NCJ NATIONAL CONTEST JOURNAL

$4

May/June 2006

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Volume 34 Number 3

Special Mobile Contesting Issue!

- GPS Software for Mobile Contesting
- Reports from the Road—What Works, What Doesn't
- W1NN's Mobile Contest Tips
- October 2005 RTTY Sprint Results
- February 2006 Phone Sprint Results

Jim Stahl, **K8MR**, (top), makes some last minute adjustments to the Hustler triple resonator antenna system before hitting the road for the 2005 Pennsylvania QSO Party. His partner was veteran mobile contester **Hal Offutt**, **W1NN** (bottom). Read about their adventures and more in this issue!

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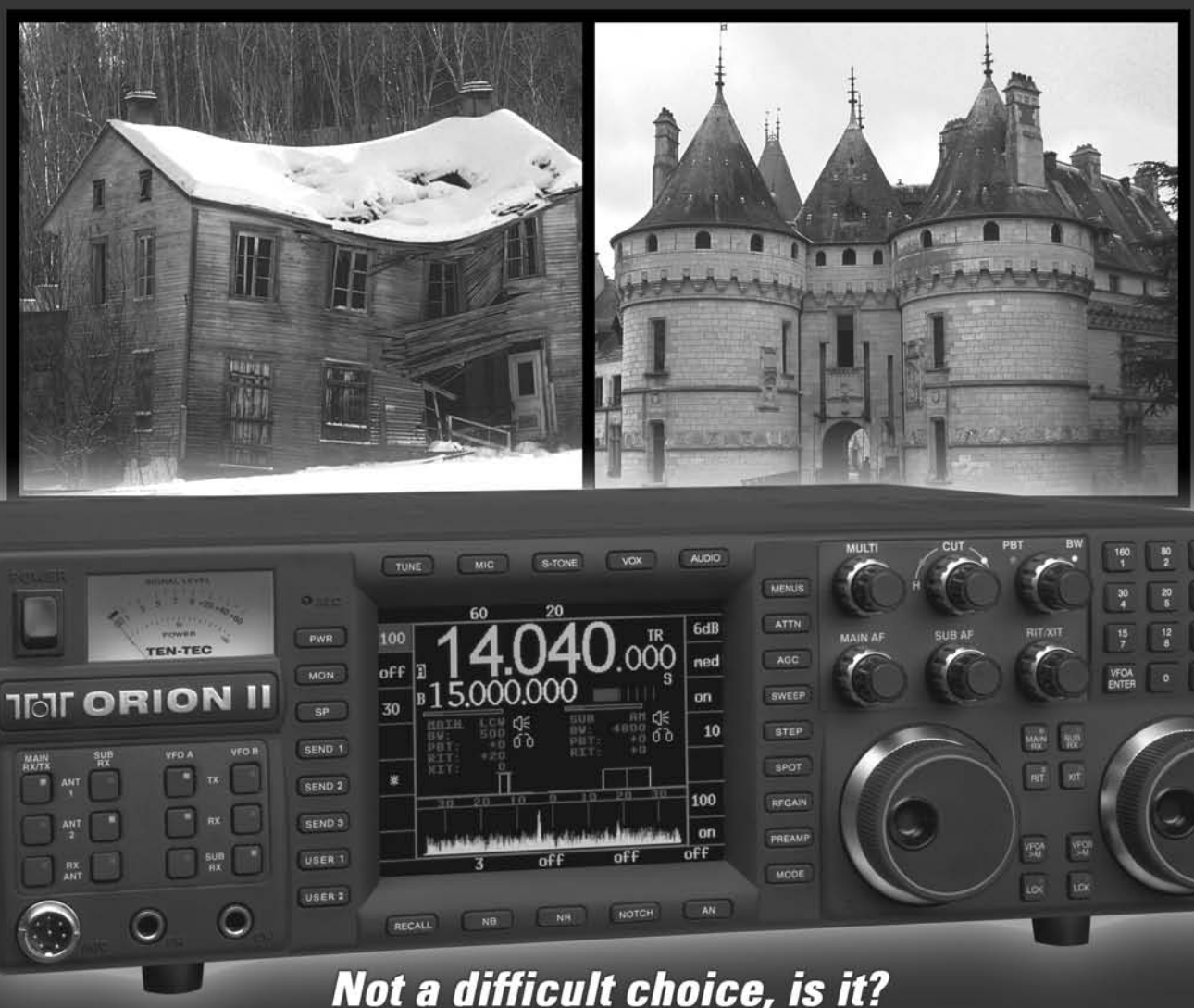

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Editorial

By Carl Luetzelschwab, K9LA

Mobile Contesting

We hope you enjoy this special issue on mobile contesting. It has contributions from many of the top mobile contesters in our hobby. There are a lot of good tips about every facet of this interesting niche of contesting. With the rigs and antennas now available, it really is easy to install a mobile station in a vehicle – even a temporary installation. I hope this issue inspires many more of you to participate in mobile contesting.

NCJ Profiles Column

I am pleased to announce that Scott, W4PA, is joining the NCJ team to continue the popular *NCJ* Profiles column (he is taking over from Paul, K9PG, as announced in the Editorial in the last issue). Scott's first effort is in this issue. Welcome aboard, Scott.

RTTY Sprint Contest Manager

As announced in the October 2005 RTTY Sprint results elsewhere in this issue, Doug, W4OX, is turning over his *NCJ* RTTY Sprint contest manager duties to Ed, WØYK. Thanks for your efforts, Doug—and a welcome aboard to you, too, Ed.

NCJ Readers Survey

In February we conducted an NCJ Readers Survey. An e-mail was sent to all *NCJ* subscribers for whom the ARRL had an e-mail address, and it pointed the recipient to a Web URL to take the survey. There were only nine questions, and the results provided us with valuable information about where *NCJ* should be headed, and what you like best and what you like least.

In a nutshell, *NCJ* will stay a printed media for the foreseeable future. Feature articles about antenna construction, contesting instruction, construction projects, product reviews and contest operating narratives fared best. And in general, the columns that address practical contesting issues for everyone fared best. I recognize that we do have several "niche" columns, and we hope to make these more attractive to everyone.

Thank you to everyone who took the survey.

RTTY Contesting Frequencies

The RTTY contest managers would like me to remind everyone that RTTY contesting usually takes place higher up in the low end of the bands—and this is generally where the NCDXF/IARU beacons are located (14.100MHz, for example). The NCDXF and the users of these valuable propagation beacons would appreciate it if you didn't operate within +/- 2 kHz of the beacons frequencies. I know mistakes are made in the heat of the battle, but please try to abide by this request.

NCJ

GPS-Enabled Software for Mobile Contesting

C.W. Sanders, NO5W
no5w@consolidated.net

It hardly seems possible that it's been almost 50 years since I could first look out my own shack window and see a nice tribander up about 40 feet or so pulling in the DX and a lot of contest Qs. As I recall it was a Hornet mounted on an old telephone pole that my dad had wrangled from the guys at the local phone company in the small Louisiana town where I grew up. With that beam, a few dipoles, an EICO 720 and a Drake 2A, I caught the contesting bug. Those days are long gone now, as are most of the personnel, and I'm living in a nice, but heavily restricted, neighborhood north of Houston. But the contesting bug remains, so I'm making do with attic dipoles and an occasional stealth dipole outside for those special contest weekends.

That's not to say that the contesting bug has been dormant. After moving to Houston in the late '90s I've been fortunate to operate at a couple of first-class contest stations—namely K5NZ and N1LN—and to discover the fun and camaraderie of participating in multi-ops with those two fine operators and other locals. But still the desire remains to create my own contest station of significant capability. With this in mind a few years ago, I decided to focus on mobile contesting and started out by participating in the Texas QSO party, which at that time was making a comeback under the sponsorship of Houston's Northwest Amateur Radio Society.

The first time out in the TQP, with my wife as driver, I started on the Saturday morning of the event with nary a plan or idea as to where we were going or what kind of participation to expect. I had spent most of the week prior to the event just getting power to the IC-706 and routing cables to the hamsticks and to the passenger seat operating position. This left little time for route planning and those kind of things.

After only a couple of counties I discovered the excitement of the pile-ups at each changeover and also discovered that you need to pay attention to the county line markers—when they exist. You can't always rely on the local fast food personnel for good county information! Not much confidence is instilled when one person asks the other "Hey Joe, the guy in the drive through wants to know what county we are in—whatdyyah think?"

That first outing far exceeded our expectations but I came back with a lot of ideas for improving the capabilities of the station, as well as some ideas for a logging program that would be developed primarily with the mobile QSO party operator in mind. I decided to focus first on the software with the requirements that it should:

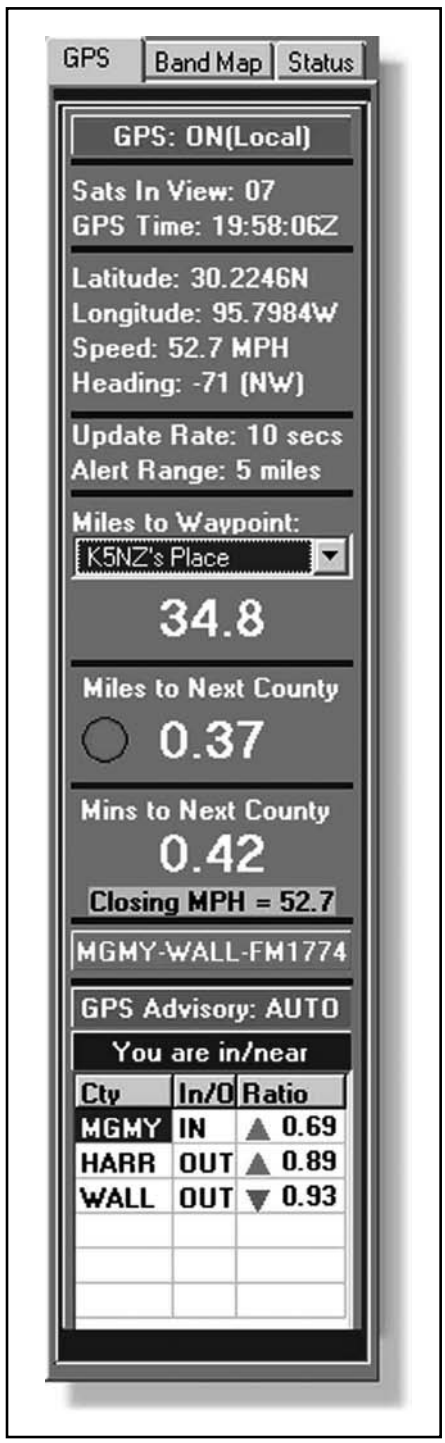


Figure 1—The GPS Status Panel.

- Provide tools for developing a trip plan
- Allow for quick county changes
- Fully integrate the use of a GPS
- Provide tools for reporting results

That was a couple of years ago and, after some work, the software has reached a state where it might be useful to others who enjoy mobile QSO party contesting. It should be noted that the program can be used in a fixed-station environment either inside or outside the QSO party state. However, the main objective of this article is to describe the features and capabilities of the program that make it a unique and useful tool for mobile contesting with emphasis on the features that utilize GPS information.

GPS Status Panel

Probably the best way to describe the GPS features of the program is to begin by simply taking a look at the GPS Status Panel shown in Figure 1 where most of the GPS-related information is displayed.

The first item in the panel shows the status of the GPS information and whether it is off, sourced from a locally connected GPS, or from a Remote GPS (one GPS connected to a machine running a server application can drive the GPS information of all of the stations on the network). The following two sections contain information supplied by the GPS: number of satellites, time, latitude and longitude and speed. Heading is computed in the program from several of the most recent positions. The third section of the display provides the rate at which the GPS display is updated. It is defaulted to ten seconds, but can be adjusted as low as two seconds which is the rate at which information is supplied by the GPS.

The next section of the panel provides the radial distance to any user-specified waypoints and can be useful for keeping track of the distance to any important locations that the user chooses to define (lunch/dinner planned meal stops, evening lodging, home, etc). Waypoints are selected from the dropdown.

Of course, the important locations in a QSO party are the counties. The remaining sections of the display present information regarding the current county and, if the user has defined a route plan to the program, distance and time to the next county along the route. Calculation of the estimated minutes to the next county is based on the calculated distance and closing speed toward the specified county crossing point. It is updated when that

speed meets certain criterion that result in meaningful results. For instance, stopping in traffic or on the side of the road pauses the updating of minutes to the next county. Updating is resumed when the speed returns to a user-defined threshold. The ability to perform these calculations depends, of course, on latitude/longitude data the user has provided for the planned route. In the example the user has specified a crossing from Montgomery (MGMY) to Waller (WALL) along farm market road 1774 and the crossing is about to occur as indicated by the Miles/Mins to next county.

As suggested by the "You are in/near" label, the final section of the GPS panel contains information regarding current location. Whereas the miles/minutes to next county section requires crossing point information provided by the user to determine distance and time to the next county line crossing, the information presented in the "You are in/near" section relies solely on a USGS polygon model of each of the counties of the state. These polygons—some simply consisting of a few vertices to define a nearly rectangular county and others of considerable complexity possibly involving multiple regions of several thousand vertices—have all been downloaded from the Internet and, using tools developed by the author, put into a form that the program can use. In addition to the county polygons which are each contained in a separate file, information on all of the counties of the state is contained in a file similar to and modeled after the well-known cty.dat file. This file contains not only the abbreviation and alias information for each county but each county record is augmented with a line containing a list of all of the counties that are adjacent to that county. More discussion on how this adjacency information is used is contained in the following section.

Inside/Outside Analysis

On each update of the GPS, the program performs a "winding number" analysis to determine which polygon contains the current point. This is one of the standard algorithms for determining whether a point is inside or outside of a polygon and is best understood by imagining traversing around each county polygon carrying a rope (an old piece of phillystran will also work), and once you are back at the starting point counting the number of times the phillystran is wrapped around the current point. When you find a polygon with a non-zero winding count that is the county you are in. Another standard approach for answering the inside/outside question is based on counting the number of times a ray drawn from the current point is crossed by edges of the polygon. This was the initial method tried in the program, but on a trip to the coastal bend region of Texas, where some complicated multi-region counties hang out, problems were found with this ray-crossing approach.

Now the winding number analysis is simple to envision and, with some care, can be programmed in only a few lines of code. However, with a state like Texas with 254 counties and a total of approximately 33,000 vertices in its county polygon model, analysis of all those polygons every 10 seconds along with logging of all those Qs can tax even today's fast laptops. The computational load is reduced by performing a screening analysis to determine which of the 254 counties deserve detailed analysis. During the implementation of the program data for a given state QSO party, when the database of polygon models is built the geometric center of each polygon is determined along with the radius of the smallest circle centered at that point that completely encloses the county.

If a point is not within this "outer radius" then it cannot be in the county and hence no winding number analysis is required. Determination of whether a point is within the outer radius of a county is, of course, a simple calculation involving only a calculation of the radial distance from the current point to the center of the county. So, when the program starts up it scans all of the counties and determines, for the current point, the small set of counties (usually under five) that require a winding number analysis. Following that initial startup the program uses the county adjacency information to maintain and update a pool of counties on which a winding number analysis is needed. As the trip progresses counties are moved in and out of the pool as their adjacency to the current county changes.

After that digression into the workings of the "You are in/near" analysis it's time to return to the information presented in that region of the GPS panel. The counties listed are those counties in the pool whose outer circles contain the current point. The main item of interest is, of course, the county that contains the current point and this (IN) information is always presented on the first row. The ratio information is simply the distance of the current point to the center of each county as a ratio of that distance to the outer radius of the county. The arrows indicate whether that ratio was increasing or decreasing on the last two updates from the GPS. For example, in the screen shot it is obvious that we are on the outskirts of the Waller (WALL) county outer circle and are, at least momentarily, moving toward the center.

The "You are in/near" region of the display was originally devised to help avoid a problem I once had in the Mississippi QSO party where toward the end we had covered more counties than originally planned and I was "winging it" by manually defining the county-specific messages for counties that were off the end of my original route plan. When we entered Marion county it seemed reasonable (but wrong) that the abbreviation was MAR. It turned out that MAR is the abbreviation for Marshall, about 300 miles to the north! For those following along, it must have appeared that we were driving a vehicle with quantum-leap propulsion! Had the in/out information been available at that time I could have looked to see that MAR was not the IN county and had not even made the short list.

County Changeover Modes

County changeovers along a pre-defined route are simple, requiring only a single press of a function key that the user has defined for that purpose, or selection of the Next County menu item. However, after becoming comfortable with the results provided by the winding number analysis and to accommodate users that do not have the time or patience to spend an hour or two entering county line changeover coordinates for a pre-planned route of thirty or more counties, the next logical step was of course to provide a mode of operation in which county changeovers are made automatically by the program. The previous screen shot indicates that the user has chosen this mode of operation. Three possible GPS Advisory modes are provided: Off, Manual and Automatic. In the Off mode the only information available to the user concerning a county crossing is provided in the IN/OUT array just described and it is up to the user to notice that a county change has occurred and to press the next county function key to effect the changeover. In the Manual mode a message pops up to alert the user of the county change with the responsibility of making the changeover left to be performed manually by the user. Finally, in the Automatic mode, all of the changeover processing is performed by the program—after any in-progress QSO has been completed.

Defining a Route

The user can define a route in the following ways, each with a different requirement for input.

No route plan—In this case the user sets the GPS Advisory mode to AUTO and simply relies on the program to make the county changes. No data entry is required on the part of the user. However, in this mode no advance information is provided regarding distance and time to the next county.

Sequence of counties with no GPS—This is for the user who may not have a

GPS and wishes to define the sequence of counties to be activated. At each new county line a press of the county change function key will advance to the next entry in the sequence setting up all messages, etc. Of course, since no GPS is being used no advance information can be provided regarding distance and time to the next county.

Sequence of County Line Crossings—In this mode the user provides a text file listing the sequence of county line crossings in the following space-delimited format

FromCty ToCty Hwy Latitude Longitude

…as suggested in Figure 2.

Development of this text file is best done with a mapping program, such as *MS Streets* and *Trips*, that contains a location tool and county line information. For a 30-county route plan, this might require a couple of hours. This process should, of course, be done before setting out because it is extremely tedious and inaccurate to attempt in a moving vehicle. The benefit of this work is that it enables the program to provide real-time information regarding distance and time to the next county. Once the text file of county line crossings is developed there is a menu item for importing and validating the information, checking for proper sequencing of the counties and performing reasonability checks on the latitude and longitude data. (A wrong sign on the longitude can put you in Tibet rather than Texas!)

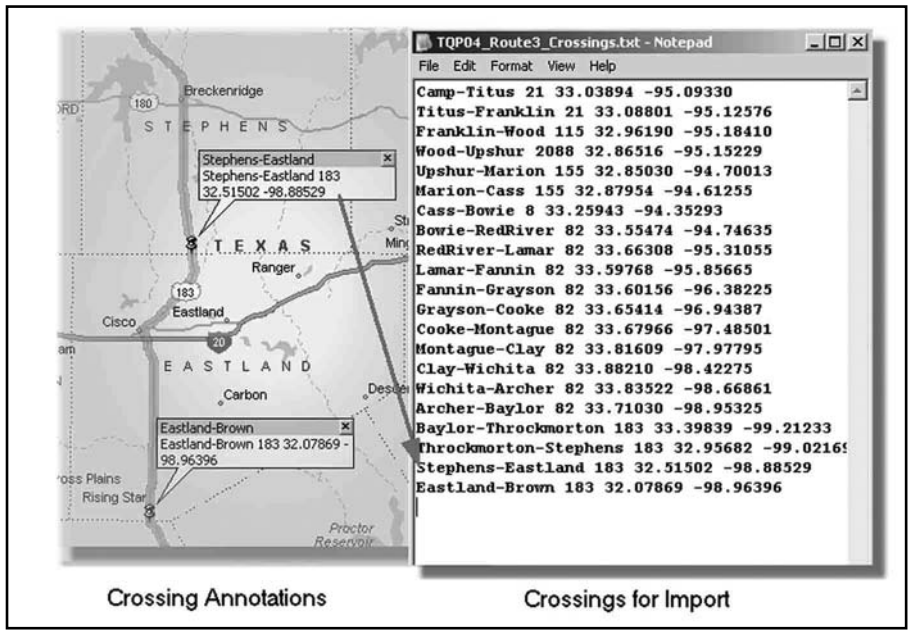


Figure 2—Using a mapping program to develop county line crossing information.

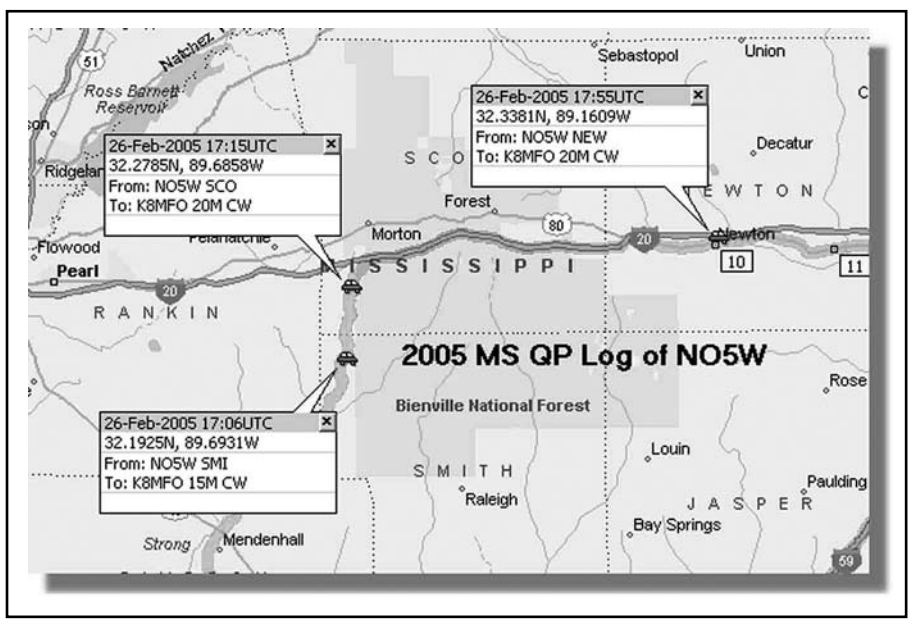


Figure 3—A QSL developed from GPS Logging.

Other GPS-Related Features

GPS Pass-through—This feature provides a mechanism for passing the sentences from the GPS through to a mapping program such as *Streets and Trips* or *Street Atlas* for real-time tracking and display of position. This can be done without additional real COM ports by using a pair of "virtual COM ports" as a null modem. Software for providing the virtual com ports is used in the Software Defined Radio project and is available free for downloading from **www.philcovington.com**.

GPS Logging and GPS-Based QSLs—With the data coming from the GPS and the calculations being performed by the program, there is a significant amount of information that might be of interest in a post-analysis of the contest. The program allows for logging of this information on several different periodic bases including: time-based (e.g. every 60 seconds), position-based (e.g. every 5 miles) and QSO-based. Now, as a general rule, I'm not real active in the QSL area, but when an operator requests a QSL for contributing several entries into the QSO party log over a weekend I like to follow-up with a unique card that reflects the mobile nature of the operation. This can be done using the QSO-based GPS logging feature to record each QSO in a separate log in a format that is easily imported into a mapping program. The capability is also provided to separate this log into a file for each station worked. After the contest this information can be imported into the mapping program to produce a unique QSL showing the position of the mobile during each QSO. Screen capture followed by printing on 4×6 photo stock completes the process. Figure 3 shows an example from the 2005 Mississippi QSO Party.

GPS Recorder/Simulator—In the early stages of this project, as the GPS capabilities were being developed and tested, I made a significant number of road trips to perform these tests. Fortunately, there is a county line not too far from my home, but still it quickly became obvious that, in order to save time and gas (not to mention saving wife driver time for the real test), a means of recording and playing back the raw GPS information would be useful. So, a record/playback utility was developed and is included with the program. It comes in handy not only for testing, but for demonstrating and exploring the capabilities of the software

without getting on the road. It can be run as a stand-alone program or spawned from a menu selection of the main program.

With the trip segment included on the distribution CD you can take a trip from the coastal bend region of Texas to Houston covering 17 counties and about 400 miles. Now a trip of that length played back in real time would run to about 8 hours, so the playback feature includes the capability of specifying shorter segments in terms of starting a user-specified number of miles prior to a selected waypoint and ending a user-specified number of miles after passing another waypoint. Recording of the GPGGA sentences (position-only) for a trip of this length at an update period of 10 seconds runs to about 500 Kbytes. Including the speed (GPRMC) sentences would result in a file approximately twice as large.

Report Next County—Use this menu item or an assigned hot key to issue a message of the form "NEXT MGMY IN 5 MINS".

Setting CPU Clock via GPS—Another item on the GPS menu is the ability to set the CPU clock from the timing signals received from the GPS to ensure ultra-accurate logging times.

Other QSO Party Features

The QP Tools menu shown in Figure 4 shows some of the other features of the program that are useful either before, during, or after QSO party operations. Here is a quick description of some of those features.

Plan Route—This menu item brings up an outline map of the state along with combo boxes from which to define a sequence of counties to be covered. When a county is added to the sequence, the combo box for choosing the next county includes only those counties that are adjacent to the last county in the sequence. Once the route plan has been built, double-clicking on any county in the list will initialize the program to that county, setting all messages, etc to their proper values. This method of route planning is mostly useful for the case where no GPS is to be used, or where the user does not wish to specify the county line crossing coordinates.

Build Plan from Crossings—This menu item is used to import a file listing the sequence of county line crossings, perform validity checks on the file and allow the user to make any necessary adjustments. Once satisfied with the plan, double-clicking on any FROM county will initialize the program and set messages.

Post Route Plans—To bring all the county hunters out for the party, it is a good idea to announce travel plans on their Web site. This menu item brings up a dialog with a generic announcement based on the sequence of counties defined in the program and provides an area for editing that announcement and then connecting to the county hunter site for posting.

Next County/Previous County—Menu items for advancing to the next county in the sequence, or reverting to the previous county.

Associate Maps/View Maps—By using a screen capture program, or the built-in screen capture available in the mapping program, a strip map may be produced and associated with each county. Then during operations it can be selected for viewing in either a small scrollable window or zoomed to a non-scrolled version. This feature is most useful when not using GPS pass-through and real-time tracking.

