

# PACK RATS'



## PACK RATS

CLUB CALL: W3CCX

MT. AIRY VHF RADIO CLUB, INC.

# CHEESE BITS



MT. AIRY VHF RADIO CLUB., "THE PACK RATS", PHILADELPHIA, PA.

NET FREQUENCIES: 50.125, 144.150, 222.125, 224.58/222.98, 432.110, 903.100, 1296.100 MHz

AFFILIATED CLUB: AMERICAN RADIO RELAY LEAGUE

W3CCX

ARNS

Meetings: Third Thursday of each month at 8:00 PM  
Southampton Free Library, 947 E. Street Road  
Southampton, Pennsylvania 18966

SCANNED TO PDF BY BERT, K3IUV, 2013

VOLUME XXXV

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NUMBER 4

## THE PREZ SEZ

It is now April and time to think about Spring activities. Hamfests, Ladies Night, antenna work and the Spring Sprints. To be followed by the June VHF contest. The first order of business is to develop a list of nominees to run for various club offices. If you are interested in helping the club, consider running for one of the open positions and let the nominating committee know your intentions. Some of you may be asked to run and before saying no consider what you have to offer the club and where the club would be without people like you.

I hope everyone has survived the Blizzard of 1993. I am sure that some of you have had antenna damage. My mast which has been in service for seven years was bent in the January storm and now appears to be bent still more. I only had 24 antennas on it, so it's time to put up something bigger I guess. Just kidding but I will be upgrading the system when I replace the mast. If you have suffered damage don't be shy - ask for help and by all means put up some new antennas on new bands. Even if you don't have any equipment yet, get the antennas up now and you will have an incentive to get on a new band.

I like to make a list of improvements I want to make to the station, based on the January Contest results and then use the Hamfests to find gear to implement the improvements. So have fun this spring and don't forget to operate the Sprints.

73

William T. Murphy  
WØRSJ FN20JR

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DEADLINE FOR ARTICLES AND SWAP SHOP IS THE MONTHLY MEETING DATE. NON-COMMERCIAL SWAP SHOP ITEMS-FREE OF CHARGE.

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 (215) 355-5730

PACKRAT 222 MHz REPEATER - W3CCX/RPTR

222.98/224.58 MHz, Churchville, PA

OFFICERS: 1991-1992


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 WA3NUF, Phil Miguez (1 YRS)  
 N3EXA, Brian Taylor (2 YRS)  
 K3ESJ, Bill Jaxheimer (2 YRS)

MONDAY NIGHT NETS

TIME	FREQ.	NET CONTROL
7:30 PM	50.125 MHz	K3EOD
8:00 PM	144.150 MHz	W2EIF
8:30 PM	222.125 MHz	WB2YEH
8:30 PM	224.58R MHz	K3ACR
9:00 PM	432.110 MHz	WA3AXV
9:30 PM	1296.100 MHz	WA3NUF
10:00 PM	903.100 MHz	N3AOG

COMMITTEE CHAIRMEN

LADIES' NIGHT: WA3YUE 215-666-1558  
 JUNE CONTEST: N3CX 215-679-7293  
 HAMARAMA: K3EOD 215-742-3312  
 VHF CONFERENCE: KB3XG 215-270-3158



