

MT. AIRY V.H.F. RADIO CLUB, INC.



CHEESE BITS

W3CCX

CLUB MEMORIAL CALL

ARRL
Affiliated
Club



Volume XLIV

April 2002

Number 4

PREZ SEZ

I want to congratulate the participants in Home-Brew Night, It's good to see the tradition of the Packrats is alive and well. You all should be proud of the projects submitted. I am a member of two other clubs and I can tell you when it comes to technical expertise there is no contest the Packrats are the BEST !!!!!

I want to congratulate Lenny N3NGE on his EME contact using Joe Taylor's new JT44 Program. Joe showed off the program at Home-Brew Night. It sure didn't take Lenny long to test it out.

V.P. Ben WA3RLT has arranged to have Zach Lau W1VT of the ARRL Laboratory come and speak at our ARRL Night meeting. Zach doesn't travel around too much giving presentations so I urge all of you to come out to the meeting. Zach as you know is an avid microwaves and weak signal enthusiast, this is more of a reason to come out: he is one of us.

The plans are sketchy right now but we hope to have a Meet The Speaker Dinner at Pippo's Fantastico. Stay tuned to the Monday nets, the club repeater and the club reflector for more info.

73 for now and don't forget listen for the weak ones. **Brian N3EXA**

JUNE CONTEST-FIRST CALL-COMMIT EARLY!

I can't believe it's March already! With what passed for winter this year (I'm not complaining) almost behind us, it's once again time to start planning for the club's big summer operating activity, the June VHF QSO Party. The club is again planning to multi op from the top of Camelback mountain and as always it will take a true TEAM effort to make it happen. This years June contest will be on **June 8th & 9th** so mark those dates on your calendar and plan to at least operate the packrats from your home station or better yet come up to the mountain and join in the fun! The following are some thoughts on ways YOU can help the club's contest effort this June.

JOIN THE CREW! For the able-bodied, this is the most direct and effective way to help the effort. It takes a large crew to pull this off, so whatever time you can find during the event to set up, operate, or tear down will be of great help, so please contact me ASAP and sign up for as much time as you can spare!

OH CAPTAIN, MY CAPTAIN! Be a Band Captain! These are the guys that are the heart of our operation. The Band Captain is responsible for securing the equipment, setting up, and operating the station on their chosen band. However keep in mind you will have help. The club has antennas, towers, rotors and feedline. There will be a crew to help set up at the mountain to help set up and tear down and help operate. If you ask around you may find unused but good equipment you can borrow to set up the station, so you don't have to rip out your whole shack.

DO IT AGAIN FOR THE GIPPER! This is to all the Band Captains from last year. I have not talked to each of you individually...yet. I will. If you were a Band Captain last year and want to do it again, that would be great, if not I understand, and tnx. for all the help in past years. Just let me know one way or another.

BE A MENTOR! If you have been a Band Captain in the past, offer your help and knowledge to this year's Captain. It's good when experience is passed on to the next "generation", this is how we grow and get better.

PACKRAT PHONE (OR CW) HOME! Many of us can't make it to the mountain for one reason or another. But you can still help the club by making sure to WORK W3CCX on all bands you have during the contest. make sure all your equipment is working BEFORE the contest and try to work us early in the event, just in case.

BE A SPONSOR! This is something new. In the past the club has been able to fund this operation from the treasury. However this may not be possible, at least not this year. So I would like to ask for donations to defray the cost. If you're going to the mountain please feel free to donate something for food, etc. it would help a lot. Anyone who feels this is a worthwhile endeavor and would like to contribute to it please do so, send checks to club treasurer W3KM, earmark "FOR JUNE CONTEST" You'll be glad you did! That's it for now, Think about how you can help the club in June, and let me know what I can sign you up for. Stay tuned for future developments! CU Soon, **73 AI N3ITT**

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PACKRAT 222 MHz REPEATER - W3CCX/R
 222.98/224.58 MHz, Churchville, PA

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 HAMARAMA: W3KJ 215-256-1464
 VHF Conference: KB3XG 610-584-2489
 Awards Chairman WA3GFZ 215-884-3116

PACKRAT BEACONS - W3CCX/B
 FM29jw Philadelphia, PA
 50.080 144.284 222.065 432.295 903.071 1296.251 MHz
 2304.037 3456.220 5763.190 10,368.140 MHz (as of 3/1/01)

MONDAY NIGHT NETS

TIME	FREQUENCY	NET CONTROL
7:30 PM	50.150 MHz	WA3EHD/K3EOD
8:00 PM	144.150 MHz	N3ITT
8:30 PM	222.125 MHz	W2SJ/N3EXA
8:30 PM	224.58R MHz	W3GXB
9:00 PM	432.110 MHz	W3RJW
9:30 PM	1296.100 MHz	WA3NUF
10:00 PM	903.100 MHz	N3AOG

THURSDAY NIGHT NETS (1st & 4th of the month)
 9:30 PM 2304.100 MHz W3KJ, & go to 3.4G & up after



Homebrew Prize Winner or Dummy Load? This 432 Quagi project comes with it's own PR campaign, operational photos and prize certificate. Congrats to Griff, NE3I for "BEST PRESENTATION"

Editor's Column

I finally followed the installation of WSJT and got started on the mode, applying a bit of a modification in pointing the antennas perpendicular to the radian of the meteor entry to the atmosphere, and instead tried to track the flight patterns of the major air carrier routes in the area, and adopt the high-speed short-burst weak-signal mode to airplane scatter. Using a modification of the satellite tracking programs, with which I had familiarity, and linking some of the algorithms to synchronize with the web-based airline flight reports, a unique set of signal patterns emerged, enabling me not only to make contacts out to the 800 km range with regularity, but also to be able to analyze my own echoes, using a Doppler shift routine, verifying the specific aircraft off which we were reflecting, and closely calculating the flight's altitude and speed. Hoping to capitalize on some of the unique aspects of this mode to run up my grid totals on 222 and 432, I plan to report the technical specs of this venture in about a year, so look forward to getting on this mode too, when you read about it again in the April* 2003 edition.

Travel (as usual) has kept me from more on-the-air activity, but Leon, N1XKT (my harmonic) has found the TS-850 and hooked it back up to the power supply and antenna...a 10m dipole in the attic. He has been working the world in the mornings when he gets up early, before work, and when my cousin called to express his son's interest in ham radio, I got on myself for a bit—sure enough, it was easy to work around the world with 50 watts, adding some JA's and a new country with Algeria, in addition to a scad of Europeans. Hopefully as the weather warms we'll get more involved in those Microwave Days on the first Sat AM and first Mon PM of the month.

This past week we received the word that postage will again rise, and that means a small but incremental cost of Cheesebits by mail. Of course, as each month has gone by, we have had more and more converts to the emailed PDF format—there's still time left for **YOU** to send me your email address and get this on the web...make sure you have Adobe Acrobat Reader version 5.0 or higher, a free download from the Adobe web site.

Randy Bynum, NR6CA, has been a real boost to the club in getting so many neat construction parts. Not that I have built and operating yet, but I have the projects ready to go. I wanted to acknowledge the great "service" he provides the club members in keeping his eyes open for useful microwave gear, and allowing us to procure them inexpensively.

I have to say that Homebrew Night is always a revelation to me. The quantity and quality of the projects is astounding. Ingenuity and self-determination, plus several good swapfests and a bit of mail-order can sure get a nice piece of equipment together.