Prepare County Logs—During the contest the log is kept as a single log, but some sponsors require that each county have a separate log. This item will perform that separation.

Prepare Statistics—This menu item will prepare the type of statistics that one usually posts on the 3830 e-mail reflector following operation as a mobile in a QSO party.

Prepare summary sheets—Many sponsors still require summary sheets with the submittal and each party seems to have a unique format. This menu item prepares the summary sheet in the specified format for each QSO party.

Prepare QSL Log Files—If a GPS-based QSL log file has been captured during the contest, this is the menu item for separating the file into a series of files each containing the GPS-based QSL information for a single station. When a QSL request comes in, use this item to produce a QSL (or series of QSLs) showing progress along the route and the location where the QSO took place.

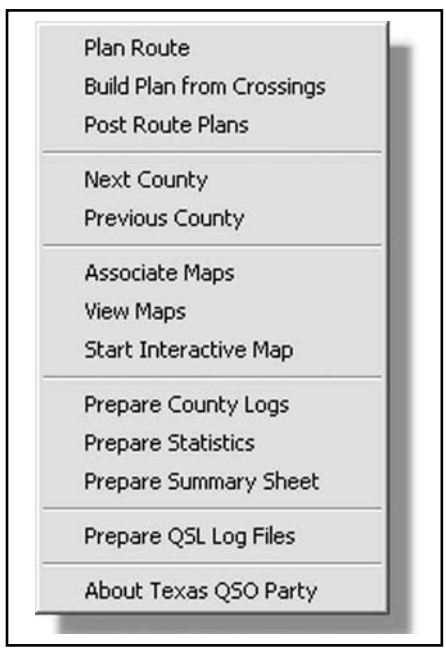


Figure 4—The QP Tools Menu.

About the ... QSO Party—Provides some information about the party including sponsor, link to the sponsor's Web site, and countdown to its next running as popularized by K4OJ (SK) for the Florida QSO party. The following contests are currently supported:

- Florida QSO Party
- Georgia QSO Party
- Illinois QSO Party
- Louisiana QSO Party
- Michigan QSO Party
- Minnesota QSO Party
- Mississippi QSO Party
- New England QSO Party
- Ohio QSO Party
- Oklahoma QSO Party
- Pennsylvania QSO Party
- Seventh Call Area QSO Party (7QP)
- Texas QSO Party
- Washington Salmon Run
- Wisconsin QSO Party

Devices and Mapping Programs

Radios—Since my mobile rig is an ICOM IC-706 MKIIG, that is the radio that has been most thoroughly tested. The program should work fine with any of the later model ICOM rigs. Modules have also been developed to support the Yaesu FT-100 and Kenwood TS-480 radios, but an opportunity to fully test these modules has not been available.

Serial Keyers—The program does not generate CW internally, but instead relies on an external serial keyer supplied by the user. Under this approach, which offloads the critical timing required for good Morse, the desired message is written as a text string via a serial port to the external keyer. Two serial keyers are currently supported: the K7MI keyer available from Hamation and the WinKeyer device available from K1EL. The latter, a very capable keyer at a reasonable price, is also the keyer used in the MicroHam keying products. So, although not yet tested, it is anticipated that the program will work with the MicroHam devices.

Global Positioning Receivers—Any GPS receiver that can be configured to output GPGGA and GPRMC sentences in the NEMA 0183 standard format and interfaces via RS232 should work fine with the program. The program has been tested extensively with the Garmin Street Pilot III. A GPS that interfaces via USB will require a USB to RS232 adapter.

Mapping Programs—The primary uses of a mapping program in this application are for real-time tracking using the GPS pass-through feature and development of the county line crossing data. Microsoft *Streets and Trips* supports both of these capabilities. Delorme *Street At-*

las provides the real-time tracking capability. Although it may exist I have not seen any mention of county line information in the documentation for *Street Atlas*.

Help Menu and Documentation

Many of the items on the help menu shown in Figure 5 are self-explanatory so the following description will focus on only a few of those items.

Getting started—Provides access to four documents to help the user get started with the program. These include the following topics: Exploring CQ/X, Hardware You Will Need; Steps for setting up to operate without a GPS; Steps for setting up to operate with a GPS.

Program Use/User Manual—The former provides access to on-line help in the classic *Windows* format and the latter access to a printable user manual in Adobe *Acrobat* format.

User-Supplied Help—Provides access to any help files that the user may define. These could be strip map screen captures for portions of the trip that may be important for one reason or another. The file used to define the trip to *Streets and Trips* or *Street Atlas* which, when accessed, will spawn a version of one of those programs running the specified file, etc. The files and labels making up the user-supplied help are defined under another (Options) menu item.

Zoom Map—When a strip map is selected, it can be docked in a small scrollable window. Use of this menu item will bring the map into a larger window for minimal-scrolling viewing.

Presentations—This menu item provides access to several presentations that have been given to clubs in the Houston-Austin area. Information in these presentations provides additional insight into use of the program.

Internet Access Based Help items—If the user's machine has internet access, there is a series of items for accessing the sponsor Web site for the latest rules and records, information on the Cabrillo format, contest calendar, etc.

How To Contribute—This menu item provides access to a document describing several ways that the user can contribute toward further development and improvement of the program. None of these require transfer of funds! They include:

1. Provide feedback and/or suggestions regarding use of the program in one of the supported QSO parties.
2. Provide feedback regarding use of the program with operating systems and/or PCs other than those tested by the author.
3. Provide feedback on use of *Street Atlas* as the real-time tracking program and for county crossing information.
4. If your favorite QSO party is not one of the supported events, volunteer to develop some of the files necessary for extending support to that contest.
5. Perform testing of the modules for the FT-100 or TS-480 and report results.
6. Perform testing of the keying module on the MicroHam devices and report results.
7. Use the GPS simulator to record GPS information as you drive through several counties in your state, or as you participate in the state QSO party, and submit the files for inclusion in future releases.
8. Use the presentation contained in the program files as a starting point for a presentation to your local club to generate interest in mobile operation in your state QSO party.

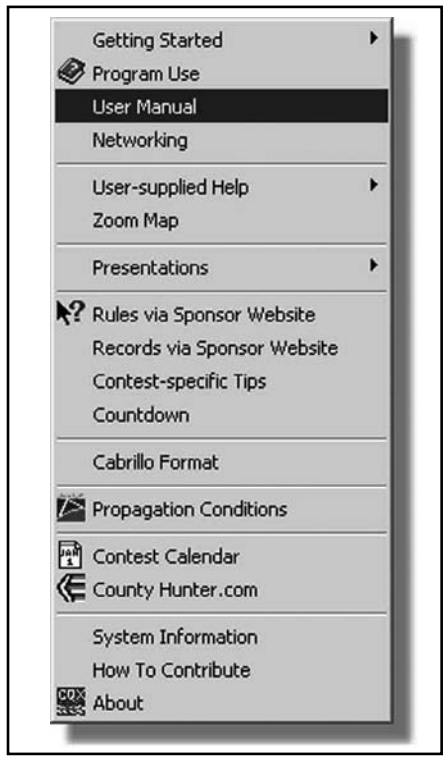


Figure 5—The Help Menu.

Technical Notes/System Requirements

The program, which is currently at release level 1.4 was developed using Borland's *C++ Builder 5.0* development environment. All interfaces for radios, keyers and GPS units as well as the contest-specific module were developed as dynamic link libraries that are dynamically loaded at run time in response to user selections.

The program has been fully tested under *Windows XP*, *Windows 2000* and *Windows NT*. The laptop used for my on-the-air operation with the software is a Dell Latitude D400 with a 1.7 GHz CPU and 1GBytes of RAM. No performance issues have been noticed while using that system. It is not known what performance loss will be experienced when running the software on less capable platforms. The mapping program I have used for real-time tracking and for defining county crossings is *MS Streets and Trips*.

A Work In Progress

Future plans for development of the program include:

- Complete testing of the interfaces for the FT-100, TS-480 and the MicroHam CW Keyer.
- Test the program with *Street Atlas*.
- Complete the implementation of the networked version of the software.
- Investigate the additional capabilities that might be available from Microsoft's *Map Point* including the possibility of simplifying the entry of county line crossing information.

Program Availability

If you are interested in using the program in one of the supported contests, or are interested in evaluating it and/or contributing to its further development along any of the lines suggested above or along lines of your own invention, please contact the author at **no5w@consolidated.net**.

NCJ

HF Mobile Roving

By John Baumgarten, NØIJ
N0IJ@arrl.net

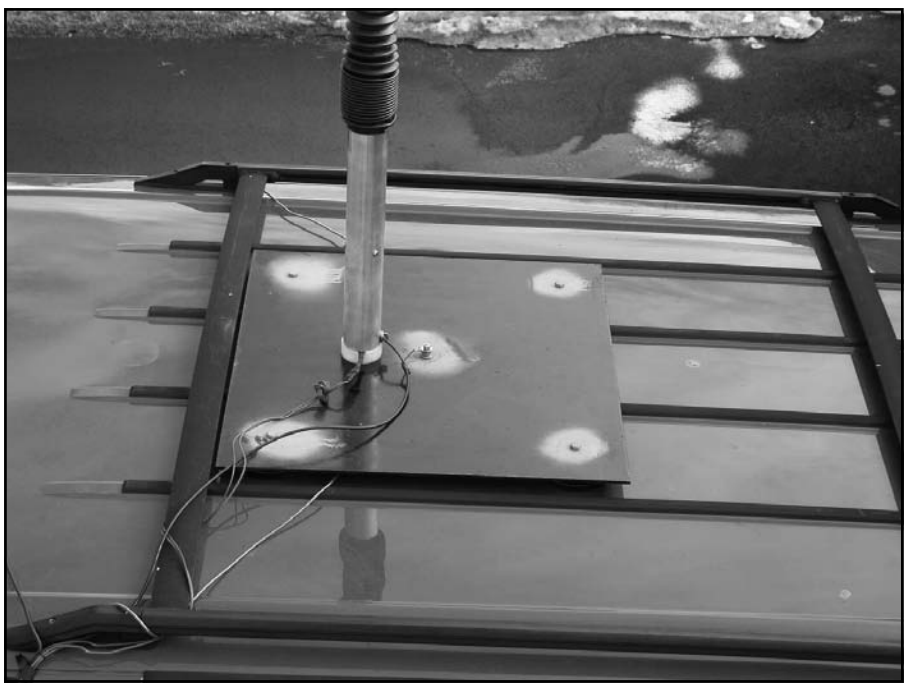
For years I have enjoyed participating in state QSO parties, and have considered how much fun it would be to be one of the rovers. I was amazed while listening to some of the pile-ups on these guys, and it made my mouth water to think about the fun they must be having.

I started thinking about the challenge of configuring a competitive rover. First of all, I don't own a mobile rig. Then there is the fact that my wife barely tolerates the presence of antennas in our yard; there would be little hope of getting approval for installing a large antenna on the family car. It didn't sound like a plan with much future, so I discarded it for a couple of years. One day I saw an ad for a "Shorty Screwdriver" antenna made by Larry's Antennas. I talked to Larry, KJ7U, who described the benefits of this antenna. I couldn't see why this wouldn't work as a portable or temporary set up.

I reasoned that my Ten-Tec Omni 6 transceiver, while not a portable rig, is powered by 12 Vdc and could surely be used as an adequate temporary rig on the road. My friend Terry, WØTVD, who is always up for a challenge, thought he'd also enjoy working on this project. Hey, things were looking up! Terry also suggested the use of his venerable Chevy Tahoe for our QSO party trips, as long as the HF antenna didn't need to be permanently installed.

Based on all this optimism, I ordered the "Shorty," and Terry added an old CB whip, which we cut down to 6 feet. Larry suggested a 4-magnet mount for the truck, which we ordered. The aluminum frame for the four magnets just didn't impress us. We probably went too far the other way, but ended up with a 24-inch square piece of $^1/_4$-inch steel. This provided plenty of rigidity and a wide base for the 4 magnets.

NØIJ in the operating position.



Close up of the antenna base plate on the car top.

We attached two heavy ground wires to the plate, and fastened them to a spot at the top of each front door frame, just below the roofline, using sheet metal screws. These were the only holes made in the vehicle, and are barely noticeable. We believed this large, extended ground plane should do a good job for us, and would provide an omni-directional pattern.

Basically, we had two projects going: one to make this rover package completely temporary, with an up/down time not to exceed an hour, and the other to make it competitive.

Solving the Computer Issue

A lot has been written about HF mobile noise problems, both from the vehicle engine and from the logging computer. There was no way I was going to log by hand, so it was imperative that we conquer any computer hash/noise at the outset. We also made full rig control and keying a mandatory requirement. Our older HP laptop had one serial and one parallel port, so the interface was fairly easy to accomplish.

Dave Pruett, K8CC, suggested that a totally separate power source was the only sure way to eliminate computer hash. Terry and I both have boats that are stored for the winter, so we decided to place our collective boat batteries (3) into a plastic storage tub, and connect them in parallel to power everything, except the rig. Power for the laptop goes through a dc/dc converter. The tub sits in the back of the vehicle during contests, and serves as a storage receptacle for all the "mobile stuff" the rest of the year. We've used the battery tub to power the computer, etc., for as long as 12 hours, and it seems to have lots of reserve power. We have had zero noise from the computer, and the Tahoe ignition noise is barely discernable.

Mobile Ergonomics

Terry and I have a lot of fun together with our radio projects, and it just didn't seem like a good idea to set up a position in the back seat, where it would be harder to communicate with each other. Besides, I've always had a weak stomach, and wanted to be able to easily see out. A "lap table" was located that mounts to a tray connected to a good size beanbag that forms to your lap. This works perfectly for the laptop computer

and the keyer paddle. I added a non-skid pad, which keeps the keyer paddle in place, and a couple of Velcro strips to anchor the laptop.

We tossed around various ideas of where to place the Omni 6. It turned out to be an easy decision when we discovered that the center console is secured to the top of the drive shaft by only two screws. It takes about 5 minutes to pull it out. With the addition of some Styrofoam packing material cut to conform to the back of the Omni 6, we had a good place to set the rig. A couple of additional pieces of foam were used to firmly wedge the rig between the two front seats.

Final Tests

We performed a full-fledged smoke test of the setup a couple weeks before the first contest (the 2005 Minnesota QSO Party), and all worked well. The final portion of the test was on 80 meters, and the one and only QSO was with an EA9—very conclusive evidence that the setup was working!

The tuning for the screwdriver is fast—almost too fast, as it often takes a few reversing bumps to catch the right spot. But tune it does, and with close to flat SWR on any frequency from 80 CW to 10 meters. A few snap-on toroids fixed a little RF in the key line (hanging up), but that only happened when we didn't get the SWR low enough.

In order to be effective you have to be able to switch logs fast when you enter a new county. This takes advance planning. I use the *NA* logging program which has all sorts of custom features for state QSO parties. Prior to the contest I create a fully set-up log program for each county, complete with my customized keyer memories, keyer speed, and call data base options. I also make a BAT file in the *NA* directory for each county so that I need only to type in the county abbreviation and the file pops up. Because after a few hours of this intense action I'm not sure where I am half the time, I take advantage of K8CC's (*NA* author) feature called Banner files. By creating an ITA.BNR file containing the abbreviation and name of the county (ITA – Itasca County) in the same directory as the QDF file with log data, that abbreviation and name will flash up on the main logging screen to remind me which county I'm in. I always bring along a floppy with all the QDF, BAT, and BNR files on it—just in case!

Speaking of just in case, we have an extra laptop, my other Omni 6, an electronic tool kit, and, of course, lots of duct tape.

Mission Accomplished

So far we've run two Minnesota QSO parties and two Wisconsin QSO parties, all with good success. As a member of the planning team for the Minnesota Wireless Association, who sponsors the MNQP, and living in the northern part of the state, Terry and I agreed to cover some of the large northern counties that don't see any action otherwise.

The goal of the MWA has been to activate all 87 MN counties, which was accomplished in both 2005 and 2006. Mike, K9NW, did, in fact, work all 87 counties, both years. We also took northern counties in Wisconsin in the WIQP, because they were close to home. Clearly, the north is not the best place to be for propagation, but we have been competitive with the other mobile rovers in both states, and in all four contests. We have been able to run stations 95% of the time, and to add mults with occasional S/P. It all seemed very worthwhile in last year's MNQP as we entered Itasca County as the first operation from that county. We were met with a pile-up at least 25 deep on 80 meters and had the rate meter well over 200. This year the same thing happened in Vilas County, Wisconsin where we only had 9 minutes of actually operating time, but logged 25 Qs.

This year (2006), we added APRS to our setup, and we had nearly continuous coverage in both MN and WI.

We've accomplished our goals: to make the setup completely portable (and on a budget), to become a competitive rover, and to have a *lot* of fun!

NCJ

The start of the WiQP on the Burnett/Washburn County line in Wisconsin.

A Multi-2 on Wheels

Ford Peterson, NØFP

What a great way to spend a Saturday! Beautiful sunshine, good friends, and lots of QSOs. It has been said that roving in a state QSO party is as much fun as working a DX contest from the Caribbean. Dewey, NØVO, Kelley, WØRK, and I decided it was time to throw our hats into the Minnesota QSO Party "roving" ring. We activated 19 rare Minnesota Counties while driving 464 miles. A total of 906 QSOs were logged in the space of 10 hours using a novel multioperator, 2-transmitter station installed in a Dodge Caravan.

Our M/2 system included two ICOM IC-746 radios, one homebrewed screwdriver antenna mounted on the front fender, two Hamstick antennas on the roof, some home-brewed band pass filters, and two laptops running Writelog for Windows. The trick to being a roving M/2 is having more than one HF transmitter connected to more than one HF antenna in the space of a few square feet. QRP would be fairly easy. But 100W is enough to toast a radio's front-end when the antennas are only a few feet away.

A Kaleidoscope of Mobile Antennas

Let me start by making a few points about mobile antennas. There are quite a number of mobile antenna designs in the marketplace today. What makes a good mobile antenna? This is a topic that has been, and will continue to be, debated as long as we have ham radios in cars. All of them can be made to radiate. Some designs will radiate well for $15 and other designs require $700-$800. Mechanical design and long-term reliability are, in many respects, more important than electrical integrity due to the nature of the rover. The rover antenna must conform to severe limitations on height and size. Given where it must be installed, the antenna will be subjected to hurricane force wind conditions its entire life, and must remain with the vehicle—even in an accident. As a rover, antenna parts falling off the vehicle can cause serious damage and even injury or death! Be responsible in your designs and always endeavor to make safety a priority.

It is generally believed that antennas radiate due to current flowing in the conductor. Conductors carrying higher currents emit more photons. A short base loaded antenna (loading coil at the base) will not radiate as efficiently as the same short antenna loaded at the top. Why? Because the top loaded vertical has higher currents flowing through more conductor than does the base loaded vertical. Unfortunately, a top loaded short vertical moving at 75 MPH down a busy highway is a very difficult antenna to construct! Studies have found that center loading (loading coil in the center of the whip) is a reasonable compromise that allows some of the length of the radiator to carry full currents and are therefore more efficient. With that being said, properly installed base loaded verticals will still work very well even though they are not necessarily optimal.

Another widely accepted truism is that conductors carrying high currents are more efficient when they are higher Q. Although conductor size (bigger is better), material (lower R is better), and other factors figure into this aspect, generally a loading coil with low Q will be lossy and not radiate as well as a higher Q coil. Therefore, large diameter coils made of heavy conductors fabricated from exotic materials are no doubt "better" than rusty steel wire wound on a wooden block exposed to the weather. "Value" is in the eye of the guy writing the check.

A center-loaded antenna requires a coil that is exactly twice as inductive as a base loaded antenna. As you can quickly see, there are competing design goals requiring trade-offs and compromises no matter what antenna style you choose. More expensive fabrication methods will be more attractive, conduct better, and have higher Q components. And yes, the antenna will likely radiate "better" too. With that being said, many antennas are designed with very low Q coils, which when properly installed will still radiate very well. Once you have an antenna with reasonable design properly installed, attempting to squeeze out an additional S unit is going to prove very difficult and likewise, expensive. The benefit of an optimal design is questionable.

I am not saying "let the buyer beware" when it comes to expensive mobile antennas. But I am saying "Let the buyer be aware" of what they are buying. An efficient, 365 day/year, go-everywhere-in-all-weather antenna is going to be more expensive if it is to be reliable for a long time. As in many aspects of radio, you get what you pay for! For a weekend adventure, the $20 antenna can be made to work very well. For the op wanting a carefree, all-band, 24/7 365 day, reliable design, $800 may likely be a bargain.

Radios, Antennas and Operating Positions for a Multi-2 on Wheels

The design goals for our M/2 focused on an attempt to gain as much altitude as possible. Not that height is important, but antennas up and in the clear are better performers. The roof of a van is almost an ideal ground plane location for a short vertical antenna. The challenge is that you only get a few square feet to locate all of your antennas if you intend to operate several bands. A secondary goal was to activate 80, 40 and 20 meters. We simply abandoned the other HF bands that day. And finally, we needed to comfortably and safely carry 2 operators, equipment and a driver.

The Dodge Caravan is unique as a base for a successful M/2 operation. The unibody construction forms a Faraday cage of sorts with all of the major body panels welded together. Dewey, NØVO, established design rule #1, which was "drill no holes" in the van (the vehicle belonged to his wife). Rule #2 was "no visible signs of use by Monday." Whatever we did on Saturday had to be undone by Monday.

We removed the front passenger seat (4 bolts) and the passenger seat behind the driver (4 bolts). We removed the license plate lights on the rear door and ran the feed lines for the roof mounted antennas through the holes. Another feed line ran out to the front through a hole where the front seat had been bolted into the floor. With unibody construction, a decent ground can be obtained at any location with a screw into the sheet metal. Interior trim panel screws were everywhere and easily adapted to form decent grounds within the vehicle. We had no problems with RF getting into the laptops. Of course, our fancy bandpass filters did their magic, too. More on that later.

Based on the conditions described by other Rovers, our vehicle was quite luxurious. The removed seats were replaced with makeshift operating tables, complete with a spot to secure the laptops. This proved to be comfortable once situated, but getting in and out was somewhat difficult. Kelley, WØRK, was in the back seat and found it easier to climb over the back seat and out the back door of the van, rather than climb over the middle seat. The two IC-746s worked flawlessly. The built-in auto-tuners proved very handy for mobile operations and made the radios quite forgiving of awkward loads.

The tables proved to be comfortable for the long ride. And having a good work surface to hold the laptop, a clipboard, the radio, the screwdriver controller and the paddles proved to be a real lifesaver.

Both tables were lashed down to the floor. And everything was attached to the tables. This is very important! In an accident, a radio or set of paddles would make a deadly projectile if allowed to float around airborne inside a vehicle that was rolling end-over-end in a rural road ditch! Safety cannot be emphasized enough.

One area needing improvement relates to the Sun's "washout" effects on the laptop screen. At times, it was impossible to read the screens. Even though the van had dark tinted windows, which I'm sure helped, any direct light would bleach out the screen. Making some sort of cardboard hood to screen the laptops from direct sunlight would make reading the screen possible. Logging became an act of faith rather than visual verification that it was all logged correctly. *Writelog* needs to incorporate 100% keystroke commands in the MNQP module. The little button mouse on the keyboard is all but impossible to run accurately when bouncing down the road. This proved to be a serious annoyance at county line waypoints.

The need for clean 13.8 Vdc power became a concern early on. To compensate for the large 20A+ draw for each of the 100-W class radios, we ran two sets of 12 AWG power connections (plus and minus) all the way out to the engine compartment and attached it to the main battery. A suitable fuse link was used right at the battery connection on each of the positive leads. Inside the passenger compartment, two deep cycle batteries were lashed to the floor and used to provide exceptionally clean power right at the operating position. The direct link back to the vehicle's main battery assured a clean source of current for each radio. No visible signs of voltage drop were observed at either position. The laptops used very simple 150W inverter supplies to bring the 13.8 Vdc up to ac line voltage. We had two laptops, two inverters, two batteries, and two leads back to the vehicle main battery with one local ground connection to the vehicle unibody right at each of the interior batteries. We had no RF problems with any of the equipment at any time during the trip.

The band filters were patterned after several different designs, mostly from *QST* and *QEX*, but beefed up to handle up to 200W. The schematic of the 40-meter filter is shown in Figure 1. The other bands were similar in design, but with different values of course. I've built 3 filters so far: 80, 40 and 20 meters, which I affectionately call "Torpedoes." The specs are better than could have been hoped, with greater than 60dB of attenuation on the adjacent ham band. These filters were measured and actually out perform some commercial units

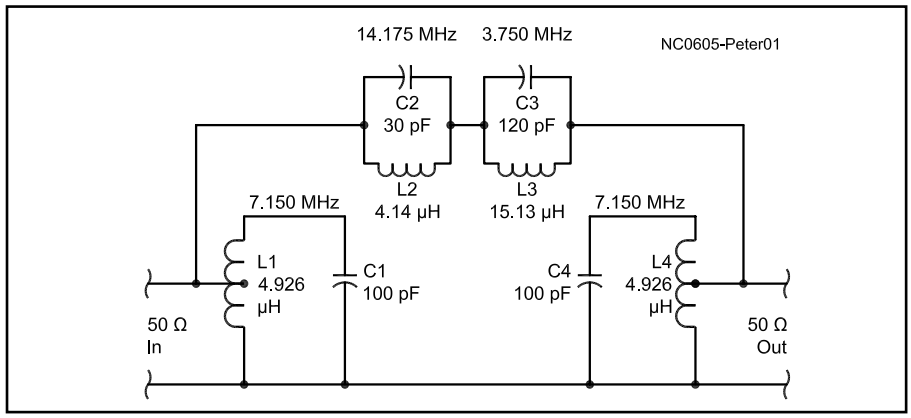


Figure 1—Schematic of the 40-meter bandpass filter. Capacitors have a voltage rating of 2 kV. L1-L4 use T-130 cores.

Figure 2—Internal view of the 40-meter bandpass filter.

Figure 3—The top of the van roof.

available. And who says hams don't home brew anymore? Figure 2 shows a disassembled "NØFP Torpedo."