THE AMERICAN RADIO RELAY LEAGUE

**HUGH A. TURNBULL, W3ABC**  
 Director, Atlantic Division

**QST**

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**Lynne D. Whitsel**

209 Frog Hollow Road  
 Churchville, PA 18966  
 215 355-5730

Calendar of Coming Events -April 1993

- 3 Chestnut Ridge Radio Club Hamfest will be held at the Education Bldg, Saddle River Reformed Church in Saddle River, NJ. TI on 146.955/R
- 4 Palm Sunday
- 5 ARRL 144 MHz Spring Sprint (Monday evening) starting at 7-11 PM local time. See March QST, page 110 for rules. Results will be published in the NCJ.
- 6 Passover
- 9 Good Friday
- 10 Saturday Packrat Board of Directors Meeting at the Qth of Bill, WORSJ at 10 AM. All interested parties invited. Call 215-252-3956 for directions.
- 11 Easter
- 12 Physicist John Thompson demonstrated his discovery of a body smaller than the atom, a negative charged he called a corpuscle now known as an electron in 1897.
- 13 ARRL Spring 220 MHz Sprint (Tuesday evening) 7-11 local time. See March QST, page 110 for rules.
- 15 Packrat April general membership meeting at the Southampton Free Library at 8:00 PM. Bring and/or invite your on the air VHF buddies. All VHFers invited.
- 17 Packrat Ladies Night will be held at the Warrington Motor Lodge in Warrington, Pa. starting at 6:30 PM.
- 17-18 Trenton Computer Festival at Mercer County Community College, just north of Trenton NJ. This is the longest running computerfest in the world. Several sessions on amateur radio including no-code licence cram sessions and exams as well as a separate packet radio conference. VE exams will be held all day saturday.
- 21 ARRL Spring 432 MHz Sprint (Wednesday evening) 7-11 local time. See March QST, page 110 for rules.
- 22 Lyrids meteor shower peaks at 0309 UTC.
- 23-25 Dayton Hamvention. If you've never been there you've never seen anything like it. If you're looking to buy it or sell it or see it GO. There will be forums on AMSAT, the Prodigy Ham Radio BBS, UHF/VHF, NEC and lots more.
- 25 Italian engineer and inventor Guglielmo Marconi, inventor of the wireless telegraph and Nobel Prize winner, was born in 1874.
- May
- 1 ARRL 902, 1296, and 2304 MHz Spring Sprint Contest, 7-11 P.M.(Saturday Evening). These sprints will be held simultaneously. See March QST, page 110 for rules.

TID BITS:

The Northeast VHF News reports that the Northeast Weak-Signal Group is being formed. Questions on the groups should be made to Stan Hilinski, KA1ZE, at 203-872-6197(H) or 203-649-3258(W).

220 Notes is looking for new management. Active 222 MHz amateurs that are interested should contact Art Reis, K9XI or Walt Altus, AA9AW.

March QST's report of the ARRL board meeting indicates a rover category for all three VHF contests was recommended and approved and that proposals for a rover class in the UHF contest is near ready for CAC approval. Anyone have any knowledge of what the proposed rules will be?

The MARC Newsletter reports that a new company called "HAMSHOWS" headed by Mike, N7KQE, has been formed to produce ham radio conventions. The first one is scheduled to be held locally at Valley Forge, Pa. on August 21-22. Every amateur within 200 miles is scheduled to receive 3 mailings notifying them of the show. This may put quite a bit of pressure on local hamfests that are presently run by individual clubs or groups of clubs and provide the expenses to run clubs. MARC's newsletter notes that the Gloucester ARC's hamfest is on Aug 22, Delaware-Lehigh ARC's on Aug 15 and MARC's is on Aug 8.

March 93 QEX has a "No-Tune" driver for 432 MHz by Zach, KH6CP. It was designed to provide a no tune driver/amp to be used with the 432 MHz transverter described in the Sept 92 QST by Ed, KA9LNV. It uses a MAV-11 MMIC to drive a MRF 559 providing 15 to 17 watts out. Portable operation using batteries was a design goal so the amp uses a 9 volt regulator to insure operation when your batteries are low. Active biasing is used for the final which is relatively unusual. Microstrip construction is used to obtain the "no-tune" capability and std 1/16 inch G10 board is used. Full size artwork is provided.

The Motorola Impedance Matching program described in the March issue of Cheesebits can be obtained by calling the Motorola Literature Distribution Center at 1-800-441-2447. Ask for DK107/D. They will want your company name and likely your "title" when you request the disk (make it sound official - you are a designer if you use it for your ham designs).

Bill, K3ESJ, has a room available at Dayton for any Packrat. Call Bill at 215-822-0121.

