetx*, but it is not adequate for much more than our local node use. The DX Summit Web site collects spots and distributes them via a Web page and IRC, which is nice, but it requires software that is capable of gathering them from there and putting them into some logging programs or for general distribution.

Going to a "MegaCluster" node—like AB5K—is convenient, as that gives more spots from one source all ready to feed to your node. But there really isn't an organized clearinghouse for worldwide spots.

Smart User Software

AR-Technology has a contest logging program that allows access to some of the advanced spot information available from the AR-Cluster. Even more integration between user programs and the network can be done, I'm sure. And with the bandwidth available to deliver raw spots from around the world directly to more users, I see a need for user software that can pre-filter spots for the operators. Some of the basics of this are available now in programs like *CT* that can separate spots by band, multipliers needed and QSOs needed. But I see in the future added filtering based on propagation predictions, actual band conditions, rareness of the multiplier, operator ability vs current run rate and many other possibilities. After all, it's only software—anything can be done in software.

Automatic Spotting

With smarter user software it should be possible to send spots automatically when you search & pounce and work a station that hasn't been spotted recently. This would make it easier for operators since they wouldn't have to manually send spots. And it would keep band maps more up to date for everybody. This would help in finding more QSOs for multi ops since everyone calling CQ could eventually be spotted—not just the ones that someone else thinks are interesting. There are lots of users now who only spot what they think is really rare stuff because they don't want to be harassed for spotting "common" countries. But during contests every QSO counts, and at the start of each contest everyone needs every QSO and every country all over again.

Again, this is something that the Internet backbone and nodes could handle now by setting of spot dupe filters to only allow the same station to be spotted every 10 or 15 minutes on the same frequency.

Electronic QSLs

For many of the recent large expeditions you can go to a Web site and check to see that you are really "in the log." With this type of almost real time confirmation you can avoid making "insurance contacts" and let them work someone else instead. Of course we won't get rid of all the paper QSL cards until we can log into a Web site and make a "donation" to the expedition with

our credit card instead of sending green stamps with a card. There are some people trying to put together an on-line database of contacts that could be used for award confirmations. I expect that some of the larger awards organizations will begin to accept electronic confirmations in the relatively near future. Most of them already accept electronic logs from contests; it should be just a short step from there to accept them for other awards. Well, maybe not a short step, but not a very big one anyway.

Real Time Score Reporting

I have talked about this with a few operators. Some are absolutely against it and others think it would help their performance and be lots of fun. The idea is to have your logging program periodically send your score (just bottom line or maybe band breakdowns) to a central server that would then display the current Top Ten lists and/or your current ranking in your category. With some help from logging program writers and a Web server somewhere, this could probably be done soon. Getting enough participants to make it interesting may be a problem for a while though.

Real Time Central Logging

Way out... Instead of keeping your own log file you send contact by contact to the contest sponsor's central log. Just think, no more endless discussions of post-contest log manipulations on the reflectors! And real-time feedback on busted QSOs if the station you work doesn't log you correctly or vice versa. And at 0001Z Sunday night there would be no net on 3830 to collect scores, only to discuss the final results and congratulate the winners. There is still a lot of infrastructure to be built and software to write before this could be done. This is not technically hard, but the current infrastructure is not nearly reliable or fast enough to collect all the data, and not enough participants are equipped with full time Internet connections and computers yet.

Remote Stations or Operators

There are a few of these out there now, but I think there is lots more that could be done to refine the control and make them really useful in a contest environment. Improvements are probably needed in connection speed so there aren't delays in the audio and control to make for smoother operation. Better control—of radios, amps, rotators, switches—is probably needed in most cases. Just think about sitting in your home operating a station at some remote location. No travel time or cost, just an Internet connection to control the remote station. There are already some remotely controlled receivers available on the Web. The Kachina radio that plugs into your PC boasts easy remote control setup, look for more remote-operable commercial products in the near future. For those of you who want to see what it's like to be at a big station, look for some stations to have streaming audio on the Web this year or next so you can listen "over their shoulder."

Robot Contesting

As has been discussed on the CQ-Contest reflector: plug in your robot Friday night and come back from skiing Sunday to see how you did. Yes, there have been some QSO robots out there on CW, but they are not yet up to world-class operating capability, and probably won't be for some time. But give it time, and someone will pass the CW torture test in a contest environment. Way, way, out—someone will do it on SSB... probably about the same time that SSB is replaced by digital spread spectrum voice on the HF bands.

Summary

We have come a long way in the last 15 years or so. By making use of more of the capabilities of the Internet I expect to see even more changes in the next 5 to 10 years. Some of these may require worldwide coordination to set standards for network logging, score exchange, QSL delivery and other interfaces—much like the recent Cabrillo log format initiative.

A Rundown of the K1TTT Station

Towers
180 feet of Rohn 55 (40 meters)
150 feet of Rohn 45 (20 meters, vhf, 80 meters, 160 meters)
(2) 120 feet of Rohn 25 (10 meters, 15 meters, 80 meters)
60 feet of Rohn 25 (vhf)
40 feet of Rohn 25 (TV, WX)

Antennas
2 meters
13 elements at 60 feet on a Hy-gain Ham-IV

6 meters
5 elements at 60 feet on a Hy-gain Ham-IV
5 elements at 50 feet, fixed south

10 meters
6 elements at 120 feet on a Yaesu G1000SDX
4 elements at 90 feet on a TIC Ring
4 elements at 60 feet, fixed on Europe
4 elements at 30 feet, fixed on Europe
4 elements at 75 feet, fixed south

15 meters
8 elements at 120 feet on a Yaesu G2800SDX
4 elements at 90 feet, fixed on Europe
4 elements at 60 feet, fixed on Europe
4 elements at 30 feet, fixed on Europe
4 elements at 105 feet, fixed west
4 elements at 75 feet, fixed west
3 elements at 45 feet, fixed south

20 meters
6 elements at 150 feet on a Yaesu G2800SDX
4 elements at 105 feet, fixed on Europe
4 elements at 60 feet on a TIC Ring
3 elements at 50 feet, fixed south

40 meters
40-2CD at 80 feet on a Yaesu G2800SDX
40-2CD at 105 feet on a TIC Ring
Inverted **V** at 60 feet
Four-square at 4 feet with a homebrew switch

80 meters
2 elements at 150 feet, NE/SW switchable
Four-square at 8 feet with a Comtek switch
Inverted **V** at 50 feet

160 meters
Inverted **V** at 150 feet
Phased inverted **L**s, 120 feet tall
Beverages: 2 wires, 6 directions for 40/80/160

Station Equipment
10 meters
Kenwood TS-870S
Commander HF-2500
386DX25 with 5M of RAM

15 meters
Yaesu FT-1000MP
Commander HF-2500
386DX25 with 5M of RAM

20 meters
Yaesu FT-1000MP
Ameritron AL-1500
386DX25 with 5M of RAM

40 meters
Yaesu FT-1000MP
Commander HF-2500
386DX25 with 5M of RAM

80 meters
Kenwood TS-940S
Alpha 76a
386DX40 with 8M of RAM
Timewave DSP-599zx

160 meters
Kenwood TS-940S
Alpha 77
386DX25 with 5M of RAM
Timewave DSP-599zx ■

John Unger, W4AU
w4au@contesting.com

NCJ *Collection CD-ROM, 1973-1998* by the ARRL

I am a relative newcomer to contesting, but not to Amateur Radio (I have been a ham since 1956, when—as an excited 13-year-old—I received WN3GOI). Over the years I've come to rely on the excellent articles in *NCJ* and other publications to increase my knowledge of contesting, equipment and techniques. I began "serious" contesting in 1994, and started my subscription to the *NCJ* shortly thereafter.

You can imagine my delight when the ARRL released a two-volume CD-ROM set of all of the issues of *NCJ* from Volume 1, Number 1 in 1973 through the end of 1998. It's amazing to have 16 years of *NCJ* on these two small disks. After using them for a few months though, I have developed mixed feelings about their utility and usability.

In some ways, these CD-ROMs represent the best—and the worst—of what happens when you apply computer technology to the previously written word, especially if some of those original words were created without the benefit of a word processor.

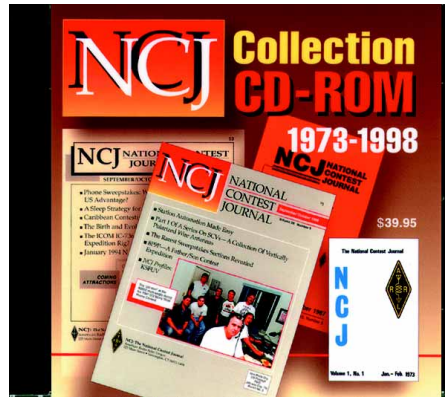
To create the CD-ROMs, each page of every issue of *NCJ* was electronically scanned, resulting in JPG or TIF graphics files. These were organized by year and then by issue. Each "issue" consists of the collection of its page images.

The CD-ROM includes a *Windows* program, *AView*, which allows you to browse and view an issue page by page. A separate search database is included that lets you locate a specific article by searching for words that appear in the title or the author's name or call sign. This index search is fast and easy to use, but its limited scope makes it difficult to take full advantage of the rich and varied information on the disks.

For those of you who are not familiar with digital file formats, what the JPG and TIF files represent are simple "photographs" of each page of each issue. They are graphic format files, *not* text files. What this all means is that neither the creators nor the users of these CD-ROMs can take advantage of today's powerful computer search engine technology to locate specific words or phrases within the text of individual articles.

This problem is my biggest complaint with the utility of the CD-ROMs. For example, you can not type in your call sign and search all the issues where it may have appeared in contest results tables to check how you did in past contests.

The only way the developers of this product could have avoided this dilemma would have been to scan each of the



individual pages with text recognition software that would then create a word processor-like file that could be readily indexed and searched by other software. This process is time consuming, requires lots of further manual editing and is probably not cost effective given the relatively limited market for the CD-ROMs.

Is this a serious shortcoming? It depends on your expectations and applications. Does it mean that these CD-ROMs are not a useful resource? Definitely not! For example, it is very easy and enjoyable to sit down in front of your computer and read through the back issues of *NCJ* and to print out those pages that you would like to keep on file.

Even though I would prefer to be able to search the entire text of each issue for key phrases or words, I have been able to make good use of the information on the CD-ROMs, and consider them to be an excellent reference and a valuable addition to any contester's shack.

The computer system requirements for viewing the CD-ROM collection are a Pentium or equivalent IBM-compatible PC with 16 Mbytes of RAM (32 Mbytes recommended), a hard disk with 6 Mbytes of free space, a CD-ROM drive, a Microsoft *Windows 95*, *98*, *or NT 4.0* operating system (*Windows 3.1* is not supported), and a minimum of 256-color video display (800 × 600 or larger is recommended).

The NCJ *Collection CD-ROM 1973-1998* (ARRL Order No. 7733) sells for $39.95. ARRL, 225 Main St, Newington, CT 06111-1494; 888-277-5289; **www.arrl.org**. ■

NCJ Profiles—A Contester in a Rus(h), Rus Healy, K2UA

H. Ward Silver, N0AX
hwardsil@wolfenet.com

What better nickname for a contester than Rush? Of course, it's a natural—just like this month's subject, Mr. Rus Healy, K2UA. A fixture on the bands from Western New York, Rush has been active for quite a while. His qrz.com listing shows that he's QRV through 10.4 GHz. How many of us can make that claim?

"I got the bug to do VHF/UHF operating while working for the League in the late 1980s. Zack Lau, KH6CP (now W1VT), was always building interesting stuff in the lab, the library was full of great reading, and there was an experimental air about the place. HF contesting is definitely where my heart is, but I'm still very interested in the higher frequencies as well.

"I progressed through building homebrew hardware for 222 MHz and up—that expanded my technical horizons a lot. I also built a rover setup that covers 50 MHz through 10 GHz. It is a wonderful part of my hobby—one that I don't get to enjoy enough these days. I've given something back to the hobby by helping a lot of guys around Rochester get their microwave stuff working right and by having a station that covers these frequencies on the air."

Rus is also giving something back to the contest world in general as the Atlantic Division representative on the ARRL Contest Advisory Committee.

With all the bands he's on, there isn't much of a between-contests time of the year. "I basically roll from HF to VHF/UHF/microwave interests with the seasons. Summer is dominated by the VHF and above events and the fall/winter period is, of course, set aside for HF. Because of the mostly separate seasonal nature of contesting activities on HF versus VHF, I can focus on the aspects of one type of contesting and then come back to the other one with a fresh perspective a few months later."

Many of us have considered what full-time ham radio must be like, and Rush has a good description of that on his resume. "After graduation in 1986, I went to work as a technical editor for the ARRL in Connecticut, where I stayed for seven years of turbocharged ham radio time. During that time I realized that my hobby is not Amateur Radio, but contesting.

"Working in Connecticut was a real blessing from the contesting perspective. Murphy's Marauders was a thriving club with about 40 members at that time—many of them were regular top-ten guys including K1CC, K1TO, W1WEF, K1RM, K1WA, K1KI and W1RM. I don't think

Photo by K1TO

there's any small contest club in the US today that has this kind of core group. I learned a huge amount from these guys. K1TO became my contest mentor and to this day remains my closest friend. Around 1987, I joined the Yankee Clipper Contest Club and benefited from meeting and getting to know a bunch of guys in New England, particularly K1EA, K1DG, K1AR and K1TR.

"During that time, I began to write the leads for the ARRL VHF contests and work on the *NCJ* as Handling Editor. This experience was one of my favorite things to do—aside from reviewing HF transceivers for the 'Product Review' column in *QST,* which was also my responsibility for the last few years I worked at HQ." I'm not sure one could pack much more ham radio into a single life.

Living in the Northeast really catalyzed Rush's ham radio interest, but the seed was sown much earlier. "Back when I was living in Indiana, Mike Cox, AB9V, did a presentation at one of our weekly Boy Scout meetings on caving. The Scoutmaster knew I was interested in ham radio [Rush is an Eagle Scout—*N0AX*] and he mentioned to me that Mike was a ham. I started to pester Mike about ham radio and attended my first National Scout Jamboree in 1981, spending at least half of my time at the K2BSA/4 tent getting really fired up about ham radio. That Halloween, the FCC tagged me KA9MAN.

"I upgraded to General in 1982. We moved back to eastern New York where I was issued N2DRR and gravitated heavily to the bottom end of the bands. I vividly recall listening to TR8JLD around 21023 every day after school—I was sure frustrated that I couldn't legally call him! After my junior year, I upgraded to Extra at the FCC office in New York City. What a thrilling time that was!

"When my family arrived back in eastern New York in 1982, I joined the Overlook Mountain ARC and found some very good contest Elmers—especially K5NA, NA2N and W2XL. K5NA had a good station and invited me over to operate and help with antenna work. I changed my call to NJ2L ("no job too large" according to K5NA), a call I kept until K2UA came along in 1998. I learned a lot from those experiences and also operated a few contests from K2CC, the Clarkson University station, while I was going to college a few miles down the road from there."

While many of us Midwest and West Coasters tend to think of everyone with a 1 or 2 in the call as having an unfair advantage, there is a lot of variation in that part of the country. "Where I live—30 miles south of Rochester—I'm a little closer to Detroit than Boston, and propagation reflects this. Although I don't do as well on the low bands as the East Coast does, the DX contest conditions are pretty favorable from the western part of New York.

"Domestic contests are another story. Although it's rural here, I'm near the center of the most populous region of the US, where so many domestic contest QSOs come from. This results in painful beatings in domestic contests—the skip zones are just too large. As an example, I have what seems like a perpetual S9+50 dB pipeline into West Texas and New Mexico, but not to the densely populated areas.

"Sweepstakes from New England was much better in this respect—the 4, 5, 8 and 9 call areas are the right distance away for good rates. This isn't the case from the WNY section, and as a result my upper limit in the CW Sweepstakes seems to be somewhere around 1150 QSOs. I had a wonderful time piloting VE3EJ's station, 120 miles west of me, to 1250 Qs in 1996—and earning my only Sweepstakes plaque in the process. But the real gem to me is finally breaking into the SOAB Top Ten in the CQ WW CW last fall.

One might expect that the low bands would certainly play well during Sweepstakes in the populous Northeast. "Forty and 80 are where it's at. The problem is that 40 during the day is not active enough. Eighty comes to life at night, of course. As N5RZ and N5KO and I have compared in the past, the 'money band' is shifted one band downward in frequency compared to the western part of the country. I make about 75% of my Sweepstakes Qs on 80 and 40. At this point in the cycle, there's activity spread across four bands at a time, but three of

them have long skip zones for us, diluting the audience quite a bit. Sweepstakes is actually much better from the East during low-sunspot years because it jams people onto 40 and 20 during the day, and then 80 and 40 at night.

"Sprints are awesome—contesting in its purest form. Some of the best contest operators on the radio are Sprint regulars, and it's great to be part of that. I'm skill-limited, rather than propagation-limited in these contests. It gives me something to work toward."

Nevertheless, K2UA is loud and is always a contender. Here's the situation at his QTH. "I have 7 acres with two towers in the back 4 acres, which is forested. The 105-foot tower rotates from 65 feet up. It supports a 4/4/4/4 10-meter stack and a 2-element 40-meter beam, as well as all of my VHF/UHF/SHF stuff. The back tower is 92 feet of Rohn 25 with a 5/5/5 stack for 15 and a 4/4 stack for 20 meters. I use various wires for 80 and 160, and three Beverages for receiving. I find them to be vastly superior to the transmit antennas on 40, 80 and 160.

"I expect to add a four-square for 80 and a phased array of some kind for 160 in the near future. I'll probably also add a small multiplier tower somewhere, mainly for working Caribbean and South American stations, and add a VHF/UHF antenna or two. This work will probably be rather slow in coming as my wife and I have a three-year-old and a seven-month-old who keep us busy about 20 hours a day!

Even though Rush, at 35, could be considered a younger contester, he sees what many of us do in the future. "I'm concerned about the dearth of new contesters in the US. The growth that contesting was experiencing 25 to 45 years ago would have made contesting the largest special interest group in our hobby today—had it continued. But it seemed to just about stop growing when I got my license at age 15. The young contesters of the '70s still dominate contesting's top-ten boxes today.

"Most successful contesters I know started in the hobby in high school and have stuck with it since. Ham radio isn't even on the radar screen today in high schoolers' minds due to other equally interesting, but higher-profile, technical pursuits for young people. If us 'young guys' are going to have anyone left to work in domestic CW contests in another decade or two, we're going to have to recruit them individually and teach them—that will benefit us all as teachers, as students, and as contesters.

"The thorough log checking that's going on today is great. N6AA's and N6TR's pioneering work has led to much more accurate results in many contests, and that makes the contests more meaningful to me. I think we've seen many contests deteriorate in overall quality because there are too many categories. With the exception of a 24-hour category in most 48-hour contests, I would like to see sponsors lean out the number of categories in their contests. A bad thing that's come with 'new' technology is a deterioration in operating ability. DX spotting networks enable bad operating practices. This is a hard problem to solve, but as a community we need to take a hard look at it and figure out a better way.