Without the filters, operation would be nearly impossible. The phase noise and desense caused by the nearby 100w transmitter would be more than the receiver could handle. With the filters, even operation at the second harmonic was possible, as long as you didn't need to operate at exactly the second harmonic. Obviously, you could hear the second harmonic's signal, but it would be weak enough to not cause any problems other than nasty S9+ QRM.

We used fiberglass whips mounted to the roof on 20 and 40-meter SSB. These particular antennas were the Hamstick brand (center loaded low Q resonators) and performed very well. This style monoband antenna is the $20 variety and available under a number of brand names. 3/8-inch x 24 thread studs at the base are used to mount the antenna. A special thanks to K5NA and KI5DR for the great M/2 ideas on their website. They do the Texas QSO Party with gusto. One of the best ideas was this nifty hoop to mount the Hamsticks on the roof of the van. The copper pipe just clamps down into the roof rack. I used thin copper sheets taped to the van roof to couple the RF into the metal of the van. The copper sheets are excellent for getting good temporary grounds. Just tape them down. The paint is so thin that the capacitor formed by this method is actually quite large. 10,000 pF (0.01µF) was measured on a 6 x 6-inch square of the stuff. Duct tape is a simply marvelous tool—ugly, but effective.

Did you notice in Figure 3 that there are 4 posts on the van? You guessed it! That was Plan B if the screwdriver had not worked out well. The 20-meter antenna was mounted in front and the 40-meter antenna was mounted in back. Twenty meters was an easy match over the whole band. Not perfect, but not bad either. Forty meters was another story. We set it up for 40-meter phone as the screwdriver was to be used exclusively by the CW station. In the end, I decided to try the Hamstick on 40-meter CW. The SWR was about 3:1. The filters like to see a decent 50-Ω! load to work correctly. As it was, the filter still worked fine, although not as good as it did on the screwdriver. The filter was getting warm. I would guess about 2 or 3 W was being dissipated by the filter insertion loss due to the bad load. But it did work, and only got warm at 100W.

Mounting the screwdriver was a challenge. See Figures 4 and 5. There is no trailer hitch on this vehicle. So we made a cardboard mount designed for the front fender and brought it to a welding shop.

It cost $25 to have the thing welded up to match the cardboard version. I thought it was a bargain! The welder did it on the spot in about 15 minutes. It's a wonderful thing to have access to such tools. The mount bolts to the lip of the fender under the hood. It worked great for the whole contest. The whip was about 7 feet long, with the top of the screwdriver mounted at about 8 feet off the ground! Needless to say, we went under bridges and gas station awnings very slowly, as the tip was at 15 plus feet off the ground. The feed line runs to the engine compartment, along with the motor control wire for the screwdriver motor. Wires were run through holes where the front seat had been mounted. The third wire was a ground for the motor noise grounding at the screwdriver motor. I couldn't hear it tune, so it must work to eliminate the brush noises.

The small rod descending below the mount is a short length of "ready rod" (threaded $^3/_8$-inch x 24 iron rod) that screws to the fender inside the wheel well. Okay, so we drilled some holes. I let Dewey drill the holes. He seemed comfortable with the idea, figuring his wife would never see them. The mount was very stable and the screw holes invisible.

The homebrewed screwdriver seemed to perform very well on 80 meters, pretty good on 40 meters and perfect SWR on 20 meters. I could tune it up to 17 meters, but we never tried it above 20 meters as there was no propagation. The antenna is very narrow in bandwidth. And the controller I built allows me to "up and down" the motor. On 80 meters, finding the "sweet spot" was tough at times. On 80 meters you move the coil to near its maximum length, which is about 6 inches higher than on 40 meters. The difference between 20 meters and 15 meters is just barely a touch of the button. The antenna was too tall and should have had the whip shortened from 76 inches down to about 64 inches, or even less. It seemed to play really well on 30 meters. The sweet spot was easy to find, and the match on all bands, but 40 meters was perfect.

The 40-meter Hamstick was tuned to SSB, but it had a high SWR on 40 meters. I noted that if another antenna was tuned to the band, the unused antenna had to be grounded to prevent coupling.

I know that the 40-meter Hamstick likes to see some loading in the form of a capacitor. We tried many different sizes of 500 V silver micas and found that a 430 pF worked the best. In Figure 6 you can see the 40-meter Hamstick with its own "mini tuner" barely visible right at the feed point (a capacitor to ground). This made a perfect SWR at resonance, but it would only tune about one half of the band.

The copper hoop was mounted under the rails for the luggage rack. The ground leads were soldered to the copper strips, which were held in place with duct tape. This is obviously a temporary installation. Like Dewey said on Friday during setup, "If you are going to look like a geek, you might as well go all out!" The arrangement did turn a few heads as we drove. A gas station attendant said he had never seen storm chasers in the middle of February before. The system played very well.

Proof of the Pudding

Our first attempt at the roving M/2 was a success. Measured by the number of QSOs, we did better than any other rover previously in the Minnesota QSO Party with 894 duped Qs in 10 hours. But alas, the rules cooked our goose. CW QSOs are 2 points and SSB are 1 point. We had hoped to be able to switch back and forth between bands to activate the CW and SSB modes on both 20 and 40 meters. Forty meter SSB proved very difficult. Why? Who knows! Daytime SSB is difficult, I guess. And the participants were not looking to 40-meter SSB. The bread-and-butter band/mode was 40-meter CW. I am absolutely, positively certain that if we had been able to successfully automate switching the station antennas around, we could have achieved a much higher QSO count by working everybody on two modes for each of the active bands. Likewise, if 80 meters is activated, the local mults would be much easier. We had hoped to be able to work more Minnesota counties on the various bands—especially on 40 meters. On 40 meters, ground wave ends at about 40-60 miles at best. Many participants later commented that the 40-meter band was very long. We managed to work 17 of the 87 counties ourselves, so there is lots of room for improvement. Eighty meters, and even 160 meters, would be excellent for in-state daytime QSOs. But the participants have got to look for us on the low bands.

Figure 4—View of the homebrew screwdriver antenna.

Figure 5—Another view of the homebrew screwdriver antenna.

Figure 6—The 40-meter Hamstick.

After the contest, we heard complaints that the SSB mode was not worked by any of the other rovers. In reality, a roving SOLP station has all it can do to work one mode. And what mode is that going to be? Answer: The mode with the highest rates. Add to that the fact that CW = 2 points each, and you have a contest that quickly becomes CW only. We attempted to hand out the Qs on SSB, but being stuck on 20 meters for SSB means you need to be located in a good place (out-of-state) to work the whole state on SSB only. The use of SSB without automated band switching cost us the "win" in the MNQP. As it was, most of the rovers were SOLP CW only.

Better switching for antennas proved to be very important. I'd even like to get a third op to run 80 meters the whole day. An M/3 rover could produce some serious results! The 80-meter band during the daytime would provide access to most of the in-state counties (read: multipliers!). As it was, our score was CW = 556 x 2 (+) SSB= 338 x 1 (x) 62 mults = 89,900 points. Eighty meters could have added 35 mults! New score? Over 140K!

If you have never roved in a state QSO party, do it! The pile-ups are deep and the challenge is great fun for all. Each time the front wheels dipped into a new county, I would send a "._..." (AS means "stand by"). The stations would wait as I changed the entry fields in the log to read the new county and fix the outgoing message memories to send the new 3-letter county suffix. Often I would hear a single dit as if to tell me they were waiting. As soon as I sent "QRZ," they would all start in unison. Every time I did it (19 counties in all) I would chuckle and say to myself, "Is this fun or what?" NCJ

A Report from the Road

Jim Stahl, K8MR

On these pages in 2002 I wrote about the art and joys of mobile contesting ("Road Warriors," March/April 2002 *NCJ*). Since then my fellow road warrior Jim Snell, W8DRZ, and I have been out regularly in the Ohio, Michigan and Pennsylvania State QSO parties, and have also done one trip each in West Virginia and Indiana. In addition, when Jim was unable to make the trip for the 2005 PAQP, I teamed up with Hal Offutt, W1NN, who has been doing mobile contesting for about a sunspot cycle longer than anybody else.

In short, it's still a great way to contest, trading the ham shack walls for a window on the world, while being a new guy on the band with a fresh pileup every half hour or so. More people have discovered this in the past four years, and also that it can be a lot of fun chasing the mobiles and others while operating from outside the featured state.

Here's an update on what I've observed and learned in the last four years.

Station Improvements

My biggest single improvement since 2002 was solving the computer power supply noise problem. Back then I was using a dc to ac inverter to power the laptop 120 V power supply. The combination made a lot of noise, as inverters (or at least most of them) simply make a 60 Hz square wave that gives the same RMS power as a 120 V sine wave. I had been forced into such techniques as turning the inverter on or off depending where the RF spurs happened to be.

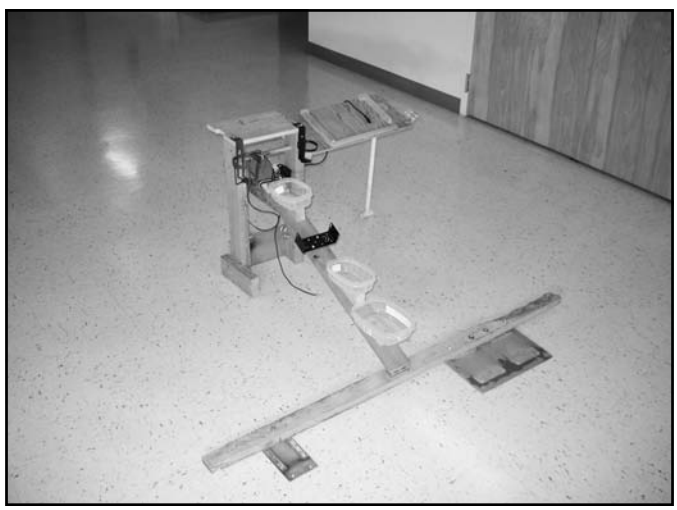
I now use a "Car Adapter", a dc to dc converter, to provide the 18 volts for the laptop. These are readily available on eBay for $30 or so. The computer noise is now entirely gone. One caveat: having had a supply of 12 V, 26 A/h batteries that had been pulled from UPS service, I used one of these for the computer, mostly to avoid a tangle of wiring into the car's electrical system. When I suggested the car adapter idea to K8CC, Dave tried it but still had serious noise with it powered from his car's electrical system. He then tried it with a separate battery and his noise was gone. Apparently keeping the car adapter isolated from the vehicle ground is necessary to keep the noise down.

A 26 A/h battery will run the laptop for a 12 hour contest, but without much to spare. I was reminded of that the hard way in the 2005 Indiana QSO Party. I forgot that I had been running the laptop for 3 hours before the start of the contest while operating the MARAC county hunters contest on the drive out to Indiana. With an hour left in the IQP the laptop died in mid pileup! I soon diagnosed the problem, hooked up a spare (external) battery, and got back on, though minus the pileup.

I still believe that the HamStick line of antennas gives the best bang for the buck, but there are times during a contest when having three bands available at the same time (and maybe more when the sunspots return) is a significant advantage. Therefore I've acquired a Hustler antenna with a triple resonator mount. This is a larger, heavier system that requires extra mechanical support when used with a magnetic mount. I use Dacron rope guys tied to the front of the roof rack on each side of the car. With careful driving this will likely be good enough, but after a VHF rover effort with even heavier antennas (another story for another time), I've recently added some sideways bracing with PVC pipe. With this PVC mount the hinged fold over feature is not useable, so I take a six foot step ladder to climb onto the van roof to change resonators or do other antenna adjustments.

The Hustler antennas do not have as wide a bandwidth as the HamSticks. This is an issue only on 40 meters, where the IC-746 tuner will cover both SSB and CW on the HamStick, but not on the Hustler. Therefore I now use the 40 meter HamStick full time on the front of the van, and the Hustlers for 80-20-15 on the rear. For 80 meters I have used a 75 meter resonator with added top hat loading wires for CW, similar to what I described for the HamStick in my original article. However, after using W1NN's 80 meter (CW) resonator in the 2005 PA test, I've acquired my own for use in future trips.

I have made some changes in the operating position. Originally I had sup-



The operating console removed from the car. The computer "car adapter" power supply is attached to the right hand leg. A headphone splitter is tied to the underside of the rear brace.

Hal, W1NN, has been at the mobile contesting game for about a sunspot cycle longer than anyone else. He wrote about his first trip (the 1988 Pennsylvania QSO Party) in the January/February 1990 *NCJ*. Here he is out with K8MR as W3USA/M in the 2005 Pennsylvania QSO Party.

ported most of the computer shelf on the wrap around dashboard in the Ford Windstar. I wanted to get the computer a bit lower for several reasons: to get it a bit more out of the way of an exploding airbag, as well as to let my arms drop a bit more naturally by my side when operating. I have bolted a piece of 2 x 2 wood to the main radio shelf in the center to support the left side, and fashioned a hook from some 2-inch aluminum tubing to fit into the door handle on the right side. This arrangement is likely applicable to more vehicles than my original dashboard support. It does require lifting the table to open the door, so I take along a small piece of PVC pipe to prop up the table when opening the door. The left side is pinned with a single 1/4-inch bolt, without a nut, to keep the shelf in place. The whole shelf can also be easily lifted out of place for easy exit and entry.

The wooden support brace running to the back seat represented wasted space that is now put to good use. I've mounted several plastic storage containers on wooden wedges to make them level. They provide a great place for sunglasses, cell phones, and all the other junk that one seems to have while driving. I also mount a VHF FM radio on the brace, detaching the front panel and mounting it so the driver can see it.

Originally this brace was hinged to a cross piece that sat on the floor against the middle seats. I now remove the seats to get more storage space, and bolt the cross piece to metal plates that are in turn held to the van's seat attachment points by hook bolts.

I also now secure the bottom of the radio shelf with wire looped around the bottom of the front seats on each side, to keep things more or less in place in case of a rollover.

In 2002 I was using a Bencher paddle. Again the thought of this flying around in an accident was scary. So I am now using the tiny K9LU Bulldog paddle, with the magnetic base. I attach a large flat washer to the right of the computer to hold the paddle. The paddle stays in place very nicely through all the bumps of the road. I can also pick it up and stick it to the side of the IC-746 to hold it out of the way.

Nighttime lighting had been from the ceiling light. This is still best when I need to see the small radio controls, but otherwise to minimize distraction to the driver I use either a battery powered reading light clipped to the strap that holds down the radio, or a LED flashlight held on the visor with a spring clamp.

W8DRZ now brings his GPS unit on our trips. While we still largely rely on paper maps for navigation, the GPS is very helpful to know just where we are, and to know which direction we are headed in the dark.

K8BL with a plethora of plaques from the 2004 Ohio QSO Party, his own for top Ohio single op and one for the Lake County Amateur Radio Association for top Ohio club score.

K8MR presenting N4PN with the 2004 Ohio QSO Party plaque for top out-of-state station.

Backup

I keep a dedicated travel kit using an inexpensive plastic toolbox. This includes various accessories dedicated to the mobile station, including a keyer interface, a homebrew ICOM CI-V interface, the computer car kit power supply, etc. It also carries the emergency supplies like spare fuses, paper and pens, a hand microphone, snap on ferrites, etc. I carry a separate took kit for possible field emergencies.

Since we have them available and have plenty of room in the back of the minivan, we take a spare rig and spare HamSticks. Fortunately we've never had to use the spares. Of course we take car battery jumper cables. I also take the battery from my lawn tractor, figuring it would be enough to start a warm engine in warm weather. And I give my driver an extra car key.

My computer is a rather old, though comfortable and familiar, IBM Thinkpad. I carry a 3.5-inch *DOS* boot disk with the necessary *NA* files so that I could, in case of a hard drive failure, run *NA* from the floppy.

In the Ohio and Michigan parties, we collect and share cell phone numbers among the mobiles for use in an emergency. Should problems arise it might be possible to get someone to cover a county that might otherwise go uncovered, or maybe even hitch a ride from the boondocks. We've also been known to call after the contest ends to share late night observations.

Software

I'm still using *NA* for my mobile operations. It took me a couple of years to figure it out, but I was spending an hour or so before each contest setting up QDF files for counties I visit year after year. I now keep a separate *DOS* directory where I set up the blank files one time for each county, and then copy the unused files to the directory I use during the contest. The blank ones are then still there for next time.

The perfect mobile software remains to be written. Though in general I like *NA*, it requires separate files for each county, so I don't have information available from previous QSOs. It also is a major inconvenience dealing with twenty or more log files after a contest.

Here's what I am looking for in the perfect software for mobile contesting:

- Use of a master file, so information shows up from previous QSOs.
- Keeps score both overall and for each county.
- Keeps separate serial number sequences for each county, including the ability to automatically pick up at the proper number if re-entering a county.
- Changes counties quickly, including all the related information such as message memories.
- Do it all without use of a mouse. (Ever try using one on a rough road?)

There is another software issue that directly affects the home stations and indirectly the mobiles: the ability to support multiple contests simultaneously. There are more state QSO parties than there are free weekends, so there are often two or more going on at the same time. So long as different contests use the same exchange, it makes no operating difference which state you are working. You just send the same 599 CA or whatever. But as a practical matter, the present software forces one to pick one contest and avoid the others.

Last May W8DRZ and I did the

Road Warriors W8DRZ and K8MR (and K8MR's minivan) are still going like crazy after all these years. Here they are about to head out on the road for the 2005 Michigan QSO Party.

K8MR making some last minute adjustments to the Hustler triple resonator system before the 2005 Pennsylvania QSO Party.

Indiana QSO party, which was the same weekend as the New England, Nevada, Oregon and the MARAC CW (county hunters) contests. (In 2006, this weekend will have the 7-land QSO Party as well). After the contest I noted several usually active out-of-state guys who we did not work, but who reported serious activity in the New England QSO Party. I believe that with suitable software that covered both (all) the contests, they would have worked us as well, and had more fun by racking up extra QSOs in those other contests.

Until the software guys get on the job, contest sponsors could help work around this problem if they would generate inclusive multiplier files covering all the contests on their weekend. In processing their logs they would then have to be able to sort out QSOs from outside their state. Ambitious software writers might figure out a way that users could merge multiple contests into one operating log, and an easy way for the users sort it all out before sending the logs to the sponsors.

Solving this simultaneous contest problem could open an interesting new competition: an overall contest involving several independent contests. In addition to the individual contest results, one would compute a score based on the total QSOs and multipliers in the several target states. QSOs made by in-state stations with non-target states would not count. The contests would not have to have concurrent hours, though only QSOs during the particular state's contest hours would count in the overall contest. I'd think such an overall contest would be a lot of fun for out-of-state guys, which in turn would make a lot more activity for the in-state people.

Operating from the Road

In my 2002 article I mentioned a goal of breaking 1000 QSOs in a 12 hour contest. We achieved that goal, though only once, in the 2004 Michigan QSO Party, where we made 1052 QSOs. Several of the recent contests have suffered from the bottom of the sunspot cycle blues, including little or no in-state propagation on 40 meters. It hurts not to be able to work your fellow in-state competitors who can be a major source of QSOs, not to mention multipliers. Even the 2004 MQP had limited in-state propagation, resulting in fewer multipliers and a lower score than in previous years in spite of our record number of QSOs.

This propagation situation has led me to a re-evaluation of one band: 75 meters. I had long figured that 75 SSB was pretty useless for a mobile, but at least for the low sunspot years I've changed my opinion. But there is one catch: it is useable, but it is a *daytime* band. In the hours before sunset (and at the start on Sunday, at 1300z, in the Pennsylvania QSO Party), there is often decent activity which can be a good source of in-state county multipliers, especially in those contests that have multipliers by mode.

After sunset, however, activity picks up, both from the contest and from the usual evening nets and ragchewers. Finding a spot between these or being heard over it is still difficult, so I don't make much effort on 75 meters after dark.

To fully appreciate the potential as a mobile, one just needs to check out what happens when one of the WRTC-certified best contest operators in the world takes to the highways. In the 2005 Florida QSO Party, Dan, K1TO, operating with and as N4TO, nearly broke the 3000 QSO mark, with 2983 QSOs in 20 hours of all CW operation. That rate for 48 hours would be over 7100 QSOs—serious offshore DX contest numbers!

Speaking of "records", my favorite is from the 2005 Michigan QSO Party. Operating on 80-meter CW, I pushed the *NA* Last-10 QSO rate meter to 223 per hour. With my 7 foot long HamStick, that worked out to a peak rate of 8842 QSOs per hour per wavelength of antenna. I don't think that's ever been done from KC1XX!

Roving

Though not purely mobile, several states such as Ohio, Pennsylvania and Indiana have a "Rover" category for portable operations from multiple counties. We have done several of these, setting up a dipole at several locations in addition to our mobile activity. A simple full size antenna, such as a 40 meter dipole up as little as 20 feet, makes a much louder signal than a mobile whip. This is especially helpful on SSB, permitting great rates that seldom happen as a mobile. If you are a phone-only operator, I'd recommend this category in those

contests that permit it. I think it is also a good choice if you operate alone and don't want to operate while driving. The rate you gain as a loud signal easily makes up for the QSOs lost while setting up an antenna.

Even if a rover category does not exist, you can always submit separate single operator logs from each county, enjoying the fun of being out on the road and frequently being a new station in a possibly rare county.

Resources

The Web sites for the various QSO Parties are a good source of information on contest plans, past results, records, etc. Many provide excellent maps of planned mobile routes. Many parties also have e-mail reflectors that also provide up-to-date information on planned activity, both by mobiles and others. Googling on "Ohio QSO Party" (or whatever state) is always enough to easily find the proper Web site.

I make a point to inform the county hunter community of my mobile plans, using K3IMC's County Hunter Web site, **www.cquest.com/ch/**, under the "Planned Trips" section. I always point out that in the QSO Party there will be many other mobiles active from many other counties as well.

A great operating aid is a state map showing the counties. An excellent source for all the states is the US Census bureau at **www.census.gov/geo/www/maps/stco_02.htm**. Such maps give you county names, help you anticipate mobile routes, and make a good multiplier check sheet. In the car I'm usually too busy to keep up a multiplier list, but when operating from home this is a very useful item.

Operating from Home

Of course it is the guys from home who let us mobiles have so much fun. And a good mobile turnout is what makes a contest a lot of fun for the guys at home.

Operating from home in the better state QSO parties offers classic retro contesting, as in the days before keeping and defending a CQ frequency became the name of the contesting game. A mix of search and pounce, CQing, and moving guys is what makes a good score. In most states there are a lot of counties, and therefore a lot of available multipliers, especially in those contests that have multipliers for each mode. That makes for interesting strategic decisions, such as whether one should be running on a good frequency or catching the 20 minute "opening" to Oscoda County.

Spotting, while allowed for single operators in many QSO parties, is not as prevalent as with the "spot anything that moves" ethos in many DX contests. In QSO parties "anything that moves" also has a different meaning, as the mobiles often have come and gone before anyone spots them. So it is skill and attention that finds the good stuff, not an Internet connection. (And the mobiles, of course, don't have Internet spotting. No worries about us self-spotting. Heck, in some rural areas we can't even find cell phone service!)

For those of you who are hopelessly addicted Internet users, you might check the alternate spotting universe of the county hunters. They have their own county hunting site at **ch.w6rk.com/**. My post contest reviews show that there is a good deal of activity during the QSO Parties. It also features real time maps of mobile routes generated from recent spots of the particular mobile.

Although out-of-state people typically don't do much CQing, it can be a reasonable and effective thing to do. This is especially true on bands where intrastate propagation is poor or nonexistent, and especially on SSB. For in-state home stations, while running is the bread and butter, it is also critical to work in-state counties, many of which are covered by mobiles who will only be there for a short time. So good SO2R techniques are very valuable.

In contests where there are multipliers for each mode, lots of multipliers can be made if you can get a mobile to QSY to the other mode. Typically this means moving from CW to SSB. Though I don't want folks busting up a good pileup, for me it is very easy to QSY and it is a lot better than otherwise unanswered CQs. I've also been known to switch bands for extra QSOs when things are slow. On 80 meters, I can't go between modes without switching antennas, but I have moved from 80 CW to 40 SSB when there was propagation on both bands.

State QSO Parties remain body-friendly events. Most are now single day contests, and except for the California QSO Party, those that are two days have an eight to ten hour break overnight.

The 2006 QSO Party season is now underway, having started in early February in Minnesota, of all places. The season runs through the Illinois QSO party, traditionally the weekend before the DX contest season begins with the CQ WW SSB contest in October. W8DRZ and I will be out for certain in the Ohio party on August 26 and the Pennsylvania party on October 14-15. I hope you'll stop by in these or other contests to see the fun the mobiles are having—or better yet, get your own mobile station going in your own state party! NCJ

My IC-7800

By John W. Thompson, MD, K3MD

The opinions expressed in this article are those of the author and do not necessarily reflect the opinions of the ARRL or the National Contest Journal.

I came about purchasing an ICOM IC-7800 transceiver by sort of an evolutionary process. I decided to sell my Yaesu FT-1000MP, which is a totally excellent contest radio, and get an Elecraft K2/100, primarily because of the expanded test results on the ARRL Web site at **www.arrl.org** (by the way, they are no longer available). The K2/100 is a fantastic QRP/DXpedition rig, but it had a few problems when it came down to actually operating the contest. The biggest thing I found that adjusting the DSP often made you QSY unintentionally to another band.

Charlie, K3WW, advised that the new Ten-Tec Orion 1 had a fantastic receiver. This rig is big, *but* mostly hollow and not very heavy. The receiver is indeed fantastic. However, the first edition of the Orion had microprocessor problems that necessitated resets in mid-contest, so that thing went out the door.

So I went on to the IC-756 Pro III. This rig got distinctly lukewarm reviews by the ARRL boys. When it was put in a lab testing environment it did not perform all that well at the close-in blocking dynamic range. However, in practice, the rig works very well. It has built-in RTTY receive, something we really have not seen for around 20 years in a rig, (the last I know of being the Patcomm). The band scope works quite well in picking out a hole in the QRM, and it is very easy to adjust the rig so that front end overload is not really a problem. The rig utilizes the 15 kHz roofing filter that comes with the IC-7800, and the preamps are similar. This is the first rig I ever had that allowed you to run the preamp on 20 or 15 during the contest without the rig getting totally wiped out.