Joe, N6CL's column in CQ reports that Jon Jones, N0QY, is the new VHF editor of NCJ starting the July-August issue. Joe also includes an explanation on the rover scoring submitted by 4 rovers of the Hampden ARC and how and why they were able to score in excess of 1.2 million points each in the January contest. Send your CAC rep any comments you may have for possible changes in rover rules. Joe also provides a mod for the Kenwood TS-680 to add a separate antenna terminal for 6 meters.

The "VHF/UHF DX Book" reviewed in the March issue of Cheesebits is now available from the ARRL. The price is \$35.00 plus \$5.00 postage. The UK publisher can provide it direct.

#### ARRL Advisory Committee Members

The April issue of QST, page 81, has a list of ARRL advisory committee members. For information and input on issues they are considering contact them. As you likely already know, the CAC now includes a VHF'er: Dave, KD5RO. The Atlantic Division members are:

CAC Adv Comm, Dave Halliday, KD5RO, 8747 Jabors Corner Road, Springwater, NY 14560.  
VHF/UHF Adv Comm, Robert Bennett, W3WCQ, 1006 Green Acre Rd., Towson, MD 21204.

#### Visitors to the March Meeting

N6JH, Jerry Hinshaw, Towson, Md  
K3BRS, Al Whiting, Lanham Md.  
N3FGG, Peter Ference, Quakertown, Pa.  
W3HAO, Dan McGovern, Holland, Pa.  
N3IJB, Bill Krimmel, Willow Grove, Pa.  
KE3HL, Ed Almay, North Wales, Pa.  
no call, Ara Babian, Southampton, Pa.

### SWAP SHOP

Send non commercial swap shop items to the editor.

**WANTED:** Hanging rotary motor with drive shaft. Contact: Charles, K3HSS at 215-342-4388.

**FOR SALE:** 3 10 ft tower sections, TH33, 20 element 2 meter beam, 3 element 6 meter beam, Ham 3 rotator, 10 thru 80 meter vertical and associated coax cables. \$250.00 for all. Contact: Paul, WB3HHO, at 215-632-5812.

**FOR SALE:** Tempo 2002 2 meter 2 KW Amp, \$700.00, 2 meter 4 way power divider, \$35.00, Larson 5/8 mobile antenna, \$5.00. Contact: Marty, WB2GEZ, 609-758-8865.

**WANTED:** Position as a local field service engineer or in house in cellular, telecommunications or bio-medical fields. Eleven years experience. AAS in electronics. Will supply complete resume. Contact: Marty, WB2GEZ, 609-758-8865.

**FOR SALE:** New Sinclair ST220-28A transverter with 28 MHz IF, 10 Watts out, NE251 GaAs Fet front end. 1 year warranty \$279.00. 2 water cooled jackets and gaskets with 3/8-16 internal threads for 2C39's (or 7289, etc.), \$20.00. Contact Bob Morton, VE3BFM, RD#1, Everett, Ontario, LOM 1J0 or call (705) 435-0689 in the evening.

**FOR SALE:** NA6E has kits available for N6CA 1296 PA's. A kit of 8 machined parts for the amp is \$150.00, A complete tested amp including a new 7289 and water jacket is \$279.00. Contact Bob at 474 Crystal Springs Road, Grants Pass, OR 97527 or call 503-471-3044.

**FOR SALE:** 432 2x 3CX800A7 Amplifier kits of all metalwork parts required including cabinet, front panel, tuning shafts, brackets, air inlet and outlet, plate stripline, tuning and loading flapper caps, etc. Anticipated price will be \$300 to 350. Contact Steve, K1FO, at 816 Summer Hill Road, Madison, CT 06443.

**FOR SALE:** Yaesu FT127RA 220 MHz synthesized 10 watt FM rig in mint condition, \$200.00. Kenwood RZ-1 AM/FM scanning receiver, 500 KHz to 950 MHz in mint condition, \$375.00. Tokyo Hi-Power 50-52 MHz base/mobile transceiver (SSB/CW) in mint condition, \$325.00. Call Harry Schools, KA3B, 215-468-1512.