Team and club contesting is certainly taking activity to new levels in Europe and excites Rush, as well. "Being part of a successful team is a huge thing to me. I got involved with the K1TR/3 group, the Bird's Hill VHF Society, which resulted in some of the best ham radio memories I have. Later I began to operate with N2WK and company, mainly as a rover in the summer contests. The highlight of that experience was beating W2SZ in the multioperator category one year in the June contest. That was also a huge team accomplishment. I've also participated in multiop HF events at 4U1UN, 6D2X, K3LR, K5NA and others. Contesting is just plain 'where it's at' for me!

Contesters or not, we won't stay with an activity that doesn't result in good friendships. "Contesting has added a great dimension to my work-related travels. I've gotten to visit a number of contesting friends at their homes, on every continent. In terms of what excites me about contesting, I'd have to say that one thing overrides all the others—the camaraderie that we share. My very best friends are contesters, and my life is vastly richer as a result. I can't even begin to list all the great friendships I have that have resulted from contesting." Good memories and good friends—who could ask for more? ■

Contest Calendar

Compiled by Bruce Horn, WA7BNM
bhorn@hornucopia.com

Here's the list of major contests to help you plan your contesting activity through June 2001. The Web version of this calendar is updated more frequently and lists contests for the next 12 months. It can be found at **www.hornucopia.com/contestcal/**.

Please note that the Ontario QSO Party is now held one weekend earlier than in the past—April 21st and 22nd. Also, the Oregon QSO Party has been moved back to its Spring dates—May 12th and 13th.

As usual, please notify me of any corrections or additions to this calendar. I can be contacted at my callbook address or via e-mail at **bhorn@hornucopia.com**. Good luck and have fun!

March 2001

ARRL Inter. DX Contest, SSB	0000Z, Mar 3 to 2400Z, Mar 4
SLP Competition (SWL)	0000Z, Mar 3 to 2400Z, Mar 4
Open Ukraine RTTY Championship	2200Z, Mar 3 to 0159Z, Mar 4
AGCW YL-CW-Party	1900Z-2100Z, Mar 6
World Wide Locator Contest	0000Z, Mar 10 to 2400Z, Mar 10
Southern African HF Field Day	1000Z, Mar 10 to 1000Z, Mar 11
RSGB Commonwealth Contest, CW	1200Z, Mar 10 to 1200Z, Mar 11
QCWA QSO Party	1900Z, Mar 10 to 1900Z, Mar 11
North American Sprint, RTTY	0000Z-0400Z, Mar 11
UBA Spring Contest, CW	0700Z-1100Z, Mar 11
Wisconsin QSO Party	1800Z, Mar 11 to 0100Z, Mar 12
High Speed Sprint, RTTY	1800Z-2200Z, Mar 11
Alaska QSO Party	0000Z, Mar 17 to 2400Z, Mar 18
Bermuda Contest	0001Z, Mar 17 to 2400Z, Mar 18
BARTG WW RTTY Contest	0200Z, Mar 17 to 0200Z, Mar 19
Russian DX Contest	1200Z, Mar 17 to 1200Z, Mar 18
Virginia QSO Party	1800Z, Mar 17 to 0200Z, Mar 19
CQ WW WPX Contest, SSB	0000Z, Mar 24 to 2400Z, Mar 25
SLP Competition (SWL)	0000Z, Mar 24 to 2400Z, Mar 25

April 2001

SLP Competition (SWL)	0000Z, Apr 7 to 2400Z, Apr 8
SP DX Contest	1500Z, Apr 7 to 1500Z, Apr 8
EA RTTY Contest	1600Z, Apr 7 to 1600Z, Apr 8
UBA Spring Contest, SSB	0600Z-1000Z, Apr 8
DX YL to NA YL Contest, CW	1400Z, Apr 11 to 0200Z, Apr 13
Japan Int. DX Contest, 20-10m	2300Z, Apr 13 to 2300Z, Apr 15
MARAC County Hunter Contest, SSB	0000Z, Apr 14 to 2400Z, Apr 15
QRP ARCI Spring QSO Party	1200Z, Apr 14 to 2400Z, Apr 15
EU Spring Sprint, SSB	1500Z-1859Z, Apr 14
His Maj. King of Spain Contest	1800Z, Apr 14 to 1800Z, Apr 15
TARA Spring Wakeup PSK31 Rumble	0000Z-2400Z, Apr 21
YU DX Contest	1200Z, Apr 21 to 1200Z, Apr 22
EU Spring Sprint, CW	1500Z-1859Z, Apr 21
Michigan QSO Party	1600Z, Apr 21 to 0400Z, Apr 22
Holyland DX Contest	1800Z, Apr 21 to 1800Z, Apr 22
Ontario QSO Party	1800Z, Apr 21 to 1800Z, Apr 22
Harry Angel Memorial Sprint	1100Z-1246Z, Apr 25
DX YL to NA YL Contest, SSB	1400Z, Apr 25 to 0200Z, Apr 27
SP DX RTTY Contest	1200Z, Apr 28 to 1200Z, Apr 29
Helvetia Contest	1300Z, Apr 28 to 1300Z, Apr 29
Florida QSO Party	1600Z, Apr 28 to 0159Z, Apr 29 and 1200Z-2159Z, Apr 29
Nebraska QSO Party	1700Z, Apr 28 to 1700Z, Apr 29
Six Club Sprint	2300Z, Apr 28 to 0400Z, Apr 29

May 2001

AGCW QRP/QRP Party	1300Z-1900Z, May 1
MARAC County Hunter Contest, CW	0000Z, May 5 to 2400Z, May 6
IPA Contest, CW	0000Z-2359Z, May 5
SLP Competition (SWL)	0000Z, May 5 to 2400Z, May 6
10-10 Int. Spring Contest, CW	0001Z, May 5 to 2400Z, May 6
Massachusetts QSO Party	1800Z, May 5 to 0400Z, May 6 and 1100Z-2100Z, May 6
ARI International DX Contest	2000Z, May 5 to 2000Z, May 6
IPA Contest, SSB	0000Z-2359Z, May 6
VOLTA WW RTTY Contest	1200Z, May 12 to 1200Z, May 13
Oregon QSO Party	1400Z, May 12 to 0200Z, May 13
FISTS Spring Sprint	1700Z-2100Z, May 12
CQ-M International DX Contest	2100Z, May 12 to 2100Z, May 13
Manchester Mineira CW Contest	1500Z, May 19 to 2400Z, May 20
Baltic Contest	2100Z, May 19 to 0200Z, May 20
CQ WW WPX Contest, CW	0000Z, May 26 to 2400Z, May 27
Anatolian RTTY WW Contest	0000Z, May 26 to 2400Z, May 27
ARCI Hootowl Sprint	2000-2400 local, May 27
MI QRP Memorial Day CW Sprint	2300Z, May 28 to 0300Z, May 29

June 2001

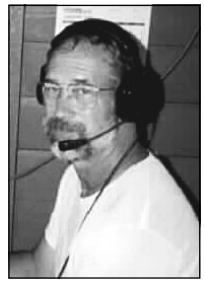
Major Six Club Contest	2300Z, Jun 1 to 0300Z, Jun 4
WW South America CW Contest	0000Z, Jun 2 to 1600Z, Jun 3
IARU Region 1 Field Day, CW	1500Z, Jun 2 to 1500Z, Jun 3
ANARTS WW RTTY Contest	0000Z, Jun 9 to 2400Z, Jun 10
Portugal Day Contest	0000Z-2400Z, Jun 9
Asia-Pacific Sprint, SSB	1100Z-1300Z, Jun 9
TOEC WW Grid Contest, SSB	1200Z, Jun 9 to 1200Z, Jun 10
ARRL June VHF QSO Party	1800Z, Jun 9 to 0300Z, Jun 11
All Asian DX Contest, CW	0000Z, Jun 16 to 2400Z, Jun 17
Marconi Memorial HF Contest	1400Z, Jun 23 to 1400Z, Jun 24
ARRL Field Day	1800Z, Jun 23 to 2100Z, Jun 24
ARCI Milliwatt Field Day	1800Z, Jun 23 to 2100Z, Jun 24

■

The Contest Traveler

Joe Pontek, V31JP/K8JP
v31jp@logical123.net

Comfort in the Tropics



V31JP/K8JP

When planning a contest DXpedition, be sure to give serious thought about what creature comforts you should bring along. Some of these items are mainly for pleasure, but others may make the difference between a successful trip and *surviving* a trip.

Some of the most obvious items to take into account are those that protect you from the elements of nature. For those visiting the tropics, sunscreen is a necessity. My dark complexion helps, but I still apply sunscreen—and often.

There are some very good sun-block products out there. Whenever I happen to be visiting a dive shop, I pick up one or two of their serious waterproof varieties. For added protection, I also wear long-sleeved shirts and pants—even when the temperature is in the 80s and 90s.

Hats are advisable as well. There are some great fold-up hats available through sporting goods stores and travel equipment suppliers that take up little room in your luggage and provide good protection from the sun. The wide brim types offer more protection, but while on a tower—or when working under one—a hard hat is always your best bet. You can drape a piece of cloth off the headband to add protection for your ears and neck.

Insect repellents are always a hot topic. I've tried quite a few different ones. For mosquitoes, it's best to choose one that contains a high percentage of DEET. It seems, though, that there are always some bugs that thrive on whatever particular formula that you select.

Reaction to bug bites is always the worst right when you arrive. After time, you tend to develop some level of immunity. Mosquito bites are among those that you'll definitely want to avoid—they seem to be the biggest carrier of diseases. In Belize, they show up around dusk. About an hour or so after dark, they go away. Therefore, that is a good time to be inside working low band openings or having dinner. Bugs are another good reason to carry long-sleeved shirts and long pants. I know you'd prefer to dress like Jungle Jim, but even he doesn't look very cool when he's lying in a hospital bed.

Temperature acclimation is another consideration. Colder climates call for layered clothing. The warmer climates do too.

I don't like air conditioning—I prefer fans. A ceiling fan can be helpful, but in my opinion, an oscillating floor fan is a better choice. Avoid using a fixed fan aimed directly at you. I recall experiencing a really sore shoulder and neck during one contest. On Sunday afternoon, I finally figured out the cause. The oscillating fan had quit oscillating, and was aimed at my left side—mainly at my shoulder and neck area.

I also use one of those small clip-on fans. I set it up it under the operating position, aimed at my feet and legs. Besides providing some cooling, it really keeps the bugs fluttering around instead of nibbling on my legs or feet. [One glance at Joe's legs will confirm that the bugs he mentions are either completely indiscriminate or hungry beyond belief.—*'BV*] Fans are also good to use when sleeping. They provide a nice manmade breeze and an even ambient noise level.

At the operating position, a small lamp can be a great fatigue reducer. Some folks like the small halogen types. I prefer ones that accept a regular bulb. Don't forget to bring along a package of the yellow 40 or 60 W-variety "bug bulbs."

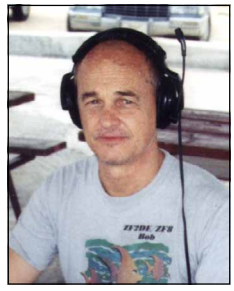
I like to use a buckwheat husk pillow at home. Guess what? It travels with me. It doubles as great packing material for delicate items. It then gets called into more serious service after the contest ends.

I hope these suggestions serve as food for thought, and contribute to making your next contest DXpedition just a little more enjoyable.

73, Joe, V31JP/K8JP ■

Contesting For Fun

Bob Patten, N4BP
n4bp@bc.seflin.org



N4BP

QRP Amateur Radio Club International defines QRP as five watts or less output from the transmitter. Many amateurs derive pleasure from making contacts at the 5 W level. For others, even less power results in even more pleasure.

There is a special challenge and level of satisfaction that results from making contacts with as little power as possible. "Milliwatting" or "QRPp" has come to mean operating at levels below 1 W of RF output power.

Accurately measuring transmitter output at milliwatt levels can pose a problem. One technique is to run the transmitter at 1 to 5 W levels through an accurately calibrated attenuator. Commercial attenuators are available for under $100, but building a **T**-pad or **Pi**-pad attenuator from stock resistors costs pennies. I use a simple 20 db **T**-pad attenuator for milliwatting at N4BP (see **Figure 1**).

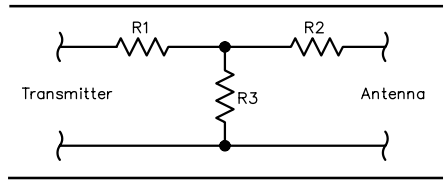


Figure 1—A simple T-pad attenuator for accurately reducing QRP-level transmitter RF output to the milliwatt (QRPp) levels.

For input and output impedances of 52 Ω, R1 and R2 are each 43 Ω; R3 is 11 Ω. The resistors used MUST be carbon (not wire wound) and R1 must be capable of dissipating most of the transmitter's output power. Resistors of higher ohm values may be paralleled to achieve the desired power handling capability at the correct resistance.

To calibrate this **T**-pad, I chose R3 to be slightly lower than the desired value, terminated the input and output with 52 Ω, and fed a known, accurate voltage into the pad. I used a rat-tail file to carefully file a small grove into R3, thereby raising its resistance, until the output voltage was exactly 1/100 of the input voltage. Finally, to seal the resistor from moisture, I applied fingernail polish to the spot where the carbon had been filed away.

The Contest Connection

Contests are the perfect environment for the milliwatter. Domestic contests such as Sweepstakes and Field Day are ideal for chasing Worked All States awards, while the ARRL and CQ DX contests can furnish contacts for DXCC awards. Serious contesters value every contact and will make the extra effort to pull out a weak signal from a milliwatt transmitter.

Besides working towards these awards, another goal for the milliwatter is to achieve the greatest mileage per watt possible. Following are some different approaches and some tips for making the most of your milliwatts.

Milliwatting During the 2000 ARRL 10-Meter Contest

By Randy Foltz, K7TQ

I didn't have much time to spare for playing in the 2000 ARRL 10-Meter Contest, but I did want to attempt some milliwatt contacts with Japan at around sundown here in Idaho. I've successfully completed 200 mW contacts into Japan using a GAP vertical in the past, but I wanted to try using even less power.

At 2230Z on Saturday I headed over to W7UQ, the club station of the University of Idaho. They have a TH7DXX up at 90 feet. I hooked up my old Triton IV, as the power level on that rig can be turned down lower than that on my K2. In 2 hours of QRPp operating, I managed to make several contacts (see **Table 1**).

Of these, JN2PYQ was the only station that had any trouble hearing me, but we still managed to complete the contact after 2 or 3 exchanges. I attempted 4 or 5 other contacts at the 25 mW level, but no one could hear me. Needless to say, I came home one very happy QRPp operator!

Table 1

Station Worked	*Output Power (in mW)*	*Miles Watt*
VR2BG	700	9560
LU1FC	1000	6440
JH1AEP	125	40160
ZL1ETP	150	49170
JN2PYQ	50	103200

Milliwatting in the 2000 CQ WW CW Contest—Some Observations

By Jerry Scherkenbach, N9AW

After working Rumi, LZ2RS, a couple of months ago on 20 meters—running about 200 mW—I was hooked. He was using only 50 mW and said that this was the first time he had worked the US on 20 meters at that power level.

At that time I couldn't accurately measure my power at levels that low. I decided to buy an Oak Hills Research WM-2 wattmeter kit, built it, and then attempt milliwatt DXCC. For mostly work-related reasons, my quest to achieve this personal goal was delayed until just recently.

I've always enjoyed the CQ WW CW Contest. In 1989, a few years after becoming interested in QRP, I entered that contest as Single Op/15 meters/QRP. Well, admittedly that's a pretty limited category, but I was really amazed when I managed to work 90 countries running 5 W. I was even more amazed when a #1 World certificate showed up for that effort! Like I said, it's a pretty limited category—I believe that there were only around 40 entrants.

Anyway, for this year's CQ WW CW

Contest I decided to try milliwatting. So, with the transmitter set to 900 mW, I started out on 10 meters on Saturday morning. Looking back on it, I was awfully casual about not getting on the air until 1547Z (9:47 AM CST), however, I didn't think things would turn out so well.

I also got a late start on Sunday. Again in hindsight, I wish I had started earlier. Perhaps I could have worked 100 countries while milliwatting in just one weekend.

My contest strategy was to maximize the number of countries—not QSOs or points. In most cases I worked one QSO per country, but I did collect a few extra contacts with Japan, England, France and Hungary.

In the end I completed 110 QSOs, including 95 countries, operating on 10, 15 and 20 meters. The majority of the QSOs were made on 10. I bagged a Worked All Continents as well. Most of the QSOs were with common countries—but there were some fairly rare ones as well. These were 3V, OX, JX, OH0, PY0F, JW, A3, 9G, KH0, 9H, FR, YJ, TZ, VP8/H and VR2.

The transceiver was a Yaesu FT-1000MP feeding a Mosley PRO-57B at 50 feet. My Oak Hills Research WM-2 wattmeter was used to monitor the output power.

The bottom line? This was *really* a lot of fun! I certainly won't hesitate to operate in the "less than 1 W" categories in future QRP ARCI contests.

Here are a few tips I'll share with you for contesting at these power levels.

- Number 1—Be patient. If you're not the patient type, milliwatting might not be for you.
- CQing—Forget about it. I don't even try.
- The PacketCluster—I use it, but you'll probably want to avoid "fresh" spots. The pileups are likely to be outrageous.
- Rare countries spotted on packet—There will always be a big pileup. It's best to forget about them.
- Stay with the highest open band—The QSOs are easier to make. Stay alert to propagation changes. When the highest band doesn't seem productive, switch back and forth between the two highest bands.
- In general, the louder they are, the faster you are likely to complete a QSO. Pileups, of course, are exceptions.
- Timing, as is always the case with DXing, is key—Even outside of pileups, it's difficult to complete head-to-head with higher power stations.
- Code speed—Don't be afraid to crank it up, if you're comfortable with the higher speeds. I hear a lot a QRP ops who slow way down, perhaps thinking that their weak signal will be easier to copy that way. Not so, some of the DX ops have a rhythm they are trying to maintain and seem to answer stations that fit it.
- And finally—Forget that you're running QRP. Remember that your QRP signal is not that far down in S units from the Big Guns. Everything else being equal, the difference between 100 W and 1.5 W (or so) is theoretically just 3 S units.

A QRPp Journal: Tales of Chasing the Miles per Watt Records and QRPp DXCC

By Jim Hale, KJ5TF

Date: Friday, 17th November 2000

Today at 1725Z, Mike, A35MO, was calling CQ on 28.038 MHz from Tonga in the South Pacific. My 2-element quad was pointed towards Europe, so he was off the back. I called him at 700 mW, got a reply—and a 599—and I sent him his report. When I told him my power he asked me to AS. He turned his 2-element Yagi towards me, and his signal came up to 599+. Naturally, I dropped my power back to 300 mW and he gave me a 569, and a BK.