Choosing the IC-7800

Well, the big decision came down to waiting for the much-touted Yaesu FTdx-9000 or going for the proven IC-7800, now that my mortgage is no longer 35 percent of my pre-tax take-home pay. If you are like me, you read the rig reviews on eham.net word for word, and the early reviews of the FTdx-9000 were not even as good as those for the Orion 1, so …. go for the proven ICOM technology.

Yes, the IC-7800 weighs in at 66 pounds and comes triple boxed. I never owned an IC-781, KWM-380, Signal One, or anything like that, so I can't compare the thrill. I will say the excitement of plugging the thing in was at least as great as my first 2 meter EME QSO or my first 1296 MHz QSO. You do get some strange responses to "what is your rig?", but who cares, anyway?

Now you are probably chomping at the bit to know how the rig performs. It is an overgrown IC-756 Pro III, with a very similar layout and operation. It has built-in send and receive PSK and RTTY, which always fun to play with. I tried RTTY contesting after getting my Pro III, but I don't think it is going to catch on with me.

The knobs are supposed to be cybernetically engineered. At any rate, they are better laid out than the Orion and larger than the K2. The last rig that really felt this solid was the FT-1000D.

The IC-7800 has good close-in BDR and IMD numbers, maybe not quite as good as the FTdx-9000 or Orion 1, but it is very easy to operate and the skirts on the IF DSP are *extremely* sharp in the sharp mode of adjustment, so much so that you will have to widen the passband a little while calling CQ in the contest. It is almost impossible to make the rig emit anything at all that sounds like IMD. It has two identical high-performance receivers in it, certainly very similar in capability to the Orion 1 for single radio SO2R operation capability. The second receiver in the Orion 1 is not as good as the main receiver. The FTdx-9000 is touted as being designed to do single radio SO2R, but I would say the Orion 1 is the first rig that really came down the pike with this in mind. Myself, I am not an SO2R guy, so I really cannot evaluate this feature at all. I estimate that I made around 30 extra QSOs out of 713 in the last NAQP just because of the good IMD numbers and performance. The weak ones just pop right out of the QRM. You cannot even hear the QRM; it is gone.

The IC-7800 is not portable, so it will not make a good Field Day rig. It has several nice little features; I am not sure they are worth $7600 more than the Pro III, but they are convenient. Auto-tune on CW/RTTY is great. It zeros the station for you automatically. The IC-7800 has Digi-sel for front-end overload protection, but I'm not sure how well this works compared to individual bandpass filters used by 90 percent of stations for multi-multi or SO2R.

The noise reduction is exceptionally good on this rig, better than the FT-1000MP, K2/100, Pro III, or the Orion 1. It's just terribly clean. The notch function really has to be experienced to be believed. This notch obliterates the interfering station; no trace at all.

It has all the bells and whistles needed for SSB, with RF processing and adjustable audio on transmit. I really have not tried the memory/individual operator adjustment card that is so highly touted, as I am just a single op. It would be good for M/S operation, similar to the memories available on the Orion.

The band scope is totally excellent. It tells you immediately exactly where the crud is, or if the band is open or if it is a bad opening—very useful. This is the only rig I have ever used that I use the bandscope to tune up and down for hunt and peck, with or without the band map on the logging program.

It is nice to read the promo material on this rig, and it is obvious that the rig was really designed for the contester. The bandscope is adjustable plus or minus to your frequency or to watch the entire band or part of the band, and looking at this bandscope makes it obvious that contesters are ensuring the future of ham radio by keeping the bands used.

Yes, there are still a few buttons on there that I really can't figure out, but that is the fun of it, isn't it? Overall it's a really clean contest rig. I'm not sure if it is worth selling the Pro III and two extremely fine VHF linears to own one, but it is a lot of fun to finally have what I

consider the best.

There are 4 antenna connectors on the back, which can be individually programmed for receive or transmit, individually by band. Do I use the antenna tuner? No. There was something crazy on eham.net about the antenna tuner. Most with this rig have a linear, and if they are running open-wire line, it is with a kW tuner.

You will find that you do not use your linear as much for rag-chewing, as the CCS-rated 200 W output is very good in the power-punching department.

The rig comes with no microphone. You would think if they give away a $250 jacket, they could give you a microphone. Which is more aggravating: the 4-pin Ten-Tec mic plug, or no microphone on the IC-7800?

Please remember that if you are going to key your trusty SB-200, Alpha 67PA, SB-220, or 30L-1, you are going to need an Ameritron ARB-704 linear switching unit or you will burn out the relay, which is rated at 18 V.

A Quantum Jump

Is the rig a truly quantum jump, such as the advent of the logging program, the TO keyer, packet spotting, super check partial, your first beam, linear, etc? Probably not, but is very nicely engineered and very clean to operate. There is a great deal of attention to detail, such as being able to individually select the 15 or 6 kHz roofing filters in a menu for each mode/filter. Yes, the FTdx-9000 has a 3 kHz roofing filter—copycats! There is also the optical input (fiber optic), but when am I going to actually use that? I have received unsolicited compliments on the audio and keying, without telling them what rig I was running.

Rig control works flawlessly with the ICOM interface. I really don't know why this is not built-in to the IC-7800, but it is totally adjustable to mimic almost any address or baud rate, or you can go for auto-baud (which I have found to be extremely inadvisable in the past).

The rig of course has built-in CW, SSB and RTTY/PSK memories, which work well. They are similar to those on the IC-756 Pro III. The built-in DVKs that did not work well (that I can remember) were those on the FT-1000MP and Orion 1. The Orion 1 would suddenly refuse to send its memory contents about every 20 minutes or so. That was aggravating.

The IC-7800 has a lot of really neat gimmicks, such as the digital analog-reproducing meters, which can be made bar graph or side reading meters when you have the mini-bandscope display similar to the Pro III (you can consult your *QST* for pictures of this). The meter looks and acts just like an analog meter. Now that is definitely worth $10,600!

It is not possible to cover all the features of the IC-7800 in an article less than ten pages long. If you want a top-end rig similar to the "greats" of the past, such as the 75A4, S-line, IC-781, the legendary FT-1000D (which still sells used for $2700), go for it!

NCJ

Some Thoughts on Mobile Contesting

Hal Offutt, W1NN

I am a huge fan of mobile contesting in QSO parties (or any venue) and I participate in as many as my work schedule permits. I think I may have set some kind of record for mobile contesting from the largest number of states: so far I have operated mobile from CA, NV, WA, TX, IL, IN, OH, MI, PA, FL, NJ, NY, CT, RI, MA, DE and MD. Most of these operations were in state QSO parties, but a few were in the MARAC County Hunter's Contest. (Some of the MARAC guys have probably operated from every state in the Union, but I think it is fair to say that their normal operations are quite different from contest operations.)

My own mobile activities began with the Pennsylvania QSO Party. I have put together a Web page about my PA mobiling experiences over the years. Take a look at **www.japancorporateresearch.com/W1NNMobile.html**. Incidentally, I wrote an article in *NCJ* on my first PAQP experience. It was back when I was K8HVT ("Contesting on Wheels," K8HVT, *NCJ*, January/February 1990). Mobile contesting has come a long way since then, and so have I.

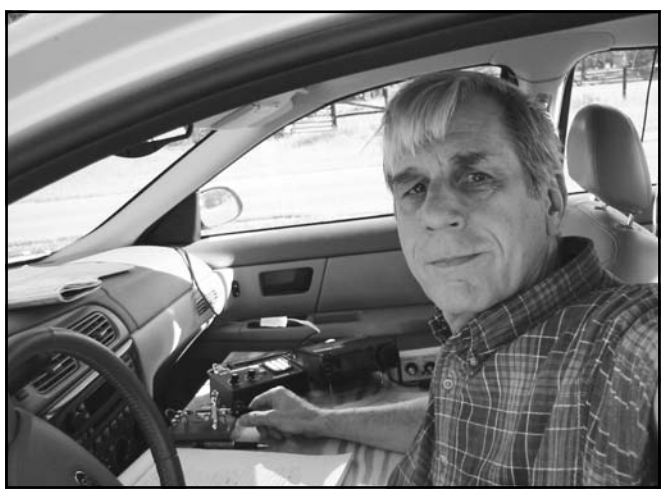
Mobile contesting has become my favorite operating mode. Why? Well, I can think of three reasons. First and foremost, it is the ultimate in operating on a level playing field. All stations are essentially the same (and the rules should make this so, I think) and the winner is the op who has put together a reliable station and who has really thought out all of the factors that go into producing the biggest score/route planning, determining how much time to spend on SSB versus CW, selecting which bands to operate and when, balancing CQing and S&P and combining all this with operating skill and experience.

The second reason is the high overall QSO rates and the pileups that result when you change counties. Sometimes these can be quite intense, especially late in the contest when you hit a rare county. In the 2005 Florida QSO Party, I was able to work 2080 stations in 20 hours operating by myself. If you like high rate, this is the place to find it! (The K1TO and N4TO team worked over 3,000 stations in that event—this is a higher rate than the best CW ops achieve during the CQWW DX contest!)

A final reason I love this form of operating is the opportunity it affords to see a lot of beautiful parts of our country that I would otherwise never visit. Largely sticking to the lightly traveled back roads, I have enjoyed the PA countryside in October, the wheat fields of eastern Washington, orange groves in Florida, Spring in the Michigan countryside, Amish country in the Ohio boondocks, the flat Illinois farm country after the harvest, and many, many other parts of this fabulous land.

The mobile antennas for W1NN's 2005 Florida QSO Party (FQP) effort.

A major issue in mobile contesting (at least to me) is the solo category. I prefer to operate by myself (rather than with a driver) but many state QSO parties do not have solo categories, so I find myself having to compete with two-person teams. I have won a couple of these and it does feel good to beat a two-man team, but I believe it is much better to have a separate category for those who do not have drivers or partners. A major reason that I flew to FL last year to operate in the FQP is that they do have a solo category where solo ops compete against each other. The Michigan QSO party also introduced such a category in 2005. I personally have learned how to operate while driving, but I realize that not everyone can (or should) do this. I'd like to see some state QSO party introduce a solo category where operating while driving is not permitted. Perhaps for a 12 hour contest there would be a limit of, say, 10 hours of operating, leaving 2 hours for driving from county to county. This would allow ops who do not feel comfortable operating while driving to get out there and compete in the solo category. Imagine what an interesting event you would have if 30, 40 or more mobiles were competing in a 10 hour contest!



W1NN operating in the 2005 FQP.

W1NN's mobile set-up in the rental car for the 2005 FQP.

County Hunter's Contest

The County Hunter's Contest mentioned earlier deserves some comment. It is not so popular among contesters mainly, I think, because it is a very long contest (48 hours) and has never been promoted very much in the contesting community. Before the relatively recent resurrection of some major QSO parties (FL, MI, OH and New England in particular) it was one of the few reasonably well attended mobile events in the annual contest calendar, so I participated several times. I feel it has a lot of potential because it is the only national event where mobiles are encouraged to contact other mobiles and have a real chance of doing so. (It's usually pretty tough for mobiles to contact each other in a state QSO party.)

The County Hunter's Contest has a scoring system that awards 15 points for contacts with mobiles versus only 1 point for contacts with fixed stations. So there is a big incentive for mobiles to work each other and home stations to work mobiles. W9MSE is the guy who owns this contest. He has operated it for many years and has racked up well over 2000 QSOs over the course of a weekend. I think he uses his brother-in-law as a driver and keeps moving the entire weekend.

Unusual Rules

With so many states having their own parties, there are many opportunities to make these events interesting by adopting unusual rules. Two state QSO parties have a very unique rule that makes their events especially challenging and fun. I am referring to the rules followed by the ILQP and the INQP. They allow mobiles operating on county lines to count one QSO for each county that they are operating in. (Beginning with the 2006 event, the INQP has limited county line operations to a maximum of two counties at one time.) For example, a station sitting on a three-county line in IL works 20 stations before moving on. He is allowed to claim credit for 3 contacts for each of these 20 contacts, or a total of 60 contacts. If he happens to work another station sitting on a 3-county line, he ends up with credit for 9 QSOs for this single contact. If he is smart enough to move this station from band to band or mode to mode, he can amass quite a large number of contacts in a short time.

The possibilities presented by rules like these are endless and require the ops to use some real strategy and not just sit there and call CQ or whiz from county to county in a marathon fashion. It is even possible for a solo op to win these two events, something that makes them extremely competitive. On the other hand, many other state QSO parties do not permit county line contacts at all. Of course, they are also fun and require a much different strategy. There is much room for making these events even more interesting by incorporating unique rules.

Pack Up and Go!

Almost by accident I have become something of a specialist in packing up my station in a suitcase, flying off somewhere and operating a QSO party from a rental car. I've done this half a dozen times and it really is not so hard to do. One of these days I will try to put together a short article on how I do this.

More and more contesters have discovered just how much fun mobile contesting can be. I think that interest will continue to increase. Among other things, it is a solution to antenna restrictions and other problems that contesters are increasingly seeing in operating from their homes. Someday, perhaps, we may see major contests like CQWW and Sweepstakes introducing mobile categories. NCJ

Can You Hear Me Now? Adjusting the Transmit Audio Chain

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We've all heard terrible transmitter audio during the recent phone contests. Some signals occupied far more space than necessary. Background noises such as blowers and other shouting operators obscured the voices from other stations. Some signals were simply too distorted or muffled to understand.

Poor quality audio means fewer contacts. If other stations cannot understand your call or exchange, they may ask for repeats – slowing down your rate. Or they simply ignore your signal as too unintelligible or difficult, a waste of their time.

On the other hand, a signal with clean, crisp audio is easy to work, even when that signal is weaker than others around it. With an hour's work you can achieve that clean, crisp sound. This article systematically aligns the transmit audio chain – the sequence of equipment between the operator's voice and the antenna – for good results. An operating position at W1KM serves as an example of steps to follow. The control settings appropriate for your voice and station equipment likely will differ, but the control adjustment process should be similar.

Components Of The Transmit Audio Chain

W1KM resembles many modern contest stations. A computer soundcard provides voice memory keyer functions. An interface box handles galvanic isolation, switching and other tasks necessary to interconnect the radio with the computer. This box can be homebrew or a commercial solution. At W1KM we use a microKeyer manufactured by MicroHam.

Figure 1 outlines the flow of audio. A short study reveals over a dozen locations along the audio chain where adjustments affect the quality of SSB audio on the air. No wonder stations have poor audio – so many opportunities exist to contaminate the signal!

The general strategy for setting all these adjustments proceeds as follows:

- Operator training.
- Controls affecting audio from the microphone through the recording of wave files (messages).
- Controls affecting audio from the playback of message to the radio's input jack.
- Controls used for live speech routed through the soundcard.
- Transmitter mic and speech processor level, and other internal settings such as audio bandwidth, threshold, or equalizer.
- Transmitter power output level to maintain linear operation of an external power amplifier.

The Operator

Good quality audio begins with the operator. Speech coaches teach that your best voice occurs while standing – hardly a convenient operating position for the contest. But sit up straight in your operating chair with your legs apart. This posture allows you to inhale and exhale air more efficiently and uniformly with muscles around your belly. Not only does good posture in the chair result in better voice control, but it also conserves energy for the long contest.

Shouting distorts your information. Notice your shouting, and train yourself to relax again to speak with a normal voice. Not only will your signal sound better, you will finish the contest with less exhaustion. And, at a multi-op station, your fellow operators will thank you for not inter-

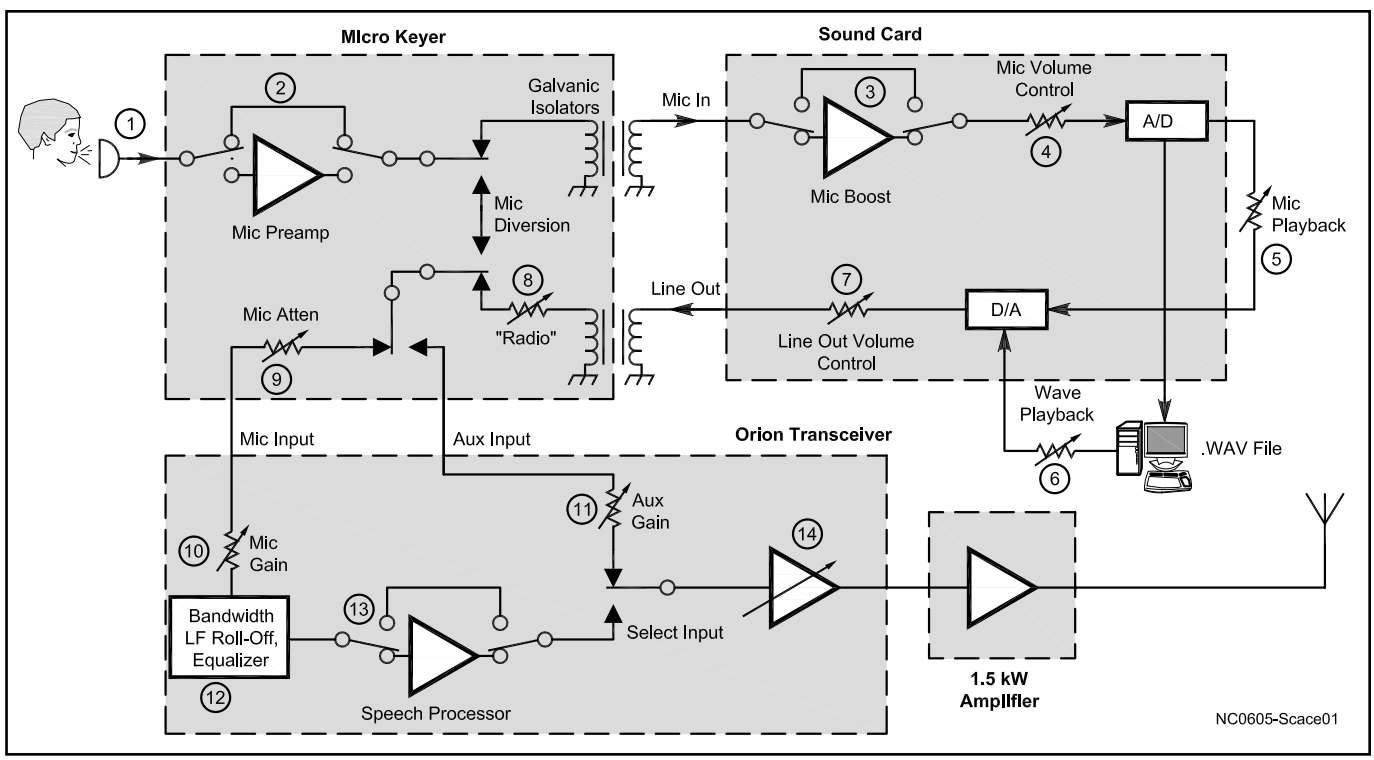


Figure 1—Flow of transmitted audio at W1KM. The numbered points identify key controls affecting transmission quality.

fering with reception!

We are accustomed to hearing our voice at a particular volume in our ears during non-radio activities. Our voice reaches our own ears through the bones of the head (and other paths) as well as through the open air. Headphones attenuate the open-air path, tricking the brain into cranking up the speaking volume. With training, we can learn to "whisper" when wearing headphones, thus speaking at a more normal volume. (You may also use the MONITOR signal from the transmitter to your headphones to replace the normal feedback to the ears. By increasing the MONITOR volume a bit, you may find yourself speaking at a more natural level. SO2R operators often don't have this option available, since they tune another receiver while transmitting.)

When speaking into the microphone, aim for maximum signal (your voice) to noise (the surrounding environment) ratio. Usually this means close talking: positioning the microphone about an inch (2-3 cm) from the lips. Modern microphones pick up the surrounding environment easily and, unfortunately, directional microphones don't fit into headsets. If your operating position includes significant external noises (e.g., blower fans), take steps to reduce this background as much as possible. Other contesters tuning across signals will far more easily understand a voice speaking against a quiet background.

The Microphone—Making Measurements

I used an oscilloscope to explore signal levels along the audio chain. Since the suppliers prefabricated the interconnecting cables with 1/8-inch stereo plugs and jacks, I built a sampling cable: a short section (few inches) of shielded cable with a stereo plug on one end and a stereo jack on the other. Room inside the connectors was limited, so I opened up the center of the cable to splice in three colored wires. Heat shrink protected each splice from its neighbors, and a larger diameter heat shrink healed the incision into the cable. The scope probe clipped to the shield and one of the two other colored wires in order to sample the voltages inside the cable.

I measured the microphone voltages for each headset at W1KM. Initially I wanted to know the normal range of mic voltages in the simplest configuration: a mic plugged directly into the front panel mic jack of the radio. With one exception, at a normal speaking voice, all of the headset mics provided about 200 mV_{P-P} (peak to peak) on hard consonant sounds such as the "k" and "t" of "kilowatt". When aggressively shouting, the microphones produce up to 400 mV_{P-P} on these hard consonants. Vowels generated significantly lower voltages: about one-quarter the peak levels associated with hard consonants and sibilants.

The exception was the Heil ProSet Plus headset. The boom contains two switch-selectable mic elements: "full range" and "DX". The full range element produces voltages similar to the other headset, but the DX element generates no more than 100 mV_{P-P}. I only had one headset of this model to test, so I do not know if this lower voltage range is typical.

At W1KM we decided to use the Heil ProSet Plus' full range mic element for two reasons:

1. In the final listening tests described later, the DX element's narrower frequency range was less intelligible under some conditions.

2. We wished to avoid changing control settings in the middle of a contest. Headsets follow their owner-operator from one operating position to another in our multi-op station. Thus, we preferred mic elements with similar voltage outputs.

Choosing A Target Voltage Level

Our next goal was to adjust the interconnect box and computer so that a clean 200 mV_{P-P} signal arrived at the radio's mic input jack.

Why stick to this level? Examine the signal flow inside the microKeyer. Depending on configuration, when stepping on the footswitch the microKeyer may route the microphone signal directly to the radio via the path marked "mic diversion" in Figure 1. This provides a simple override of a computer-generated voice message: stomp on the footswitch and get the computer out of the way![1] It also permits continued contesting even if the logging software crashes and must be rebooted. Hence, real-time speaking over the air and pre-recorded message playback must arrive at the radio with identical levels.

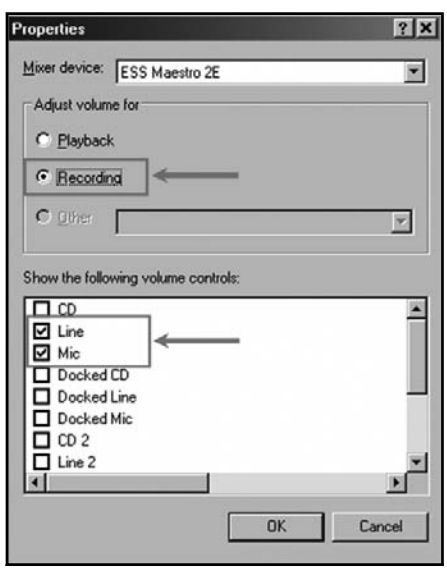


Figure 2—In the *Windows* volume control, use the Options\Properties menu to open this dialog box. By selecting only the controls needed by your station, you eliminate unintentional stray signals from other sources.

Soundcard Mic Input Audio Chain

The following steps set the microphone amplifiers (points 2 and 3 in Figure 1) and gain controls (point 4) so that this portion of the transmit audio chain delivers an appropriate signal level to the soundcard's A/D converter.

Soundcard Level-Setting Considerations

"Appropriate signal level" here means delivering enough voltage to use most of the encoding range of the converter, while leaving some spare headroom to accommodate the occasional outburst of enthusiasm. We want to employ as much of the encoding range as practical, so that the encoder digitizes the voice more faithfully; i.e., with higher resolution.

Almost every wave file editor provides a graphical picture of the recorded (incoming) waveform. I used Goldwave[2] to examine my soundcard input and recorded wave files. After running a number of tests, I decided to let the normal voice peaks occupy about 80% of the encoder range.

I also wanted to keep the *Windows* volume control sliders around their midrange. Many soundcards distort signals when the volume control sliders are set above 80% of their full-range. At the opposite end of the scale, selecting a satisfactory level can be difficult if a few increments at the bottom of the on-screen volume control produce radically different levels of signal.

Configuring *Windows*

Configure your soundcard's recording volume controls to employ only those soundcard inputs used during contesting: the microphone and the line input (e.g., for RTTY and for audio archives). By default, after installation *Windows* includes other recording volume control sliders for devices such as a CD/DVD drive. Use the *Windows* volume control Options menu and select "Properties" to open up the dialog box where you select active (usable) inputs and outputs; see Figure 2.

Preserving Signal To Noise Ratios

Mic output voltages are rather weak. We must minimize stray signals picked up by the cabling between the mic and the soundcard to preserve a high ratio be-

tween your voice's voltage (signal) and stray junk (noise). A quality cable with 100% shield coverage provides a good starting point.

At the start of this project, I reasoned that employing the microKeyer's mic preamp (point 2 in Figure 1) would further help to achieve that aim.[3] By boosting the mic signal levels close to the mic, any stray noise picked up in subsequent cabling would have little impact on the signal to noise ratio.

Without this preamp, the voice peaks on the cable between the microKeyer and the soundcard mic input jack reached 150 mV_{P-P}. (Galvanic isolation, discussed below, accounts for the loss from the 200 mV_{P-P} mic output levels.) Routing the signal through the preamp produced a very healthy 2 V_{P-P} on voice peaks, about +20 dB gain. However, this 2 V_{P-P} signal completely overwhelmed my soundcard's D/A converter, resulting in very distorted recordings.

When I bypassed the preamp at point 2 and set the *Windows* volume control (point 4) at maximu,m m, the results reversed. Even very loud speech into the microphone produced only enough oomph to hit 50% of the encoder range.

Most soundcards contain a "mic boost" control, accessible via the *Windows* volume control dialog. Click the "Advanced" button under the mic volume control's slider (Figure 3). If your volume control does not show an "Advanced" button, turn on the Advanced Controls option under the Options pull-down menu.

In my case, using the soundcard's mic boost control and setting the mic volume to ¼ of full-scale produced the desired encoding range. Figure 4 shows the resulting recording of our team's callsign in the most recent ARRL DX phone contest.

Soundcard Line Output Audio Chain

The next steps set controls affecting the audio generated by the computer and delivered to the transceiver. These controls sit at points 5 through 9 in Figure 1.