Spring Sprints are upon us—I have a few penciled in, and it's only fun if you are on the air too! So be there! Zach Lau is making one of his rare appearances at our April Meeting as the guest speaker. We'll host him at dinner before the meeting, and expect a full-house to be present for his surprise topic slide show. Show the club and our guests your support by your presence at both dinner and the meeting. Call a buddy and car-pool. You will get from the club double of what you put in! 73, Rick K1DS

* Happy April Fools Day

2002 Spring VHF/UHF Sprint International Contest Sponsored by East Tennessee DX Association

ETDXA is pleased to announce the 2002 Spring VHF/UHF Sprints. Everyone is encouraged to participate, even if only in a small way. The rules have intentionally remained simple, and yes, they do encourage rover and microwave operation. The contest is intended for single operator, single transmitter entries, however if one wishes to introduce a newcomer to weak signal vhf/uhf operations, the sponsors of the contest reserve the right to allow such entries, if identified as such.

We are continuing to refine the process, and we appreciate all the support, which has been shown. ETDXA Certificates from 2001 are in process now. The official rules for 2002 will be found on the ETDXA Web-site: www.etdxa.org/vhf.htm I wish you the very best of VHF! 73, Jeff Baker KG4ENR

Object: To work as many amateur stations in as many 2 degree by 1 degree grid squares as possible, using authorized amateur frequencies on the 50, 144, 222, 432, 902 MHz and above bands.

The 144 MHz Sprint will be from 7 PM until 11 PM local time on Monday (April 1, 2002).

The 222 MHz Sprint will be from 7 PM until 11 PM local time on Tuesday (April 9, 2002).

The 432 MHz Sprint will be from 7 PM until 11 PM local time on Wednesday (April 17, 2002).

The Microwave Sprint will be on Saturday (May 4, 2002) from 6 AM until 1 PM local time. This includes all Amateur frequencies above 902 mhz.

Please include band data in summaries and logs. NOTE: use of Liaison Frequency is encouraged.

The 50 MHz Sprint will be from 2300Z Saturday until 0300Z Sunday (May 11 & 12, 2002).

Exchange: Grid-square locator - signal report is optional.

Scoring: QSO Points: Count one point for each complete QSO.

Multiplier: The total number of different grid squares worked. Each 2 degrees by 1 degree grid square counts as one multiplier.

Final score: Multiply QSO points by multipliers. Each Sprint is scored separately.

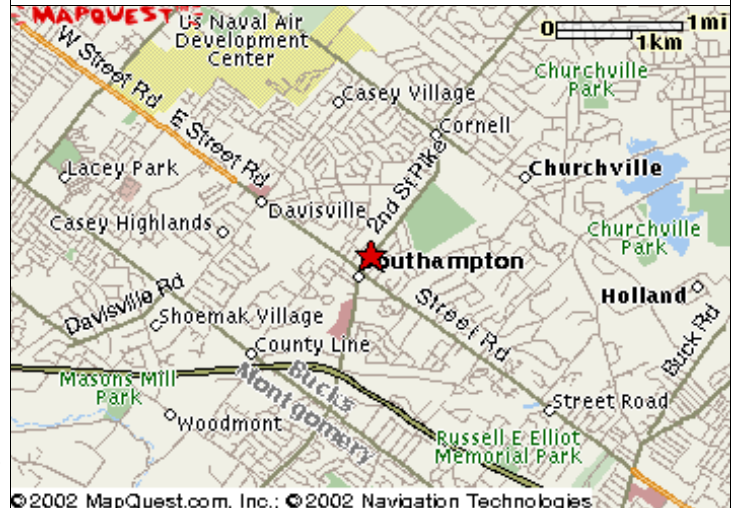
Rovers score same, but please segregate logs by grid. Scoring for Rovers is cumulative, total # of grids worked from each grid activated multiplied by total # of stations worked in each grid activated. (Cont'd on bottom p10)

ALL CLUB MEMBERS INVITED Dinner with the Speaker Meet with Zach Lau, W1VT

and enjoy a great dinner
with your fellow Packrats
Thursday, April 18th at 6PM

At Pippo's Fantastico Restaurant
765 Second St. Pike
Southampton, PA 18966
215.953.7775

Please let Brian, N3EXA know by April 11th if you will be joining us. Meeting follows the dinner, a few blocks away at the Southampton Free Library



Radio Activity April 2002

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1 Spring Sprint 2m 7-11PM	2	3	4	5	6 Timonium Ham Fest Microwave Activity AM 7A-1P
7 Timonium Ham Fest	8 Microwave Activity PM 7P-11P	9 Spring Sprint 222 7-11PM	10	11 Bd of Dir at QTH of	12	13
14	15 Mondays are Net Nights. See P2 for times and freqs and net control starting 7:30pm	16	17 Spring Sprint 432 7-11PM	Thursday, April 17th, Dinner with the speaker 6PM Pippo's Fantastico 765 Second St. Pike Club Meeting 8PM Southampton Free Library ARRL Guest Speaker, Zach Lau W1VT Surprise Slide Show		
21	22 Mondays are Net Nights. See P2 for times and freqs and net control starting 7:30pm	23	24			
28	29 Mondays are Net Nights. See P2 for times and freqs and net control starting 7:30pm	30				

"KEEP THOSE CRYSTALS BURNIN"

de: John Sortor, KB3XG

INITIAL PROBLEM:

Two June contests ago in FN21hb I realized that I was using the wrong IF frequency. A 28 / 144 MHz IF worked just fine at home but up on the mountain all I could hear was that darn 2 meter station blasting through with 59 signals on all bands up through 10 gigs. All my transverters are shielded well. This RF energy was coming in through the microwave antennas. During one of the many slow periods during the contest in the microwave truck, I pointed my antennas directly at the 2 meter shack to see how bad things really were. I listened to WA3NUF clearly calling CQ on 10,368.250 MHz. I then switched to 10,369.250 MHz and Phil's voice disappeared into the noise. In an effort to lure WA3RLT and W2SK to help me in the microwave truck the following year, I promised that I would change all of the crystals for a 29/145 MHz IF before the next June contest.

Changing crystals in 6 rigs was not a fun job. Each rig had to be thoroughly dismantled increasing the chances that something unrelated would break during the Xtal swap. I finished about 2 months before the contest. The crystals were "burned in" over a long weekend but I noticed that the frequency never did stop drifting over that short time period. I decided since I was ahead of schedule I would add complexity to the problem to ensure a last minute pre-contest flurry of activity.

THE EXPERIMENT:

I started taking a frequency data point each day at about the same time using an ovenized HP frequency counter with 1 Hz accuracy. This was easy since all of my transverters have a coupler in line with the base frequency oscillator. I finished swapping the 2304, 3456, and 5760 crystals first so they were the first into the burn in rack. The 903 and 1296 burn in process started about a week later. I noticed an up and down frequency shift on two of the transverters so I started recording room temperature in hopes of correlating frequency to temperature. Please note that all of my LO's are ovenized so temperature should not be a big problem.

The 10 GHz crystal data is limited since the 10 gig Xverter rig was still on the assembly floor up until 8 days before the contest. The 24 gig crystals are also missing from the list since they are now 5 years old and have been aged thoroughly.

DISCLAIMER:

Let it be known that I am not a crystal expert. This is another aspect of RF engineering that is an entity all to itself. Please do not beat me up over any claims that I am making. I am merely reporting on what I have observed.