He wanted LESS power!!! So back at him with 150 mW—and I got a "559 BK." I lowered my power to 30 mW—"539 BK." So okay, now down to 7 mW—and "329 BK!" At this point my Ten-Tec 290 attenuator is nearly maxed out, and the power output needle is hovering just above zero. I sent him "2MW" a few times and he replies, "2MW UR 229 IN THE NOISE BK!" I went to no needle movement and called him with my full call at about 1 mW—but no copy.

My rig is an Elecraft K2. I was using the Ten-Tec attenuator, an Oak Hills Research WM-2 wattmeter and a 2-element quad. We are 6403 miles distant—3201269 miles per watt!

Date: Monday, 20th November 2000

Today I worked 5C8M (Morocco), TS7N (Tunisia) and J75KG (Dominica)—on 10 and 15 meters all at 700 mW.

Date: Friday, 24th November 2000

At 1508Z I bagged Kim in Greenland, OX3FV/QRP. He was running 5 W and had a pileup going on 28.061. I called and called at the 750 mW level—but to no avail. Finally the pileup thinned out, and he came back with "/QRP?" I got a 439 with QSB. On the next go-round I raised my power up to 2 W and managed a 559! Kim was 449, and mostly working European stations. I didn't hear many other US stations work him.

Date: Monday, 27th November 2000—A Wrap Up of the 2000 CQ WW DX Contest

On Saturday I concentrated on 10 and 15 meters and landed several new DXCC countries. These included ES9C (Estonia), YP3A (Romania), Z30M (Macedonia), 6Y7A (Jamaica), TZ6DX (Mali), EI4DW (Ireland), EW1WZ (Belarus), P3A (Cyprus), LZ1NG (Bulgaria), EA6BX (Balearic Islands) and ZB2X (Gibraltar).

On Sunday, operating from my parked pickup truck, running 700 mW, while waiting for my XYL, I did the hunt/pounce routine for about 1 1/2 hours. I logged the following: NP4A, WP2Z, ZF2RR, HC8N, CT3BX, EA8BH, C6AKW, ZF2NT, AL7O, FY5KE, EA4ML and NH7/N6HC.

Date: Monday, 11th December 2000—The ARRL 10-Meter Contest

By the end of this month I hope to have all the contacts I need for a milliwatt DXCC in the log. Next month the cards should begin flowing in. New country contacts not yet confirmed are LZ1NG, FS/W2JJ, PY0FF, YR8A and TK5EP. I worked them all at 700 mW.

I set up my QRP+ and my PW-1 screwdriver mobile antenna on my pickup truck around 2:20 PM Central Time. Running 700 mW, I worked the following: K6ROC (California), K7NV (Nevada), J38DX, ZF2NT, K1IB (Vermont), VO1MP, VP5DX, W2MU (New York), AA1JD (Massachusetts), N7OU (Oregon), AD4TR (Florida), WE1USA (New Hampshire), VP5K, KB7N (Washington), W5RL (Arkansas), KH6ND (Hawaii), W3EP (Connecticut), VE6BF (Alberta), VE5SWL (Saskatchewan), YV4A, NP3X/W4 (Pennsylvania) and NA2U (New Jersey)

I turned the power back to 500 mW and collected N7WA (Washington), 3G3R, N2GA (New York), VE2FFE (Quebec), W6UT (California), WK2G (New Jersey), VE6JY (Alberta) and KH6ND (Hawaii).

I throttled the power further back to 250 mW. WN6K (California), KL7RA (Arkansas), N2MO (New Jersey), W1TJL (Connecticut), KL2A, V31QI and VE7XF (British Columbia) all went in the log. I ended operations at 3:55 PM.

From Arkansas to Alaska is about 3100 miles. At 250 mW, that's 12440 miles per watt from a mobile setup. It's 4000 miles from here to Hawaii—at 500 mW that's 8000 miles per watt.

Date: Tuesday, 19th December 2000

I had some fun working UR7GW, Alex,

on 12 meters this morning. I started out at 750 mW, where I was 579, and then went down to 250 mW. I was still 579. Further down to 15 mW—where I was 229! Looks good for a record.

At 5820 miles apart, our miles per watt works out to to 388012. I held the old record of just over 127000 miles per watt with CO8LY:

24 MHz, #1709, KJ5TF/12 mW, CO8LY/QRO, 1531 miles, 127583 miles per watt, CW 000203

We have two 160-meter contests coming up, and someone might just break my current record on top band:

1.8 MHz, #1708, KJ5TF/20 mW, W8JI/QRO, 536 miles, 26800 miles per watt, CW 000129

Date: Monday, 8th January 2001

On Saturday I had a chance to try out one of the latest PSK31/RTTY soundcard programs—*Zakanaka*. It's in development and free to download, along with the latest version of *Logger*, at **www.qsl.net/kc4elo/**.

I started out using *Logger*, but switched to the *Zakanaka* internal log after I got confused and failed to log some QSOs. I set my power at 750 mW and kept it there, except for a couple QSOs where I lowered it to a couple hundred milliwatts.

KL7QR went in the log for a 300 mW RTTY QSO on 10 meters. On 80 meters, I only had about 1 hour to play and got Minnesota, Rhode Island and Wisconsin with between 400 and 700 mW. There were loads of stations on 80, and if I had more time I know I could have done considerably better.

Here are a few highlights: YL7A, IK0YVV, LX8DL, HA8EK, GI4KSH, S53S, PA3FQA, DK7MD, SM6WQB, T94MZ, 8S5W, LA7CL, DF0KU, DK1RS, LZ2PL, DM5TI, EI4DW, SP5ZCC, F5NZO, JH4UYB, JA1SJV, LT1F, KL7QR and KL7AC.

Running less than 1 W, it wasn't too difficult to make as many contacts as I had time for!

[Jim is the Editor for the "Adventures in Milliwatting" column of the ARCI QRP Quarterly. The records he has earned for his milliwatting efforts are posted on his Web site, **www.madisoncounty.net/~kj5tf/**.—*'BP*]

Tales of Chasing Worked all States QRPp

By Larry Cahoon, WD3P

The first QRPp QSO I ever made was in March of 1997. I worked my friend WK3I on 80 meters. I was using a Micronaugt, putting out about 7 mW. I started out low. My next two QSOs were about two weeks later. Those were made with a Norcal 38 Special at about 300 mW.

Late in April of 1997 I picked up a Kenwood TS-570S. This rig gave me the ability to run the "full QRP gallon"—5 W.

I had a Wilderness Sierra assembled in time for Field Day 1997. For the next 2 1/2 years, this was my QRPp workhorse.

The first contest I participated in at the QRPp level was the August 1997 North American QSO Party. I joined in strictly for fun, just to see what could be done operating very low power. I ended up completing 59 QSOs in 28 states running just 900 mW.

My QRPp activities took a back seat for the next 5 months, until December 1997. Then I started playing around with the County Hunters at the 500 mW level. During the Christmas season I managed to work KU4UG/mobile in 32 Mississippi counties. I was surprised that most of the signal reports I received from him were 559s, 579s and even a few 599s. At that point I knew what milliwatts were capable of, and it was full steam ahead from there.

The January 1998 North American QSO Party was my first real QRPp contesting endeavor. I ran 500 mW and ended up with 130 QSOs and 38 states.

A brief return to the 5 W level, on January 21st, 1998, put Hawaii in the log—completing my WAS/QRP.

The February 1998 CQ WW DX Contest was my next big QRPp contest effort. I operated this at 500 mW and netted 53 QSOs.

Around November 1998 I decided to pursue DXCC/QRP. During that time I did manage to bag KL7Y using 500 mW—thereby completing my WAS/QRPp.

Since that time I have been enjoying a mixture of contesting and DXing activities at the QRP and QRPp power levels. Here are a few extracts from my recent journals.

Date: Sunday, 10th December 2000

I've been playing around off and on in the ARRL 10-Meter Contest today. I'm running my Elecraft K2 at no more than 500 mW. So far the total take is only 24 QSOs.

One of my best catches so far was PY0FF—on the first call! I didn't operate much this morning, so no Europeans yet. I may try chasing them tomorrow morning.

Most of the contacts up until now are with the western states. I've got Nevada at 120 mW, Washington at 60 mW, Oregon at 45 mW and California at 45 mW.

I'm trying to reduce my cumulative power total for WAS. I'm hoping to catch New Mexico, Hawaii, Idaho and Montana, where my lowest power QSOs to date are all at 500 mW or more. I'd also like to work Arizona again, where my best QSO to date is at 250 mW. I've heard them all on, but I haven't been able to work any of them so far. I'll try again tomorrow.

Date: Monday, 11th December 2000

The highest power level I used during the contest was 500 mW. The log shows 73 QSOs and 30 multipliers for a score of 8760 points. Considering the power level I was using, I'm very satisfied with those results. The K2 worked perfectly.

Part of my plan was to work several of the western states at new lower power levels. I was pretty successful. I worked Arizona with 40 mW, Montana with 35 mW, Colorado with 30 mW, Washington with 50 mW, Oregon with 45 mW, California with 40 mW, Nevada with 60 mW and Hawaii with 400 mW.

There are only five states that I haven't worked at 100 mW or less. These are Hawaii, Wyoming, New Mexico, Idaho and North Dakota.

The 400 mW Hawaiian contact I made in the 10-Meter Contest works out to about 10000 miles per watt. With that contact and the others I got in this contest I'm down to eight states needed for WAS at 10000 miles to the watt.

The antenna I was using for this contest was a dipole up about 25 feet.

Date: Monday, 25th December 2000

I've been following Mike, WU3H/mobile, as he has been driving around the country the last week or so. Yesterday I worked him while he was in South Carolina using just 2 mW. That beat my old record for that state of 30 mW. Today I worked him while he was traveling through Maryland at 4 mW. That beat my old record for that state of 7 mW. I was a little sad to break that one—the old 7 mW mark was set during my first QRPp QSO.

Tallying the Totals

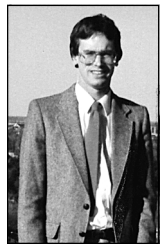
The cards have started trickling in from the 10-Meter Contest. I've received them from Oregon, New Mexico and Montana so far—officially dropping those states down into the 30 to 65 mW range. I'm still waiting for cards from Arizona, California and Colorado.

My confirmed WAS QRPp accumulated total power tally presently sits at 5.02 W—my unconfirmed tally is 3.40 W. So far I've managed to work New Hampshire, Alabama, Florida, Georgia, and South Carolina at 2 mW. When all the cards come in, the only states that have required over 100 mW up to this point will be Idaho, New Mexico and Wyoming (500 mW), Hawaii (400 mW) and North Dakota (200 mW). ■

VHF-UHF Contesting!

Jon K. Jones, N0JK
n0jk@hotmail.com

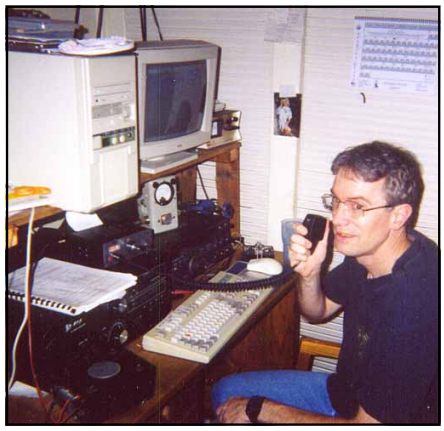
How to be a "DX Station" in the June VHF QSO Party



N0JK

Six-meter DX activity has been a hot topic lately. Operating on 6 meters from a rare DX location and catching an F_2 opening at the peak of the solar cycle is an exciting operating experience. But you don't necessarily have to travel to a foreign country to get a taste of what it's like to be on the "DX end" of a VHF pileup. Operating from a rare grid square for the June VHF QSO Party would be an alternative way to experience this.

Grid Squares are the multipliers in the June VHF QSO Party. Many of these squares do not contain permanent residents that are active on VHF. Often you can identify "unoccupied" grids that are within reasonable driving distance. These are perfect candidates for a VHF contest expedition.



KH8/N0JK operating 6 meters from American Samoa.

KM5FA operating the Spring 6-Meter Sprint from the University of Texas Amateur Radio Club station.

For example, here in Kansas, grids EM17, EM18, EM27, EM28 and EM29 all contain several active VHF operators, as they include the cities of Salina, Pittsburg, Wichita and Kansas City. But EM08, which is about an hour and a half drive from Wichita, apparently has no permanent VHF-active residents. I visited EM08 for the 2000 June VHF QSO Party and operated QRP portable. I had several good 6-meter pileups going during an E_s opening to the West Coast on Sunday evening and received several comments from stations thanking me for the new grid.

All over the US and Canada there are grids—probably some of them close to where you live—that are considered rare. Local VHF ops would likely be able to tell you which ones are rare in your area. If you live near the coasts, operating maritime mobile can put really rare all-water grids on the air—FM00 east of Jacksonville, Florida for example. Out west, there are many grids that are "vacant" in Utah, Arizona, Idaho, Montana, etc. More ambitious ops sometimes travel to Mexico to activate some of those grids.

Otherwise active grids may still be "rare" on 222 Mhz, 903 Mhz or the microwave bands, even in the highly populated East Coast regions. Rovers such as W3IY/R, ND3F/R, AA2UK/R and K1DS/R enjoy plenty of activity when operating from grids such as FN10, FN11, FN21 and FM08 for example.

After you have selected a grid, there are several contest entry categories to consider. I usually operate QRP portable. The gear is easier to pack and 10 W can get out great on 6 meters during an E_s opening.

Rover operating is a way to put multiple rare grids on the air. It's a good way to hand out plenty of contest QSOs as the stations you've worked in one grid square can work you for credit again when you move into a new grid square. Many rovers plan their route to cover multiple sought-after grids.

You could also set up a high power multi-op fixed location portable station. The Grid Pirates have done this from Spruce Knob, a mountaintop in West Virginia.

Pre-planning can help a portable or rover operation go more smoothly. I suggest that you visit potential portable locations before the contest. If you plan to operate from private property or from a state/national park, be sure to get permission well ahead of time and secure any required permits. For rover operations, you may want to drive the planned route before the contest, or at least parts of it. A GPS unit can be a great aid for verifying which grid you are in and ex-

The W1XE contest station operation for the 2000 June VHF QSO Party. (Photo courtesy of N0KE.)

actly where the border into the next grid is located.

Rover and portable operations really help boost activity in the VHF contests by providing the opportunity for more QSOs and grids for everyone. Either of these operating methods will allow you to play the part of a "DX station" in a VHF contest—and you won't have to spend thousands of dollars traveling to some remote island. Why not consider giving one of these a try for the June VHF QSO Party, June 9th thru 11th, 2001?

Improving Your 6-Meter Score in the June VHF QSO Party

Six-meter E_s openings often occur in several directions simultaneously. Here in the Midwest, 6 can be open to the East Coast, the Gulf Coast and California all at the same time. Stations in Florida sometimes experience multiple E_s openings towards New England and the West Coast.

Taking full advantage of these multiple paths can be challenging. You typically have to spin the antenna back and forth to pick up stations. A surefire means of improving your score is to come up with ways to have ready access to multiple directions. Putting up a second 6-meter directional antenna is one way to do this.

At WB0DRL, the primary 6-meter antenna is a Cushcraft Boomer located at 75 feet. A 5-element Yagi at 50 feet points west. When there's E_s openings to both coasts, we can easily switch between the two antennas.

For home stations, consider installing a spare 3- or 5-element 6-meter Yagi on the roof on an inexpensive TV-type rotator. For an even less expensive antenna alternative, try a simple homebrew 2- or 3-element 6-meter quad. (See **www.uksmg.org/3_ele_quad.htm** for some designs.)

Most modern 6-meter Yagis have a high front to side ratio, so pointing a small Yagi or quad broadside to the main antenna can really help fill in gaps in the radiation pattern.

Even a simple dipole up in the clear can be useful. John Dorr, K1AR notes, "Any time you can eliminate the use of one of those darn rotators is a good day in contesting." You may be pleasantly surprised by how much a second 6-meter antenna can improve your score.

VHF Contesting Logging Software

Reader Jim Harrison, K6OUE, sent me an e-mail asking, "Which contest logging software would you recommend for VHF/UHF contesting? It seems like most of these programs are geared towards HF contesting—their VHF capabilities appear to be only an afterthought."

I use *CT* for my VHF contesting logging. *NA* and *TR-Log* also support VHF contests. See **www.contesting.com** for a discussion of these contest logging programs.

VHF DX is a dedicated VHF contest logging program, and is available from VHF Products Inc, PO Box 23391, Chagrin Falls, OH 44023; **vhfdx@iName.com**.

Another fine VHF logging program is W3KM's *VHF Log* for *Windows*. See **www.qsl.net/w3km/index.html**. Note that this software generates results in the Cabrillo format, which is now required for all ARRL log submissions. (The current versions of most commercial logging software programs are Cabrillo compatible.)

KC6TEU offers *VHF Contest v2.0*. You can download it from **uhavax.hartford.edu/~newsvhf/vhf-soft.html**. There is also an ARRL log to Cabrillo log converter program for download at this site.

There are, of course, other VHF contest logging programs out there. Consider these just a sample of what is available.

Get on the "Light Band" for the June VHF QSO Party

A simple laser transmitter for the "light" band that can be built quickly and easily, and a matching receiver, is described in the latest Packrats *Cheesebits* newsletter. The laser transmitter uses parts from a laser penlight with the addition of an 800 Hz modulator. More information is available at **www.qsl.net/wb9ajz/laser/laser.htm**.

And Finally...

Here's a list of the 6-digit grid locators for some of the popular mountain top locations used by the "Big Gun" multi-ops for the June VHF QSO Party.

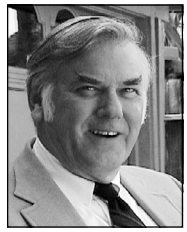
Mount Equinox, VT	FN33KD
Mount Everett, MA	FN32GC
Mount Greylock, MA	FN32JP
Mount Wachusett, MA	FN42BL
Mount Washington, NH	FN44IG
Spruce Knob, WV	FM08GQ

■

International Contests

Joe Staples, W5ASP
w5asp@aol.com

An International 3830?


W5ASP

Using the 3830 Reflector to report major contest scores immediately following the end of a contest has become second nature to most active contesters. In fact, it ranks in importance right along with the preparation of the actual log for final submission (in Cabrillo format of course).

Submitting the contest information has been made even easier with the advent of a customized submittal form for each contest that's posted by Bruce, WA7BNM, on his Web site. The form allows Mike, W7WA, to grab up the scores as they arrive and organize them into the 3830 Score Reports that appear on the Contest Reflector.

The net result is a quick and fairly accurate overview of the contest results well before the smoke of battle has finally cleared. Granted these are only "claimed" scores and are subject to the thorough checking procedures that now prevail, but they go a long way towards satisfying our innate curiosity as to "how things went." It's certainly in keeping with the need for instant gratification that has become embedded in today's society. And fortunately, the early availability of this information doesn't seem to have detracted much from our eager perusal of the published final results when they appear some six months to a year later.