More *Windows* Configuration

Open the Settings\Control Panel\Sounds and Audio Devices properties dialog in *Windows*. Click the Sounds tab in this dialog, and select the "no sounds" sound scheme. This prevents accidental transmission of *Windows*' sound effects over the air.

Depending on the capabilities of your soundcard, this properties dialog box may show other tabs or buttons used to control equalizers, quadraphonic (or more) sound channels, and other specialized functions. Try to disable as many of these special functions as possible. When you cannot disable a function, set its parameters for neutral or minimal effect on the output.

During these adjustments, we want the soundcard to deliver to the radio a faithful reproduction of what it received from the microphone. While you might be tempted to add special effects like reverberation to make your signal distinctive, such modifications will not aid the intelligibility of your signal on crowded bands or after transiting the polar auroral zones.

Another reason for keeping the soundcard's reproduction of your voice as neutral as possible hinges on the use of the footswitch-activated mic diversion function shown in Figure 1. During diversion your microphone connects directly to the transmitter without passing through soundcard signal processing. You want your voice to sound the same regardless of the path it takes from microphone to transmitter.

Finally, use the *Windows* volume control program's Options menu to open the Properties dialog. In that dialog, after selecting "playback", uncheck every playback source except for "microphone" and "wave". As was done for recording, you want to eliminate signals from any unnecessary audio sources.

Setting Controls

The goal for this part of the audio chain is to deliver to the radio a signal at the same level occurs as when the microphone connects directly to the radio; i.e., 200 mV_{P-P} for the equipment at W1KM.

I began by attaching the scope to the soundcard line output and was startled to discover a 100 mV_{P-P} signal. At the time no one spoke into the microphone and the computer was not playing a recorded message. Investigation revealed this signal contained a sine wave with a period of 2 µs, equivalent to a frequency of 500 kHz. Since the transmitter's audio stage rejects signals this far outside the audio passband, I could ignore it.

After configuration as described above, the *Windows* volume control for playback now contains three controls affecting levels for contest operations; I set each to mid-scale as an initial guess:

The Mic slider (point 5 in Figure 1) governs signal levels when the operator speaks live on-air, and the interconnection box configuration routes the operator's voice into the soundcard and back out again. This slider is not the same as the recording mic volume control, so be sure to adjust the playback sliders, not the recording sliders. In this part of the procedure you will set this control last.

The Wave slider (point 6) governs signal levels during wave file playback of your recorded messages.

The Volume slider (point 7) represents a master gain control for all forms of output from the soundcard's line ouput jack.

The microKeyer includes:

A front panel control labeled "radio" (point 8) that adjusts the signal level delivered to the radio. I set this control to 12 o'clock as an initial guess.

An attenuator trim pot (point 9) for signals delivered to the radio's front panel mic jack. Adjust this pot with a small Philips screwdriver through a hole on the right side of the cabinet. The full counterclockwise setting represents no attenuation, and I began with this setting. (The box arrives from the factory with this control set in mid-range.)

To provide a consistent audio source, I used my logging software to play a previously recorded CQ message whose peak levels hovered around the recording goal of 80% of the A/D encoder range. The scope probe, when attached to the output of the soundcard, revealed a vigorous 700 mV_{P-P} on voice peaks. The "radio" control in the microKeyer and losses in the galvanic isolator brought this level down to 200 mV_{P-P} at the transmitter's mic input jack – right on target.

The *Windows* playback mic slider re-

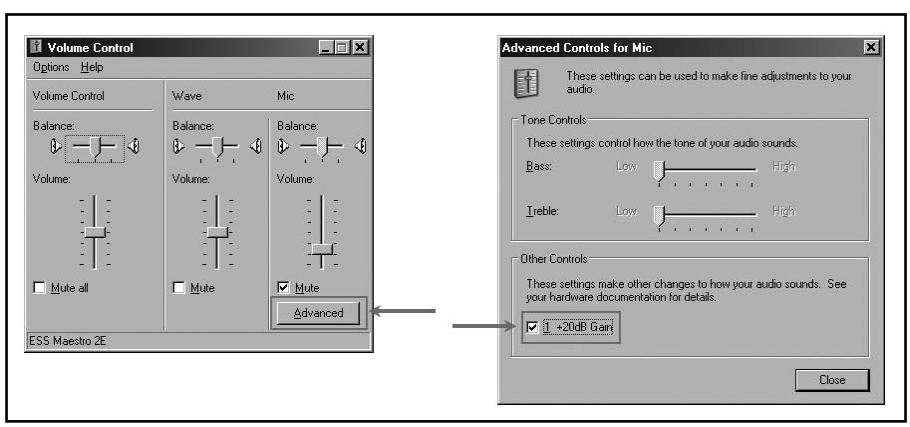


Figure 3—Click the mic volume control's "Advanced" button to reveal the mic boost control. For this particular soundcard in my Dell Inspiron laptop, the mic boost checkbox says +20•dB gain, but actual gain seems significantly less.

mained as the final adjustment in this phase. First I configured the microKeyer to route the microphone through the soundcard for live on-air speaking; i.e., not using the mic diversion shown in Figure 1. By speaking the same CQ message in a normal speaking voice, I could adjust the mic playback slider setting for the same 700 mV_{P-P} soundcard line output audio signal level on the scope as for the recorded messages. The initial mid-scale setting turned out to be perfect.

Transmitter Adjustment

Transmitter adjustments vary by model and manufacturer. The description below for the Orion radios at W1KM illustrates the general approach. You should consult your own radio's operating manual for the corresponding adjustment instructions, and make all of the adjustment at the power level you intend to use in the contest; e.g., including the 1.5 kW amp.

The Orion contains seven relevant adjustments:

- Selection of the audio source: front panel jack, AUX rear panel connector, or both. For this article we assumed delivery of the transmit audio to front panel mic jack.
- Audio input gain control for the chosen source.
- Speech processor level.
- Audio equalization.
- Audio low frequency rolloff.
- Transmitted audio bandwidth.
- Power output.

Following the Orion instruction manual and using the CQ message recorded by the logging software, I first adjusted the audio input's gain (mic gain, in this example) until the ALC light winked on voice peaks.

After setting the mic gain, I faced a collection of settings for which an oscilloscope pattern or meter reading provided no clues for correctness. What I needed was the ability to hear the over-the-air signal as any other station would hear it.

To do this, I used another receiver at the station as a *monitor receiver.* At W1KM another Orion radio served this role, but you can use any other good quality receiver for this task.

The signal strength into the monitor receiver must remain at a level typical for a normal signal; e.g., S-9 or thereabouts. Many receivers (including the Orion) will deliver a distorted copy of the incoming signal if that signal drives the S-meter close to its limits. Use the following techniques to reduce the signal strength of your 1.5 kW transmitter into the monitor receiver:

- If available, connect the transmitter to a dummy load with sufficient power capability. Enough leakage will occur locally for your receiver to pick up a usable signal.
- Disconnect the antennas from the monitor receiver. If this is insufficient to reduce the signal strength, disconnect the coax cables from the receiver's rear panel. Even a short length of coax to an antenna switch will add some signal strength. If a beverage or other specialized receiving antenna connects to the monitor receiver, leakage in the antenna selection relays within the receiver can provide more signal strength than desired.
- Crank up the receiver's attenuation setting.
- Attach a shorted connector to the monitor receiver's antenna terminals.

One or more of the above steps will deliver a signal of modest strength to the monitor receiver. At W1KM, disconnecting the antennas and setting 18•dB of attenuation did the job.

If possible, begin by setting the monitor receiver's bandwidth to a wide value. Play the recorded message from the computer while adjusting the speech processor level and, if available, bandwidth, equalization, rolloff, etc. These settings may interact, so go through them in turn multiple times until they converge on a collection that sounds crisp, authoritative, and clear.

Many phone contesters operate with reduced receiver bandwidths and shifted passband tuning on the more crowded bands. You want your signal to be easily understood under these circumstances as well. Change the monitor receiver's bandwidth and passband tuning controls. I cranked the monitor receiver down to the 1.8 kHz roofing filter, a DSP filter of 2.1 kHz, and +100 to +200 Hz of passband offset.

Now listen to your recorded messages again. Are they still easy to understand? Try some adjustments in either direction to the speech processing and other transmitter controls to see if further improvements in intelligibility result. Try some other settings on the monitor receiver that might be used by contesters listening on crowded bands, and check again to see if the intelligibility of your signal remains good over a wide range of monitor receiver settings.

After a few minutes' work, I settled on these values for the transmitting Orion: 2700 Hz bandwidth, 200 Hz low frequency rolloff, and –5 dB equalization (slightly favoring the higher end of the voice).

Don't try to make these adjustments while talking live yourself, or having another operator talk into the microphone. The sound of your voice or the other person's voice will overwhelm what you hear in the monitor receiver, preventing you from forming a good opinion of the transmitted signal quality.

Similarly, don't rely on the transmitter's MONITOR function for a quality check. The transmitter monitor does not accurately emulate a real receiver listening to the on-air signal.

Final Checks

I used another wave file editing software feature to simplify the following tests. Goldwave can create sounds by formulae or by selecting some standard sounds (sine wave, DTMF tone pairs, etc). I created a few wave files for experimentation and testing purposes:

- A 1500 Hz sine wave at 100% and 85% encoding range.
- White noise at 100% and 85% encoding.
- A sequence of DTMF tones at 100% and 85% encoding.

Each file lasted about 20 seconds. By assigning these files temporarily to some of the spare message playback keys in my logging software, I could play any of these test signals conveniently.

Amplifier Linearity Check

Since you have made the transmitter adjustments at the full power level appropriate for your class of entry, the monitor receiver's audio has included any impairment introduced by the power amplifier (if used).

An oscilloscope can provide a quick check for linear operation of an amplifier. Wind a length of hook-up wire around the coax line connected to the amplifier input and another length around the output coax. Increasing the number of turns will increase the signal picked off the coax; I find this simple approach picks up enough signal to deflect the scope beam. Connect one wire to the scope's X input via a probe, and the other wire similarly to the Y input. Adjust the X and Y gain controls so that, while transmitting the recorded message, a diagonal line of around 45° appears on the scope.

Examine this line, focusing particularly on modulation peaks. If the diagonal line remains straight and the audio quality is good in the monitor receiver, the amplifier is operating linearly (good!). If the tip of the diagonal line starts to deviate away from straight, even just a little amount, then the amplifier has moved into nonlinear operation. You're definitely transmitting some garbage on the bands then!

The 100% encoding level test tone files are particularly helpful here, as we want to be sure the amplifier remains in linear operation even if the operator speaks louder than normal.

Signal Width Checks

Use the recorded messages and the test tone files as source material. Tune the monitor receiver away from your transmit frequency, and listen critically nearby. Since the transmitter's signal strength in the monitor receiver remains at moderate levels, listening on an adjacent frequency reveals how your signal sounds to other contesters working next to you. If your monitor receiver registered S-9 when

on-frequency, but 3 kHz away still sees your transmitter lifting the S-meter off the pin, then your signal is too wide.

Background Noise

Use the monitor receiver to listen to the recorded contest messages. Can you hear anything in the background between syllables? Extraneous background noises can reduce the intelligibility of your signal, so try to identify and eliminate sources of noise in your shack.

A wave file editor also can help you judge background noise levels. Figure 4 shows very little signal between the syllables recorded in this wave file. Expanding the vertical scale in the editor revealed that the quiet parts of this message use just ½% of the encoder range, compared to 80% at peaks. This ratio represents 44 dB, which seems like a lot. When watching the power output meter of the amplifier, the transmitted signal drops from 1.5 kW to just a minimal indication between syllables. But when a DX station hears the W1KM site's signal at S-9 plus 20 dB (and I hope we often exceeded that, hi!), a 44 dB lower background noise level hovers at S-4. We have hardly achieved the tomb-like quiet of a broadcast studio – and, for a contest, probably don't need to. Forty dB seems plenty to allow the message to stand clearly above the residual noise.

We grow accustomed to the sounds within our own stations. Sometimes listening to a recorded empty message, made with a live mic but no one speaking, and then transmitted over the air and received with the monitor receiver, reveals the nature of a background noise source that eluded earlier notice.

- Make notes!
- Finally, draw a diagram, annotate it with measured voltages, and write down all the settings for future reference.

Other Aspects—Galvanic Isolation

The audio connection between computer soundcard and radio must contain galvanic isolation, typically achieved with 1:1 transformers. Without isolation, small short-term differences in currents circulating on the radio and computer chassis impose noise on the audio leads. Not only does this noise contaminate the transmit audio recorded messages and on-air signals, but also frequently travels across the radio chassis to appear in the operator's headphones.

Many radio-computer interconnection articles suggest the inexpensive RadioShack 1:1 isolation transformer part number 273-1374 for use as a galvanic isolator. This transformer performs poorly at audio frequencies. The small core saturates relatively easily, causing audio frequencies to mix non-linearly and generate distortion products. If you have an interest to explore this effect, try feeding two low- or mid-range audio tones into the transformer and examining the result at your soundcard in the frequency domain with audio spectrum display software. As the strength of the signals increase, you will see spurious mixing products at other frequencies appear on the display.

RadioShack's Web site also lists a "ground loop isolator" for two audio channels, part number 270-054, for about $17. While the product description seems promising, the website specifications remain sketchy. I haven't tested this device.

Isolation transformers in the broadcast industry are expensive ($50 and up), large, heavy, and perhaps overkill for the audio frequency range used in voice or RTTY contesting. Perhaps readers can suggest other sources for appropriate isolation transformers.

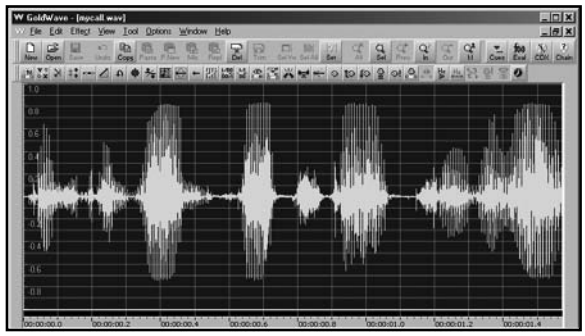


Figure 4—Typical recorded message with peaks of about 80% of the soundcard's A/D converter. This message says "Whiskey One Foxtrot Juliet."

External Audio Amplifiers

The microKeyers used at W1KM conveniently include both galvanic isolation transformers and a mic amplifier. If you build your own interconnection box, you may wish to include one or more audio amplifiers. Many on-line and retail electronics suppliers carry a simple, inexpensive (around $7) audio amplifier kit. The kit employs an LM386 audio amplifier chip, includes a small circuit board and a handful of parts including a gain-adjustment trim pot. Search for "lm386 audio kit" on the Internet to find suppliers. The kits run off a wide range of supply voltages; use your station's +12 Vdc supply or a 9 Vdc battery. The tiny current demand means one battery lasts for many contests.

Instrument Characteristics

I used an oscilloscope to measure voltages, in part because I was curious about the peak voltages. A common voltmeter will not provide accurate RMS readings on anything other than a sine wave, and cannot capture peak voltage values. During another project I attempted to use an inexpensive digital AC voltmeter to measure sine wave audio tones, but discovered that this meter read accurately only at the power line frequency of 60 Hz! If you wish to use a digital AC voltmeter for audio measurements, check the specifications first! And be aware that a voltmeter cannot reveal distortion on voice peaks.

Wave File Encoding Algorithm

Contest messages are short. Little justification exists for using compressed encoding algorithms, each of which introduces additional processor burdens and delays. Stick to a simple algorithm with high resolution; e.g., PCM signed 32-bit encoding, mono, at a speed of at least 11 kilosamples per second.

AFSK and PSK Operations

This article focuses on adjustments for voice operations. Modes such as AFSK and PSK have additional considerations that may require different control settings for the transmit audio chain. Other articles published recently in the *NCJ* and on Web sites devoted to these modes cover these considerations. Again, take notes on your configurations and settings so that you can switch modes quickly with confidence.

Conclusion

Although the procedures outlined above may seem rather lengthy and daunting at first, the task actually goes quickly. Check your results with some other stations on the air, asking them to listen not only to your signal, but also above and below for any splatter or excessive bandwidth. You should find that these steps result in excellent reports.

For us at the W1KM contesting site, the confirmation came Friday night during the ARRL DX phone contest in a 40-meter multiplier pileup. A friend happened to be on that contest expedition. Although I was using a different call sign and my friend had no advanced knowledge of my location, he answered with the remark "Gee, that sounds like Eric. Nice audio, Eric! Can you work us on another band?"

Notes

[1]Some logging software packages automatically abort transmission of a recorded message when the operator steps on the footswitch. Typically the software detects footswitch status on the CTS lead of a serial port.

[2] **www.goldwave.com**

[3]I understand that ICOM radios support electret mic elements; these elements require a DC bias voltage for proper operation. Soundcards provide this bias voltage routinely. The microKeyer mic preamp does not provide a bias voltage and cannot support electret mics.

NCJ

Mobile Contesting: Short Notes on Antennas, Power Supplies, and Logging

Charlie Wooten, NF4A

I usually operate with two antenna systems: one on the front bumper (a 15-meter HamStick) and a special long mast on the rear bumper that resonates on 10 meters (from back in the day when 10 meters was actually open!). On top of the long mast are 20 and 40 meter Hustler resonators. This gives me 40, 20 and 10 meter capability on one antenna. I use a simple A-B coax switch to change between the 15-meter HamStick and the rear antennas. It seems to work pretty well. I guess I haven't gotten the screwdriver bug yet.

I log with a laptop and I use the Igo "Juice" to power the laptop. I do not get any receiver hash with the Igo. Many people try to use regular inverters and they can be quite noisy! The Igo steps 12V up to about 18-20V, which is what most laptop ac power supplies produce. There are adapters for literally all laptops. These are available from **Igo.com,** or some of the better RadioShack stores. The Igo Web site will tell you what adapter to purchase for a particular laptop. The Igo adjusts the voltage to make your laptop happy and it also charges your laptop battery at the same time.

I use *CT* contest software and the CW keying from the laptop LPT1 port to the transceiver. I have noticed that most of the interfaces such as the W1WEF interface will lock up when they're hit with too much stray RF, so some ferrite beads and ferrite donuts might also be needed (it may also be my particular vehicle and the layout of the antenna being so close to the laptop). It seemed to be more of a problem on 15 than any other band in my particular installation.

2004 Florida QSO Party contesters George, K5KG and Charlie, NF4A.

The accompanying picture is of K5KG and me as we crossed paths in the 2004 Florida QSO Party in Taylor County, Florida. NCJ

Field Day Records

Denis Catalano, W4DC

Although ARRL Field Day 2005 saw lower sunspot activity and slightly fewer than the record number of entrees submitted in 2004, 11 stations still racked up enough points to break records (as indicated by **bold type**). The Field Day rules for 2006 are essentially the same as in 2005, with the exception of the GOTA station, so be sure to check the 2005 Field Day rules. Good luck, be safe, and have fun!

The listing shows class, call sign, year record set, club or group name (if applicable), number of QSOs, power level (5—less than 5W, 2—less than 150W, 1—more than 150W), number of operators, and total score. Commercial classes are not listed.

Class	*Call*	*Yr*	*Name*	*QSOs*	*Pwr*	*Ops*	*Points*
1Abat	K6MI	03	Chew's Ridge Gang	1080	5	7	11,725
1A	N5RR	92	Albuerque DXA	2870	2	28	8550
2Abat	W0CQC	00	Colorado QRP Club	1688	5	12	17,410
2A	KP2N	93	Virgin Islands ARC	5252	2	16	15,580
3Abat	W0CQC	01	Colorado QRP Club	2310	5	10	20,360
3A	W0GG	00	Pikes Peak DX Group	5825	2	17	17,306
4Abat	KP2AA	04	Pina Colada Contest Club	3400	5	11	25,630
4A	W2GD	02	Cherryville Rpt Assoc II	6626	2	57	20,112
5Abat	W3VPR	84	Anne Arundel RC	2495	5	49	26,570
5A	W2GD	99	Cherryville Rpt Assoc	6566	2	42	20,520
6Abat	AA5B	04	NM FD Coalition	1643	5	6	16,445
6A	W2GD	00	Cherryville Rpt Assoc II	6694	2	43	20,628
7Abat	W4DW	89	Raleigh ARS	1236	5	12	11,215
7A	W3AO	99	Potomac Valley RC 1	9163	2	17	26,224
8Abat	N6WG	00	Alameda County Rpt Club	1305	5	25	10,850
8A	W4IY	02	Woodbridge Wireless	7839	2	63	24,088
9Abat	VE3NAR	95	Nortown ARC	1105	5	30	7930
9A	W4IY	98	Woodbridge Wireless	6217	2	56	18,834
10Abat	W6PIY	04	West Valley ARA	1081	5	16	10,240
10A	W4IY	85	Woodbridge Wireless	5067	2	67	15,474
11Abat	K8UO	04	Utica Shelby ECA	1363	5	11	12,850
11A	W4IY	90	Woodbridge Wireless	4669	2	60	14,688
12Abat	AA6CV	00	Conejo Valley ARC	1340	5	38	11,490
12A	W4IY	04	Woodbridge Wireless	6583	2	55	21,002
13Abat	AA6CV	99	Conejo Valley ARC	1142	5	30	9880
13A	W4IY	99	Woodbridge Wireless	7329	2	65	22,780
14Abat	AA6CV	97	Conejo Valley ARC	1246	5	55	10,795
14A	W4IY	00	Woodbridge Wireless	8064	2	83	24,904
15Abat	K6CAB	94	Conejo Valley ARC	3460	5	34	30,150
15A	W4IY	01	Woodbridge Wireless	6572	2	68	22,056
16Abat	K8UO	01	Utica Shelby ECA	2111	5	153	19,015
16A	**W4IY**	**05**	**Woodbridge Wireless**	**6501**	**2**	**55**	**22,508**
17Abat	K6CAB	89	Conejo Valley ARC	3119	5	40	23,685
17A	W4IY	03	Woodbridge Wireless	5922	2	73	20,272
18Abat	K6CAB	90	Conejo Valley ARC	2569	5	30	21,275
18A	N1FD	00	Nashua Area RC	6246	2	100	19,614
19Abat	KK8M	98	Utica Shelby ECA	2233	5	177	18,650
19A	K2AA	86	South Jersey Radio Assn	4320	2	65	13,178
20Abat	KK8M	99	Utica Shelby ECA	2527	5	176	20,920
20A	N1NH	96	Nashua ARC	6738	2	85	21,756
21A	**W3AO**	**05**	**PVRC & CARA**	**8553**	**2**	**96**	**27,534**
22Abat	AD6T	91	Conejo Valley ARC	2962	5	52	23,500
23Abat	K5DX	89	Texas DX Society	3326	5	28	25,260
23A	N1FD	01	Nashua ARC	4484	2	80	15,740
24A	N1NH	95	Nashua ARC	6209	2	95	21,648
25Abat	K6CAB	92	Conejo Valley ARC	2343	5	62	20,255
26A	W3AO	01	PVRC & CARA	10141	2	40	31,760
27A	N1NH	97	Nashua ARC	6768	2	87	22,080
28Abat	K8UO	02	Utica Shelby ECA	2193	5	17	20,595
28A	N1FD	99	Nashua ARC	7902	2	96	24,358
30A	W3AO	00	PVRC & CARA	9908	2	50	31,534
35A	VA3RAC	00	Capital Region FD2000	1940	2	190	10,136
38A	W3AO	02	PVRC & CARA	10150	2	45	33,442
50A	W3AO	04	PVRC & CARA	9304	2	60	32,372
51A	W3AO	03	PVRC & CARA	7754	2	60	27,834

Class	*Call*	*Yr*	*Name*	*QSOs*	*Pwr*	*Ops*	*Points*
1B-1bat	KW8N	95		945	5	1	8975
1B-1	W8TK	96		1460	2	1	6586
1B-2bat	W8DL	02		1095	5	2	11,250
1B-2	N5RZ	03		2136	2	2	7524
2B-1bat	KW8N	02		727	5	1	7525
2B-1	KW8N	00		1698	2	1	6374
2B-2bat	WB8JBM	81		953	5	2	8965
2B-2	W2GD	88		2560	2	2	8814
3B-1bat	KW8N	04		723	5	1	7515
3B-1	**KW8N**	**05**		**1612**	**2**	**1**	**5748**
3B-2bat	KW8N	97		962	5	2	8695
3B-2	K5TA	93		2137	2	2	7000
4B-2	KW8N	98		1720	2	2	6040
5B-2	W8TQE	89		272	2	2	1212
6B-2	K6Z	04		94	2	2	1390
1C	WA4YRN	91		934	5	1	8080
2C	N6BT	80		1885	2	3	4912
3C	WB4GQX	76		836	2	3	2162
4C	WA5FRF	00		301	5	5	2525
5C	AB3A	80		694	2	8	1696
6C	VO1AA	78		30	5	8	715
1D	**W2BC**	**05**		**1373**	**2**	**3**	**5842**
2D	W4MYA	99		4019	2	14	10,758
3D	K1AR	78		3825	2	6	8928
4D	N6TV	92		2253	2	17	5708
5D	W1AW	91		1650	2	6	4726
6D	W1AW	95		3200	2	16	9290
7D	W1AW	94		2890	2	7	8820
8D	N4T	00		2465	2	10	6034
9D	N6OP	91		2849	2	22	8206
1E	KR0B	88		1525	5	3	11,490
2E	KR0B	89		2000	5	5	13,975
3E	N0NI	99		4421	2	6	12,480
4E	W3PP	99		3720	2	8	10,504
5E	W0NT	04		3171	2	18	9202
6E	W6YX	01		4722	2	22	13,902
7E	W6YX	02		4304	2	24	12,570
8E	**W0NT**	**05**		**3460**	**2**	**27**	**11,402**
9E	**N6H**	**05**		**925**	**5**	**24**	**8805**
11E	W4WVP	01		205	2	13	632
13E	AA5EQ	90		235	2	7	554
15E	K9GL	82		8179	1	25	10,541
41E	K7AUO	91		567	1	20	815
1F	**W3CF**	**05**	**Montgomery Co Races**	**1569**	**2**	**2**	**4180**
2F	W5UR	03	Albuquerque DX Assn	2621	2	18	8494
3F	**W9FCC**	**05**	**Mississippi Valley ARA**	**1406**	**2**	**11**	**5318**
4F	W8FY	04	Van Wert ARC	2029	2	17	6236
5F	**W6NWG**	**05**	**Palomar ARC**	**3411**	**2**	**98**	**11,874**
6F	**W6YX**	**05**	**Stanford ARC**	**7250**	**2**	**35**	**21,796**
7F	W6YX	03	Stanford ARC	4349	2	30	15,610
8F	W6YX	04	Stanford ARC	7183	2	35	22,694
9F	**W2GSB**	**05**	**Great South Bay ARC**	**556**	**2**	**78**	**3322**
11F	N7ACS	04	Yuma Aux Comm Service	250	2	11	1260
12F	K2K	04	HREG	618	2	17	3,340

Official WRTC-2006 Teams

The WRTC2006 Committee is pleased to officially announce the Teams for the next WRTC 2006.