**FOR SALE:** 5.7 GHz, 25 watt TWTA, -24v, 7 amp, fully metered, \$125.00. 5.7 to 6.3 GHz Microwave sources with internal oven, \$30.00. Various isolators and filters for 5.7 GHz, 2 ft. GG214 cables with N conn, 6x8xi in and 3x8xi in sealed boxes and 15 dB, 1watt coax attenuators with N connectors. Call Pat, WB3DNI at 215-672-5289.

### COMMERCIAL AD

**LOOP YAGIS:** 902 MHz 33 element \$89 kit, \$109 assembled and tested. 1296 MHz 45 element, \$89 kit, \$109 assembled and tested. 1296 MHz 55 element "Sooper Looper" \$99 kit, \$124 assembled and tested. 2304 MHz 45 element \$75 kit, \$89 assembled and tested. Also available: element and hardware kits for the above. 2 and 4-way power dividers. Discount on complete arrays. Solid State Linear Power Amps, 13 VDC: 1296 - 8W in 35W out \$315, 1W in 20W out \$265, 4W in 70W out \$695. GaAs FET Preamps: 903 MHz .8dB NF \$90, 1296 MHz .8 dB, 2304 MHz 1 dB max NF \$140. SHF SYSTEMS No-tune Transverter kits, w/144 MHz IF now available for 903 through 3456 MHz. Write or call for complete catalog. **DOWN EAST MICROWAVE**, Bill Olson, W3HQT, Box 2301 RR-1, Troy, Maine. For information and orders telephone (207) 948-3741.

### PRELIMINARY SCORES -JAN SWEEPSTAKES

Some of the submitted scores for the Unlimited Category for the Jan VHF Sweepstakes are as follows:

Hampden Co. RA	approx. 6,000,000
Rochester VHF Group	2,581,000
Mt. Airy VHF Radio Club	2,057,340

## "Intermodulation Distortion"

By Dave Hackford, N3CX

This is a brief explanation of what this term means to a novice/tech beginner. In a linear amplifier, the output signal should be an exact replica of the input signal. The intelligence is contained in the amplitude variations in the signal. It is most important that the linear amplifier amplifies the information with as little distortion as possible. This distortion occurs when the output signal levels are not proportional to the driving signal. Our human voice is made of many frequencies in a complex waveform and if the linear amplifier can't reproduce these frequencies correctly, we become a little unpopular with broad "cottony" fuzzy reproductions of the original voice signal. All this unpopularity seems to occur during the contests when all of the signals are on. Here are some things to think about:

1. Please don't overdrive your amplifier (Note that the term amplifier does not just refer to an external power amp - it's also the amplifier stages in your driving transceiver and your transverter). All high power tubes are rated with an IMD specification. A lot of the amplifiers people use are tetrodes such as 4X150/4CX250B/8930 series. These tubes are rated at IMD levels in the order of -25dB. This is a good number for a tetrode if all operating parameters are followed such as drive level, screen voltage, plate voltage, and idling current. Transistor amps are a different breed and will be described later.
2. Ask any of your local buddies to listen to your signal. Make sure he has a good transverter front end with a high dynamic range. Ask him to listen to your signal's bandwidth. A lot of times if you are listening to someone breathing in and out while they're talking to you and you hear a crackling sound something is not linear.
3. Remember that your power output meter should read a maximum of about 25% to 30% of your total power output. Meters cannot respond to rapid changes of voice modulation. Don't overdrive your amplifier and use ALC with your amplifier. Turning your microphone gain down will help if you don't have an ALC connection.
4. Selection of a good linear amplifier power tube is the best direction to making a good start when building a good linear power amplifier.
5. IMD specifications are expressed in decibels below the rated output power of the tube. A spec of -25 dB is not bad at all for the 3rd order IMD products but that value goes to hell if you overdrive your amplifier. The tube data sheets should be consulted for the correct operating parameters.
6. What about the solid state amplifiers that a lot of the guys are using??? These amps are linear to a point. Remember to use heavy leads to hook up the amplifier to the power supply. A little drop in supply voltage to the amp can cause the IMD to skyrocket. Use #12 or #10 stranded wire. Think about the how the voltage drop across the power supply leads to your amp will change when the collector idling current of 250 ma. goes to a peak current is 20 amp or more. This change to the voltage at the collector of your amp final transistor (and drivers) is going to cause the output power to sag. Just because a manufacturer of an amp puts 10 watts in for 150 watts out doesn't mean it's linear power. It's only linear to a point.
7. Using 2 power meters to check for the compression point in your amplifier (tube or solid state). Put a power meter on the input to the amp and one on the output and plot the input/output response. Measure 10 points or more and look for the point where the output doesn't increase for an increase in drive. Plot the data and observe the point where the curve of output power does not continue in a straight line. A 1 dB increase of input should result in a 1 dB increase of output. The value where the output drops by 1 dB from the straight line curve of output vs input is referred to as the 1 dB compression point. You should avoid operating your amplifier above this point. If you take data until the amp driven into saturation, don't be surprised if you find that the 1 dB compression point is only 80% of the amps rated output power by the manufacturer (Ed note: See the homebrew night's list of projects where Dave's 222 MHz amps are run linear at a level much below their saturated capacity).
8. Also remember that your receiving system should have a high dynamic range before you go around pointing fingers at the someone for having a dirty (high IMD) signal. Your preamp, receive converter, and receiver should not suffer from IMD. Most GaAs Fet preamps