This same scenario, however, doesn't apply to most of the contests dealt with in this column. While there has been a modest increase in the number of claimed scores being posted to sponsor's Web sites, by-in-large we must wait until the final results have been released, and then gathered and published. This distinction may very likely result in a reduction of the visibility of such contests—and hence thereby limiting participation.

It would seem that if those who are active in the international contest arena were to post their scores right after the contests, and then those scores were compiled and displayed where they could be easily seen, it would help build further interest and activity. I have the feeling that, given the proper conditions, this idea could quickly catch on, both here and abroad.

The obvious dilemmas are how and where to submit such scores, and then who does what to make them accessible. However, the first step is to find out if there is sufficient interest in such a scheme to justify proceeding further. If you care to comment, my e-mail address is listed above. If there's enough response, I'll see what can be done to "float this boat." Meanwhile… have fun in the 'tests.

2000 ARI International DX Contest

Place	Call	QSOs	Mults	Score
W/VE				
Single Op/CW				
30	N4AF	333	176	300720
36	N6ZZ	285	143	210067
64	K5HP	171	103	90988
68	AA1CA	143	94	75998
78	WA2VQV	119	79	61304
84	VA3UZ	111	74	45956
139	K0COP/4	19	18	2411
140	VE2FFE	26	21	2298
Single Op/SSB				
2	W1NA (op I8CZW)	755	309	1373742
71	W9LYN	55	46	22310
96	N8WTH	30	25	5285
107	N1BCL	21	17	2560
116	N2LQQ	9	9	747
122	VE2PIJ	4	4	160
Single Op/Mixed				
6	VE3KZ	814	280	1162367
17	K3WW	497	216	535050
35	VE2AWR	168	103	115785
44	W1TO	118	87	63680
53	W7LGG	60	39	22347
57	K4OGG	43	33	11852
69	WA2BMH	19	18	420

2000 Marconi Memorial HF Contest

Call	Score	QSOs
Single Op		
W3CP	1032	43

2000 RSGB 21-28 MHz CW Contest (Claimed Scores)

Place	Call	QSOs	Claimed Score
9	K3ZO	104	24960
12	N4AF	65	16575
16	VE3MQW	68	10812
21	N7DR	47	5382
22	VE1KB	62	5007
35	VA3TTT	23	1311
40	K4BAI	12	396

2000 RSGB 21-28 MHz SSB Contest (Claimed Scores)

Place	Call	QSOs	Claimed Score
11	N4UH	170	39780
15	VE3XAP	80	13509
17	K3ZO	70	11130
26	N4MM	30	2160
29	W6/G3MHV	25	1575
36	KB9JIF	5	75

2000 French (REF) HF Contest

Place	Call	QSOs	Points	Mults	Total	Band
W/VE						
CW						
1	K3ZO	437	1299	265	344235	
6	VE2AWR	142	710	101	71710	
9	W3BYX	121	359	93	33387	
11	K4BHI	107	315	81	25515	
13	N4CW	89	265	69	18285	
14	AA1CA	85	250	65	16250	
17	N4MM	77	231	59	13629	
20	W2EZ	51	147	41	6027	
21	W7LGG	51	159	33	5247	
22	K0COP/4	40	108	38	4104	
23	W3FQE	36	108	30	3240	
25	K4IU	35	104	27	2808	
Phone						
2	WQ2M	185	555	126	69930	
3	K4ZW	151	453	101	45753	
7	W6AFA	82	244	51	12444	10m
8	K4IU	74	220	55	12100	
13	K4WK	47	141	38	5358	
16	N4MM	37	107	31	3317	
22	W9CNF/4	17	51	15	765	
28	AH7C	12	36	10	360	10m

2000 RSGB Islands-on-the-Air (IOTA) Contest

Place	Call	QSOs	Mults	Score	Category	IOTA
Multi-Operator						
17	AA1IZ	2087	265	3319125	DXpedition	NA148
42	VE7UF	1002	191	1323630	DXpedition	NA036
72	W4LVS/P	949	92	486036	100W DX	NA112
75	NM8O/4	756	89	380208	100W DX	NA062
83	W5DDX	516	38	87096	100W DX	NA082
84	VE1JS	205	35	37800	DXpedition	NA127
85	KL7/NO7F	294	24	31248	Permanent	NA059
87	K7PAR	93	31	23157	100W DX	NA065
Island Single Op—24 Hour/CW						
26	KP4AH	511	55	143715	Permanent	NA099
Island Single Op—24 Hour/SSB						
2	KP2/AA1BU	1685	174	2057724	100W DX	NA106
11	KW1DX	756	120	560160	100W DX	NA137
18	KF9YL	656	83	294816	Dxpedition	NA076
22	VO1BC	473	69	217143	Permanent	NA027
30	KE7CU	294	63	109242	Permanent	NA065
Island Single Op—12 Hour/Mixed Mode						
9	N2US/P	451	68	173604	100W DX	NA083
23	KS4S	124	27	18792	100W DX	NA112
Island Single Op—12 Hour/CW						
33	W4SAA	236	25	33300	100W DX	NA141
49	WX3Q	121	10	7680	100W DX	NA083
Island Single Op—12 Hour/SSB						
51	VE7XO	69	38	25498	Permanent	NA036
65	K4RFK	34	20	7320	DXpedition	NA069

World—24 Hour/SSB

34	N3FX	196011
45	VE3ZZ	136809
46	K4GW	128094

World—24 Hour/Mixed Mode

8	W1NG	2760471
32	K4BAI	676800
43	W5FO	414936
53	VO1SDX	319986
55	N6VR	289416
65	N4MM	227156
66	VE2AYU	221850
67	W1JR	198699
86	KW4JS	55272
89	VE2AWR	45216

World—24 Hour/CW

12	VE3KZ	953904
29	NT1N	310272

World—12 Hour/SSB

27	W3TN	194085
55	W6AFA	99186
56	W1DAD	98865
74	W8TTS	49833
111	K3GV	20928
112	WB0YJT	20352
117	VE4RP	19264
118	N2SQW	19080
136	W5CTV	10950
151	N2LQQ	5392
154	N8WEL	4032
164	K1MOM	2112

World—12 Hour/Mixed

6	WB2YQH	477000
10	N4UH	345576
13	K5ZD	317343
21	AA4V	217116
23	VE6JO	176904
39	N6JM	71064
45	VE5SF	48735
46	VA3UZ	46953
49	VO1WET	36498
51	VE4IM	34164
54	W6FA	29148
58	K8KFJ	21525
64	VE6ZT	11466
67	VE5CPU	9768

World—12 Hour/CW

84	N3TG	22032
91	W9HR	15912
103	W4NTI	8400
105	K8CV	4995
106	KC2AFK	4545
122	W7/JR1NKN	126
123	W5AB	12

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Contest-pedition Destination Listing

Steven Nace, KN5H
kn5h@earthlink.net

Fellow Contesters, Spring has arrived and Old Man Winter is history. What's in store for the 2001 contest season? Are you planning for your group's annual multi-multi expedition? How about that trip with your wife to a beautiful island paradise, complete with transceiver and dipole. Well, after you have chosen that special spot, drop me a line. I will do my best to make sure that everyone knows where (and when) you are going.

This list also appears on the *NCJ* Web site **www.ncjweb.com**, so be sure to check there for the latest information.

Happy trails!

73 de Steve, KN5H

Call/QTH	Category	Operator(s)	Status
2001 ARRL DX CW			
8P9	SOABHP	W2SC	Firm
AC4G/KH9	SO	AC4G	Firm
C6AKW	SOAB	K3TEJ	Firm
D68C	M/M	5 Star DXers	Firm
HR3?	SO	N7YW	Firm
KH0/	M/?	JQ1NGT, JI1EFP	Firm
PJ2T	M/S	KP2L, W0CG, N8BJQ, WA9S, W9EFL, W9VA	Firm
XA5T	M/M	TDXS	Firm
XX9TDX	SOAB	SM0GNU	Firm
ZF2NT	SOABQRP	N6NT	Plan
2001 ARRL DX SSB			
6Y8A	M/M	K2KW++	Firm
8P9	M/S	AA4NC, K4MA	Firm
P40W	SOAB	W2GD	Firm
XA5T	M/?	TDXS	Firm
ZF2AH	SO	W6VNR	Firm
ZF2NT	SOABQRP	N6NT	Plan
2001 CQ WPX SSB			
P40A	SOABLP	KK9A	Firm
2001 CQ WPX CW			
FO8DX	SOABLP	W1HIJ	Firm
2001 CQWW SSB			
FS/AH8DX	SOAB	AH8DX	Firm
PJ2?	M/S	KU8E, K8NZ, N8VW, WC4E	Firm
PJ7/K7ZUM	SOAB	K7ZUM	Firm
2001 CQWW CW			
PJ2T	M/S	W0CG, KP2L, W9EFL, KU8E	Firm
VP2V/KN5H	M/M	KN5H, KG5U, KB3EHU	Plan

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Contest Tips, Tricks & Techniques

Gary Sutcliffe, W9XT
w9xt@qth.com

Avoiding Fatigue—Part 1

The topic for this installment of CTT&T is avoiding fatigue and maintaining concentration. We had an exceptional response on this topic, giving some indication of its importance to serious contesters. The responses fell into two general categories: the environment and the operator.

W9XT

The environmental part is what is going on in the shack. The latter includes things relating directly to the operator, such as food, rest, exercise, etc.

In this installment, we'll consider the environmental issues. Next time we'll turn our attention to the operator aspects. There are a lot of variables to consider here, so let's dig right in.

The Operating Chair

You're going to be spending a lot of time in the operating chair, so picking the right one can make an enormous difference. Ward, N0AX, notes that a multi-kilobuck radio doesn't help much if your back and/or butt are hurting thanks to a "cheap seat."

K6LA echoes that observation. Ken has a Herman-Miller Aeron chair. These are very expensive, but he offers, "What good is all the money spent on rigs, antennas and towers, if you can't stand to stay in the chair?"

N9FH recently procured a new chair for contesting. Fred says that it is not an expensive chair, but it does allow him to adjust the tilt and lumbar support. Fred notes a significant reduction in back pain since getting the new chair.

K2UA and others recommended having two or more chairs, and switching between them. When you get sore in one chair, change to the other. K4XS has a regular chair and one of those knee chairs. Bill says it puts strain on different parts of the body. When he becomes sore in those areas, he returns to the regular chair. Bill says his third chair is no chair at all. He operates in a kneeling position. The heavily padded carpeting in his shack makes this comfortable for periods up to a half-hour or so.

A number of years ago I was looking for a new chair for my shack. I ended up buying the same kind of chair that I had at work. I was already used to sitting long hours in front of a computer in that chair—including lots of late nights during crunch times. (Not too different from contesting!) I figured that my body had adjusted to that chair, so I got one that matched!

A foot switch tends to restrict you to keeping a foot in a certain area. This prevents you from shifting around to avoid getting stiff. KK1L came up with a way around that. Ron has several ways to key his transmitter. In addition to his foot switch, he has a thigh switch and a small switch next to the keyboard. This lets him stand up and walk around a bit as well as shift position in the chair.

K9XD notes the importance of a comfortable chair, but also says that it must match the operating table. Dave sets the height so that his arms rest comfortably on the table while his back rests against the back of the chair. This allows him to operate comfortably for hours.

Shack Temperature

K4XS and others recommend keeping the shack cool to avoid sleepiness. K2UOP even goes so far as to run the air conditioner in his shack in the winter, if necessary. Tom says that a cool shack provides the added benefit of keeping the equipment running cooler.

K4OJ recommends varying the temperature in the shack to keep alert. In warmer climates Jim suggests turning the air conditioning up and down. Layered clothing is his suggestion for colder areas.

My Wisconsin basement shack is nice and cool in the summer, but can get cold in winter. My biggest problem is cold feet. The amplifier helps keep the shack warm when I am using it. For barefoot operations (excuse the pun) or really cold periods I have a small electric space heater that blows warm air towards my feet. Carpet on the floor is a necessity for keeping your feet from freezing with a basement cement floor.

One of the best additions to my shack is a foot rest. I made it out of $^3/_4$-inch plywood. The dimensions are about 14 × 24 inches. Triangular sides raise the front up about 2 inches and the back by about $5^1/_2$ inches. Wood screw and glue assembly makes it very solid.

The footrest helps in several ways. It keeps my feet up off the cold floor. More importantly, it takes some of the pressure off the legs above the knees. Finally, my footswitch is screwed to it so it doesn't slide around. In nearly 30 years of contesting, my footrest has delivered the biggest bang for the buck of anything in the shack.

K9XD feels that fresh air is another important consideration for keeping you alert and awake. Dave uses a fan for pushing the warm, stale air out of the shack.

Lighting

Keeping the shack bright is common advice. The idea is that it fools the body into thinking that it's day—and you *should* be awake—regardless of the actual time.

Just as he likes to vary the temperature of the shack, K4OJ likes to vary the lighting. Jim really likes it when the only lights in the shack are from the monitor and the radios, but he cycles the room lights on and off periodically to keep him from drifting off.

The shack at my last QTH was in a spare bedroom. It had an east-facing window. The light coming in at sunrise seemed to help me wake up. If at all possible, I will always have an east-facing window in future shacks.

Position of the light source is also important. I have ceiling florescent lighting in my shack. The lights were previously positioned almost directly above the radios—they were up and in front of my eyes somewhat. I had a certain amount of annoying glare until I moved them back a foot or so. You don't want to be looking into them, but they shouldn't cast shadows over the operating area either.

Miscellaneous Suggestions

KK1L and others have a couple of sets of headphones. They suggest switching between them just like changing chairs. K6LA uses the little ear buds rather than the larger style of headphones to keep his ears from getting sore. Ken has a couple of pairs of these that he rotates during the course of the contest.

Another area of importance is shack layout. This was noted by PY1NY and others. Essentially you want to have the station set up to minimize motion during operation. We have covered station layout a couple of times in previous CTT&T columns, but that was quite some time ago. Perhaps we're due for another look? What do you think?

As usual, this column succeeds because of the input of its readers. These tips for improving the shack environment come from K2UA, K2UOP, K4OJ,

K4XS, K6LA, K9XD, KK1L, N0AX, N9FH and PY2NY. Thanks to the readers who have already sent in tips regarding food, drink, sleep and other tips for avoiding fatigue. Their suggestions will show up next time. If you did not get around to providing your comments on the considerations yet, there's still time!

Topic for May-June 2001 (deadline March 4)

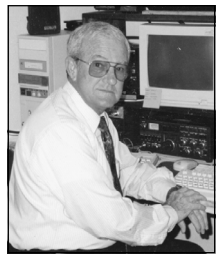
Avoiding Fatigue and Maintaining Concentration—Part 2

What food and drink do you consume during contests to keep you at your peak? What kind of a sleep schedule do you keep before and during a contest? What other things do you do to stay in top contesting shape?

Send in your ideas on these subjects or suggestions for future topics. You can use the following routes: Mail—3310 Bonnie Lane, Slinger, WI 53086. Internet—**w9xt@qth.com**. Please be sure to get them to me by the deadline. ■

RTTY Contesting

Wayne Matlock, K7WM
k7wm@i10net.com


K7WM

In past columns we have addressed the importance of trying two-radio operation to increase your fun, and hopefully your point count. We have also had guest columnists who have thrilled us with stories of contest operations from exotic locations.

Recently, we covered some of the more mundane—yet frequently overlooked—contest preparation considerations one may wish to ponder before jumping into the next battle on the air. In this issue's column I would like to continue along that thread of contest preparation—we will actually prepare and operate a contest—through words, and with a little help from your own imaginations.

Contest Preparation

The contest is starting this afternoon, so you had better gather all of the information you need and get your station ready. First things first—you surf over to your favorite propagation Web site and download the current and predicted propagation data. Then you dial up your contest station's computer, located in… get this… *Aruba*.

Next, you remotely fire up your station's contesting software and tell it what contest you will be participating in. You will also need to let the program know that you will be operating as a single op/high power entry, and inform it of your new personal pager frequency. You tell it what time to start—it already knows how many hours you are allowed to operate in this contest. Using the propagation data you downloaded and transferred to the computer in Aruba, it will compute your best off-times to optimize your rate.

With the info you've provided, your station computer will set the frequencies on your Scanning Radio and your Run Radio. Fortunately, your amps don't particularly care what frequencies are going to be used since they automatically adjust to whatever frequency the radios are tuned to.

The software automatically sets your scanning frequencies to scan those frequencies that your Run Radio is not on. This will automatically post multipliers encountered during the scan to the contesting software's band map. The Run Radio will use the data on the band map to switch to the multiplier's frequency and work him. After completing the contact, the run frequency is quickly reactivated again. That Scanning Radio is a dandy addition to the station—it is much faster at spotting multipliers than a Web-Cluster or a DX packet cluster, and you don't have to worry about incorrectly posted call signs.

A quick query sent to the computer-station interface hardware down there in Aruba runs a check of the standby generator and the power interrupt units. A positive response assures you that power outages will not be a matter of concern during this contest. However, further equipment checks reveal that the grayline-tracking tower rotator interface is showing an error.

Dang—its 15 degrees out of calibration again! Once again you'll have to fire off a couple of computer commands to correct for it. It could be worse… In the back of your mind, you cannot help thinking about how annoying it would be to have to drag the wife and kids (or grandkids) back down to the beach and somehow find a way to keep them occupied while you climbed up the tower and re-tightened the rotator clamps.

A silent smirk appears on your face as you pat yourself on the back for installing that fantastic rotator control software. Besides easily making the calibration adjustment, you paid the extra expense to have the programmer plug in changes that have the rotators on both tower stacks adjust themselves if a monitored signal is a mult and it is over 45 degrees off the current beam heading. You sure don't want to waste time by having the station repeat the exchange more than twice before logging it!

Your thoughts drift back to that programmer. You would feel a lot more comfortable if he would hurry up and get the software program revised so that it would automatically bring a third radio online if something happens to one of the other two. As terrible as it may seem, right now you are at the mercy of a pager call notifying you that you must deal with a failure. What the heck are you going to do if you aren't close to a computer to correct the problem?!

Well, that's all done. The exchange for the contest is CALL-RST-QTH-CQ ZONE, so at the conclusion of the contest, the software will scan all entries looking for busted calls and suspicious QTHs and CQ zones. That software will even connect to one of the "callbook" Web sites and check out those call signs that are in question and then "red flag" them if it cannot automatically make a correction. All you have to do now is wait for the contest to end and let the software generate the logs and send them to you for perusal prior to forwarding it on to the Dreaded Log Checkers.

You might actually have to spend a few moments to make some decisions, though, about those "red flagged" entries. It sure would be nice if the Old Timers who refuse to keep up with the changing technology would just send their state abbreviation instead of the entire state and would figure out what darned CQ zone they are in. Thankfully, software is pretty good about guessing what they mean, but it sure would make things easier if those Die-Hards would trade in their keyers and microphones for a decent computer!