In line with our philosophy to use the maximum transparency in all the WRTC 2006 procedures, the process has been totally open to all competitors and participants. Our Results Checking System, and the Updated list of Applicants, has been open to the entire contest community on our Web page at **www.wrtc2006.com,** and this philosophy will continue.

National Special Invited Teams

USA: K1DG / N2NT
Russia: RA3AUU / RV1AW

National WRTC2006 Teams

USA: N6BV / AG9A
USA: N0AX / KL9A
Slovenia: S50A / S59AA
Finland: OH1JT / OH2IW
Brazil: PY2YU / PY1NX

Bi-National Young Teams

Brazil: PY2NDX / teammate to be announced shortly
Italy: IZ3EYZ / teammate to be announced shortly
Croatia-Germany: 9A6XX / DJ1YFK

Special Sponsored Young Team

Denmark-Sweden: OZ1AA / SM0W

Special Sponsored Lady Team

Aruba-USA: P43E / WA1S

Bi-National & National WRTC2006

USA-West: W2SC / K5ZD
USA-West: N6MJ / N2NL
USA-East: K4BAI / KU8E
USA-East: K1ZM / K1KI
USA-Central: N9RV / K3LR
USA-Central: K5TR / KM3T
SA-Brazil: PY2NY / PY2EMC
SA-Argentina: LU1FAM / LU5DX
OC-Hawaii-USA: KH6ND / K9PG
NAC-Canada: VE3EJ / VE7ZO
EU-3-Estonia: ES5TV / ES2RR
EU-3-Russia: RW3QC / RW3GU
EU-3-Lithuania: LY2TA / LY2CY
EU-3-Finland: OH2UA / OH4JFN
EU-3-Latvia: YL2KL / YL1ZF
EU-2-Ukraine: UT4UZ / UT5UGR
EU-2-Germany: DL6FBL / DL2CC
EU-2-Poland: SP7GIQ / SP2FAX
EU-2-Czech Republic: OK1FUA / OK2RZ
EU-2-Romania: Y09GZU / Y03JR
EU-1-Serbia: YT6A / YT6T
EU-1-Bulgaria: LZ4AX / LZ3FN
EU-1-Italy: IK2QEI / IK2JUB
EU-1-Croatia: 9A8A / 9A5K
EU-1-France / USA: F6BEE / W2GD
CA-Panama / USA: HP1WW / N5ZO
CA- Mexico: XE1KK / XE1NTT
AS-JA-Japan: JK2VOC / JA2BNN
AS-BY-China: BA4RF / BA7NQ
AS-Russia: UA9AM / RZ3AA
AS-Cyprus: 5B4WN / 5B4AFM
AF-South Africa/Georgia: ZS4TX / 4L5A

NCJ

Scott Robbins,W4PA

Kirk Pickering, K4RO

Greetings! I'm Scott Robbins, W4PA, of Knoxville, TN, your new (or is it present?) columnist for NCJ Profiles. Thanks to Paul Gentry, K9PG, as outgoing columnist for his fine contribution to NCJ over the past couple of years. NCJ Profiles is about telling the story of contesters active in our great hobby, so I'll leave any further introduction of myself to a later issue. This issue's profile is of a fellow Tennessee Contest Group member, Kirk Pickering, K4RO.

*Kirk Pickering, K4RO, has been a mainstay of Tennessee contesting for the last 13 years. Kirk was among the small group of Nashville hams in the mid-1990's that would eventually form the Tennessee Contest Group into an ARRL-affiliated contest club in 1997. Possibly the most avid supporter of the TCG, he has provided hosting for the club web site (***www.k4ro.net/tcg.html***) for the past several years and administrates the TCG email reflector via k4ro.net, which recently passed its one millionth e-mail message forwarded! Kirk has also served two terms as a club officer. Contesting with a single 100-foot tower on a half-acre yard presents its own set of challenges and Kirk's results speak for themselves. Here's Kirk to tell his story…*

Kirk Pickering, K4RO, at his station.

K4RO Contest Achievements

Single op (from home station):
- 1st place overall CW SS QRP 2005 (claimed)
- 1st place overall CW SS QRP 2004
- Delta Division leader ARRL DX CW SOAB LP 1996, 1998, 1999
- Delta Division leader SS CW HP 1995
- Top Ten category finishes in CW SS, CW NAQP, ARRL DX CW, California QP

Multi op:
- 1st place NA M/S CQ WPX CW 2004 - VQ5V
- 1st place USA M/S CQ WPX SSB 2004 - W4PA at K4JNY
- 1st place NA M/2 CQ WW SSB 2003 - VP5B
- 2nd place USA M/S CQ WW CW 2001 - W4AN
- 4th place W/VE M/2 ARRL DX CW 2002 – W4AN

I was first licensed as WB3FAX in Pittsburgh, PA at age 14 in 1976. I have held the calls WB3FAX, WR3O, K4RO and VP5/K4RO. Looking back, I wish I had discovered contesting as a youth. I think it would have been a good thing for me; it might have kept me out of trouble.

When I first got on the air in '76, I worked whoever could hear my QRP Heathkit HW-7 and 15 foot high 40-meter dipole. I built a Heathkit HW-101 after I got my General class license in 1977, and I was in ham heaven. After finishing high school, I moved to Nashville, TN to attend Vanderbilt in 1980, graduating later with a degree in Civil and Environmental Engineering. I have lived in the Nashville area for the last 26 years and am presently employed as a telecommuting UNIX systems administrator. My current home is in Pegram, TN, about 20 miles west of Nashville where I live with my partner Susie and our cat, Bela.

On moving to Nashville, I was basically off the air from 1980-1988, when suddenly the DX bug came from out of nowhere and bit me. I was back on the air! At that time, I still didn't understand what contests were about, but I soon discovered the joy of CW DXing. In the pre-packet age I worked over 200 countries with 100 W and a wire 25 feet in the air. Conditions were great then, and I finally replaced my trusty HW-101 with a modern synthesized rig. It was the rebirth of radio in my life.

Contesting did not begin for me until 1993, when I came across the ARRL 160 Meter Contest in full bloom. I had recently put up an antenna for 160, and I heard all of these stations exchanging RST and state. I didn't really quite understand that it was a contest, but I jumped in anyway, and I had an absolute ball operating all through the night. Things really got interesting once I got brave enough to call CQ.

Local DXer and contest op Billy Cox, AA4NU, noticed my enthusiasm on the air, and basically introduced me to contesting. While Billy hasn't been very active operating contests over the last 10 years, he spent a lot of time and energy as I started helping myself (and others) get more involved with contest operating. Billy kept my head full of ideas, from antenna and station design to operating strategy. He also made it very clear from day one that any type of cheating was unacceptable, and that cheaters were to be shunned. Billy also helped me with small construction projects, and he loaned me equipment and tools to improve my station. It's safe to say that if it were not for AA4NU and the time he generously gave, I would not be the avid contester that I am today.

It's All About the People

Contesting to me is all about the

people, and I've been fortunate to have been around some of the best. There are many who have taught me by example. I have lots of contesting heroes out there. Most of you know who you are, but some of you don't. These contesters have made a significant impact on me over the years: AA4NU for nurturing my latent contesting tendencies and getting me started, N5KO for actively demonstrating the importance of community in contesting, N6TR for writing great code, and keeping the CW Sprint contest alive and well, K4OJ for believing in me, and calling me "guiding light" at Dayton every year, W4PA for teaching me to think like a true champion, K4AMC for showing me how to operate CW the right way, N4ZZ for being the ever-present competitor and enthusiast, W9WI for showing me that giving back to contesting is vital, K0EJ for making it clear that cheaters were to be avoided, W4AN for demonstrating how to create one's own reality—good and bad, N0AX for keeping me laughing and learning constantly, and playing bluegrass with me at Dayton, and finally W0ETC for helping me keep perspective on life and contesting.

I would also like to credit the Tennessee Contest Group, whose support and camaraderie over the past sunspot cycle has been nothing short of amazing. TCG has taught me a lot more than how to operate a radio. TCG has given me a place to belong, a place to learn, and a place to give something back to contesting. I am grateful to the all of the folks over the years who have stepped up to help us grow and thrive as a contest club.

While the majority of my contest operating has been as a single op, some of my best experiences have been operating at multi-ops as a team. It the early days, it was weekend-long parties at K1KY's mountaintop retreat north of Nashville. Then W4PA got me in the door to operate with W4AN at the tool-shed station on the mountain in Dahlonega for the 2001 CQ WW CW. This was my introduction to very serious contesting, and I was thrilled to operate with some of the best in the game—W4AN, W4PA, K4BAI, W4OC, K9AY and W8JI. For the last few years, I've been joining K4JNY and W4PA for the Sweepstakes SSB and WPX SSB contests. We've won one contest as a multi-op from there so far (WPX SSB 2004 M/S) and we learn something new each time. We also get those "moments of hilarity" that only happen at a multi-op. My first experience from the DX side was operating VP5B with K4ISV and his gang (K1LZ, WX3B, W5AO, K4UU) for CQ WW SSB 2003. Bud knows how to have a good time, and that was probably the most fun I've ever had as a ham radio operator. My worst experience to date was attending Bill Fisher's memorial service.

The Home Station

My home station is nothing special by contest standards. I have a single tower, and I've tried to cram 2 or 3 antennas per band into the small yard. I have stacked tribanders at 60 and 100 feet, and wires for every other band, including a two-element wire Yagi at 70 feet for Europe. I use a 4BTV and a Windom on a second radio. All of the antenna switching is automated, and I love operating the NAQP contest, where I can hop from band to band without missing a beat. My SO2R skills are improving, but there is still plenty of room for growth there. My biggest challenge is eliminating SO2R interference at high power. I can only do effective SO2R work at QRP or 100-W power levels because of the interference. I use older ICOM radios (781 and 765) and I have two Ameritron amps, an AL-1200 and AL-811. The radios and amplifiers, like most of the equipment in the K4RO shack, were bought second-hand. I have some limited home-brewing skills, and I am able to keep the station maintained and in working order. I do all of my own tower and antenna work, with ground help from friends and neighbors.

If I am not playing radio, I am probably playing music. My other main passion in life is making music with my friends. Currently I am most interested in so-called "Old Time Fiddle" music, but I have played everything from Rock n' Roll to Celtic to Classical. Music, not unlike contesting, is about listening, communicating, and getting in the rhythm of the flow. You may check out my website to learn more about my interests: **www.k4ro.net**.

Attracting New Operators

I think the biggest challenge facing contesting today is getting new operators into the game, and keeping them there once they show an interest. I think the Internet has been helpful in spreading the word. Much of my initial enthusiasm in the early years came from reading the posts on N5KO's (and later W4AN's) CQ-Contest reflector. The lists and archives at contesting.com are very valuable to the newcomer. I also suggest that every contester read every back issue of *NCJ*, now available on CD-ROM.

I think that we can find new contesters at all age levels and backgrounds. I feel that we could probably do a better job of defining the game to the new folks, the uninitiated. Some of the tougher challenges and apparent inequities of contesting might be easier for the newcomer to handle if a little perspective is introduced. I think many active contesters take for granted things that are entirely baffling to the newcomer, at best. I think it's our job to help new operators understand contesting in all of its nuances, and to help keep their expectations reasonable. K3LR said that it was all about making dreams come true, one at a time. I have been fortunate to have some of my little dreams come true. I look forward to working towards the next one.

I am humbled to have been asked to be the subject of an "*NCJ* Profile". I am reminded of K1AR starting off a Dayton Banquet with the old joke "Well, enough about me. Tell me now, what do *you* think about me?"

In the grand scheme of things, few activities could really be less important than radio contesting. I have decided for myself that radio contesting *is* an important part of my life. I like the type of people it attracts. I have chosen you as my peers. You are my teachers. You are folks whom I choose to respect, and whose respect I seek. I think contesters are some of the more intriguing and clever folks around, and I'm grateful to have found you. Thanks for being there, and for keeping this game alive and interesting. See you on the bands! NCJ

Software for Contesters

Pete Smith, N4ZR

SH5 - Post-Contest Log Analysis Software

With the main part of the contest season behind us, I suspect many contesters are looking at their logs and wondering how they can learn from them, to improve their scores next year, or else just for the fun of it.

For many of us, our first exposure to this post-contest log analysis was probably through the rate sheets and other analytical tables produced by *CT* and *TR Log*. Later, there were *Writelog's* built-in functions, which added some capability for graphical analysis, as well as the statistical functions built into *N1MM Logger*. But what if you want more?

A few weeks ago I asked that question on the CQ-Contest reflector, and I was frankly surprised by the paucity of answers I received. A couple of people suggested *CBS*, a *DOS* utility written by K5KA; you can read a description at **www.kkn.net/~k5tr/software/cbs-readme.txt** or download it from **www.kkn.net/~k5tr/software/cbs.exe**.

CBS produces a fairly standard set of post-contest reports, for most of the major US-based contests, starting with the Cabrillo file produced by your logging software, including rate sheets, country distributions, and the like. Somewhat contrary to the caveat in the "readme" file, it will run in a *DOS* box under *Windows XP*, so long as you have the executable program, a cty.dat file, and the Cabrillo file all in the same directory (on your Desktop, for example).

I find that graphical representations of data do more to stimulate my brain cells, so I was really interested in finding out what *Windows* resources might be available. Several references on CQ-Contest led me to *SH5*, a new freeware log analysis tool written by Dmitriy Gulyaev, UA4WLI, which is obtainable free from the author at **rescab.nm.ru/**. As this is written, the most current version is 1.15beta, released February 24, 2006. By necessity, this review can only be a quick snapshot of a program that is evolving quickly.

SH5 can work with Cabrillo, ADIF, and *TR Log* files; support for *CT* 10 binary files is apparently planned. When it opens a log, the first two screens that you are offered are an annotated copy of the log and a graphical summary of the log's contents. The latter is difficult to represent effectively in black and white, but here goes:

Figure 1 shows this "Summary" screen, and it presents several key statistics visually and numerically, showing you how many QSOs you made on each band, how much time you spent on each one, and a third variable, "Moves." The latter demonstrates an important gap in *SH5*—currently, there is no user manual or published documentation, so the user has no idea what this represents. Right at deadline, Dmitriy sent me a draft help file that fills some of this gap; I will be helping him edit and supplement it before it is published.

Many of the screens in *SH5* are less

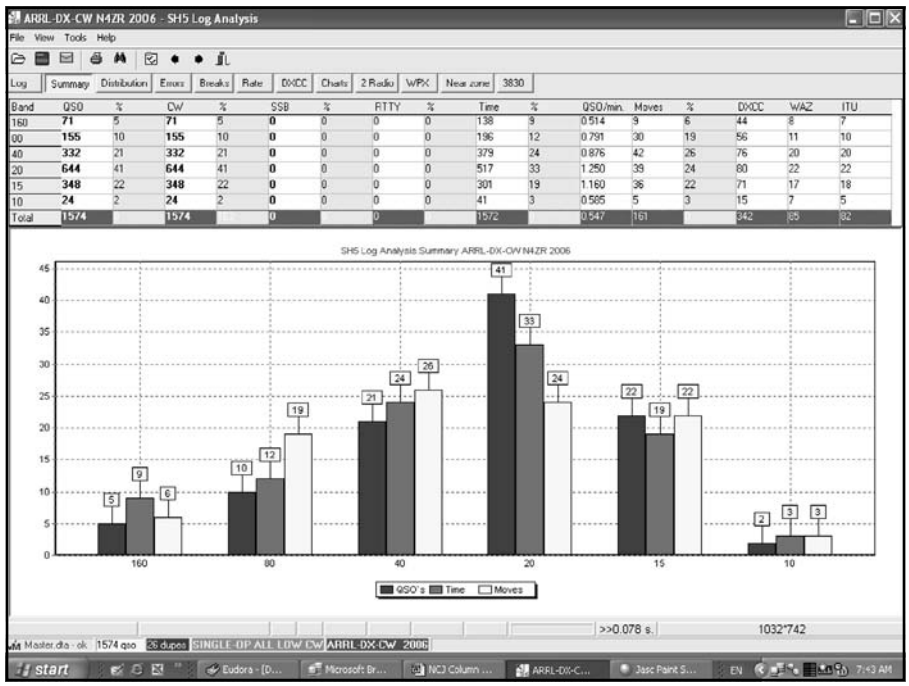


Figure 1—The *SH5* "Summary" screen.

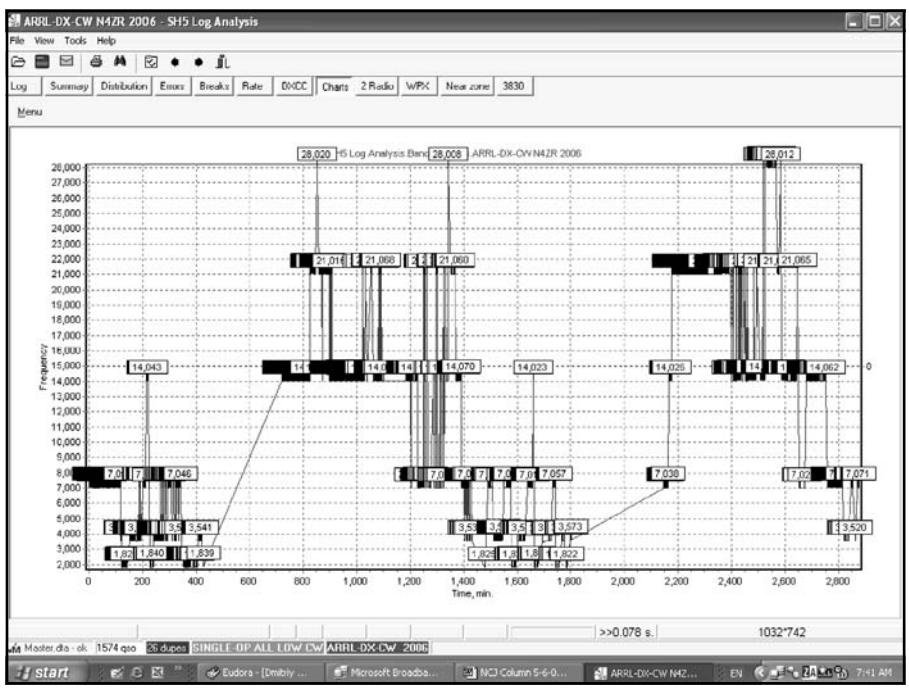


Figure 2—By using the "Charts" function in *SH5* you can select from among over a dozen 2 and 3-dimensional charts that display various aspects of your log.

cryptic. For example, the Log Screen simply shows you the log of the contest, derived from Cabrillo or the other formats, with color coding to denote new multipliers, band changes, and so on.

SH5 really emphasizes graphical representation of data. Click the "Charts" button and you can select from among over a dozen 2 and 3-dimensional charts that display various aspects of your log, including your QSO rates in various forms, the aggregate growth of your QSO total over the contest, when you were changing bands rapidly, and so on. Other charting buttons display your second radio QSOs, the number of QSOs with various DXCC entities and a variety of other variables. For example, in Figure 2 you can clearly see the times when you were QSYing rapidly between bands (in SO2R for example). Charts can either be labeled (as they are in Figure 2) or not, and you can zoom in for closer examination of a shorter time period. I would prefer to see actual clock times during the contest on the horizontal axis, frequency bands rather than kilohertz on the vertical one, and no chart line during off periods, but these are easily correctable nitpicks.

One of the things that *SH5* already excels at is in pointing out errors in your log. I don't want to get off on the subject of how much and which kinds of post-contest log "clean-up" are ethically permissible. Whatever your personal standards, *SH5* provides excellent tools. One table, for example, calls out all the call signs that are in your log but not in the master.dta file. Another identifies call signs in the log that are almost the same (only one character different) from other call signs that are in also your log, ranked in order of how many times the "almost the same" calls appear. It also tells you whether the call you logged is in the master.dta file. These would be high-probability "busts", of course.

When I finished looking at my ARRL DX CW log in *SH5*, I was impressed, but somehow also a little disappointed at the amount of tactical and strategic insights I had gained. Fortunately, the software is early in its evolution, and the author seems very open to input from users, so we can hope for significant evolution.

As an example, I would like to see more charts in which multiple variables are displayed. For example, the chart that shows your QSO rate over time would be much more useful if it also showed (perhaps through color coding) the bands you were on. I would like to be able to graphically compare the results from two runnings of a contest, to see where I gained or lost ground. Currently *SH5* is limited to just one. *SH5* already does rather elegant 3-dimensional charts, so perhaps this capability could be used to display two logs at once. Linking from areas of a chart to the corresponding area in the log would also be useful; this is already done with many of the statistical tables.

There's one important consideration that is both a limitation and an opportunity. Right now, *SH5* can read any Cabrillo file and do its various analyses. However, some analyses I would like to be able to do would require the software to "know" the rules for particular contests. For example, I would like to see charts of complex values such as points per minute, computed from multipliers times QSOs and displayed across the entire 48-hour expanse of a contest, so that you could see when you gained ground and when you lost it. Perhaps in a future version, *SH5* could read the Cabrillo header and apply the rules for a particular contest if it "knows" them.

And that's my bottom line—add a good user manual and the next level of analytical capabilities, and *SH5* will become a required tool in every contester's software toolbox. NCJ

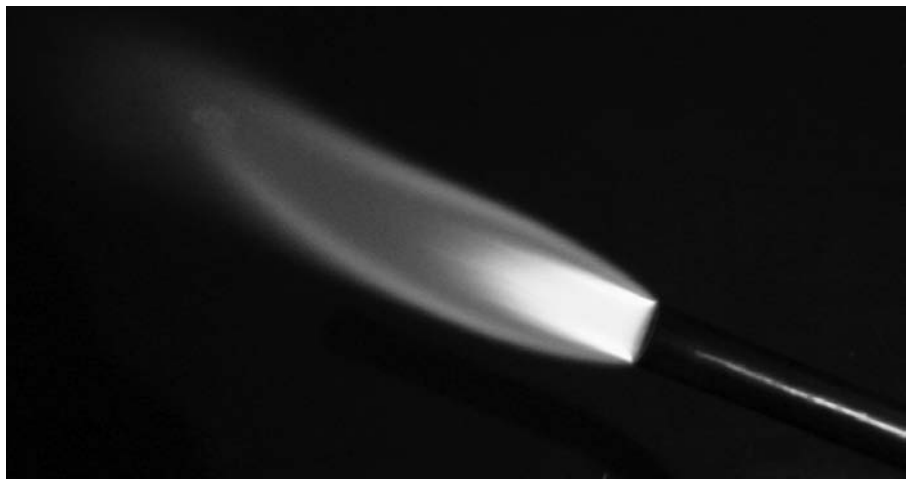
Workshop Chronicles

Don Daso, K4ZA

Silver Soldering

This column had its beginnings in a smaller version for the PVRC newsletter, as you may know. The response and e-mail traffic from that recent article prompts this follow-up feature.

The focus is silver soldering, which I'd suggested we use on a client's radial ring because the parts would be exposed to the weather with attendant acid rain, minerals in the soil, and the ravages of time. Rosin-core soldered joints are affected by all of these, and can deteriorate over time. Most hams know something about the soldering process, and may know a bit about silver soldering. A full treatise on this topic could fill an entire *NCJ*; here, we'll just cover the basics.



Controlling the heat you apply to the solder joint is easy—simply watch your flame tip. The hottest part is the "point" inside the flame. By using the "outside" or the larger part of the flame, you can gently warm up the joint and surrounding metal, and then move the higher heat point to the joint, rapidly raising its temperature prior to applying the solder.

The Secrets of Silver

Most everyone who's been around a while, and built some things requiring solder, has heard or read about silver soldering. It's very useful for fabricating small fittings, doing odd repairs, and making tools. Maybe they've even tried it. Initial efforts are often unsuccessful because of two main faults: insufficient heat or an excess of solder. The secrets of silver soldering include:

- Having close-fitting joints
- Making sure the work is clean before starting
- Fluxing the work thoroughly, using the right flux
- Using the right amount of heat
- Using the right amount of solder
- Applying the solder correctly

There are several grades of silver solder; some flow more easily than others. (The silver provides the solder's free-flowing characteristic.) But silver solder isn't good at gap filling, despite its ability to creep into every nook and cranny. It's precisely because of this that your joint needs to be tight. While this is important in model making, it's not crucial to having a successful ground radial ring, however. A simple twist-tightened joint should suffice. What *is* absolutely essential is that all of your joints be quite clean and oil-free to guarantee good connection. Silver solder will not flow across or bind to dirty or oxidized surfaces. It's just that simple. All joint faces should be cleaned with emery paper or steel wool prior to applying flux.

Different fluxes are recommended for different silver solders. You should always use one that matches the grade you're using. Most fluxes are based on borax (botanic acid is the active ingredient), but the temperature at which they work, and the length of time they will work once the metal gets hot, varies. Most fluxes are sold as a white powder that's mixed with water to a creamy paste. Pre-mixed fluxes, while convenient, often have a limited shelf life. Buying very small containers (something we'd often not consider) may be a bargain.

It's All in the Technique and the Torch

Make sure all joint faces are thoroughly coated. Then, your first application with the torch should be a gently moving wall of heat to vaporize the water, leaving the flux in place (powdered flux would simply blow away), and then gradually increasing the heat until it melts. You may be surprised at how much heat is needed to make the solder flow correctly. (Think of what you'd need to build a boiler, for instance, and the delicate nature of silver solder will be brought home to you!)