DATA ANALYSIS:

I have included comments referring to each figure to try to explain what I believe are probable explanations for the recorded results. All crystals were brand new and put into service at about the same time. The actual crystal frequency has been normalized to zero Hz at time zero to make it easier to see relative changes over time. Only the

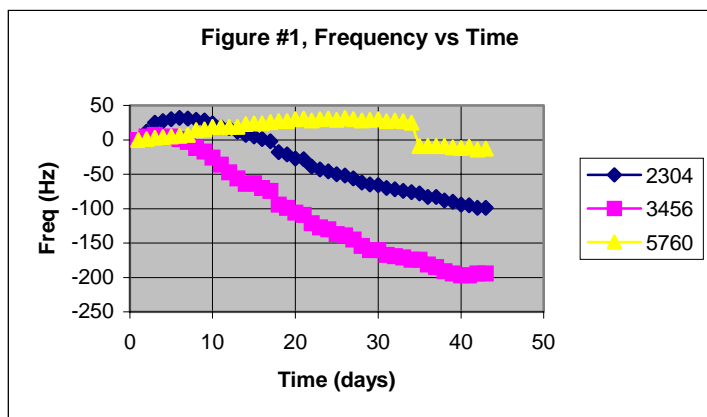
last 3 significant digits (100 Hz, 10 Hz, 1 Hz) of each base frequency were used in the data analysis. All Frequency vs Time plots have the same frequency span (300 Hz) to make it easy to compare data. I have also included a table that outlines the specifics of each crystal oscillator.

Table #1, KB3XG TRANSVERTER LO'S

<i>band</i>	<i>base freq</i>	<i>mult</i>	<i>LO freq</i>	<i>overtone</i>	<i>holder</i>	<i>LO type</i>
903	94.750000	8	758	5th	HC49/U	DownEast no-tune with insulated thermistor oven
1296	191.833333	6	1151	7th	HC49/U	DownEast no-tune with insulated thermistor oven
2304	89.958333	24	2159	5th	HC51/U	Vectron ovenized crystal oscillator
3456	103.468750	32	3311	5th	HC51/U	Vectron ovenized crystal oscillator
5760	93.583333	60	5615	5th	TO-39	California Microwave brick with ovenized crystal
10368	189.314815	54	10223	7th	HC49/U	DownEast no-tune with insulated thermistor oven
24192	97.037500	240	23289	5th	HC51/U	Vectron ovenized crystal oscillator

Figure #1 FREQUENCY vs TIME [2304, 3456, 5760]

The shape of both the 2304 and 3456 LO's seem to be tracking each other with a frequency difference of about 100 Hz. Both of these Xtals are housed in a Vectron ovenized oscillator at a temperature of +70 degC. It's looks like the frequency has stopped drifting at the last few data points but I think that additional burn in time is necessary. Surprisingly, the 5760 crystal shows very little drift over time. It is also heated by an oven inside the brick. The 2304 and 3456 crystals use a large HC51/U crystal holder (0.75" x 0.75") The 5760 crystal uses a small TO-39 can.



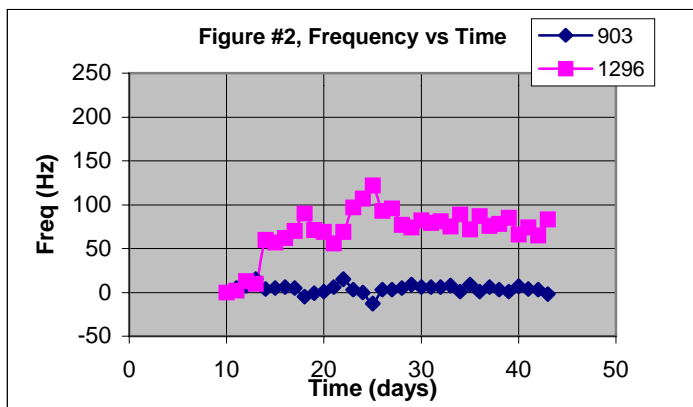
This does bring up a question about hermeticity. I remember working on the 24 gig rigs with W2PED. He had a crystal in his 903 IF box that never stopped drifting even after

months of burn in. We decided that the crystal holder must have a hole in it and that contamination entering the crystal was causing a continuous decrease in frequency. Replacing the crystal fixed the problem. Maybe the larger crystal holders are more prone to leakage?

There is a simple explanation regarding the abrupt LO frequency change in the 5760 MHz transverter on about the 34th day. A 7/8" box wrench fell from the bench top and smacked the LO brick pretty hard. This shows that the LO bricks are not completely shake, rattle, and roll proof. Some of the frequency sensitive inductive elements inside the brick can permanently deform due to a sudden impact or vibration. It is advisable to periodically check and re-tweak your crystals back on frequency.

Figure #2 FREQUENCY vs TIME [903, 1296]

The 1296 crystal that came with the DownEast kit had a large initial frequency shift, but the 903 crystal barely had any shift over the entire time period. After 30 days or so the 1296 Xtal stabilized at a fixed frequency. The 903 crystal is a standard 5th overtone (94.750 MHz) and the 1296 LO uses a 7th overtone (191.833 MHz) crystal. I wonder if lower overtone crystals stabilize in a shorter period of time?



Notice that there is a small up and down frequency shift during the last 10 days of the experiment. Both crystals have a thermistor soldered to the crystal holder (The W3KM trick.) with a small piece of foam cut out to insulate the oscillator. On closer inspection it appears that the frequency shift of the two crystals are somehow 180 degrees out of phase. (One increases in frequency as the other decreases.) This is most apparent on the 25th day when 1296 increased by 25 Hz and 903 decreased by about 12 Hz. I tried to correlate this to room temperature but could not identify any trends.

The only other thing common to both rigs was the power supply. The power supply I was using was an old 15V, 30A Lambda which uses a resonant transformer type of regulation which is poor compared to modern regulated supplies. Maybe the frequency shift due to voltage changes on a 5th overtone crystal oscillator is inversely proportional to an oscillator using a 7th overtone crystal?

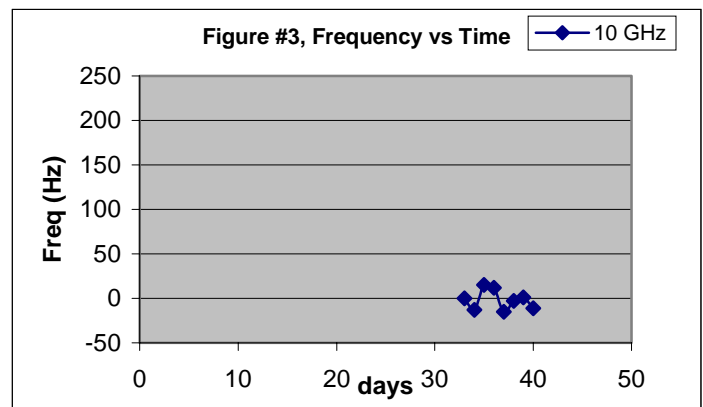
I also noticed that the 1296 data seemed to be "amplified" compared to 903. Using a higher overtone crystal saves building another multiplier stage and makes filtering out the unwanted spurs easier, but it does not really buy you anything in terms of stability. I looked carefully at the data from the 33rd day through the 43rd day and the frequency shift

at 1296 was almost exactly 2 times greater than 903. (191.833 MHz / 94.750 MHz = 2)

Figure #3 FREQUENCY vs TIME [10,368]

The data on the 10 GHz crystal is limited since I only finished building the kit a week before the contest. It is interesting to note the same sort of daily up and down frequency shift just like the 903 and 1296 oscillators. The 10 gig rig was powered by a good linear power supply so this kind of blows my theory about the old Lambda supply used to collect the 903 / 1296 data.