You check your watch and see that there is still plenty of time to make the dive boat leaving from Laguna Nigel heading out for weekend dives over at Catalina and San Clemente Islands. You better stop what you are doing right now and stick your pager and note-pad computer with that cool new satellite access modem in the travel bag. Boy, that was dumb forgetting it last time! Having no offshore access to the Internet cost you a bunch of points. It sure won't be much fun to see that guy with the remote station in the Cape Verde Islands beat you again.

A station of the future? Far-fetched? Not so. It's here now. The computer software, the radios, the rotators, etc are available today. Is this scenario isolated to RTTY contesting? Not a chance. For the most part, completely automated CW and SSB contesting capability is here if one learns to use readily available soundcards, voice keyers and various software combinations.

A programmer, who will remain anonymous, has stated that he could have a working copy of the needed software in 60 days and a bug-free copy in 180 days. It boggles my mind. Is this where we want contesting and Amateur Radio in general to go?

Friend or Foe?

A thread on the RTTY reflectors awhile back centered around a discussion of the pros and cons of using the *friend.ini* file. This uses a growing database of known calls (originally started by Ron, K5DJ) to insert the contacted station's first name, or any other information you've programmed, into the reply exchange. There were comments along the lines of "It slowed down the

exchange," "it's too impersonal if you didn't actually know the operator," "It helped to confirm the exchange if you weren't sure of the call sign," etc. I guess if we go completely automated we will have to make it mandatory to use the *friend.ini* file just to make it "seem" like there is actually someone on the other end!

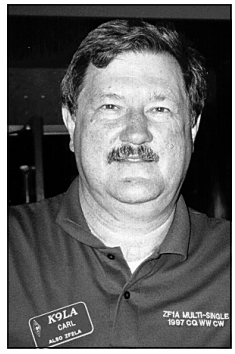
The next *NCJ* RTTY Sprint is coming up on March 11th, 2001, from 0000Z to 0400Z (Saturday evening for North America). Come and join the throngs of dial twisters, band hoppers, and antenna twirlers, who take the time to exercise their fingers, their minds, and their equipment *and have a good time doing it.*

That's all for this issue. Remember, it took a person to think up and design these machines that we use, so in that context they aren't any smarter than we are... ■

Propagation

Carl Luetzelschwab, K9LA
k9la@gte.net

How Accurate Are Propagation Predictions?



K9LA

In the July/August 2000 column I voiced my opinion that propagation predictions are pretty accurate under quiet magnetic field conditions. Let's check this out by comparing a prediction to the actual results experienced over a real path.

Propagation predictions programs typically provide two outputs: the monthly median MUF (*maximum usable frequency*) and the monthly median signal strength (or signal-to-noise ratio through the addition of noise into the calculation). To properly validate a propagation prediction, both entities must be evaluated separately.

Let's look at the path from WWV in Colorado to my QTH in Fort Wayne for the month of August 2000. I used *ICEPAC* for the prediction, which is the version of *VOACAP* that includes an improved high latitude model of the ionosphere. I used a smoothed sunspot number (*SSN*) of 130, a time of 2300Z, appropriate antennas and power levels at the WWV end, and my LPDA at my end. The output of the prediction is shown in **Table 1**.

The first column is the median MUF for this specific path for the date, time and SSN we are considering. Note that the parameter "MUFday" is 0.50 for this column—it should be, as median implies 50% probability. In other words, the actual MUF should be at least 17.6 MHz on half of the days of the month.

On 10 MHz, the parameter MUFday is 1.00—that means that the actual MUF is predicted to be greater than 10 MHz on all 31 days (1.00×31) of the month. On 15 MHz, the parameter MUFday is 0.82—that means the actual MUF is predicted to be greater than 15 MHz on 25.4 days (0.82×31) of the month. On 20 MHz, the parameter MUFday is 0.18—that means the actual MUF is predicted to be greater than 20 MHz on 5.58 days (0.18×31) of the month. This MUFday data allows us to draw the probability curve of the MUF, which is shown in **Figure 1a,** in terms of the number of days of the month a band is predicted to be open. This curve is one of the two prediction outputs to be validated.

Table 1
***ICEPAC* prediction software outputs**

frequency (MHz)	17.6	10.0	15.0	20.0
mode	1F2	1F2	1F2	1F2
MUFday	0.50	1.00	0.82	0.18
signal level (dBm)	——	–56	–54	–75

Next we have to take the predicted median signal levels and come up with their probability curves. This is a more difficult task, and one needs to go to the excess system loss tables (similar to the MUF variability tables referenced in my July/August 2000 column) to get the lower and upper decile values for signal strength. I did this for the 15 MHz prediction, and the results are in **Figure 1b**. This curve is the other prediction output to be validated. With Figures 1a and 1b, we have the curves that we want to validate with actual results.

Now we need some actual data to see how accurate the predictions are. Thus for the month of August 2000, I listened to WWV on 10 MHz, 15 MHz and 20 MHz each day at 2300Z and recorded the signal strength. Prior to doing this, I calibrated my receiver's S meter with a signal generator.

If I heard WWV on one of the frequencies on a given day, then that meant that "band" was open on that day—the MUF was high enough. By counting up the number of days the signal was heard on each frequency and dividing by 31 (number of days in August), the MUFday parameter for each frequency was determined. This is plotted in **Figure 2a**, which also includes the predicted MUF probability curve of Figure 1a.

For signal strength, I ordered all signal strength readings on each band by as-

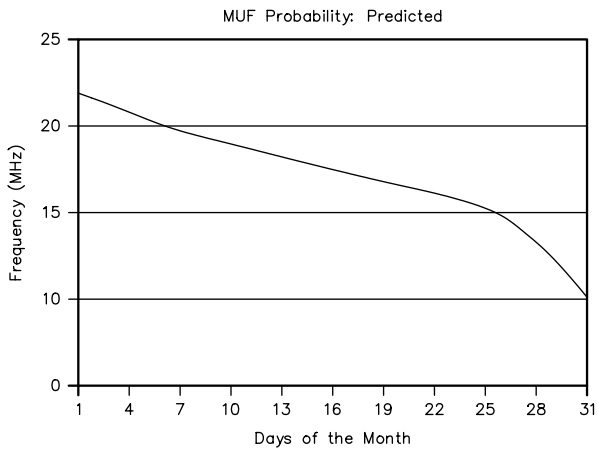


Figure 1a—The maximum usable frequency in terms of the number of days of the month that its value is predicted to reach the level of the curve (ie, the MUF will be at least 15 MHz on 25 days of this month).

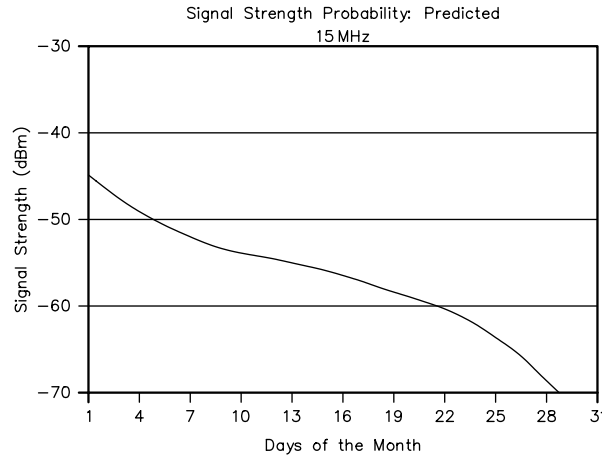


Figure 1b—The approximate signal strength in terms of the number of days of the month that its value is predicted to reach the level of the curve (ie, the signal strength will be at least –50 dBm on 8 days of this month.)

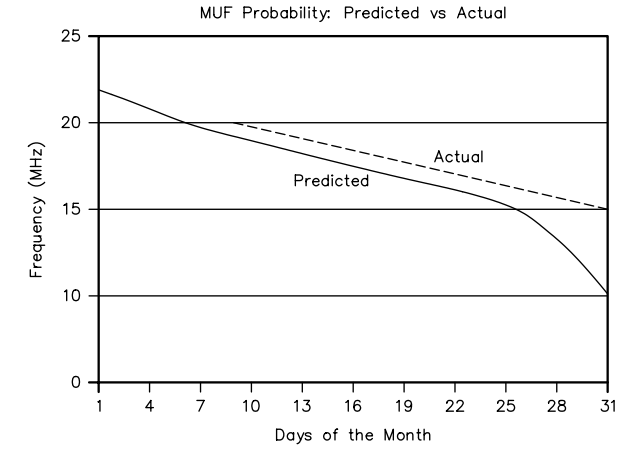


Figure 2a—The maximum usable frequency in terms of the number of days of the month that its value is predicted to reach the level of the curve, along with a plot generated from actual observations.

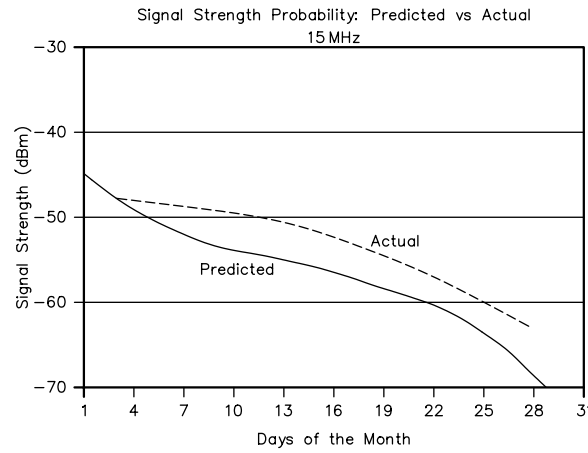


Figure 2b—The approximate signal strength in terms of the number of days of the month that its value is predicted to reach the level of the curve, along with a plot generated from actual observations.

cending signal strength. This allowed me to easily determine the median signal strength for each frequency—the value that had half of the readings above it and half of the readings below it. This ordering of data also allowed me to pick out the 10 percentile and 90 percentile points. The data for 15 MHz is plotted in **Figure 2b**, which also includes the predicted signal strength probability curve of Figure 1b.

Eyeballing Figures 2a and 2b indicates that the predictions aren't too bad at all. The MUF prediction is a bit pessimistic compared to the actual results—15 MHz was open several more days than predicted and 20 MHz was open a couple more days than predicted. The signal strength prediction on 15 MHz came out about one S-unit greater than what I measured. I'll have to admit that's a heck of a lot closer than I expected (maybe I screwed up somewhere!), considering all the variables that go into calculating signal strength. For the record, 15 MHz was the best, with 10 MHz and 20 MHz within two to three S units—still not bad.

As you can see, validating a propagation prediction is not a quick task. Properly done, it takes a month's worth of signal strength data and multiple-frequency data for just one path at a given time, date and SSN. What about using contest logs to validate predictions? I've done that, even going to the effort of separating out the MUF issue and the signal strength issue. But I always end up with the same problem—how good is any conclusion when you're only using two days worth of data to try to validate a prediction that is based on probabilities over a month's time frame? I think that all I really can say is that my two days worth of data falls within the statistical limits of the prediction.

In summary, my opinion that propagation predictions are pretty accurate under quiet magnetic field conditions worked out okay for this path. But this is just one small step in validating predictions on the whole. And what about predictions involving high latitude paths? I don't think they will fare as well. The way to find out is to monitor a month's worth of data on a high latitude path. Hmm, I just may do that. Stay tuned...

Finally, if you're interested in downloading the free *VOACAP* and *ICEPAC* software mentioned at the beginning of this column, send me an e-mail and I'll send you a *Microsoft Word* attachment that tells how to download the software and provides very basic instructions for using it. ■

Contest Expeditions

Kenny Silverman, K2KW
k2kw@prodigy.net


K2KW

Here I am—chilled to the bone—while the Pacific Coast's first major storm of the year is pounding the area, and wishing I were sipping a margarita on some tropical isle! As I pen this column, I'm sitting at my desk and gazing out the window at the Pacific Ocean—located about 300 feet away and 100 feet down the cliff.

The waves are peaking 25 feet atop a 7-foot storm surge. The ocean is a mass of white froth, the winds are howling at gale force, and we're even experiencing thunder and lightning—a rare occurrence on this part of the West Coast. As I view this scene, I'm already daydreaming about where I'll operate from for the CQ WW CW Contest. I'm beginning to research some possible destinations on the Web, and this seems like an ideal opportunity to share some of my research tips with you.

The Perfect Spot

What makes the perfect DX contest QTH? Well, that's a subjective topic, but there are some tools that all contest expeditioners should be aware of that will help them identify *their* perfect location. There is a staggering amount of information available on the Web, but—as always—the key is finding and unlocking all of those hidden resources.

Many people like to operate from hotels or villas. One of the best ways to find a villa is to bring up your favorite search engine (mine is **www.dogpile.com**), and key in the country name along with the word "villa." For example, "Jamaica" and "villa" will generate a huge number of hits.

There are also a number of travel-related sites that have lists of villas to rent. Here are a few of my favorites.

Islands Magazine is a great source of information on—well—*islands!* They have an extensive rental/classified section, but they also post an on-line listing. Check out **www.islands.com**.

Hideaways International—a "travel club"—is another one of my sources for villa information. You'll find their Web site at **www.hideaways.com**. If you become a (paying) member of the club, they will provide the contact information for villa owners so that you can book direct. Otherwise, you'll need to book your accommodations through them.

International Vacation Homes (IVH) also maintains a large on-line database of villas available for rent. IVH's Web site?—**www.ivacation.com**.

Contour Considerations

A detailed map is extremely helpful if you are looking for that "special" operating location. Many large college and university libraries maintain extensive map collections, and their resources are free! My favorite (local) source of street and topographic maps is the U of C/ Berkeley Library in Berkeley, California. I just make a personal visit and photocopy the maps I need.

If you are really interested in further investigating a prospective site to see if it meets particular topographical requirements—such as a hilltop location and/or clear RF shots towards the all-important "population centers"—it's prudent to get your hands on a topographic map. Topographic maps show (among other things) terrain contours, nearby major cities, buildings and roads.

Many times I like to purchase my own maps, and there are many map stores worldwide. Good stateside sources for international maps (including topographic maps) are Maplink in California: **www.maplink.com** (805-692-6777), and Omni Resources in North Carolina: **www.omnimap.com** (336-227-8300).

The International Map Trade Association maintains a Web site that features a large list of map stores and map dealers in both US and foreign locations. Visit **www.maptrade.org**, or call 815-939-4627.

The best map store that I have located so far is Geo Center ILH in Germany. I stumbled upon it in the late '80s when I was in that country working on a cellular telephone project. I was just driving around the countryside and happened to discover this gem by accident. ILH claims that they actually supply most of the map stores in the US! You can contact them directly at Geo Center ILH, **www.geokatalog.de/home.htm**; e-mail **GeoCenterILH@t-online.de**; +49-711-781 946 70. US customers can order ILH products through their US distributor: East View Cartographic, **www.cartographic.com**; 612-550-0961.

Predetermined Destinations

Of course, you can always consider traveling to well-known operating locations. For some possibilities, check out Paul Gentry's (K9PG) "The Contest Registry" in *CQ Contest* magazine. Paul's listing is predominantly intended to hook up new contesters with contest mentors, but most of the DX ops that appear on it will welcome visiting operators to their stations.

And, of course, don't forget to check out my Web page—DX Holiday—at **pages.prodigy.net/k2kw/qthlist/**. A link to the Web-posted version of the "The Contest Registry" is provided on my Web site.

Help Preserve Our Resources

Once you find your perfect location, there are a few guidelines you should follow to help assure that the location will remain available for future operations.

The Contest Expeditioner's Guide

- Leave the QTH in at least as good a condition as it was when you arrived.
- Be a goodwill ambassador to everyone you meet.
- If equipment is provided, treat it as if it were your own (or considerably better!). Repair and replacement of equipment are typically the largest expenses incurred by the owner of a Rent-a-QTH.
- Do not make modifications to the antennas, the station or the facilities unless you are given explicit permission to do so.
- If you break something, offer to pay for it!
- Be kind to the neighbors, so that other hams may follow in your footsteps.
- Out of courtesy, become a dues-paying member of the local radio club.

Finding a perfect DX contest location is pretty easy these days. One just needs to know how, and where, to look!

CU on the air from Jamaica as 6Y8A during the ARRL DX SSB Contest.

73, Kenny, K2KW ■

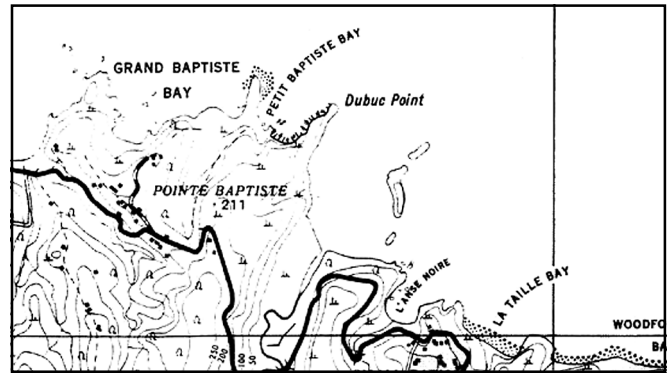


Figure 1—A portion of a topographic map of Dominica, J7. The scale of the actual map is a very detailed 1:25000.

Results, August 2000 NAQP CW Contest

Bob Selbrede, K6ZZ
k6zz@ccis.com

Participation was higher than normal for an August running of the CW NAQP Contest. There were approximately 220 participants submitting logs, about 25% more than usual. Electronic log submission continues to gain in popularity with better than 80% sent in via e-mail this time around.

Taking Top Single Op honors this time was Dave Mueller, N2NL. Dave had fewer QSOs than the second, third and fourth place finishers, but did a bang-up job on multipliers with 20 more than second place finisher Dan, N6MJ. Multiplier totals for most Western US stations were lower than those of Midwest and Eastern US stations. The scores of second place N6MJ, third place W6EEN (operated by N6RT) and fourth place N5RZ were all quite close. Doug, N6RT, faired well in the log checking department and climbed two positions in the final standings due to the FB accuracy (better than 99%) of his log.

In the Multi-Two category, the gang at W5NN came out on top again with a respectable lead over second and third place finishers W0UO and K4NO. I still receive a significant number of Multi-Two log submissions in which the QSOs are not identified according to which transmitter made them. Please remember, as per the rules (5/ b/ iii.), Multi-Two stations are required to submit a log for each of the two transmitters or identify which transmitter made the QSO in the case of a merged log.

Team competition is still a popular aspect of the NAQP contests. This running saw 27 registered teams in the fray with the Southern California Contest Club ending up on the top of the heap. The Tennessee Contest Group did well again—as usual—placing second, and the Potomac Valley Radio Club took third. The Society of Midwest Contesters managed to get 6 teams together; and most of the members operated and submitted their logs! The Tennessee Contest Group did likewise with 4 teams. Both clubs are to be commended on their excellent efforts to bolster participation.