For small jobs like ground radials, a propane torch works well. (Butane has a lower calorific value, meaning the flame isn't as hot; don't waste your time. And, in this same vein, oxy-acetylene or oxy-propane gear is really for the specialist. Again, don't waste your time.) I use a standard BernzOmatic torch, with a dedicated tip just for silver solder work. (If you need more heat, try using MAPP gas in place of the propane bottle.) For rosin-core jobs, I have a butane-powered torch. It's been a life-saver in winter and outdoor work conditions.

The first sign you're nearing the required temperature is when the flux turns into brownish, sticky goo. Then, it will become a light-amber liquid as the correct temperature is reached. Suddenly, it's rolling everywhere. Flux in this state can remove any oxidation from the metal and keep it bright. When you're sure this temperature has been reached, move the flame away from the work and just touch the silver solder wire to the joint. Yes, just touch it. It should immediately melt and "flash" around, into, and through the joint. If it does not, then the work isn't hot enough. *Never* have the silver solder rod poking into the flame! (Silver solder is available in different sized wires and rods; use a size appropriate to your job—exactly like your rosin-core experience tells you.)

Finishing Up

Next, follow all the typical steps you take in rosin-core work—clean the joint afterward, and inspect it for flaws. (The flux container will have instructions on proper cleaning, for instance.) Silver soldered joints can truly be things of beauty, and they will survive environments that can easily destroy softer-soldered joints over time.

One final hint: if you somehow wish to control *where* the solder goes or flows, ordinary typing correction fluid works perfectly as a "mask," positively stopping the solder from sticking. It's easily cleaned off afterward, too. NCJ

Carl Luetzelschwab K9LA

QSOs During Daylight in the CQWW 160-Meter CW Contest

After this year's CQWW 160-Meter CW contest (January 28 and 29), several interesting messages were posted to the topband reflector (moderated by W4ZV) from VE3CUI, W0EB and K1FZ. The topic of each message was making 160-meter QSOs during daylight—and not just local QSOs, either. The distances ranged from roughly 700 km to 1900 km, with the average about 1500 km. Were these QSOs unusual? Or were they just normal, but usually we don't really look for them? With the tools available to us nowadays, we can come up with a pretty good estimate of how far those of us in North America should be able to communicate during the day on 160 meters.

First, though, a caveat. We'll only look at a winter month (specifically January) around solar minimum. The solar zenith angle (the angle in degrees measured from directly overhead to where the Sun is) is largest during a winter day, and thus the D region absorption will be less than the absorption during a summer month when the solar zenith angle is very small during the day. And the daytime absorption at solar minimum is less than at solar maximum, as the contribution of ionizing radiation at hard X-ray wavelengths (0.1 to 1 nanometers) is minimal at solar minimum. As a side note, there is still a lot of radiation at 121.5 nm from the Sun at solar minimum to ionize nitric oxide (NO) in the D region.

An interesting way to analyze this situation is to back into it. In other words, we'll estimate how much absorption we can tolerate over a one hop 1500 km path (the average cited above). To do this, we'll assume both stations are running 1000 W, and they're both using quarter-wave verticals (about 0dBi maximum gain). We'll further assume both stations are in an extremely quiet rural noise environment (that works out to a noise power of about -110 dBm in a 500Hz CW bandwidth, which is the true sensitivity of our system regardless of the sensitivity of the receiver).

The difference between our effective radiated power (+60dBm) and our system noise floor (-110dBm) is how much loss we can tolerate. This works out to 170dB, but it also includes the free space path loss (the one over r-squared loss). Subtracting that out (101dB) results in our estimate of how much absorption we can tolerate for a 0dB signal-to-noise ratio—about 69dB. That may sound like a lot, but we'll soon see it isn't during the day—even during the winter at solar minimum.

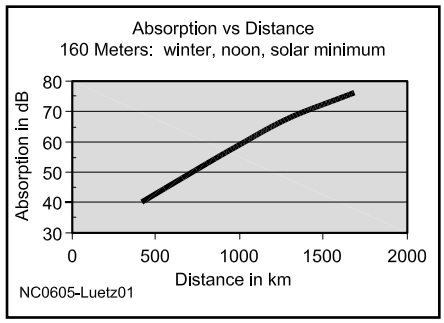


Figure 1—On half of the days of the month, the actual absorption on 160 meters will be higher than the predicted median, and on the other half of the days of the month the actual absorption will be lower than the predicted median.

Now let's use *Proplab Pro* (from Solar Terrestrial Dispatch) to determine the absorption on 160 meters versus distance around local noon during January near solar minimum. We'll plot absorption versus distance because a farther distance requires a lower elevation angle—and that means the electromagnetic wave will spend more time in the D region.

We also need to remember that the model of the ionosphere in *Proplab Pro* (and in all of our propagation prediction software) is a monthly median model. Thus our absorption values will likewise be monthly median values. That means on half of the days of the month the actual absorption will be higher than the predicted median, and on the other half of the days of the month the actual absorption will be lower than the predicted median (unfortunately it's tough to predict which days are better and which days are worse). Figure 1 plots the result of the absorption versus distance exercise.

From this data, a 500 km path will give a signal-to-noise ratio of about 27 dB. There shouldn't be any problem copying that. A 1000 km path will give a signal-to-noise ratio of about 9dB; still no problem in copying. A 1500-km path will give close to a 0dB signal-to-noise ratio. That's starting to get marginal, and may depend on the individual person. So our study shows that the limit is around 1500 km.

As mentioned previously, though, the distance could be shorter on "bad" days and longer on "good" days. And your mileage may vary according to your set-up and the other station's set-up compared to what I assumed. If you run the legal limit power, that's almost another 2dB. If you have a gain antenna (a 4-Square, for example), that could add many more dB. And if you have a Beverage antenna, you'll add even more dB because you'll be able to hear farther down than -110dBm. All of these improvements can increase the distance to considerably more than 1500 km.

So what can you do with this knowledge? For one thing you can apply it to next year's CQWW 160-Meter CW contest. I doubt this will make the difference between winning and not winning your category, but it will be fun defying a myth in propagation—the one that says you can only make local QSOs on 160 meters in daylight because of absorption. Maybe there should even be an SOD category (single op, daylight) for the night-challenged!

A final note—several days after the CQWW 160-Meter CW contest, another message showed up on the topband reflector from KD9SV saying that N7DD in Tucson was being heard in New Hampshire about two hours after New Hampshire sunrise. Tucson to New Hampshire is about 3600 km, and I believe this is far beyond the realm of what has been discussed in this column. A quick look at space weather shows a similar pattern to other such relatively long distance QSOs in daylight on 160 meters—it appears to have been enabled by a small spike in the K index. This interesting phenomenon was discussed in a two part series in the Propagation columns in the February and March 2006 issues of *WorldRadio*.

NCJ

Contest Tips, Tricks and Techniques

By Gary Sutcliffe, W9XT

Noise – Part 2

In the last installment of CTT&T we started a series looking at noise. Noise is the limiting factor on what signals we can receive. We can have the biggest antenna and most sensitive receiver in the world, but if the noise is sufficiently larger than the desired signal, all we will get is the noise. Last time we looked at atmospheric (QRN) and power line noise. We will continue this time looking at some of the more unusual sources of noise.

Noisy Lights

Bill, K0UK, had a noise source that came on about 4:45 every evening and lasted until 7:45 AM. It covered up everything from 160 through 6 meters. With the help of some local hams he was able to track it down to a burned-out mercury vapor light. This neighbor happened to be one that complained to the local planning commission about his towers. Bob knocked on the door to explain "their" problem. The neighbor was aware the light had burned out, but had been too busy to replace it. It was on the same circuit breaker as his ceiling fan so he had left it turned on. The interference was so bad it was even messing up the neighbor's television reception. Bill replaced the light for them and the problem was solved.

Ron, KK9K, had a similar problem with mercury vapor lights. The noise would start at nothing and then build to about 20 over S9 on 160 meters over a period of a half minute or so. Then it would be completely gone for about another half minute. On advice from others, Ron concentrated his search on Christmas lights in the neighborhood. After walking up and down the neighborhood with his AM radio he was unable to find the source. Ron was standing in his driveway in total frustration when he noticed a dim glow on a neighbor's pole barn. As the glow got brighter the noise got louder, until the failing mercury vapor lamp hit full brightness and then died. Ron had a good time explaining the problem saying that it was usually them complaining about hams causing interference. They all had a good laugh about it, and the next day the light was replaced with a new and quiet bulb.

N9AU passes on one of his experiences with noisy lights. Ron was getting S8 noise on 20 meters that came on at night and went away during the day. He tracked it down to a neon light at a small business about 6 blocks away. He went in to talk to the owner about the radio interference. The owner said he was wondering why he was not able to listen to AM broadcast inside his shop. The problem was leakage between the HV supply and a metal frame around the sign. Ron fixed it for him, and the shop owner gave him $10 for his trouble!

Stealthy Noise

A few years ago Jack, W1WEF, was noticing birdies, especially on the low bands. It sounded like harmonics from the horizontal oscillator from a TV, but the TV in the shack was turned off. When he unplugged the TV the noise went away. Apparently the circuitry that was left powered up to detect the remote control was causing the interference. Jack added unplugging the TV his pre-contest check list.

Dastardly Dust

Ten meters usually has very little atmospheric noise compared to the lower HF bands, but even noise too weak to move the S-meter can still cover up a lot of otherwise Q5 signals. Imagine what a strong noise source would do.

A number of years ago I was operating the ARRL 10-Meter contest. On Saturday afternoon my noise level started to rise to almost S5—a very serious level. It sounded like line noise.

The next morning I was relieved to find the line noise had gone away. I waited until the band started to open. Once I started to hear signals I turned the amplifier on. The line noise immediately returned. I turned the amp off, and the line noise went away. It was coming from the amplifier. I decided I was better off running low power than not being able to copy 80% of the other stations, so the amplifier remained off for the rest of the contest. Afterwards I found there had been some dust build up on the high voltage rectifier board. The dust was just conductive enough to allow a small amount of arching. I cleaned the board and sprayed it with some conformal coating and the problem has not reappeared.

W1WEF had a similar problem with his computer monitor in a recent contest. Computer monitors are a common source of interference, but usually it is digital noise. Jack was getting line noise type interference that went away when the power was removed. This started happening during a contest, and the noise blanker on his FT1000D did a pretty good job removing it until things slowed down enough for Jack to swap out the monitor. He suspects that dust in the high voltage supply was causing the arcing.

Feisty Ferrites

Hal, N4GG, reports increased noise with the ferrite bead type current baluns. Current baluns of this type use ferrite beads over the coax. The beads increase the impedance, choking off current flow on the outside of the coax braid. Hal says if you hook one of these to your receiver and put it near a laptop switching power supply you will get a lot of noise, even with double shielded coax. Repeat this exercise without the beads and the noise will be gone. Hal does not have an explanation for this.

A Noxious Neighbor

Larry, N6NC, had a problem about a year ago that was wiping out his receiver with S9 + 20dB spikes that would last about 6 seconds, twice each minute. Using a RadioShack aircraft band radio he isolated it to an apartment building next door, and then determined which apartment it was. He left a note and his phone number, but no one returned his calls. The utility RFI guy confirmed the source as that apartment, but was unable to do anything about it without the occupant or landlord's permission to enter. Further investigation found additional RFI coming from an illegal cable hook up from the same apartment. Larry talked to the apartment manager, who was cooperative. Her uncle was a ham. That got the cable hook up removed, but the worst part was still there.

Larry finally got fed up and wrote a letter on his legal letterhead stating that the interference was illegal per the FCC, and confirmed by the utility company, and that he would file a lawsuit seeking a temporary injunction with fines for every day the interference continued. That got noticed. The property manager and the local antenna guru entered the apartment and found the source right away. It was a defective piezo ignition for a gas stove. The spark could be seen and heard from the door of the apartment. The landlord replaced the stove, which solved the problem.

More Oddities

The first year I moved to my current residence I did a noise survey before the

start of the contest season. I went around the house and yard with an AM radio tuned to a clear frequency. One of the worst noise sources turned out to be strongest in the dining room. It was strange because nothing was turned on there. After some investigation it turned out that a light dimmer was the culprit. The light did not even have to be turned on to cause the noise. It only had to be turned to a dim setting. Turning it up to full brightness, with the light on or off, eliminated the noise. I left it turned off, but on the bright setting, until I had time to replace it.

W9RE had a noise problem that was tracked down to an electric fence that a neighbor had put up. The wire was near vegetation and the insulators were poor. Mike was able to convince them to turn it off during contest weekends. Most electric fences do not generate a continuous high voltage but rather high voltage spikes every second or so. They often sound like a clock ticking.

Another strange problem Mike had originally seemed to be a line noise problem. The noise was strongest near a 138-kV substation. He could not get them to fix the problem and finally went to the FCC for help. The problem was eventually tracked down to a metal sign that was arching to a static discharge wire or something similar.

That wraps up the second part of our study of noise sources. There are two other sources of noise that have not been covered, so we will look at them next time. These noise sources are digital noise from computers and audio noise. Please share your experiences with our readers.

Topic for July 2006 (Deadline May 8)
Noise – Part 3

What types of computer or other digital noise have you experienced and solved? What computer equipment have you found to be the quietest? What headphones and other equipment or techniques do you use to reduce background audio noise? What other noise reducing equipment have you found effective?

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

Contest Calendar

Compiled by Bruce Horn, WA7BNM

Here's the list of major contests of possible interest to North American contesters to help you plan your contesting activity through July 2006. The web version of this calendar is updated more frequently and lists contests for a 12-month period. It can be found at: **www.hornucopia.com/contestcal/**.

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

May 2006

ARS Spartan Sprint	0100Z-0300Z, May 2
Thursday NCCC Sprint Ladder	0230Z-0300Z, May 5
MARAC County Hunter Contest, CW	0000Z, May 6 to 2400Z, May 7
10-10 International Spring Contest, CW	0001Z, May 6 to 2359Z, May 7
Microwave Spring Sprint	0600-1300 local, May 6
7th Call Area QSO Party	1300Z, May 6 to 0700Z, May 7
Indiana QSO Party	1600Z, May 6 to 0400Z, May 7
ARI International DX Contest	2000Z, May 6 to 1959Z, May 7
New England QSO Party	2000Z, May 6 to 0500Z, May 7 and 1300Z-2400Z, May 7
Thursday NCCC Sprint Ladder	0230Z-0300Z, May 12
Mid-Atlantic QSO Party	1200Z, May 13 to 2400Z, May 14
VOLTA WW RTTY Contest	1200Z, May 13 to 1200Z, May 14
CQ-M International DX Contest	1200Z, May 13 to 1200Z, May 14
FISTS Spring Sprint	1700Z-2100Z, May 13
50 MHz Spring Sprint	2300Z, May 13 to 0300Z, May 14
Run for the Bacon QRP Contest	0100Z-0300Z, May 15
NAQCC 80-meter Straight Key/Bug Sprint	0030Z-0230Z, May 18 and 0330Z-0530Z, May 18
Thursday NCCC Sprint Ladder	0230Z-0300Z, May 19
US Counties QSO Party, SSB	0000Z, May 20 to 2400Z, May 21
His Majesty King of Spain Contest, CW	1200Z, May 20 to 1200Z, May 21
EU PSK DX Contest	1200Z, May 20 to 1200Z, May 21
Portuguese Navy Day Contest, CW/SSB	1500Z, May 20 to 1500Z, May 21
Portuguese Navy Day Contest, PSK31	1500Z-2100Z, May 20
Manchester Mineira CW Contest	1500Z, May 20 to 2400Z, May 21
CQ WW WPX Contest, CW	0000Z, May 27 to 2359Z, May 28
ARCI Hootowl Sprint	2000-2400 local, May 28
MI QRP Memorial Day CW Sprint	2300Z, May 28 to 0300Z, May 29

June 2006

Thursday NCCC Sprint Ladder	0230Z-0300Z, Jun 2
SEANET Contest	1200Z, Jun 3 to 1200Z, Jun 4
QRP TAC Sprint	1800Z-2359Z, Jun 3
ARS Spartan Sprint	0100Z-0300Z, Jun 6
Thursday NCCC Sprint Ladder	0230Z-0300Z, Jun 9
ANARTS WW RTTY Contest	0000Z, Jun 10 to 2400Z, Jun 11
Portugal Day Contest	0000Z-2400Z, Jun 10
Asia-Pacific Sprint, SSB	1100Z-1300Z, Jun 10
GACW WWSA CW DX Contest	1500Z, Jun 10 to 1500Z, Jun 11
ARRL June VHF QSO Party	1800Z, Jun 10 to 0300Z, Jun 12
NAQCC 80-meter Straight Key/Bug Sprint	0030-0230Z, Jun 14 and 0330Z-0530Z, Jun 14
Thursday NCCC Sprint Ladder	0230Z-0300Z, Jun 16
All Asian DX Contest, CW	0000Z, Jun 17 to 2400Z, Jun 18
SMIRK Contest	0000Z, Jun 17 to 2400Z, Jun 18
West Virginia QSO Party	1600Z, Jun 17 to 0200Z, Jun 18
Quebec QSO Party	1700Z, Jun 17 to 0300Z, Jun 18
Kid's Day Contest	1800Z-2400Z, Jun 17
DIE Contest	0600Z-1200Z, Jun 18
Run for the Bacon QRP Contest	0100Z-0300Z, Jun 19
Thursday NCCC Sprint Ladder	0230Z-0300Z, Jun 23
His Majesty King of Spain Contest, SSB	1200Z, Jun 24 to 1200Z, Jun 25
Ukrainian DX DIGI Contest	1200Z, Jun 24 to 1200Z, Jun 25
Marconi Memorial HF Contest	**[cancelled]**
ARRL Field Day	1800Z, Jun 24 to 2100Z, Jun 25
ARCI Milliwatt Field Day	1800Z, Jun 24 to 2100Z, Jun 25
Thursday NCCC Sprint Ladder	0230Z-0300Z, Jun 30

July 2006

RAC Canada Day Contest	0000Z-2359Z, Jul 1
Venezuelan Ind. Day Contest	0000Z, Jul 1 to 2359Z, Jul 2
DL-DX RTTY Contest	1100Z, Jul 1 to 1059Z, Jul 2
Original QRP Contest	1500Z, Jul 1 to 1500Z, Jul 2
DARC 10-Meter Digital Contest	1100Z-1700Z, Jul 2
ARS Spartan Sprint	0100Z-0300Z, Jul 4
MI QRP July 4th CW Sprint	2300Z, Jul 4 to 0300Z, Jul 5
IARU HF World Championship	1200Z, Jul 8 to 1200Z, Jul 9
FISTS Summer Sprint	1700Z-2100Z, Jul 8
Six Club Contest	1800Z, Jul 8 to 2100Z, Jul 9
ARCI Summer Homebrew Sprint	2000Z-2400Z, Jul 9
Thursday NCCC Sprint Ladder	0230Z-0300Z, Jul 14
CQ Worldwide VHF Contest	1800Z, Jul 15 to 2100Z, Jul 16
North American QSO Party, RTTY	1800Z, Jul 15 to 0600Z, Jul 16
Run for the Bacon QRP Contest	0100Z-0300Z, Jul 17
NAQCC 80m Straight Key/Bug Sprint	0030Z-0230Z, Jul 20 and 0330Z-0530Z, Jul 20
Thursday NCCC Sprint Ladder	0230Z-0300Z, Jul 20
Great Lakes Sweepstakes	**[cancelled]**
RSGB IOTA Contest	1200Z, Jul 29 to 1200Z, Jul 30
ARS Flight of the Bumblebees	1700Z-2100Z, Jul 30

RTTY Contesting

Bill Turner, W6WRT

Curing the Interface Blues, Part 1 of 2

Unless you are using a mechanical TTY machine for your RTTY operations, your only other choice is to use a computer, and to do so you have to connect the computer to your transceiver. That connection is called the *interface*, and it can be simple or complex depending partly on your hardware and partly on what functions of your transceiver you want to control. In this article I'm going to focus on interfacing *MMTTY*, since that is probably the most widely used RTTY program today, both in standalone mode and when used as an engine in other contesting programs such as *WriteLog* and *N1MM Logger*. I'm not going to talk about how to construct the interfaces (since that is well covered in the *MMTTY* help files and on the internet), but rather on how to decide which kind to use and when.

I love *MMTTY*. I've been a user since it first appeared and by now I think I understand it pretty well. Getting it to run can be daunting for the beginner, however, and that's what I hope to simplify here. The complexity comes from having so many options, but not because RTTY itself is complex—it's far from it. Let's look at the basics of *MMTTY* interfacing.

The Audio Signal

There are four commonly used interfaces between computer and transceiver, but only two are absolutely required and this is one of them. This is simply the audio signal from your transceiver to the computer's sound card and it is nothing more than the same audio you hear through your speaker. Making the connection is dead simple. You just run a monaural cable from your transceiver to the Line In jack on your soundcard. There are two ways you can connect at the transceiver end: You can connect to the speaker terminals, or if you rig has one, connect to the **Line Out** or **Data Out** jack.

There are advantages and disadvantages to each. Connecting to the **Line Out** jack gives you a constant output level that does not change with the **VOLUME** control setting. Connecting to the speaker terminals gives you the same signal but it does change with the volume control setting. Which to use depends mostly on your signal levels on different bands. If your antennas are pretty good on all bands, use the **Line Out**. If you have some bands where the signal is weak compared to the others, use the speaker terminals so you can manually compensate. The idea is that you want about the same signal level going to the soundcard at all times. Don't worry too much about this since *MMTTY* has a very wide tolerance for incoming levels, but don't push it too far, either. If you are just starting with *MMTTY*, get this working first before you go on to the transmitter functions.

Figure 1—TX setup tab under the Options setup.

Figure 2—MISC tab under Options setup.

The RTTY Keying Signal

This is the other necessary signal, and it comes in two flavors: AFSK and FSK. The simplest to connect is AFSK and with some equipment it may be your only choice. The AFSK keying signal is just two audio tones, pure sine waves of two different frequencies that are fed into your transceiver. You can feed them into your microphone input or, if you rig has one, into a **Data In** or **Line In** jack. With most rigs the **Data In** or **Line In** is preferable since the drive level is usually correct and no attenuator is needed. If you use the microphone jack, you will certainly need an attenuator, typically about 100:1. The only tricky part about using AFSK is to not overdrive your transceiver. This has been covered extensively in many sources but I'll say it again: Keep the audio drive low enough so there is no ALC action showing on your ALC meter. If you don't have an ALC meter, keep the drive down to about half the power your rig is capable of.

FSK With *MMTTY*

When *MMTTY* is first installed, it defaults to AFSK mode, and if you want FSK you have to make some changes. This is where things become a little tricky. First, FSK mode requires a level-changing interface between computer and transceiver. This can be as simple

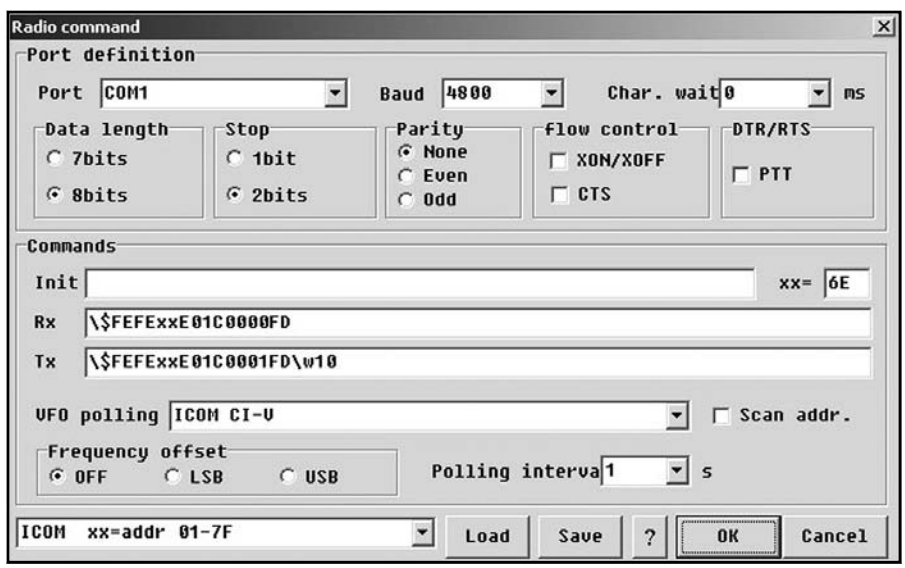


Figure 3—Radio command window.

as one transistor, one resistor and one diode, or it can be more complex with opto-isolators and perhaps other enhancements. All I have ever used is the one transistor version and have had no problems. Be sure to run a heavy ground wire between your transceiver chassis and computer chassis to help avoid ground loop problems, and also be sure to plug your computer's ac plug and your transceiver's power supply ac plug into the same wall outlet. This assures a single ground point for the ac mains and also helps reduce ground loop problems that could introduce hum modulation into your signal.

Here is probably the most important thing to remember about *MMTTY*'s FSK output: by default *MMTTY* puts the FSK keying signal on the TXD line of a COM port of your choosing, but there are some restrictions. For one, the TXD signal cannot be on the same COM port as the VFO control data (more on that later). For another, the default is to share the COM port with the PTT signal, if you use hardware PTT. Figure 1 shows a partial screenshot of part of the TX setup tab under the Options setup. Nowhere does the image mention FSK, but the FSK signal goes on the TXD line of whatever COM port is selected here. *Even if you decide not to use hardware PTT, you must still select a COM port here to get the FSK signal you need*. If you leave it at NONE (the default) you cannot do FSK. I believe a more correct label for this section would be PTT/FSK.

When you operate FSK, you must also tell *MMTTY* to put the FSK signal on a COM port instead of simply outputting audio tones. Figure 2 is a partial screenshot of the MISC tab under Options setup. The default here is Sound, so change it to COM-TxD (FSK) as shown. Leave it at Sound for AFSK.

VFO, Band Control and PTT

Now it gets easier. If you have a late model Kenwood or Yaesu transceiver, you can do VFO/Band Control and PTT with just a simple DB-9 cable. Look on the back of your rig and see if it has a DB-9 connector. If so, just plug in the cable and you are almost done. All ICOM rigs and older Kenwood/Yaesu rigs require a level converter to change the RS-232 signal to the TTL signal the rig needs. These are a little more complex to homebrew than the FSK level converter because they are bi-directional, i.e. data flows both ways, not just one. There are many commercial units available and homebrew instructions are available on the Internet. A list of sources will be at the end of Part 2, or you can do a Google search.