A thermistor heater is connected to the 78L08 on-board regulator. All three DownEast oscillators (903, 1296, & 10368) use a thermistor heater soldered to the crystal holder. Power to the thermistor is supplied by the 78L08 on-board regulator. This same voltage regulator is also the power supply for the oscillator and buffer amplifier. This same voltage regulator is also the power supply for the oscillator and buffer amplifier. The regulator gets pretty hot especially at cold temperatures when the thermistor demands maximum current. I added a small snap on heat sink to the 78L08 to help cool things down. I'm wondering if the regulator is on the edge of dropping out and this is the cause of my frequency shift? In any case I think it's safe to say that the unidentified frequency shift is not caused by the crystal.



Figures #4 & #5 FREQUENCY vs TEMPERATURE:

It was impossible to make any sort of sense out of the 2304 or 3456 temperature data since both crystals were still drifting downwards in frequency. The frequency of the 903 and 1296 crystals stabilized on about the 33rd day. Both crystals have an up and down frequency shift over the last 10 days of the experiment. I thought there may be some correlation with temperature, but I was wrong. The 903 data sort of shows a downward trend between 24.55 degrees and 25.55 degrees but I think this was coincidence. The shape of the 1296 plot tells me that there is no correlation between frequency and temperature at least over this small temperature range. It would have been nice if I had access to an environmental chamber.

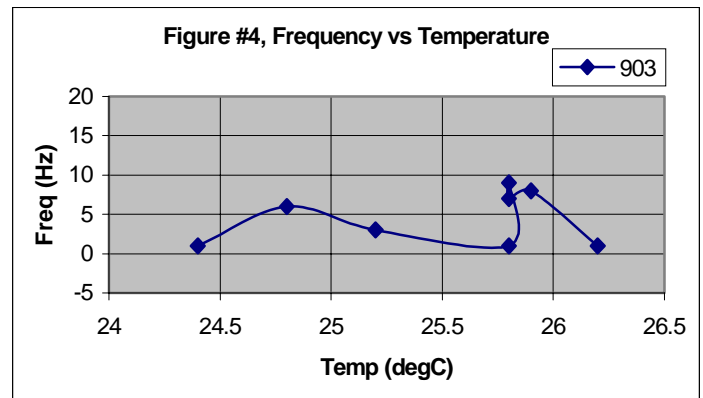
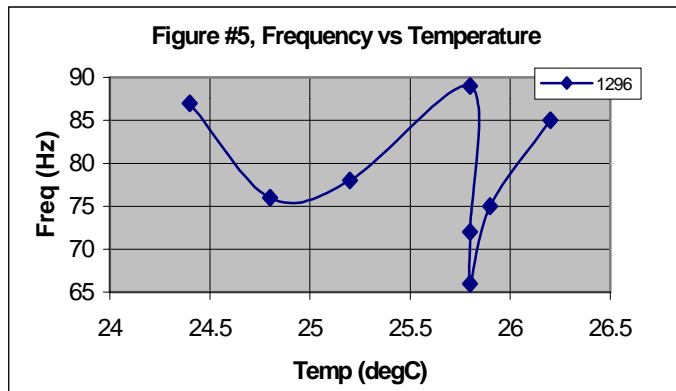


Figure #5, Frequency vs Temperature



FREQUENCY vs VOLTAGE:

This is one piece of data that I did not collect. Like temperature, it would not make any sense to record data until the crystals have stabilized in frequency. I feel it will be worth while at some point in time to measure this parameter. I remember working on W2PED's 24 gig rig. On transmit, the rig would pull slightly more current and the LO brick would shift by 20 Hz or so. At 24 GHz this puts you 5 kHz up the band. The LO brick had it's own -20V regulator plus the power to the Xverter was regulated. This problem went away when we switched to a brick with an external LO input fed by a Vectron oven oscillator with its own internal voltage regulation.

CONCLUSIONS / UNFINISHED BUSINESS:

- 1) It may be worth it to switch to a 29 MHz or 145 MHz IF for your microwave rigs if you live near one of the big gun Pack Rat stations. Next contest, switch to 29 MHz or 145 MHz on your microwave transverters and see if your receiver gets quiet. By the way, the experiment was a success. The QRM on the microwaves caused by the two meter truck was eliminated.
- 2) It looks like 6 weeks of continuous duty is still not enough to completely burn a new crystal in. I will re-start the burn in process a few months before the June 2002 contest and report back with an update.
- 3) Taking LO frequency data over a long period of time may uncover a problem with your base frequency oscillator. (leaky crystal holder, poor voltage regulation, poor temperature regulation)
- 4) Occasionally check the frequency of your LO's with a good frequency counter. There are lots of reasons why the LO in your transverter could drift off frequency.
- 5) I could not correlate temperature to frequency. This would not be the case if I was not using some sort of temperature regulation. Consider adding crystal ovens or thermistor heaters to at least your upper microwave Xverters. It's a very easy modification to any oscillator circuit. (Ask W3KM for a copy of his old Cheese Bits article.) Knowing what frequency you are on eliminates one variable.
- 6) I need to revisit the up and down frequency shift problem I am seeing with the three Xverters that utilize the DownEast oscillator circuit. I may have to go back and replace the 8 volt LO regulator with something has more current capability.

Beta release of WSJT Version 1.9.4

March 22, 2002 Joe Taylor, K1JT

The news is getting around fast that the **new JT44 mode in WSJT works extremely well for EME (moonbounce) communications**. A number of EME QSOs have been made, even at a less-than-optimal time of the month. Smaller stations may be able to get into the EME game with WSJT,

because JT44 works well with signals that are 10 dB or more below the weakest copiable CW signals. I have been running WSJT v1.9.4 for about a week now at my own station. It is proving itself to be very effective as it continues to evolve. This update provides a collection of fixes and features outlined below. More improvements are in the works, but for many reasons this seems to be a good time to release what is already done. As usual, to upgrade from any older version of WSJT you need to replace two key files in your installation directory. First you should read the file

<http://pulsar.princeton.edu/~joe/K1JT/BETA194.TXT>

Then download

<http://pulsar.princeton.edu/~joe/K1JT/BETA194.ZIP>

Unzip it into a convenient directory and replace your existing files WSJT.EXE and WSJT1.DLL by new ones of the same name. It is no longer necessary to delete your old "INI" file when upgrading between versions, as they are now tagged with the version number. It is perfectly safe to delete older INI files if you wish to do so.

To use the JT44 mode you must have a copy of the file TSKY.DAT in the same directory as WSJT.EXE. If you do not already have this file, download it from

<http://pulsar.princeton.edu/~joe/K1JT/TSKY.DAT>

The BETA194.ZIP file also includes a new version of the file CALLSIGN.TXT. Many new stations are listed, but if you have been maintaining your own callsign file you will want to save it as a backup copy and perhaps merge its information into the new file provided. CALLSIGN.TXT belongs in the main WSJT installation directory.

What's new in WSJT v1.9.4:

1. Fixed a bug that caused short TX sequences.
2. Fixed a bug that caused program crashes after program runs for an hour or so.
3. Fixed a "Run Time 6 Overflow" that sometimes occurred on JT44 startup if the lookup grid field is left blank.
4. Disabled any editing of the active TX message box.
5. Fixed a potential loss of program state if the FSK441/JT44 mode is switched while running.
6. Made it impossible to run one version of WSJT.EXE together with a different revision of WSJT1.DLL. (In the past this has caused a few people grief until they figured out what they were doing wrong.)
7. Fixed a bug that could cause a program crash if DT was found to be < -1.5 s or $> +3.7$ s.
8. Fixed the "Lookup" command so that it works even if you have only a 4-digit grid entry in the CALLSIGN.TXT file.
9. Added a box labeled "Freq" on the "Setup | Options" page. This sets the active frequency band so that lunar Doppler and sky background temperatures can be calculated.
10. Implemented a long-awaited feature that permits direct-

ing the TX audio to the Left, Right, or Both channels of sound card output. This will please W8WN, N0UK, and WB5APD's dog, I believe.