As we wrap up Y2K and enter this new year of NAQP contests, I would like to thank everyone for supporting and promoting the NAQP. NAQP participation and scores have grown nearly 100% over the last 7 years and hopefully the trend will continue. Soap Box comments frequently include the words, "this is a fun and friendly contest." I'm hopeful

Team Scores

1. Southern California Contest Club #1		*2. Tennessee Contest Group #1*		*3. Potomac Valley Radio Club #1*	
N6MJ @W6KP	166,740	N4ZZ	133,318	VP5Y (KD4D)	134,820
W6EEN (N6RT)	165,572	K0EJ	127,488	K3MM	133,238
N6ZZ	156,434	K1KY	122,202	N4AF	122,486
K6LL	136,756	K4RO	120,384	N4CW	84,364
XE2MX (N6KI)	72,712	WO4O	89,813	K4QPL	73,794
Total	698,214	*Total*	593,205	*Total*	548,702

4. Northern California Contest Club #1 (N6RO, K6AW, AE6Y, K6TA, K5RC) 535,437
5. Society of Midwest Contesters #1 (WE9V, N0AV, N9FH, KJ9C, K9XD) 494,829
6. North Texas Contest Club (N5RZ, K5RX, W5FO, WQ5W) 415,052
7. Texas DX Society (K5WA, N7FO, W5ASP, KG5U) 409,295
8. Mad River Radio Club #1 (W8MJ, N8EA, KU8E, K5IID, K8JM) 384,546
9. CANDU (VE3EJ, VA3UZ, VE3KZ, VE3FU, VE5MX) 358,487
10. Society of Midwest Contesters #2 (K9IG, K0OU, K9MMS, WT9U) 344,596
11. Florida Contest Group (N2NL, K4LQ, WD4AHZ, KB4N) 344,428
12. South East Contest Club #1 (W4OC, K9AY, AA4S, W4NTI, AA4LR) 340,793
13. Minnesota Wireless Association #1 (KT0R, K0OB, K0AD, NA0N) 330,146
14. Tennessee Contest Group #2 (N4VI, K4LTA, K4AO, K3WU) 320,444
15. Potomac Valley Radio Club #2 (K7SV, WJ9B, W2CS, K2YWE) 314,143
16. Southern California Contest Club #2 (K6AM, W6TK, WN6K, N6BM) 268,906
17. Society of Midwest Contesters #3 (WO9S, N9RV, NT1N) 233,536
18. Tennessee Contest Group #3 (NA4K, K4BEV, N4KN, N4PQV, W4TYU) 150,896
19. South East Contest Club #2 (K4BAI, K4OGG, K2UFT) 146,876
20. Mad River Radio Club #2 (K8MR, NU8Z, AA8U, KC8FXR) 132,593
21. Society of Midwest Contesters #5 (N9CK, K9WX, N9JF) 95,009
22. Society of Midwest Contesters #4 (K9ZO, K9BG, N9IJ, K9GY) 83,408
23. Northern California Contest Club #2 (K6III, N6ZFO, W6ISO) 48,753
24. Rush Drake Orchestra (KI7Y, K7NT) 36,271
25. Minnesota Wireless Association #2 (N0AT, K0RC) 32,578
26. Tennessee Contest Group #4 (W4PA, N4ZI, KE4OAR) 31,353
27. Society of Midwest Contesters #6 (N9BOR, W9LYA, KG9PQ) 25,050

2000 NAQP Award Winners and Sponsors

The following plaques were awarded to the winners of the 2000 NAQP CW and SSB Contests. Congratulations to the winners and a special thanks to the FB contest clubs that made these awards possible.

January 2000

Award	*Winner*	*Sponsor*
Top Single Operator CW Score	Doug Brandon, N6RT (@W6EEN)	Florida Contest Group
Top Multi-Two CW Score	K0RF (K0RF, N0HF)	Texas DX Society
Top Single Operator SSB Score	Dave Hachadorian, K6LL	South East Contest Club
Top Multi-Two SSB Score	K5KA (K5KA, N5RZ)	Tennessee Contest Group
Top Combined CW/SSB Score	Dave Hachadorian, K6LL	Southern California Contest Club

August 2000

Award	*Winner*	*Sponsor*
Top Single Operator CW Score	Dave Mueller, N2NL	Florida Contest Group
Top Multi-Two CW Score	W5NN (K1OJ, K5GA, K5NZ)	Texas DX Society
Top Single Operator SSB Score	Doug Brandon, N6RT (@ W6EEN)	Southern California Contest Club
Top Multi-Two SSB Score	N6RO (K6AW, K3EST, K2KW)	Northern California Contest Club
Top Combined CW/SSB Score	Doug Brandon, N6RT (@ W6EEN)	Southern California Contest Club

that the NAQPs will continue to grow and that they will always be fun for everyone. With your help, I'm confident that they will!

73, Bob, K6ZZ

Soap Box

While I still don't have my tower up yet, I managed to improve my "personal best" score. Caught K9AY in the first 10 minutes, and he moved me through all 6 bands. That's a first for me. (Of course, Gary is only about 2 miles from me, so it's almost cheating.) Later I remembered that I forgot to change antennas during the move. The "Golden Ears" award goes to AA4S. Ron pulled my 160-meter signal out of the mud for my only other top band QSO. Mostly S & P, but I did manage to do a lot of CQing. My apologies for my grotty, error-laden sending—I'm out of practice with the paddles. My keyer also appeared to randomly speed up and slow down by a couple of WPM—I'm not sure why. Ten meters was disappointing, and things were slow early on, so I took a break at 2030Z. With the obligatory dinner break at 2330Z, and not being able to keep my eyes open past 0400Z, I only managed 7.7 total hours. Looking forward to the January NAQP with a tower and decent antennas.—*AA4LR*. Just a short effort again because of our radio club picnic. But we handed out a few from there also, using the club call.—*AA1SU*. Did not get as much time as I anticipated, only about 7 hours. Still had fun.—*K3WU*. I keep learning by mistakes—not to save most of my OFF time for the end, to move more mults, and not to operate on 40 meters with my 10-meter antenna. My one-day-old 160-meter inverted-L worked pretty well "out of the box" both on 80 and 160 meters.—*K2YWE*. Thanks to W5KFT for use of the station and to K5TR for help on several fronts. This was my second NAQP—first as a single op—and my first SO2R effort. Great contest—CU in the next one.—*K5PI*. The normal Floridian 2 hour thunderstorm shut me down in the early evening, but I got back in action later and was able to operate for 9.25 hours. NAQP is always a fun contest, and makes a nice break from the summer contest inactivity. Unusually high noise levels on the low bands, even for the summertime in Florida, but I was still able to copy a few weak stations.—*K4LQ*. Good show TCG!—*K4RO*. The rules of this particular contest enable it to be a busy one, which I think is one of the prime ingredients of its popularity. My thanks to the *NCJ* for their continued support and sponsorship of the NAQP.—*K8KFJ*. First full-time effort for me in the August NAQP. I might do it again.—*K5RX*. My personal best for an August NAQP CW. I've got to get a 160-meter antenna!—*KA8OKH*. Conditions were poor, activity was fair. This was my first SO2R HF effort—I think it went pretty well with only a few moments of confusion. Early on the second band was 20 using a dipole at 25 feet, which worked for the big guns but not for the scatter level QSOs. My most amazing QSO was when WE9V successfully passed me from 160 to 15 meters at 0430Z.—*K8MR*. Made some Qs between TWO wedding receptions.—*K9GY*. On vacation again this year and operated from a campground. Lots of fun as usual.—*K9LU*. No 160 antenna (windstorms), 80-meter dipole just doesn't cut it on 160, and there are a lot of mults there. Poor conditions, especially on 10. Rain from the thunderstorms eliminated the local line noise but replaced it with lightning QRN. There was competition for a time from the Brickyard 400. I considered using BRICK for a name (see W9RE). Great minds! My score was down from January, but better than my prior August scores. Lot of good INDIANA competition this time (W9RE, K9IG, N9RV, WT9U). K9BG is now there too. The first place IN certificate should go to SMCer.—*KJ9C*. I had to go with the XYL to the Mother-in-law's, but I got to take a radio and antenna for a few hours of fun. I even got the 20-meter ground-mounted vertical to tune on 40 for another few contacts on that band.—*KE4OAR*. This is one of my favorites because of the length and the leisurely way I work it. I always manage to get a Saturday afternoon nap during this one!—*KJ5WX*. Tried to plan op time around predicted heavy thunderstorms but they never came so I spent too much time on the high bands. Ten was not very productive but 80 and 160 were quite good, despite the QRN.—*N0AV*. Conditions were bad on 10, 15 and 20. But 40 and 80 picked up the slack. Had a great time. Look forward to the next NAQP.—*NU8Z*. I really screwed this one up, figuring 160 and 10 would be no good (thunderstorms and propagation, respectively). Well, I heard LOTS of sigs on 10, and the S/N on 160 was WONDERFUL. I even devoted a 1/2-hour break trying to hook up an old, low 160 dipole to some new coax. Might have worked, too, if I hadn't forgotten that the lawn mower ate one end early this year! Not even the old TS-830S (which kinda loaded up whatever that wire looked like) could be heard! The antenna analyzer showed a sorta-match at around 2.3MHz! Wish we had a band there. Activity seemed to be down. The 80- and 40-meter band were short, with the left coast the longest worked (no pacific). One of these days I really need to get some antennas! 73, All.—*W2CS*. No 160-meter antenna. I tried to load an 80-meter dipole with almost no luck. Thanks to everybody who agreed to move for me.—*VA3UZ*. As usual the NAQP is a great mid-summer tune up session. Very unusual conditions this year. Lots of fluttery low band signals.—*VE3EJ*. Conditions on 15 started out good but died later. Twenty was the best band for me. Worked one on 10 and 5 on 40. Only operated 5 hours and 50 minutes due to other activities. Thanks to all for the QSOs and to the sponsors for a good contest. See you in the SSB shuffle.—*VE7QO*. This was my first participation in this contest—it was really fun. I look forward to the next one!—*XE1RGL*. All was going great until the computer started to crash with 90 minutes of operating time left! Couldn't get it to stop crashing after every few calls. Thanks for everyone's patience and sorry to my SCCC Team #2 teammates. Hope I can do better next time.—*W6TK*. Not a great score, but I enjoyed the contest. I operated in "search and pounce" mode exclusively to help the more serious contenders. There was plenty of activity to keep me busy.—*W8IDM*. I kind of set the tone for this one early (and a bad tone it was) when I connected the computer interface to the new (MARK V) rig about 20 minutes before the start of the

Single Op Top Ten Breakdowns

Call	*Score*	*QSOs*	*Mults*	*160*	*80*	*40*	*20*	*15*	*10*	*Team*
N2NL	169,510	737	230	28/20	76/34	197/49	196/48	151/47	89/32	FCG
N6MJ @W6KP	166,740	794	210	10/5	60/29	213/45	277/53	183/45	51/33	SCCC #1
W6EEN (N6RT)	165,572	781	212	15/8	100/37	195/49	264/53	179/47	28/18	SCCC #1
N5RZ	164,590	755	218	26/13	80/32	182/45	256/49	119/44	92/35	NTCC
W0UA @K0RF	161,993	733	221	56/24	110/40	157/47	200/48	176/40	34/22	
N6ZZ	156,434	731	214	33/18	78/32	141/40	249/50	166/48	64/26	SCCC #1
K5WA	147,662	731	202	26/15	96/35	213/49	176/43	165/39	55/21	TDXS
VE3EJ	140,335	635	221	71/34	145/44	203/51	114/48	81/31	21/13	CANDU
K5RX	136,920	652	210	51/24	69/31	152/42	227/48	98/37	55/28	NTCC
K6LL	136,756	716	191	9/6	40/23	130/41	310/54	198/49	29/18	SCCC #1

Multi-Two Breakdowns

Call	*Score*	*QSOs*	*Mults*	*160*	*80*	*40*	*20*	*15*	*10*
W5NN	254,584	1052	242	39/20	156/44	295/48	318/53	183/46	61/31
W0UO	150,733	781	193	30/16	107/33	284/49	238/47	104/38	18/10
K4NO	119,822	662	181	43/24	110/36	315/50	136/41	44/19	14/11

contest. I couldn't get the keying interface to work, so 17 minutes into the contest, with 3 QSO's in the log, I decided to go to the '940. I finally got going at 1835Z, but my spirit or desire—or whatever—was shot. Not being able to put the MARK V "through its paces" was disappointing. Putzed around on the radio a little, watched the Brickyard 400 a little, back on the radio a little, watched the Pittsburgh Steelers in a pre-season game, then back on the radio. By then—0100Z—40 was already going long; spent an hour or so there, and then went to 80, which was also already long. By 0245Z, I decided I'd chalk this one up to experience.—*WA3SES*. I really enjoy the pace and gentlemanly atmosphere of this contest. I still have lots to learn about strategy!—*WO9S*. Conditions were not very good. I had high hopes after wonderful sounding bands on the Thursday before the contest. My score is 20% less than last year. Signal paths seemed skewed even on 15 and 20. Ten meters never produced much despite the occasional strong signal. My "Field Day" 80-meter dipole, which I strung up on Friday, was worth 5.5k more points. I experienced a peculiar RF problem on 15, which made my CW paddles useless. To send anything not already programmed I had to switch to keyboard mode. My high school typing class really paid off at times! One of these years my work schedule will permit me to operate the January party. Seems the conditions are much better then. 73 and thanks to all for the QSOs.—*XE1/AA6RX*.

Single Operator Scores

Call	*Score*	*QSOs*	*Mults*	*Section*	*Team*
K1VUT	114,560	640	179	MA	
WE1USA	92,910	570	163	NH	
NT1N	73,776	464	159	CT	SMC #3
AB1BX	28,320	295	96	RI	
NY1S	27,604	268	103	ME	
K1HT	20,800	208	100	MA	
K1TS	18,270	203	90	MA	
AA1SU	14,322	186	77	VT	
W1FJ	13,266	201	66	MA	
N1MD	11,169	153	73	CT	
K1UQE	384	32	12	CT	
W2TKF	7,254	117	62	NY	
K3MM	133,238	614	217	MD	PVRC #1
AA3B	118,482	637	186	PA	
K3WW	80,033	491	163	PA	
K2YWE	55,062	399	138	MD	PVRC #2
K3WU	54,264	408	133	PA	TCG #2
W3CP	18,860	205	92	MD	
WA3SES	15,738	183	86	PA	
KC3QU	11,289	159	71	PA	
N3NZ	10,872	151	72	PA	
N2NL	169,510	737	230	FL	FCG
N4ZZ	133,318	698	191	TN	TCG #1
K0EJ	127,488	664	192	TN	TCG #1
N4AF	122,486	673	182	NC	PVRC #1
K1KY	122,202	657	186	TN	TCG #1
K4RO	120,384	627	192	TN	TCG #1
K7SV	108,679	569	191	VA	PVRC #2
K4BAI	105,764	548	193	GA	SECC #2
W4OC	101,384	551	184	SC	SECC #1
K9AY	95,930	530	181	GA	SECC #1
WO4O	89,813	551	163	TN	TCG #1
K4LQ	87,606	471	186	FL	FCG
N4CW	84,364	524	161	NC	PVRC #1
K4MA	84,335	505	167	NC	
K4LTA	84,000	525	160	TN	TCG #2
AA4S	82,732	481	172	NC	SECC #1
NA4K	82,134	507	162	TN	TCG #3
WJ9B	80,542	523	154	NC	PVRC #2
N2NFG	77,672	532	146	NC	
K4AO	74,228	482	154	KY	TCG #2
K4QPL	73,794	502	147	NC	PVRC #1
W2CS	69,860	499	140	NC	PVRC #2
WD4AHZ	66,912	492	136	FL	FCG
K4IQJ	52,896	348	152	AL	
W4NTI	38,517	347	111	AL	SECC #1
KA8OKH	38,304	336	114	KY	
K4BEV	33,840	282	120	TN	TCG #3
K4IU	25,908	254	102	KY	
AA4LR	22,230	234	95	GA	SECC #1
K4OGG	20,910	205	102	GA	SECC #2
KB4N	20,400	204	100	FL	FCG
K2UFT	20,202	222	91	GA	SECC #2
NY4T	19,392	202	96	TN	
K4BAM	18,746	206	91	KY	
W4DWS	16,605	205	81	AL	
W4PA	16,461	177	93	TN	TCG #4
N4KN	14,965	205	73	TN	TCG #3
N4ZI	13,662	207	66	TN	TCG #4
W4SAA	11,550	150	77	FL	
N4PQV	10,585	145	73	TN	TCG #3
K4BX	10,295	145	71	TN	
W4TYU	9,372	132	71	TN	TCG #3
K4WI	7,198	122	59	AL	
KG4BIG	6,270	114	55	KY	
WB4IHI	5,291	143	37	FL	
K4WW	1,650	50	33	KY	
K4PTT	510	34	15	GA	
WD4IFN*	390	26	15	NC	
N5RZ	164,590	755	218	TX	NTCC
N6ZZ	156,434	731	214	NM	SCCC #1
K5WA	147,662	731	202	TX	TDXS
K5RX	136,920	652	210	TX	NTCC
W5VX	131,040	720	182	TX	
K5PI @W5KFT	127,300	670	190	TX	
W5WMU	119,973	609	197	LA	
AB5SE	101,421	531	191	AR	
W5TM	97,704	552	177	OK	
N5YA (N5UM)	95,804	557	172	TX	
W5ASP	95,274	603	158	TX	TDXS
KZ5D	90,424	508	178	LA	
N5RG	89,091	521	171	TX	
W5FO	80,685	489	165	TX	NTCC
KG5U*	65,349	411	159	TX	TDXS
WA5JWU	55,836	396	141	LA	
AF5Z	35,960	290	124	TX	
N5UE	35,880	312	115	MS	
WQ5W	32,857	319	103	TX	NTCC
KG5RM	22,213	229	97	AR	
KJ5WX	14,685	165	89	AR	
W3DYA	12,320	160	77	TX	
NO5W	11,988	162	74	TX	
K0GEO	7,812	126	62	TX	
W5NR	5,096	104	49	TX	
K5QQ	3,366	102	33	NM	
K5OI*	1,696	53	32	NM	
AB5FS	1,000	40	25	OK	
KJ5CR*	936	36	26	TX	
N5KB	875	35	25	TX	
N6MJ @W6KP	166,740	794	210	CA	SCCC #1
W6EEN (N6RT)	165,572	781	212	CA	SCCC #1
N6RO	130,611	663	197	CA	NCCC #1
K6AW @W6NL	125,364	674	186	CA	NCCC #1
AE6Y	99,879	591	169	CA	NCCC #1
K6TA	99,129	573	173	CA	NCCC #1
K6AM	98,832	568	174	CA	SCCC #2
W6TK	63,662	458	139	CA	SCCC #2
WN6K	58,695	455	129	CA	SCCC #2