Whether you buy or homebrew, you need to tell *MMTTY* how to communicate with the transceiver. Figure 3 shows the radio command window. It looks pretty complex and it is, so let me walk you through it. First, select the COM port you are using for VFO/Band control and software PTT. As mentioned before, this *cannot* be the same port you use for hardware PTT and FSK. You need two COM ports with *MMTTY* if you are going to do FSK, although one or both can be a virtual COM port (more on this later). Select the baud rate, data length, stop and parity appropriate to your rig. The info will be in your rig's manual. When you get it right, *MMTTY* will immediately display your rig's frequency. If it doesn't work exactly right, experiment with things, especially the number of stop bits. I had one transceiver that supposedly needed two stop bits, but it worked more reliably with one.

See the areas marked **Flow control** and **DTR/RTS**? With all the rigs I have used, it did not matter at all which were checked or unchecked; *MMTTY* worked fine. The help file says that the PTT box must be checked to do software PTT, but this is not the case with any rig I have tested. *MMTTY always* does software PTT and you cannot shut it off except by disabling software control entirely. This may or may not be true for all rigs, so just keep it in mind if you have problems.

PTT: Hardware or Software?

MMTTY always does software PTT, so if your rig supports it and it works okay for you, use it. That way you save building or buying a separate PTT cable. To tell whether your rig supports it or not, once you have the VFO reading correctly, click the **TX** button on *MMTTY*'s main window. If your rig goes into TX mode, you are all set. Click **TX** again or click **TXOFF** to go back to receive. One caution, however—in my experience, software PTT is not 100% reliable. Once in a great while *MMTTY* will fail to go into TX mode when it should and likewise will fail to go back to RX mode when it should. I believe this is due to data collisions between the VFO polling and PTT commands, but I can't prove it. I only know it does happen. Test your setup thoroughly before committing to software PTT. If there is any sign of what I've described, install the hardware PTT cable and it should fix the problem.

Stay tuned for Part 2 in the next issue: *MMTTY*, the laptop interface and EXTFSK. NCJ

DX Contest Activity Announcements

Bill Feidt, NG3K

CQ WPX CW Contest (May 27-28, 2006)

Call	*Entity*	*Class*	*Operators*
C6AYM	Bahamas	SOAB LP	K9GY
E21IZC	Thailand	SOAB	E21IZC
LX/DL2OBF	Luxembourg	SOAB LP	DL2OBF
TM4Q	France	M/S	F6FYA, F5SQM, F6EMT, F5CWU, F5CQ, F5MOO, F4EGD, F6IIT, F6EKS
WP3C	Puerto Rico	SOAB LP	WP3C
LZ9W	Bulgaria	M/M	LZ contest team

Thanks to: DL2OBF, E21IZC, F6FYA, K9GY, LZ2CJ and WP3C. See **www.ng3k.com/Misc/wpxc2006.html** for further details

RSGB IOTA Contest (July 29-30, 2006)

Call	*Entity*	*IOTA*	*Operators*
DL3KUD	Germany	EU-129	DL3KUD
K1VSJ	USA	NA-046	K1VSJ
M8C	England	EU-011	GØVJG, G4BUO, MØMYC, G7GLW, M3CVN, GØFDZ
MM3M	England	EU-123	G3VCQ, M3VCQ, M1ERS, 2EØTWS, MØGAV
MWØNJW/p	Wales	EU-124	MØNJW
OZ	Denmark	EU-125	ON4ACA + NOK members
OZ/DL2VFR	Denmark	EU-088	DL2VFR
VE7SAR/VE2	Canada	NA-038	VA7AQ

Thanks to: DL2VFR, DL3KUD, GØVJG, G3VCQ, K1VSJ, MØNJW, ON4ACA and VA7AQ. See **www.ng3k.com/Misc/iota2006.html** for further details. NCJ

Results, February 2006 Phone Sprint

Jim Stevens, K4MA
ssbsprint@ncjweb.com

There is one word for this Sprint: *Ugh!* Conditions were probably the worst since the last sunspot low.

Except for 3 stations, no one east of the Mississippi River even made 50 QSOs on 20 meters before it closed. Forty meters was definitely the money band, but until the separation from foreign broadcast happens in a few more years, it was tough sledding too. Eighty meter conditions were OK, but not outstanding. And to think the actual sunspot cycle bottom is still about a year away. The next few Sprints will be gut-check affairs.

With that said, 113 logs were received, which is about normal. One DX entry was received from N6VR operating as XF1K. Some of the rare NA multipliers worked included: VE8, KL7, TI, KP2, and CM. And maybe a first: an OX multiplier. N6TR worked OX3WM on 20 meters.

QRP

There were a few brave souls who turned the wick down to 5W or less. Notching his first QRP victory was Brian, NA4BW. The remaining QRP entries in order of finish were: K4BP, NF2L, KC9ECI and VA3RKM.

Low Power

Bill, KØUK, won his first LP SSB Sprint rather easily with 14 more QSOs and 4 more multipliers than the second place finisher Dave, N5DO. Paul, N4PN, took third place with a good performance from the East Coast. Rounding out the LP Top Ten were WØETT, KE5OG, K7SV, N6ZFO, NA4K, N6QQ, and NX9T. It was N6QQ and NX9T's first time in the LP Top Ten.

High Power

The winner of the HP category was not a first time winner. Bill, K4XS, has now officially taken over the February SSB Sprint crown from K9PG with wins in the last 2 February events. It was Bill's 4th overall HP win, and he once again did it easily as the only station over 300 QSOs and topping the multiplier list. It was also Bill's 20th time in the HP Top Ten. Congrats to Bill on all the success.

Taking second place with his highest finish ever in the HP category was Jon, KL2A, operating at Joe Rudi's fine NK7U station. Jon only had the third highest QSO total, but he was able to ferret out the second most multipliers. Claiming third was Dan, W7WA. Dan had 3 more QSOs than NK7U but 2 less multipliers.

The rest of the Top Ten were: N6TR,

Corrections

An error crept into the final printed results for the September 2005 SSB Sprint. Here are the corrections:

Call	*Name*	*QTH*	*20*	*40*	*80*	*QSOs*	*MLTs*	*Score*	*Team*
K9BGL	Karl	IL	55	98	62	215	40	8600	
WT9U	Jim	IN	63	96	43	202	41	8282	9 & 0 Lids

Team Scores

NCCC #1	
NK7U	12848
N6DE	11508
N2NL	11298
N7TR	11234
AE6Y	10720
W6NL	10184
N6RO	10146
K7NV	7922
WX5S	6864
NI6T	6335
	9059

SEAHAWKS	
W7WA	12390
N6TR	11644
K7RI	11560
K7SS	9880
K5PTC	7227
N7LOX	6831
KI7Y	1932
K7WA	477
	61941

#1 Southern Sprint Coalition	
K4XS	14355
KU8E	7000
N4PN	5940
W4NZ	5808
K4BAI	5600
K7SV	5024
NA4BW	2754
	46481

#1 Lids from Nine & Zero Land	
W9RE	10920
KA9FOX	10783
KØOU	6666
K9ZO	5049
KTØR	3016
KK9K	2889
K9NW	2600
AA9RT	2160
WE9V	1520
	45603

5. NCCC #2 (W6YX, K6LRN, N6ZFO, K6MM, W6OAT, AE7DX, W6EB, NO6X, W6FB, KJ6RA) 32140
6. SCCC #1 (K6LA, W6TK, K6EY, K1USC, XF1K) 24072
7. GMC A-Team (KØUK, WØETT) 14070
8. #2 Lids from 9&0 Land (N2BJ, WI9WI, KA9F, KJ9C, WGØM, WW9R, NØAT) 13184
9. YCCC #1 (K1KI, K5ZD) 7131
10. #2 Southern Sprint Coalition (N4GI, K4BP, WA4VJC) 3961
11. North Hills Amateur (W3WC, N3TXH, KA3ZIP) 2085
12. NCCC #3 (NU6T, W6ZZZ) 277

Top Ten

Call	*Scores*	*Band Chges*	*QSOs Lost*	*ERROR RATES You*	*Them*	*CLAIMED/FINAL +/-*	*00Z*	*01Z*	*02Z*	*03Z*
K4XS	14310	58	4	0.9%	2.8%	0	86	69	80	84
NK7U (KL2A)	12804	66	7	1.7%	3.1%	0	102	63	65	63
W7WA	12390	5	2	0.7%	4.4%	0	87	85	70	53
N6TR	11603	4	11	3.4%	6.3%	0	75	73	52	84
K7RI (K7SS)	11520	4	7	2.4%	3.5%	0	96	92	65	46
N6DE (at W6XK)	11466	2	6	1.4%	1.8%	+1	67	70	53	85
N2NL	11298	8	8	2.5%	3.0%	+1	73	80	55	62
N7TR	11234	11	5	1.8%	4.7%	-2	72	76	74	52
KO7AA	11094	8	2	0.8%	4.7%	+2	85	57	60	56
K6LA	11070	20	5	1.8%	1.5%	-1	95	54	81	40

Top 10 QSOS

K4XS	318
W7WA	295
NK7U	291
K7RI	288
N6TR	283
W9RE	280
N7TR	274
N6DE	273
K6LA	270
N2NL	269

Top 10 Low Power

KØUK	8460
N5DO	7072
N4PN	5940
WØETT	5610
KE5OG	5310
K7SV	5024
N6ZFO	4672
NA4K	4290
N6QQ	4125
NX9T	4092

Top 10 Golden Logs

KW8N	218
K5ZD	103
W6OAT	96
AE7DX	83
K4BP	71
W3WC	71
WT9U	61
WA7BNM	42
NØAC	25
NU6T	23

Top 10 Multipliers

K4XS	45
NK7U	44
KO7AA	43
W7WA	42
N6DE	42
N2NL	42
K6LA	41
N6TR	41
N7TR	41
KA9FOX	41

Top 10 QRP

NA4BW	2754
K4BP	1775
NF2L	143
KC9ECI	120
VA3RKM	30

Top 10 Band Changes

W9RE	111
NK7U	66
K4XS	58
NA4BW	57
AE6Y	50
N4ZZ	44
KØUK	41
N6RO	40
KW8N	37
N5DO	24
N6ZFO	24

K7RI (K7SS), N6DE (at W6XK), N2NL, N7TR, KO7AA, and K6LA. It was N2NL and KO7AA's first time in the Top Ten.

After a hiatus in the September article, I've added the ERROR RATES and CLAIM / FINAL +/- columns to the Top Ten box. Interestingly enough, even scores in the Top Ten are bunched from numbers 4 through 10 (only 550 points separation), there was not a lot of movement up or down from claimed to final scores. If you are wondering how N7TR dropped 3 spots when he only lost 5 QSOs, well, unfortunately, one of the QSOs he lost also cost him a multiplier. Also notice KO7AA. He is +2 at number 9, which means he moved into the Top Ten from number 11 due to good logging accuracy (W9RE dropped out). Finally, if you are comparing +/-s here to the 3830 list, you will notice that while N6TR and K7RI are flipped in the 3830 list, they are both listed as 0s here. As it turns out, K7RI logs on paper initially and as a result his claimed log had 5 dupes counted and an extra, non-existent, multiplier counted. His claimed score after the dupes and multiplier were removed was lower than N6TR's score.

Golden Logs

The Top Ten Golden Logs were KW8N, K5ZD, W6OAT, AE7DX, K4BP, W3WC, WT9U, WA7BNM, N0AC and NU6T. Congratulations to all on the accuracy! If you want a copy of your log checking report, please send an e-mail to **ssbsprint@ncjweb.com**.

Records

As you would expect with the conditions, there were no records broken. There were 3 QRP area records initially established by NF2L in New York, K4BP in Tennessee, and KC9ECI in Wisconsin.

You can view the SSB Sprint records at **www.ncjweb.com/ssbsprintrecords.php**.

Teams

Starting to establish some dominance of their own of late in SSB Sprints, the Northern California Contest Club #1 Team took first place with 99,059 points from 10 entries. Finishing in second place—just like their namesakes would in the Super Bowl later on Sunday—was Team Seahawks with over 60K from 8 entries. Making a good showing from the East Coast with a third place team finish was Southern Sprint Coalition #1. Rounding out the top 4 was another creative name from those SMC guys with a team of Lids from Nine and Zero Land.

Notes

Station A calls CQ on frequency X and works station B. Station A is now required to QSY and make a QSO on a different frequency before returning to frequency X. Sometimes (hopefully inadvertently and not intentionally) station A will return to frequency X and work station C before making a intervening QSO on a frequency different than X. This is a round robin QSO for station A and it is prohibited by the rules. Please be more careful to follow this rule. There are observers listening (including yours truly and others) from time to time. Stations that are noted repeatedly making round robin QSOs will be disqualified.

The September 2006 Phone Sprint will be held at 0000Z on September 17

(September 16 local time). Get on and join us in the fun!

Soapbox

Long skip almost right from the start, made this a tough one! – *W9RE*. This contest is the pits for us folks up in the NE. 20 was dead and not enough people were on 40. The first hour was a disaster. – *WB1GQR (W1SJ)*. They said you should try something new this year. Maybe this one counts for me because this was my first serious attempt in any SSB contest. It was pretty brutal. – *W6YX*. Bands were really screwy at the start of this Sprint. – *N4PN*. Got on to give out the Iowa multiplier. It seems like Iowa is not very well represented in the sprints so I try to get on and hand out some points. – *NØAC*. First serious effort from new QTH. Great fun despite very poor conditions and lower participation. – *KA9FOX*. Simply brutal. Eight Qs on 20 with none being from CA. Broadcast crud on 40 was loud and the band was long. Even 80 seemed long. – *K7SV*. My First NA Sprint. Fast paced! It's kind of like dealing with a multiple personality Schizophrenic. – *K1USC*. 20 died early and 40 was long from the beginning. My worst sprint in years. – *KØOU*.

Scores

* denotes Low Power
** denotes QRP

Call	*Name*	*QTH*	*20*	*40*	*80*	*QSO*	*MLT*	*Score*	*Team*
WB1GQR (W1SJ)	MITCH	VT	5	49	95	149	34	5066	
K1KI	TOM	CT	4	85	56	145	30	4350	YCCC #1
K5ZD	RANDY	MA	0	44	59	103	27	2781	YCCC #1
W1CRK	*CAL	MA	0	3	0	3	3	9	
W2EQ	*TOM	NJ	2	41	37	80	22	1760	
WA2RY	*RON	NJ	0	38	32	70	21	1470	
NF2L	**ANDY	NY	0	4	9	13	11	143	
W3WC	PETER	PA	0	10	61	71	29	2059	N Hills
N3SD	*GREG	PA	0	0	57	57	24	1368	
N8NA	*KARL	DE	2	16	15	33	16	528	
AJ3M	MASA	MD	11	3	0	14	11	154	
N3TXH	*ERNEST	PA	0	5	0	5	5	25	N Hills
K3ASK	*LINT	MD	0	2	2	4	4	16	
KA3ZIP	*LEN	PA	1	0	0	1	1	1	N Hills
K4XS	BILL	FL	106	115	97	318	45	14310	#1 S Sprint
N4ZZ	DON	TN	43	104	83	230	38	8740	
N4OX	JAY	FL	101	10	103	223	39	8697	
KU8E	JEFF	GA	17	97	86	200	35	7000	#1 S Sprint
N4PN	*PAUL	GA	20	92	53	165	36	5940	#1 S Sprint
W4NZ	TED	TN	43	76	57	176	33	5808	#1 S Sprint
K4BAI	JOHN	GA	25	88	62	175	32	5600	#1 S Sprint
K4MA	JIM	NC	18	75	75	168	33	5544	
K7SV	*LARRY	VA	8	71	78	157	32	5024	#1 S Sprint
NA4K	*STEVE	TN	13	61	69	143	30	4290	
NX9T	*JEFF	NC	16	66	50	132	31	4092	
NA4BW	**BRIAN	GA	3	43	56	102	27	2754	#1 S Sprint
N4GI	BLAKE	FL	37	45	0	82	26	2132	#2 S Sprint
K4BP	**JEFF	TN	20	21	30	71	25	1775	#2 S Sprint
K4CZ	*BARRY	NC	2	28	34	64	23	1472	
N4CW (WA2JFK)	*JIM	NC	4	32	23	59	21	1239	
KG4YNM	DORNEY	NC	0	24	10	34	19	646	
W4IFI	*RANDY	VA	0	15	13	28	14	392	
WA4VJC	*BOB	GA	0	0	9	9	6	54	#2 S Sprint
K5PTC (N1LN)	BOB	TX	43	96	80	219	33	7227	SEAHAWKS
N5DO	*DAVE	TX	52	103	66	221	32	7072	
KE5OG	*BILL	TX	40	80	57	177	30	5310	
K5XR (W5ASP)	JOE	TX	44	108	0	152	34	5168	
WW5X	BILL	OK	26	75	52	153	27	4131	
W2MN	*TOM	TX	37	40	23	100	24	2400	
KD5OWO	*STEVE	TX	14	50	0	64	21	1344	
AD5OS	*BRIAN	TX	14	1	8	23	13	299	
N6DE (at W6XK)	BILL	CA	72	114	87	273	42	11466	NCCC #1
N2NL	DAVE	CA	74	118	77	269	42	11298	NCCC #1
K6LA	KEN	CA	62	123	85	270	41	11070	SCCC #1
AE6Y	ANDY	CA	75	107	86	268	40	10720	NCCC #1
W6NL	DAVE	CA	62	108	98	268	38	10184	NCCC #1
N6RO	KEN	CA	72	105	90	267	38	10146	NCCC #1
W6TK	DICK	CA	58	61	83	202	34	6868	SCCC #1
WX5S (at K6XX)	MATT	CA	68	80	60	208	33	6864	NCCC #1
NI6T	AL	CA	30	78	73	181	35	6335	NCCC #1
W6YX (W6RK)	MIKE	CA	52	70	61	183	34	6222	NCCC #2
K6LRN	DICK	CA	33	63	69	165	31	5115	NCCC #2
N6ZFO	*BILL	CA	32	67	47	146	32	4672	NCCC #2
N6QQ	*JOHN	CA	47	68	10	125	33	4125	
K6EY	*BECKY	CA	34	64	33	131	26	3406	SCCC #1
K6MM	JOHN	CA	34	46	39	119	24	2856	NCCC #2
W6OAT	*RUSTY	CA	46	50	0	96	29	2784	NCCC #2
N6AN	REX	CA	55	45	0	100	26	2600	
N6NF	*TOM	CA	18	45	39	102	25	2550	
W6EB	JIM	CA	23	39	36	98	25	2450	NCCC #2
NO6X	KEN	CA	15	52	21	88	25	2200	NCCC #2
K1USC	*TONY	CA	23	38	28	89	24	2136	SCCC #1
W6FB	*JACK	CA	18	35	31	84	21	1764	NCCC #2
KJ6RA	*RICH	CA	23	34	12	69	23	1587	NCCC #2
K6III	JERRY	CA	48	0	0	48	20	960	
ND6S	*RAY	CA	20	25	2	47	19	893	
WA7BNM	*BRUCE	CA	0	42	0	42	21	882	
K6ST	*BARRY	CA	12	11	13	36	19	684	
NU6T	*RICH	CA	10	10	3	23	12	276	NCCC #3
W6ZZZ	MARK	CA	1	0	0	1	1	1	NCCC #3
NK7U (KL2A)	JOE	OR	64	130	97	291	44	12804	NCCC #1
W7WA	DAN	WA	94	120	81	295	42	12390	SEAHAWKS
N6TR	TREE	OR	77	121	85	283	41	11603	SEAHAWKS
K7RI (K7SS)	DAN	WA	98	123	67	288	40	11520	SEAHAWKS
N7TR	RICH	NV	77	119	78	274	41	11234	NCCC #1
KO7AA	BILL	AZ	60	125	73	258	43	11094	
K7SS (K7RL)	HAWK	WA	68	104	88	260	38	9880	SEAHAWKS
K7NV	KURT	NV	64	85	84	233	34	7922	NCCC #1
N7LOX	BRIAN	WA	53	83	71	207	33	6831	SEAHAWKS
AE7DX	*JACK	NV	1	70	12	83	30	2490	NCCC #2
KI7Y	*JIM	OR	28	34	22	84	23	1932	SEAHAWKS
KE7YF	*PAUL	AZ	24	43	21	88	18	1584	
K7WA	*JIM	WA	7	24	22	53	9	477	SEAHAWKS
WA7YUL	*BOB	AZ	7	10	2	19	10	190	
KW8N	BOB	OH	35	89	94	218	34	7412	
K8MR	LEBRON	OH	8	33	32	73	21	1533	
K8BB	DON	MI	0	28	0	28	12	336	
W9RE	MIKE	IN	59	121	100	280	39	10920	#1 Lids
KA9FOX	SCOTT	WI	60	99	104	263	41	10783	#1 Lids
K9BGL	KARL	IL	45	76	84	205	37	7585	
N2BJ	BARRY	IL	37	72	70	179	31	5549	#2 Lids
K9ZO	RALPH	IL	28	62	63	153	33	5049	#1 Lids
KK9K	RON	WI	19	33	55	107	27	2889	#1 Lids
K9NW	MIKE	IN	30	41	29	100	26	2600	#1 Lids
AA9RT	*LOU	IL	18	21	51	90	24	2160	#1 Lids
WI9WI	JIM	WI	29	34	34	97	22	2134	#2 Lids
KA9F	JOHN	IN	0	48	30	78	24	1872	#2 Lids
WE9V	CHAD	WI	40	40	0	80	19	1520	#1 Lids
KJ9C	MEL	IN	24	24	25	73	20	1460	#2 Lids
WT9U	JIM	IN	27	33	1	61	16	976	
WW9R	*PAT	WI	17	3	21	41	15	615	#2 Lids
KC9ECI	**TOM	WI	9	6	0	15	8	120	
KØUK	*BILL	CO	54	108	73	235	36	8460	GMC A-Team
WØBH	BOB	KS	31	96	88	215	36	7740	
KØOU	STEVE	MO	36	90	76	202	33	6666	#1 Lids
WØETT	*KEN	CO	43	87	40	170	33	5610	GMC A-Team
KØHW	JIM	SD	43	65	64	172	31	5332	
KTØR	DAVE	MN	14	13	77	104	29	3016	#1 Lids
WGØM	*MIKE	MN	16	33	12	61	16	976	#2 Lids
NØAT	*RON	MN	0	20	14	34	17	578	#2 Lids
ACØW	*BILL	MN	0	25	2	27	16	432	
NØAC	*BILL	IA	0	25	0	25	9	225	
VE3WG	*BOB	vE3	0	32	19	51	19	969	
VA3RKM	**BOB	vE3	0	5	1	6	5	30	
XF1K (N6VR)	*RAY	XE	16	12	0	28	10	280	SCCC #1

October 2005 NA RTTY Sprint Results

Doug McDuff, W4OX

The NA RTTY Sprints for 2005 are history with the running of the October event. With the close of 2005 came a difficult decision for your editor regarding this "chaotic" but enjoyable contest. Having been assigned an increased case load at the sweat shop due to a shortage of personnel, it was felt that that this contest was not getting the attention and promotion that it deserved. So, while it had been a great several years, the time had come to turn over the reins to someone else who will infuse new energy into this contest. Your new editor will be Ed, WØYK. Welcome aboard, Ed!

This past year also saw the passing of several friends and supporters of RTTY and RTTY contesting. Among them were Jules, W2JGR, Chuck, W6JOX, Wilf, VE7QO and of course Larry (or LAR from IA), WØETC. While the passing of each of them left a unique hole in our contesting fabric, your editor was particularly saddened by Larry's demise. Despite his continued battles with various health issues, he was always there with a kind word and encouragement. Thankfully, several of you agreed to sponsor a plaque in his name. What a great and fitting honor for him. For all of our lost RTTY members, may they RIP.

Now, on a more upbeat note - the results:

Scores

High Power

K6LL	6775
W7WW	6534
NB1B	6500
AD4EB	6291
KE9S	4800
K3MM	4669
KJ6RA	4401
WK6I	4401
KE6RAD	3816
K8IR	3586
K5AM	1360
W6ZZZ	1026
N5KO	104

Low Power

K7SV	5928
K7WM	4860
KE5OG	4700
W9WI	4200
N6QQ	3045
VE3ESH	2562
K1GU	2508
NTØF	2420
K6UM	2220
WW4LL	2200
KI6DY	1976
VE3IAY	1827
K6OWL	1782
KJ7NO	1540
W8WTS	1458
WA6BOB	1428
WA4OSD	1349
WB6TQG	867
N6RCE	799
W1DY	644
KA5EYH	429
NØAT	384

QRP

W6YX (at K6UFO)	2553

TEAMS

SWACC	45,224
NCCC #1	15,102
TCG	14,348
PVRC	5928
CCO	4389

High Power

Congratulations are in order for the winning score in this category submitted by perennial leader Dave, K6LL, with a score of 6775. Not far behind, in second place, was Red, W7WW. Red edged out third place finisher and relative new Sprinter, Dennis, NB1B, by 34 points. Once again the significance of the scores of these top three finishers was that they all happened to be on the same team (SWACC). As noted later in this write-up, the combed scores of these gentlemen, along with their other team members, led to a convincing victory in the team competition.

Low Power

Again of interest, the number of low power logs that were submitted numbered almost twice as many high power logs. And once again, the top low power scores were quite competitive with their high power counterparts.

Larry, K7SV, took top honors in the low power category with a score of 5928. A quick check showed that he would have placed in the top five in the high power category. Nice effort, Larry! Taking second and third place, respectively, in this category were Wayne, K7WM and Bill, KE5OG.

QRP

With a fine finish in this category, one might begin to think that Mark, K6UFO, operating at W6YX, had cornered the market on this one. With a score of 2553, Mark would have placed in the top ten in low power and would have come close to having done so in the high power category. Great effort, Mark!

Team Competition

Of the five teams to participate in this category, once again SWACC claimed the trophy. A great effort by all!

Congratulations to all of the participants and thanks for getting on during this contest. Hope to see you in one of the upcoming Sprints as a "civilian." In the meantime, 73 to all. And when you have a moment, drop Ed, WØYK, an e-mail and let him know your ideas on how this contest might be tweaked to make it even more enjoyable. NCJ

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