11. Created a new EME message format for JT44 mode, based on the conventions used for other EME work. The messages read as follows for K1JT calling W8WN:

- 1. W8WN K1JT
- 2. W8WN K1JT OOOOOOOOOOOO
- 3. RORORORORORORORORORORO
- 4. RRRRRRRRRRRRRRRRRRRRRR
- 5. 73737373737373737373
- 6. CQ K1JT CQ K1JT K1JT

12. For non-EME uses of JT44 the following message formats are recommended, and are presently the defaults:

- 1. W8WN K1JT FN20
- 2. W8WN K1JT FN20 RRRRRRR
- 3. RRRRRRRRRRRRRRRRRRRRRR
- 4. 73737373737373737373
- 5 (blank)
- 6. CQ K1JT CQ K1JT K1JT

13. To take full advantage of the new formats, several kinds of message averaging are now provided. The first two were already available in v1.9.2. A single character at the right edge of the decoded line represents the average of the last four character positions of the 22-character message. The full-text average from multiple RX sequences appears in the smaller text window. Averages are also now provided of all of the odd-numbered character positions and all of the even-numbered character positions in the message. These will be very effective in decoding the "RORO...", "RRRR...", and "7373..." sequences. The resulting pair of characters appears just to the left of the "last-4-positions" character. If the WSJT system succeeds in syncing up on the other station, and he's sending you JT44 standard messages #3, 4, or 5, you will most likely see the message decoded correctly in these averages. The S/N advantage of the "odd" and "even" characters is on average about 5 dB better than for single characters in an arbitrary message.

14. Buttons labeled "Include" and "Exclude" have been added. The first will force the most recently decoded RX file to be included in the accumulating average, even if it did not exceed the specified "sync" limit, if the signal strength was greater than -32 dB. The Exclude button forces removal of the present RX file from the average, even if it has satisfied the Sync and strength limits.

15. A pop-up "Tool Tip" has been added so that if you hold the mouse pointer over the "To Radio" box, the full entry for that station in the CALLSIGN.TXT file will be displayed. (More precisely, this works for the callsign most recently looked up in the database.) Use this feature to look up the other station's name, state, email address, power output on each band, etc. Other Tool Tips have been added, too. Try holding the mouse pointer over most controls to see what they do.

16. When WSJT has properly synchronized to one of the other station's transmissions -- i.e., it has decoded a recognizable portion of the transmitted message -- you may

check the box labeled "Freeze" to tell the program it need not search the whole +/- 600 Hz range of DF in subsequent transmissions. The actual range may be set with the "Tol" parameter, similarly to its use in FSK441 mode. Among other advantages, this can help to combat birdies. Further enhancements of these features are planned.

17. New Shortcut Keys have been added for a number of menu items.

18. Solar and lunar coordinates have been checked and are believed to be accurate to within about 0.03 degrees. For the astronomically inclined, these are "topocentric" coordinates, including lunar perturbations. They do not include atmospheric refraction.

19. Values of Tsky come from a well-calibrated map of the full sky at 408 MHz with 1-degree resolution. The values are scaled to your specified frequency according to a frequency^(-2.6) power law. They are highly localized sky temperatures, and do not include the effect of an antenna's "averaging" over its full beamwidth and sidelobes.

20. The figure labeled "dB" is the additional path loss caused by increased distance when the Moon is more distant than at perigee.

21. "Dgrd" is an estimate of total S/N degradation caused by increased path loss and by Tsky being larger than a nominal minimum for the specified frequency. A default receiver noise temperature of 80 K has been assumed. The actual degradation will be different for every station, depending on many details of the antenna, RX feedline, and preamplifier.

22. The displayed Doppler shift is the two-way EME Doppler for your own echo. The correct value of shift for the other station, received at your station, will be slightly different. I am not yet sure about the accuracy of the Doppler shift as calculated, but will look into it further.

Please let me know of any problems you find with v1.9.4, and also of your successes with it.

-- 73, Joe, K1JT

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**From the reflectors:**

I have found the Dubus magazine to be one of the best sources of radio amateur microwave articles. Now I have found that many of the articles are available at: <http://www.marsport.demon.co.uk/archive.htm>

**73, Ken, W6GHV**

There is a wealth of data on microwave equipment at the Dubus Archives website (<http://www.mrs.bt.co.uk/dubus>) Here are some other webpages that have info and links you might find useful:

- <http://www.wa1mba.org> (our own list master's page)
  - [http://www.w1ghz.cx/10g/10g\\_home.htm](http://www.w1ghz.cx/10g/10g_home.htm) (Paul has just about everything there is about 10 GHz on his page)
  - <http://www.shfmicro.com/faq.htm>
  - <http://www.sonic.net/~n6gn/index.html>
- And for lots of parts and other info - <http://www.downeastmicrowave.com>

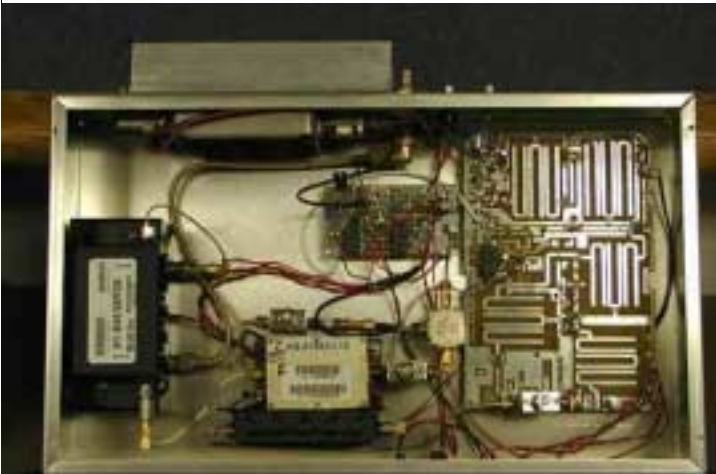
I hope this helps! It should keep you busy for a while. :-)

**73, Zack W9SZ**

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## Homebrew Night

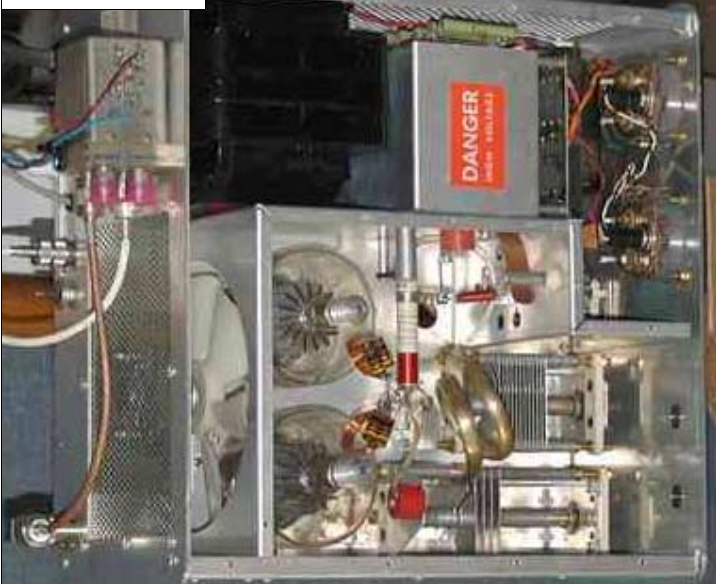
It was an evening that brought out the inventor, the craftsman, the dreamer, and the actor. Eight projects were displayed and detailed by their project managers, and with thanks to the judges panel, everyone received recognition. Some of the projects are pictured in this edition, others will be featured in subsequent editions. The 903 transverter by Paul, WA3GFZ, incorporated several pieces from kits, internet acquisitions and the "party favors" given out at the last 'rats microwave conference. It won the BEST DESIGN.