Call	Score	QSOs	Mults	Section	Team
N6BM	42,750	342	125	CA	SCCC #2
K6III	27,392	256	107	CA	NCCC #2
NA6E	26,244	243	108	CA	
N6ZFO	18,601	209	89	CA	NCCC #2
K6EY	17,200	200	86	CA	
K6EP	13,104	168	78	CA	
W6ISO	2,760	69	40	CA	NCCC #2
K6LRN	1,100	44	25	CA	
K6LL	136,756	716	191	AZ	SCCC #1
N7FO (KN5H)	101,010	546	185	AZ	TDXS
K4XU	98,496	608	162	OR	
K7ON	85,013	563	151	AZ	
K5RC	80,454	506	159	NV	NCCC #1
WO7Y	72,720	505	144	ID	
N7WA	61,744	454	136	WA	
N7LOX	59,780	427	140	WA	
KI7Y	32,883	291	113	OR	Rush Drake
KD7AEE	20,070	223	90	UT	
W7HS	13,430	170	79	UT	
KU7K	12,210	165	74	OR	
K7NT	3,388	77	44	OR	Rush Drake
W8MJ	121,089	669	181	MI	Mad River #1
N8EA	101,520	540	188	MI	Mad River #1
WA8WV	75,300	502	150	WV	
KU8E	73,568	484	152	OH	Mad River #1
K8MR	63,516	402	158	OH	Mad River #2
K5IID	62,769	427	147	WV	
N8BJQ	59,584	392	152	OH	
K8KFJ	47,360	370	128	WV	
NU8Z	35,417	331	107	MI	Mad River #2
KG8GW	25,742	211	122	WV	
K8JM	25,600	256	100	MI	Mad River #1
AA8U	19,800	200	99	MI	Mad River #2
KC8FXR	13,860	180	77	MI	Mad River #2
W8IDM	11,400	150	76	OH	
WX3M	11,256	168	67	MI	
K8CV	6,161	101	61	MI	
K8DD	5,100	100	51	MI	
K9NW	2,380	70	34	OH	
KE4OAR	1,230	41	30	OH	TCG #4
AB8DF*	315	21	15	MI	
WE9V (K9PG)	127,866	606	211	WI	SMC #1
K9IG	100,050	575	174	IN	SMC #2
N9FH	89,308	538	166	WI	SMC #1
K9MMS	83,834	502	167	IL	SMC #2
WO9S	82,000	500	164	IL	SMC #3
KJ9C	80,028	513	156	IN	SMC #1
N9RV	77,760	480	162	IN	SMC #3
K9XD (K9YO)	76,472	484	158	IL	SMC #1
WT9U	71,288	469	152	IN	SMC #2
K9ZO	50,180	386	130	IL	SMC #4
N9CK	47,056	346	136	WI	SMC #5
K9WX	29,480	268	110	IN	SMC #5
K9JWI	19,780	215	92	IN	
N9BOR	19,082	203	94	IL	SMC #6
K9BG	18,601	209	89	IN	SMC #4
N9JF	18,473	203	91	IL	SMC #5
N9IJ	11,316	164	69	IL	SMC #4
W9LYA	5,500	100	55	IL	SMC #6
K9GY	3,311	77	43	IL	SMC #4
W9CM	2,220	60	37	IN	
AF9J	1,856	64	29	WI	
KG9PQ	468	26	18	IL	SMC #6
WB9MII*	253	23	11	IL	
W0UA @K0RF	161,993	733	221	CO	
N0AV	121,155	591	205	IA	SMC #1
N4VI	107,952	624	173	CO	TCG #2
KT0R	95,216	541	176	MN	MWA #1
K0OU	89,424	552	162	MO	SMC #2
K0OB	88,088	572	154	MN	MWA #1
K0AD	78,732	486	162	MN	MWA #1
NA0N	68,110	490	139	MN	MWA #1
WA0SXV	52,531	401	131	MO	
K9LU	52,152	424	123	MN	
N0AT	16,380	182	90	MN	MWA #2
K0RC	16,198	178	91	MN	MWA #2
W0UY	11,700	150	78	KS	
W0ETC	3,621	71	51	IA	
KS0M	3,150	70	45	MO	
K0COP	1,922	62	31	CO	
K0CO*	1,700	50	34	CO	
WA0OTV	693	33	21	MO	
VE3EJ	140,335	635	221	ON	CANDU
VA3UZ	92,575	529	175	ON	CANDU
VE3KZ	82,134	507	162	ON	CANDU
VE5SF	56,712	417	136	SK	
VE3KP	49,046	358	137	ON	
VE3IAY	45,150	350	129	ON	
VA3UA	44,132	374	118	ON	
VE2AWR	33,712	301	112	QC	
VE3FU	28,569	267	107	ON	CANDU
VE7QO	23,305	295	79	BC	
VE5MX	14,874	201	74	SK	CANDU
VE3WZ	7,750	125	62	ON	
VE7/JR1NKN	60	12	5	BC	
VP5Y (KD4D)	134,820	630	214	VP5	PVRC #1
XE2MX (N6KI)	72,712	488	149	XE	SCCC #1
XE1/AA6RX	61,061	427	143	XE	
XE1RGL	24,384	254	96	XE	
UZ7U (UT3UA)	304	19	16		

Multi-Two Scores

Call	Score	QSOs	Mults	Section
W5NN (K1OJ, K5GA, K5NZ)	254,584	1052	242	TX
W0UO (+N5PO)	150,733	781	193	TX
K4NO (+K4GU)	119,822	662	181	AL
NJ4U (K4EA, K4TW)	116,365	629	185	GA
K0SN (+AA9PB)	116,100	645	180	WI
K0DE (+KC0EXR)	61,770	426	145	CO
N6IJ (AE0M, AA6EG)	36,515	335	109	CA
W9RE (+K9XV)	10,050	150	67	IN

*Denotes a QRP Entry

Results, August 2000 NAQP SSB Contest

Bruce Horn, WA7BNM
bhorn@hornucopia.com

Although no new scoring records were set during the August 2000 NAQP SSB Contest, participation was close to the best ever for the summer session. During the contest, activity dropped dramatically after its peak during the 1900Z hour, but steadily increased again, with the 0200Z hour producing almost as much as the peak. More than half of the activity occurred on 20 and 40 meters.

N6RT piloted W6EEN's aluminum farm to first place by a 20k-point margin in the Single Op division by working more mults than any other single op or multi-two entry. Fellow SCCC team member, K6LL, used his QSO advantage to capture second by less than 800 points over third-place finisher and FCGer, K4XS. Rounding out the top five, N6MJ (ex AD6DO) took fourth, while fellow SCCCer, K6RO, took fifth. SMCer K9PG operated WE9V to sixth place and the top Midwest score, while nipping seventh-place N4ZZ by only 350 points. N6ED used W6AQ's station to capture eighth place by less than 100 points over ninth-place finisher, W5AO (at W5TM). K5RX took tenth.

NCCCers K6AW, K3EST and K2KW operated N6RO to first place in the Multi-Two category by a whopping 90k-point margin. The W5NN ops used their multiplier advantage to edge KT0R for second place.

In the team competition, the Southern California Contest Club #1 team, with five Top-Ten Single-Op finishers (four in the top five), took first place with a cumulative score that was greater than the second and third place teams combined. This is an amazing team score for an August NAQP. Unlike any other part of the continent, California ops enjoyed favorable 10-meter propagation that produced large numbers of QSOs.

The always-competitive Tennessee Contest Group #1 team captured second, while the SCCC's #2 team took third. The Society of Midwest Contesters and the Tennessee Contest Group continued their outstanding support of the NAQP by pre-registering more than a third of the teams in the contest.

Maximizing Your Score

One of the best ways to improve your score is to make sure that you correctly log the required exchange information. Unfortunately, many contesters, including some Top-Teners, suffer significant score reductions because of improper logging. Make sure that your submitted log includes the QTH for all QSOs with North American stations. A blank QTH is only acceptable for QSOs with stations outside of North America. You may need to check the configuration of your contest logging program to insure that it properly logs the exchange.

Top Combined Scores for the August 2000 NAQPs

The Top combined CW/SSB score honors go to Doug, N6RT. Doug did a FB job piloting the W6EEN station to a win in the SSB contest and a third place finish on CW. Rounding out the top 3 were Dan, N6MJ, and Dave, K6LL. All three are members of the SCCC.

Call	*CW Points*	*SSB Points*	*Total Points*
N6RT	488	500	988
N6MJ	492	429	920
K6LL	403	463	866
N4ZZ	393	321	714
K9PG	377	322	699
K5RX	404	288	692
K3MM	393	265	658
K6AM	292	278	570
WE1USA	274	264	538
K4MA	249	225	474

Single Op Top Ten Breakdowns

Call	*Score*	*QSOs*	*Mults*	*160*	*80*	*40*	*20*	*15*	*10*	*Team*
W6EEN (N6RT)	266,574	1154	231	10/5	75/30	141/50	260/54	208/51	460/41	SCCC #1
K6LL	246,688	1186	208	6/3	50/18	193/47	320/53	280/49	337/38	SCCC #1
K4XS	245,937	1123	219	13/11	95/33	136/44	459/54	219/45	201/32	FCG #1
N6MJ	228,480	1120	204	5/2	45/17	144/43	377/55	147/50	402/37	SCCC #1
K6RO	180,808	932	194	3/1	31/14	106/39	189/52	199/50	404/38	SCCC #1
WE9V (K9PG)	171,580	746	230	43/22	107/38	234/48	228/50	91/46	43/26	SMC #1
N4ZZ	171,234	906	189	24/18	142/42	275/49	277/44	133/29	55/7	TCG #1
W6AQ (N6ED)	165,401	857	193	6/5	47/14	104/37	229/52	80/46	391/39	SCCC #1
W5TM (W5AO)	165,319	791	209	10/7	88/34	160/47	239/44	226/44	68/33	
K5RX	153,440	685	224	20/14	56/29	108/40	205/53	230/48	66/40	NTCC

Multi-Two Breakdowns

Call	*Score*	*QSOs*	*Mults*	*160*	*80*	*40*	*20*	*15*	*10*
N6RO	343,958	1502	229	18/7	79/27	177/48	262/54	513/56	453/37
W5NN	253,622	1202	211	12/7	70/32	266/54	460/53	289/46	105/19
KT0R	252,657	1257	201	20/10	127/43	333/53	549/53	212/31	16/11

Team Scores

1. Southern California Contest Club #1

W6EEN (N6RT)	266,574
K6LL	246,688
N6MJ	228,480
K6RO	180,808
W6AQ (N6ED)	165,401
Total	1,087,951

2. Tennessee Contest Group #1

N4ZZ	171,234
K4MA	120,109
K1VUT	96,712
W4CAT	87,580
N4VI	72,588
Total	548,223

3. Southern California Contest Club #2

K6AM	148,320
WN6K	128,140
W6TK	125,229
K6LA	114,872
WK6I	17,945
Total	534,506

4. Florida Contest Group (K4XS, N2NL, N4PK, N4BP, W4SAA) 432,325
5. Northern California Contest Club #1 (AE6Y, N6BZA, K6III, AK6L) 394,834
6. Mad River Radio Club #1 (ND8DX, K5IID, W8MJ, K9NW, U8Z) 383,116
7. Potomac Valley Radio Club #2 (WM3T, K7SV, N4GU, K3MM) 356,749
8. Society of Midwest Contesters #1 (KE9I, N0AV, WE9V) 348,848
9. Society of Midwest Contesters #2 (K9PW, K9NR, WT9U, WT9Q, N9RV) 285,356
10. Tennessee Contest Group #2 (W0ETC, NY4T, KE4OAR, N4PQV, N5TWV) 262,167
11. Order of Boiled Owls (KS2G, N2GA, N2FF, WM2V) 237,575
12. Texas DX Society (W5ASP, KG5U, KN5H) 218,035
13. Tennessee Contest Group #3 (W4TDB, K4BEV, KS4YT, K4OOO, K0EJ) 193,980
14. Potomac Valley Radio Club-NC Part Timers (KI7WX, AB0MV, N4CW, K4QPL) 171,460
15. North Texas Contest Club (K5RX, K5RT) 170,912
16. Society of Midwest Contesters #3 (WO9S, K9MMS, WS9V) 144,322
17. Connecticut Radio Society (W1CRS, W1CTN, N2EAB) 132,085
18. South East Contest Club (W4NTI, K4OGG, K4BAI) 97,407
19. Society of Midwest Contesters #7 (K9SD, N9FH, WB9ZEZ) 82,508
20. Twin City Hams ARC (K5ER, K5OR, W5WZ, N5IX) 78,378
21. Northern California Contest Club #2 (K6EP, N6EM) 50,884
22. Disaster & Comm Action Team of Texas (KK5CA, KK5IJ, KM5VI) 49,552
23. Society of Midwest Contesters #4 (W9HL, KG9PQ, N9BOR, K9MI) 42,291
24. Society of Midwest Contesters #6 (KJ9C, KG9N, KU9Z) 34,758
25. Portland ARC (N7RX, K7FLE) 32,804
26. Mad River Radio Club #2 (KU8E, K8MR) 32,064
27. Tennessee Contest Group #4 (AK4ST, KG4BIG) 23,643
28. Tennessee Contest Group #5 (N4JN, AF4QB, NY4N) 20,856

Single Operator Scores

Call	*Score*	*QSOs*	*Mults*	*Section*	*Team*
WE1USA	140,649	813	173	NH	
KK1L	114,408	681	168	VT	Green Mtn Boys
W1CTN	97,760	611	160	CT	CRS
K1VUT	96,712	616	157	MA	TCG #1
K1PLX	76,194	498	153	RI	
N1ND	73,287	479	153	CT	
AB1BX	30,160	290	104	RI	
N1MD	25,856	256	101	CT	
W1CRS (W1RPG)	25,095	239	105	CT	CRS
KZ1O	13,728	176	78	NH	
W1FJ	4,048	88	46	MA	
N2GA	110,550	737	150	NY	OBO
WM2V	109,385	655	167	NY	OBO
KS2G	15,050	175	86	NY	OBO
KE2I	10,653	159	67	NY	
N2EAB	9,230	142	65	NY	CRS
N2LQQ	4,176	87	48	NY	
N2FF	2,590	70	37	NY	OBO
WB2BAU	931	49	19	NY	
KC2FZT	330	22	15	NJ	
K3MM	141,381	683	207	MD	PVRC #2
K3PP	42,125	337	125	PA	
K2YWE	27,352	263	104	MD	
W3TWI	17,763	191	93	PA	
NA3V	13,529	163	83	PA	
N3ZPL	1,170	45	26	MD	
K4XS	245,937	1123	219	FL	FCG #1
N4ZZ	171,234	906	189	TN	TCG #1
K4NO	129,642	697	186	AL	
K4MA	120,109	671	179	NC	TCG #1
K4WI	108,896	656	166	AL	
K7SV	102,256	581	176	VA	PVRC #2
K0EJ	97,244	604	161	TN	TCG #3
N4BP	90,729	593	153	FL	FCG #1
W4CAT (K1KY)	87,580	580	151	TN	TCG #1
N4GU	73,788	516	143	VA	PVRC #2
W2JJC	73,008	507	144	SC	
KE4OAR	72,215	505	143	TN	TCG #2
K4OGG	62,288	458	136	GA	SECC
NY4T	62,230	490	127	TN	TCG #2
N4PK	58,953	457	129	FL	FCG #1
N4OKX	54,889	419	131	KY	
K4BEV	50,307	409	123	TN	TCG #3
N4CW	48,128	376	128	NC	PVRC-NC PT
N2NFG	47,085	365	129	NC	
KI7WX	40,506	314	129	NC	PVRC-NC PT
WM3T	39,324	339	116	VA	PVRC #2
K4QPL	38,304	342	112	NC	PVRC-NC PT
N5TWV	36,630	333	110	TN	TCG #2
K4IU	33,072	318	104	KY	
N2NL	27,606	258	107	FL	FCG #1
WC4E	26,730	297	90	FL	FCG #2
K4BAI	22,410	249	90	GA	SECC
K4OOO	18,841	227	83	TN	TCG #3
KG4BIG	18,693	201	93	KY	TCG #4
N4PQV	17,928	216	83	TN	TCG #2
KS4YT	15,810	255	62	AL	TCG #3
K3MZ	13,528	178	76	VA	
AF4QB	13,392	186	72	TN	TCG #5
W4NTI	12,709	179	71	AL	SECC
W4TDB	11,778	151	78	TN	TCG #3
W4SAA	9,100	130	70	FL	FCG #1
NY4N	6,552	126	52	TN	TCG #5
KV4CN	5,831	119	49	NC	
K4GU	5,047	103	49	AL	
AK4ST	4,950	99	50	TN	TCG #4
KG4ICF	3,774	74	51	FL	
AA4LR	3,276	78	42	GA	
N4JED	2,542	62	41	VA	
N4JN	912	38	24	TN	TCG #5
W5TM (W5AO)	165,319	791	209	OK	
K5RX	153,440	685	224	TX	NTCC
KZ5D	119,016	684	174	LA	
W5WMU	115,248	686	168	LA	
W5ASP	110,825	715	155	TX	TDXS
KG5U	89,375	625	143	TX	TDXS
WA0SXV	60,480	480	126	NM	
KM5VI	34,832	311	112	TX	D-CAT TX
K5ER	24,274	229	106	LA	Twin City ARC
K5OR	23,744	224	106	LA	Twin City ARC
W5WZ	23,100	231	100	LA	Twin City ARC
K0GEO	18,490	215	86	TX	
K5RT	17,472	182	96	TX	NTCC
K0CIE	13,167	231	57	OK	
K5LBU	11,431	161	71	TX	
W5RL	10,207	173	59	AR	
KK5CA	8,120	116	70	TX	D-CAT TX
KJ5WX	7,590	115	66	AR	
N5IX	7,260	121	60	LA	Twin City ARC
KK5IJ	6,600	120	55	TX	D-CAT TX