WA3GFZ-903 Transverter

The MOST INGENIOUS award went to N3NGE for his transformation of a Heathkit SB-220 into a full KW 6m linear amp. Some of the details included a series of coils that were attempted, but had too little "Q" until he arrived at the right dimension for some copper tubing that was silver-plated by hand, using the "Cool Tube" product. He was also able to reduce the stator and rotor plates of the tuning caps, and preserved the hardware spacers by replacing the removed items with a crimp ring from N connectors. After the final conversion and testing, getting 12db gain, (52w in

N3NGE 6mKW



CheeseBits

for 1Kw out) the original plate xfrmr blew, creating a rush order for a Peter Dahl replacement, which arrived a few days before the contest.



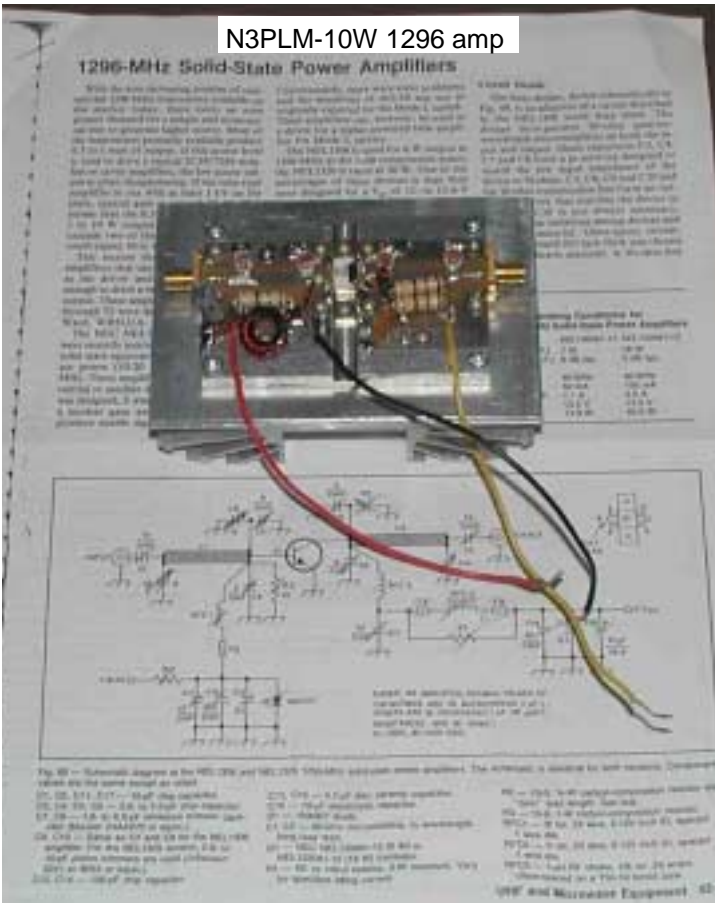
N3NGE 6mKW

Steve Kerns, N3FTI, a new applicant for membership, demonstrated his determination to have a big signal on 5 and 10GHz with a chassis full of transverter, amplifier, power supply and switching for these two bands, using a TWT common to both set-ups. DEMI kits were the transverter basics, along with DEMI LNAs. The TWTs were purchased from eBay and various surplus components added to round out a very impressive piece of construction, which won the judges attention for the BEST CONSTRUCTION.

N3FTI 5 & 10G amp, showing DEMI XVTRS and LNAs, TWT, PS







N3PLM-10W 1296 amp

“Doc,” W3GAD showed off his skills with a transceiver interface, rapidly constructed in that short window of opportunity between decision making and the January contest. Armed with a new IF rig, he quickly went to work to assemble the switching necessary to interface with his transverters in time for the contest, leaving enough energy to move the entire operating station from the attic to the basement, and erecting several new antennas in the process. He won the “Doc Cutler Memorial Award.”

A teaser of the newest JT44 software was also entered by Joe, K1JT. This newest addition to the WSJT software set is detailed on pages 6-7, and another article on using it will appear next month. Needless to say, the judges awarded him the BEST SOFTWARE award. Our awards chair, WA3GFZ will be busy. More pix from Homebrew Night next month.

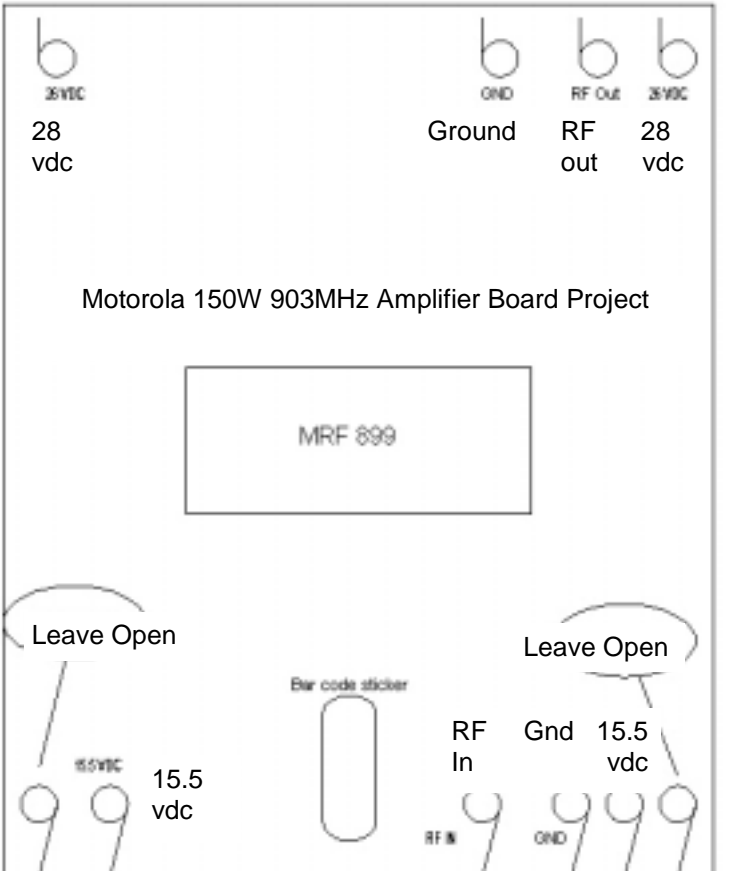


JT44 Screen-shots



The award for the MOST ECONOMICAL went to Chris, N3PLM for his “dollar-a-watt” 10W 1296 MHz amplifier, purchased as a kit at a swapfest, and put together according to the published ARRL Handbook design, highlighted in the background copy. After first assembly, he said it was the world’s finest oscillator. After a trip to W3RJW’s workbench, cleaning up the connections it was working according to spec.

I have now added the 903 150 watt amplifier board layout to my web site. **73, Randy, NR6CA** You can go to the following URL for pin out information:  
<http://www.usenergycontrols.com/905amp-150watt.jpg>



## January 2002 VHF SS Score Breakdowns

| SingleOp | 50     | 144    | 222    | 432    | 903  | 1.3  | 2.3  | 3.4  | 5.7 & up | Qs  | Gs  | Score   |
|----------|--------|--------|--------|--------|------|------|------|------|----------|-----|-----|---------|
| WA3NUF   | 168/28 | 255/31 | 102/18 | 110/23 | 33/7 | 50/8 | 22/3 | 12/2 | 22/6     | 774 | 126 | 205,002 |
| K1JT     | 262/46 | 221/33 | 97/20  | 129/21 | 19/4 | 7/2  |      |      |          | 735 | 126 | 130,914 |
| W3RJW    | 139/25 | 169/22 | 78/10  | 74/11  | 25/4 | 37/6 | 21/5 | 13/3 | 21/6     | 577 | 92  | 119,600 |
| N3EXA    | 145/20 | 233/18 | 95/13  | 102/17 | 38/7 | 51/8 | 25/3 | 2/1  |          | 691 | 87  | 116,928 |
| WA3DRC   | 85/13  | 131/18 | 59/6   | 90/15  | 23/6 | 43/8 | 25/6 | 17/6 | 2/1      | 475 | 79  | 89,270  |
| WA3GFZ   | 92/14  | 139/13 | 79/9   | 84/10  | 28/3 | 46/7 | 21/4 | 13/2 | 20/5     | 522 | 67  | 86,095  |
| AA3GN    | 58/10  | 203/25 | 68/13  | 38/7   | 30/7 | 38/6 | 24/4 | 13/3 | 2/1      | 474 | 76  | 80,332  |
| W3KM     | 70/12  | 109/15 | 85/14  | 79/12  | 33/7 | 36/6 | 15/3 | 9/2  | 2/1      | 438 | 72  | 71,352  |
| W3KJ     | 110/22 | 139/22 | 71/9   | 87/18  | 42/5 | 19/3 |      |      |          | 468 | 79  | 69,915  |
| AA2UK    | 69/22  | 127/25 | 45/13  | 52/17  | 12/2 | 19/5 | 9/4  | 3/1  |          | 336 | 89  | 54,290  |
| K3IPM    | 280/42 | 163/20 | 67/7   | 43/6   | 1/1  | 8/1  |      |      |          | 562 | 77  | 53,823  |
| WA2OMY   | 81/10  | 140/16 | 63/9   | 68/12  | 12/1 | 22/3 | 12/2 | 8/2  | 5/2      | 411 | 57  | 46,683  |
| K1DS/R   | 60/4   | 68/7   | 71/7   | 64/7   | 22/3 | 26/3 | 21/2 | 12/1 | 26/7     | 370 | 41  | 43,542  |
| KB3XG    | 44/9   | 37/6   | 35/6   | 36/5   | 21/4 | 24/5 | 21/4 | 14/3 | 20/7     | 252 | 49  | 41,307  |
| N3ITT    | 98/19  | 98/10  | 67/5   | 67/7   | 22/3 | 33/3 | 10/2 | 2/1  |          | 397 | 50  | 39,000  |
| N1XKT/R  | 70/3   | 77/7   | 69/6   | 61/5   | 20/3 | 25/3 | 18/2 | 11/1 | 26/7     | 377 | 37  | 37,999  |
| WA3EHD   | 112/13 | 124/14 | 62/7   | 60/7   | 16/2 | 25/2 | 11/2 | 2/1  |          | 412 | 48  | 35,904  |
| AA3RE    | 88/15  | 132/16 | 67/9   | 60/6   | 22/4 | 21/3 |      |      |          | 390 | 53  | 34,238  |
| W3OR     | 101/43 | 41/16  | 22/8   | 32/12  | 9/5  | 6/4  | 1/1  | 1/1  | 1/1      | 214 | 91  | 30,394  |
| K3MFI    | 89/10  | 125/8  | 71/8   | 64/8   | 21/2 | 4/2  |      |      |          | 374 | 38  | 22,800  |
| W3GAD    | 101/12 | 139/16 | 65/5   | 83/8   |      |      |      |      |          | 388 | 41  | 21,976  |
| W2SJ     | 44/5   | 58/4   | 42/3   | 39/3   | 20/3 | 31/3 | 18/2 | 8/1  | 9/2      | 269 | 26  | 19,448  |
| WA3RLT   | 75/9   | 89/12  | 42/6   | 52/7   | 21/4 | 1/1  |      |      |          | 280 | 39  | 17,316  |
| KU3A     | 16/3   | 127/16 | 47/9   | 52/7   | 17/4 |      |      |      |          | 259 | 39  | 15,951  |
| K3IUV    | 82/10  | 84/7   | 64/5   | 52/4   | 10/2 | 2/1  |      |      |          | 294 | 29  | 13,166  |
| W3KKN    | 66/7   | 61/6   | 40/3   | 16/4   | 12/2 | 21/2 | 12/2 |      |          | 228 | 26  | 12,142  |
| K3GNC    | 20/4   | 60/10  | 45/7   | 43/6   | 19/4 |      |      |      |          | 187 | 31  | 10,292  |
| W2UR     | 41/12  | 88/18  | 13/2   | 44/10  |      |      |      |      |          | 186 | 42  | 10,206  |
| W3SZ     | 100/22 | 6/2    | 22/7   | 16/6   | 5/1  |      |      |      |          | 149 | 38  | 9,880   |
| N3PLM    | 67/9   | 66/6   | 32/2   | 33/3   | 12/2 | 14/2 | 2/1  |      |          | 226 | 25  | 9,575   |
| K3DMA    | 67/7   | 94/8   | 52/3   | 44/2   | 14/2 |      |      |      |          | 271 | 22  | 8,998   |
| NE3I     | 50/5   | 67/9   | 40/6   | 40/5   | 13/1 |      |      |      |          | 210 | 26  | 8,554   |
| W3GXB    | 31/10  | 72/10  | 13/1   | 21/3   | 9/2  |      |      |      |          | 146 | 26  | 5,382   |
| K3JJZ    | 70/8   | 40/2   |        |        |      |      |      |      |          | 110 | 10  | 1,500   |
| N2DEQ    | 84/7   | 12/2   | 9/2    |        |      |      |      |      |          | 105 | 11  | 1,386   |
| WA3YUE   | 11/2   | 27/8   | 4/1    | 12/2   | 4/1  |      |      |      |          | 58  | 14  | 1,204   |
| NE3I/R   | 11/2   | 20/2   | 15/2   | 15/2   | 2/3  |      |      |      |          | 63  | 11  | 1,177   |
| W3HMU    | 43/7   | 6/1    | 23/2   |        |      |      |      |      |          | 72  | 10  | 950     |
| N3EMY/R  | 36/4   | 43/8   |        |        |      |      |      |      |          | 79  | 12  | 948     |
| K3IB     | 5/2    | 44/15  |        |        |      |      |      |      |          | 49  | 17  | 833     |
| KB3IB    | 22/5   | 14/3   | 7/1    | 6/2    |      |      |      |      |          | 49  | 11  | 682     |
| KB3GJT   | 1/1    | 25/2   | 3/2    |        |      |      |      |      |          | 29  | 5   | 160     |
| WR3P     | 3/2    | 11/2   | 2/1    |        |      |      |      |      |          | 16  | 5   | 145     |
| K3VEQ    | 42/3   |        |        |        |      |      |      |      |          | 42  | 3   | 126     |
| N3OZO/R  | 15/1   | 6/3    |        |        |      |      |      |      |          | 21  | 4   | 108     |
| KA3MGB   | 21/4   |        |        |        |      |      |      |      |          | 21  | 4   | 84      |
| N3EVV    | 4/1    | 2/1    |        |        |      |      |      |      |          | 6   | 2   | 48      |
| WA3AQA   | 16/1   |        |        |        |      |      |      |      |          | 16  | 1   | 32      |
|          |        |        |        |        |      |      |      |      |          |     |     |         |
| Multi-op | 50     | 144    | 222    | 432    | 903  | 1.3  | 2.3  | 3.4  | 5.7 & up | Qs  | Gs  | Score   |
| N3NGE    | 303/45 | 267/47 | 97/29  | 102/31 | 34/9 | 43/9 | 26/6 | 15/5 | 14/6     | 901 | 187 | 320,892 |
| W0RSJ    | 247/43 | 333/44 | 97/21  | 117/20 | 19/5 | 25/7 |      |      |          | 838 | 140 | 165,760 |
| K3EOD    | 131/17 | 137/19 | 51/6   | 61/9   | 19/4 | 22/5 | 3/2  |      |          | 424 | 62  | 42,160  |