Call	Score	QSOs	Mults	Section	Team
N3AWS	130	13	10	MS	
W6EEN (N6RT)	266,574	1154	231	CA	SCCC #1
N6MJ	228,480	1120	204	CA	SCCC #1
K6RO	180,808	932	194	CA	SCCC #1
W6AQ (N6ED)	165,401	857	193	CA	SCCC #1
K6AM	148,320	824	180	CA	SCCC #2
WN6K	128,140	745	172	CA	SCCC #2
W6TK	125,229	741	169	CA	SCCC #2
N6BZA	117,067	701	167	CA	NCCC #1
AE6Y	115,335	699	165	CA	NCCC #1
K6LA	114,872	692	166	CA	SCCC #2
K6III	101,802	722	141	CA	NCCC #1
W6ISO	64,801	473	137	CA	
AK6L	60,630	470	129	CA	NCCC #1
K6EP	44,250	354	125	CA	NCCC #2
N6UUG	37,184	332	112	CA	
K6TA	27,405	261	105	CA	
WA6DLM	24,752	238	104	CA	
WK6I	17,945	185	97	CA	SCCC #2
KO6XB	11,169	153	73	CA	
N6EM	6,634	107	62	CA	NCCC #2
N6AA	5,400	100	54	CA	
K6EY	884	34	26	CA	
K6LRN	396	22	18	CA	
K6ZCL	192	16	12	CA	
K6LL	246,688	1186	208	AZ	SCCC #1
W7ESU (K4XU)	105,865	683	155	OR	
W7ZR	86,578	593	146	AZ	
WA7LNW	83,584	653	128	UT	
K7ZZ	61,625	493	125	OR	
KW7N	33,784	328	103	ID	
K7ZO	20,769	301	69	OR	
N7RX	18,920	215	88	OR	Portland ARC
KN5H	17,835	205	87	AZ	TDXS
K7FLE	13,884	178	78	OR	Portland ARC
KI7Y	11,175	149	75	OR	
W7HS	2,332	53	44	UT	
W7/JR1NKN	165	15	11	WA	
W8MJ	122,484	708	173	MI	MRRC #1
ND8DX	116,412	654	178	OH	MRRC #1
K5IID	66,792	484	138	WV	MRRC #1
N8IKR	62,350	430	145	MI	
NU8Z	39,022	358	109	MI	MRRC #1
K9NW	38,406	346	111	OH	MRRC #1
WA8WV	34,848	363	96	WV	
KJ8F	33,372	309	108	OH	
KU8E	28,200	300	94	OH	MRRC #2
KA8FCC	20,070	223	90	OH	
KC8JNC	9,600	150	64	OH	
K8CV	8,448	128	66	MI	
KC8HWV	5,512	106	52	OH	
N8BJQ	5,151	101	51	OH	
K8MR	3,864	84	46	OH	MRRC #2
AA8U	3,672	72	51	MI	
N8KM	2,772	66	42	OH	
N8PVZ	48	8	6	MI	
WE9V (K9PG)	171,580	746	230	WI	SMC #1
K9PW	93,636	612	153	IL	SMC #2
WO9S	82,896	528	157	IL	SMC #3
KG9X	71,700	478	150	IL	
K9SD	64,650	431	150	IL	SMC #7
KE9I	62,776	472	133	IN	SMC #1
K9MMS	61,336	451	136	IL	SMC #3
N9RV	58,437	453	129	IN	SMC #2
K9NR	56,515	445	127	IL	SMC #2
K9ZO	50,184	408	123	IL	SMC #5
WT9U	44,526	362	123	IN	SMC #2
WT9Q	32,242	329	98	WI	SMC #2
N9NT	22,900	229	100	IL	
K9MI	16,632	198	84	IN	SMC #4
KU9Z	16,268	196	83	IL	SMC #6
W9HL	15,390	190	81	IL	SMC #4
KJ9C	13,932	172	81	IN	SMC #6
WB9ZEZ	11,270	161	70	IN	SMC #7
N9BOR	8,576	134	64	IL	SMC #4
W9YS	8,174	122	67	IL	
N9FH	6,588	122	54	WI	SMC #7
KG9N	4,558	106	43	IL	SMC #6
KB9JIF	2,520	70	36	WI	
KG9PQ	1,683	51	33	IL	SMC #4
WS9V	90	10	9	IL	SMC #3
N0AV	114,492	609	188	IA	SMC #1
W0ETC	73,164	469	156	IA	TCG #2
N4VI	72,588	526	138	CO	TCG #1
AE9B	45,396	388	117	MO	
AC0W	45,000	360	125	MN	
AB0MV	44,522	394	113	CO	PVRC-NC PT
W0BR	25,048	248	101	KS	
K0KY	16,968	202	84	MO	SMC #9
N0WY	15,200	200	76	NE	
W0UY	5,940	99	60	KS	
K0DAT	1,334	46	29	MO	
WA0OTV	242	22	11	MO	
W0CLS	168	14	12	SD	
VE5SF	66,417	507	131	SK	
VE3VZ	34,320	312	110	ON	
VE7XB	29,150	275	106	BC	
VE5CPU	23,035	271	85	SK	
VE3BUC	19,314	222	87	ON	
VE2AWR	13,694	167	82	PQ	
VE9WH	7,986	121	66	NB	
VA6RA	7,748	149	52	AB	
VE3WZ	2,847	73	39	ON	
VE2GWL	2,520	63	40	PQ	
SM6DER	4	2	2	DX	

Multi-Two Scores

Call	Score	QSOs	Mults	State/Prov
N6RO (K6AW, K3EST, K2KW)	343,958	1502	229	CA
W5NN (K5NZ, W5BAK, DL3YEH)	253,622	1202	211	TX
KT0R (+K0OB, N0UR)	252,657	1257	201	MN
N5YA (+K5WO, N5KR, NM5M, W5IUA)	210,552	1132	186	TX
W4WS (N0KTY, N4VHK, KU4BP)	138,942	837	166	NC
N9KI (K8IR, N9PQU)	130,928	784	167	WI
N6ZZ (+N5RZ)	116,095	749	155	NM
K7GJ (+N0AX)	90,880	568	160	NV
N0XI (+K0OU, KC0DEA, KC0DXK, KC0ELZ)	81,241	593	137	MO
K9IG (+KB9THU)	25,920	240	108	IN
K9S (K9OT, KB9LIE, KD6SXA)	14,094	174	81	WI
W0EEE (AA0YW, KB0UKP, KC0CDG, KC0EWD, KC0FRI, KC0HBM, KC9UMR, KI0PX)	11,484	174	66	MO
W7TU (W7RRR, W8EQA)	3,726	81	46	UT

Relative Band Activity

This table shows the relative activity, based on submitted logs, for each band during each hour of the contest. A score of 100 is assigned to the most active band-hour, in this case 40 meters during the 2Z hour. As an example, 10-meters/18Z had 63 percent of the activity of 40 meters/2Z. Similarly, the All Bands column shows the relative total activity for all bands during each hour. For example, the 2Z hour had 99 percent of the activity of the 19Z hour.

Hour/Band	160m	80m	40m	20m	15m	10m	All Bands
18Z	—	—	—	40	79	63	97
19Z	—	—	—	34	83	72	100
20Z	—	—	—	50	72	48	90
21Z	—	—	1	58	73	28	85
22Z	—	—	7	64	48	19	73
23Z	—	—	43	71	30	10	81
0Z	—	1	51	89	20	3	87
1Z	—	7	87	67	10	5	93
2Z	1	34	100	46	4	2	99
3Z	4	50	82	29	1	—	88
4Z	15	43	55	6	—	—	64
5Z	6	31	34	1	—	—	39

■

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K3WW I have used TTD products for many years. They have provided me the rapid flexibility that is essential for present day contesting or DXing.

K1GQ My ICOM decoder and Six Way have performed flawlessly. Top Ten devices are central to the antenna switching scheme we're designing for the new ***KC1XX*** radio room.

N3RS My station doesn't work without Top Ten Devices hardware, which includes decoders, Six Ways, and A/BSS relays. It's simply the best!

P43P What else can I say about the TOP TEN Band Decoder and the 2 Six Way Relay Boxes I installed at my station, They Work Great!! Makes DXing and All Band contesting fail safe when switching bands.

5B4ADA My TT Band Decoder works fine switching my Dunestar bandpass filters.

N3BB/5 Good personal service and very high quality hardware from experienced contesters and good people.

N7TR After many years of fumbling over manual coax and stack-box switches during a contest, Top Ten has taken the burden off of wondering if I was on the right antenna for that band, now allowing me to concentrate on making QSO's!!! Thanks Top Ten!!

K1VR Once you've gone to automatic antenna switching, you'll never go back. I love the way it handles the change of both antennas and band pass filters. I'll never say "Oooops" again -- at least for those reasons.

KG6OK Just a note to let you know how satisfied I am with the Top Ten Devices Six Way Relay Boxes, AB switches and band decoders. They have performed flawlessly for me, and operators here at the contest station are amazed at the level of automation I can have for instant band changes and automatic selection of the right antenna. Even under the heavy RF of multi transmitters and Alpha amps, they work reliably, without RFI problems. They are amazing, and I can't imagine operating without Top Ten Devices in the Shack.

K1DG Chose Top Ten Band Decoders and Six-Way Relay boxes over rebuilding my homebrew system. Saved me a lot of time.

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- *ARRL 160-Meter Contest*
- *WAE European DX Contest (Europe & DX)*
- *CQ WW DX Contest*
- *CQ WPX Contests*
- *CQ 160-Meter Contests*
- *JARL All Asia Contest (Asia & DX)*
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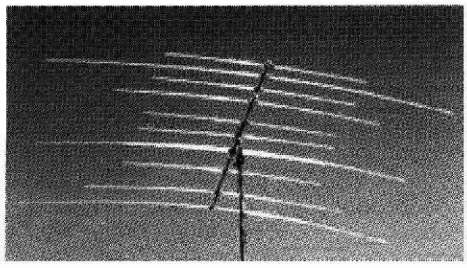

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Powerhouse in a Small Size

19' boom with: 3 ele on 20, 3 ele on 15 and 5 ele on 10
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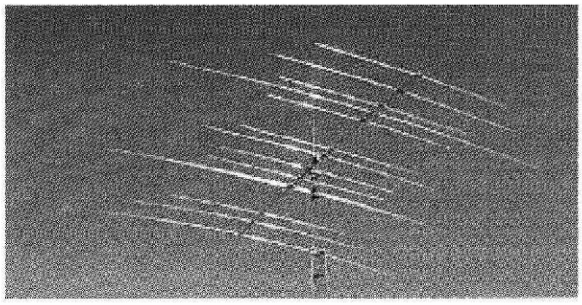

C-31XR for 20-15-10

The 20-15-10 Leader

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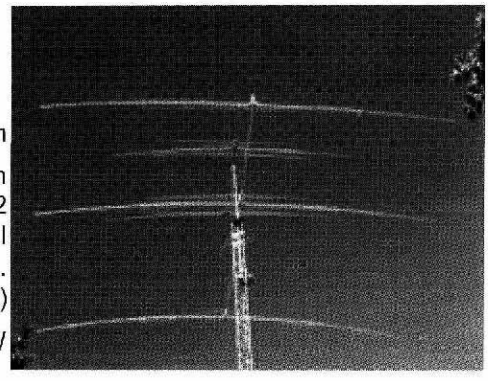

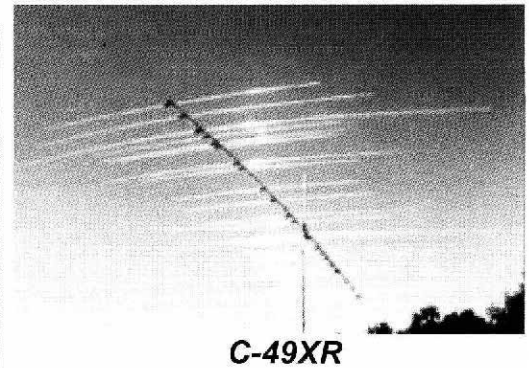

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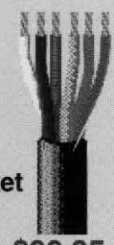

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With USA made Silver/Teflon®/Gold Pin male "N" connectors.

FLEXIBLE 9913 strd BC cntr foil+95% braid 2.7dB 400MHz NC/DB/UV JKT.
150' $116.95 125' $98.95 100' $83.95 75' $69.95 50' $56.95
35' $46.95 25' $40.95 15' $33.95 10' $26.95 6' $17.95 3' $16.95 1' $15.95

Assemblies now available at all AES locations

With USA made Silver/Teflon®/Gold Pin PL259 to male "N"

FLEXIBLE 9913 strd BC cntr foil+95% braid 2.7dB 400MHz NC/DB/UV JKT.
200' $146.95 175' $126.95 150' $107.95 125' $92.95 100' $76.95 75' $61.95
50' $45.95 25' $30.95 15' $27.95 10' $24.95 6' $15.95 3' $14.95 1' $13.95

Assemblies now available at all AES locations

RG142/U 50 OHM COAX ASSEMBLIES

Double Silver Braid Shields, High Power Teflon® Dielectric & Jacket

PL259 ea end: 1ft $9.95 ea, 3ft $12.95 ea, 6ft $17.95 ea, 9ft $21.95 ea, 12ft $26.95 ea, 18ft $36.95 ea • "N" male ea end: 1ft $13.95 ea, 3ft $18.95 ea, 6ft $21.95 ea • 3 ft jumpers $19.95 ea: RA BNC male-"N" male, RA BNC male-"N" female, SMA, male-BNC female, SMA female-"N" male, RA SMA male-"N" female, SMA female-"N" male, SMA Male-"N" male.

HT SOLUTION ASSEMBLIES

These jumpers will help improve the performance and life of your Hand Held Transceiver.
RG58A/U Group: 1ft R.A. SMA Male-SO239 (UHF Female) $14.95ea • 1ft R.A. SMA Male-"N" Female $15.95ea • 1ft R.A. SMA Male-BNC Female $14.95ea • 3ft R.A. SMA Male-PL259 $13.95ea.RG58/U Group: 3ft R.A. BNC Male-SO239 (UHF Female) $14.95ea 3ft R.A. BNC Male-PL259 $12.95ea. RG8X Mini Group: 6ft PL259-BNC Male $9.95ea.

All connector terminations are soldered, Hi-Pot® tested @ 5kv for one minute, continuity checked, ultra violet resistant heat shrink tubing, and red protective caps, which can also be used as a boot.

PL259

CONNECTORS

Made in USA

"N" Male

Both connectors fit 9913 types and LMR400 types

MADE IN USA

PL 259 SILVER/*Teflon®*/GOLD TIP.....10PC $12.50.....25PC $27.50.....50PC $52.50.....100PC $100.00
"N" (2PC) SILVER *Teflon®* /GOLD TIP...10PC $37.50.....25PC $87.50.....50PC $162.50..100PC $300.00

Jake's Featured Products of the Month

Velcro™ Lite Rainbow Pack

1-3 pks $4.99/ea;
4-6 pks $4.49/ea;
7-9 pks $3.99/ea;
10/up pks $3.49/ea

Size: 1/2" wide x 8" long. Makes Cable organization quick, simple, & safe. Each package includes 10 popular colors. Black, Brown, Red, Orange, Yellow, Green, Gray and White.

"N" FEMALE CHASSIS MOUNT

UG-58/AU
1-9 $3.00/EA
10-24 $2.70/EA
25/UP $2.40/EA

Part 603

ORDERS ONLY:

800-828-3340

416 Diens Drive,
Wheeling, IL 60090

Hours: M-F 9AM-5PM CST

Visit us on line at www.cablexperts.com for Discounts, Specials and our complete catalog

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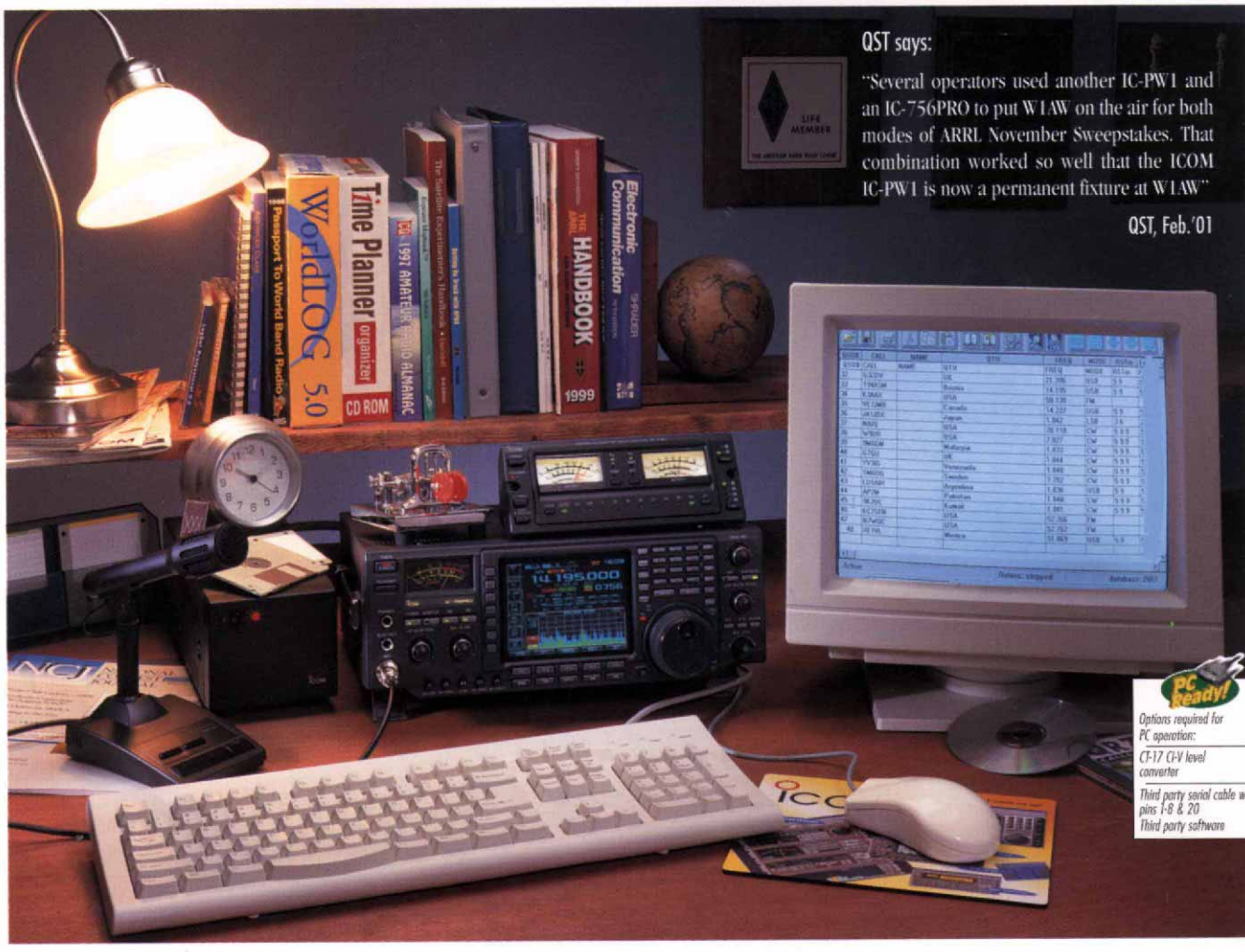
CABLE X-PERTS, INC.

Look Closely. It's a 1kW Contest Station

ICOM IC-756PRO & IC-PW1: All Mode, HF / 6M, Desktop Size



"TRANSPARENT" OPERATION

Set the entire, compact 'PW1 right on a desktop, or remote the 'PW1 body to a nearby location. The best in solid state makes for powerful performance and low maintenance.

13.8 w x 10.6 h x 14.9 d in
350 w x 269 h x 378 d mm
55 lb, 2 oz / 25 kg

IC-756PRO AND IC-PW1:
A FULL GALLON HF / 6M DESKTOP STATION THAT'LL REALLY TAKE YOU PLACES

You and ICOM create the competitive edge with this 100% duty cycle desktop station. The IC-756PRO is a contester's dream, with 32-bit DSP, dual watch, memory keyer, spectrum scope, and much more.

Control your contest frequency with the IC-PW1. This 1 kW powerhouse sports a remotable control head, auto antenna tuner, simultaneous multi-variable analog metering, 4 antenna connectors, and, of course, much more.

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