SPRINTS (from p3) Microwave Sprint scoring is cumulative, total # of grids worked from each band activated multiplied by total # of stations worked in each band activated Reporting: Logs (paper, ASCII, xls) must be submitted no later than four weeks after the closing of each event. Only submitted logs are eligible for awards. Certificates for top three scores in each Sprint, Certificate for top three scores in Rover Category.

Questions ? Email [springsprints@etdxa.org](mailto:springsprints@etdxa.org) Submission of Logs: E-mail logs to : [springsprints@etdxa.org](mailto:springsprints@etdxa.org)  
 Paper Logs to: ETDXA / KG4ENR Jeff J Baker 8218 Foxworth Trail **Powell , TN 37849 USA**



Attached is a photo of the NR6CA tower. I even snuck a 3 element 10 meter in there. There are antennas for everything from 28 MHZ through 10 GHZ up there. A little tight but it was the best I could do. Only about 20 feet above the tower and 6 feet inside. There is a 20 foot piece of 2" schedule 80 (1/4" wall) and 6 foot of 6061 1 1/2" 1/8" wall at the top. NR6CA (CM97) will be operational on all bands through 10,368 in the very near future. All antennas are up and the cables into the shack and the attic, as appropriate. I just need to wire the different transverters up and bring the IF, switching and power supply wires into the shack. The IF radio will be an IC-706 MkII G except for 144 and 432. 144 will be my IC-746 and 432 will be my IC-841H. Here is a brief run down on the station:

- 50 MHZ, 100 watts all voice modes and CW - 3 element yagi
- 144 MHZ, 100 watts all voice modes and CW - 13 element yagi
- 222 MHZ, 25 watts all voice modes and CW - 8 element yagi
- 432 MHZ, 35 watts all voice modes and CW - 19 element yagi
- 903 MHZ, 50 watts all voice modes and CW - 33 element loop yagi
- 1296 MHZ, 35 watts all voice modes and CW - (2) 24 element loop yagis
- 2304 MHZ, 15 watts all voice modes and CW - 45 element loop yagi
- 3456 MHZ, 40+ watts all voice modes and CW - 76 element loop yagi
- 5760 MHZ (a few more weeks) 8 watts all voice modes and CW - horn antenna
- 10368 MHZ, 2 watts all voice modes and CW - small 17 DB horn

In the not too distant future I will build a 432 amplifier to get to the 80-100 watt level and add a remote preamp. 24 GHZ will not be too far behind either though it is planned only for mountain top operation. 47 GHZ is on the drawing board but a few months away, maybe this fall. Thought this might be of interest: this is one very few, if any, Pack Rats will get to see in person. **73, Randy, NR6CA**

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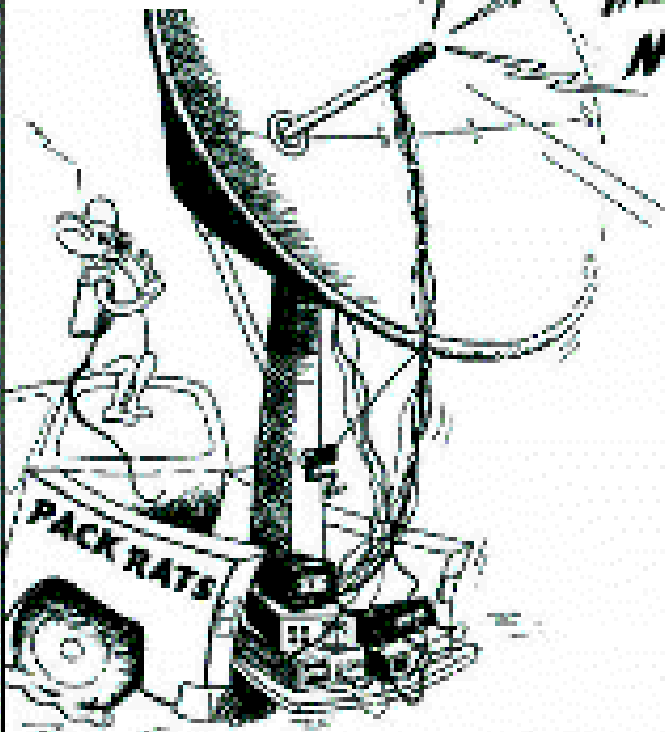
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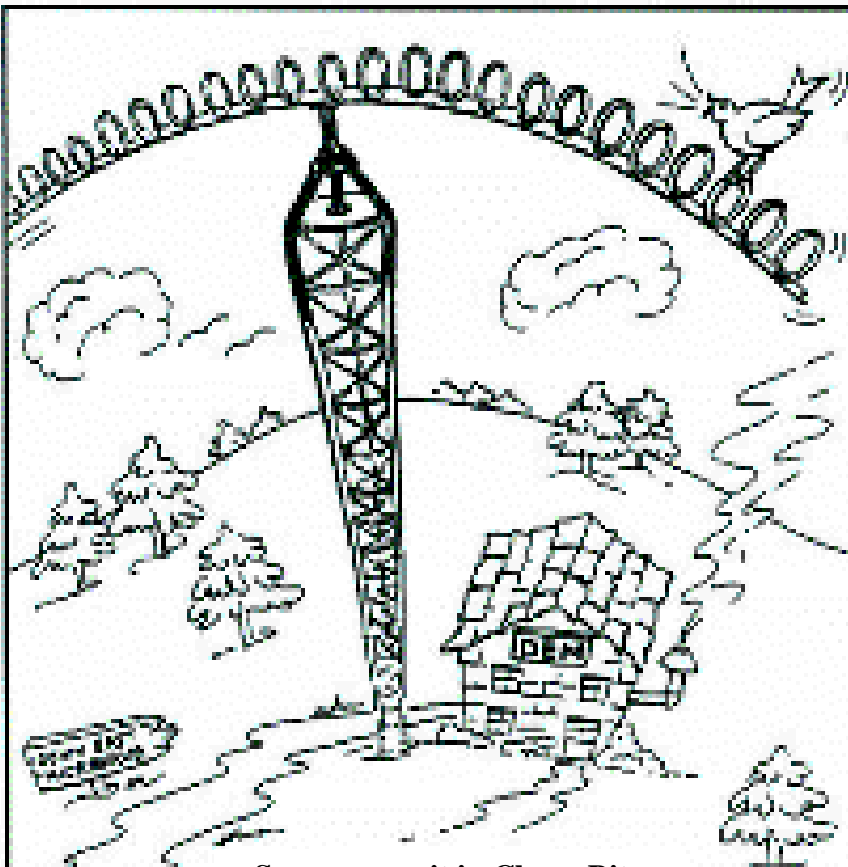
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