## "Intermodulation Distortion" Contd.

are good but overdrive from your preamp or your receive converter can overdrive your receiver (this is why you're seeing more high level mixers in receive converters). Paul, WB3JYO, has published many good transverter designs over the past few years. Paul is a perfectionist and has done a good job in testing his designs.

Just remember that it's your responsibility to have a clean signal on the bands and to know that our gear is running correctly is a feather in our cap. Ask your "Elmer" to help you out.

### 1993 VHF SWEEPSTAKES TEAM COMPETITION RESULTS

By Phil, WA3NUF

To add a little internal competition to the club's efforts for the 1993 VHF Sweepstakes, the club membership was again divided into 5 separate teams. Each team was closely matched in potential based upon their previous scores in the contest. Bonuses were given for 100% participation, the addition of non-active members, and the addition of new bands by members. The results are:

TEAM	RAW SCORE	100% PARTICIPATION		NEW BAND		TOTAL SCORE
		BONUS	NON-ACTIVE MEMBER BONUS	BONUS		
#3	578,704	0	10,000	4,000		592,704
#2	433,625	0	5,000	2,000		440,625
#4	423,311	0	10,000	3,000		436,311
#1	353,263	0	10,000	6,000		369,263
#5	318,437	10,000	0	2,000		330,437

Congratulations to the members of winning team #3: K3ESJ, K3BPP, WA3NFV, W0RSJ, WB2ONA, W3IIT, WB3HHO, N3EXA, WA3OMY, W3GAD, N3BB1, WA3IAC, WA3EHD, KB3XG, AK3O, AND WD5BRP.

### Let's Build a High Performance 222 MHz Transverter

By Dave Hackford, N3CX

#### Part 3, Low level 222 TX stages and 10 watt Final Amplifier.

Hello again! I hope everyone made it through the big snow of March 93 - Hi! First, I thank Paul, WB3JYO for checking the low level stage for IMD. The schematic for this part should allow you to construct the stages using the "dead bug" method. All spurious signals should be more than 50 dB down at the 1 watt level of the SD1520 driver. With -2 dBm drive to the mixer, you should get 1 watt output. The 10 watt SDS1274 amp will require approximately. 800 mw of drive.

The output amplifier schematic and pc board layout is not included since it is as published in the August issue of QST by Dave, WA3JUF. What I did was to use the "scotch tape" method of making a pc board. I cut out just the amplifier board pattern from the article on a small piece of G10 board. The output stage is biased class AB with about 250 ma. and required 1.3 amps to get to the 10 watt level.

I hope to hear you on 222 MHz low end and drop me a line if you have any questions.

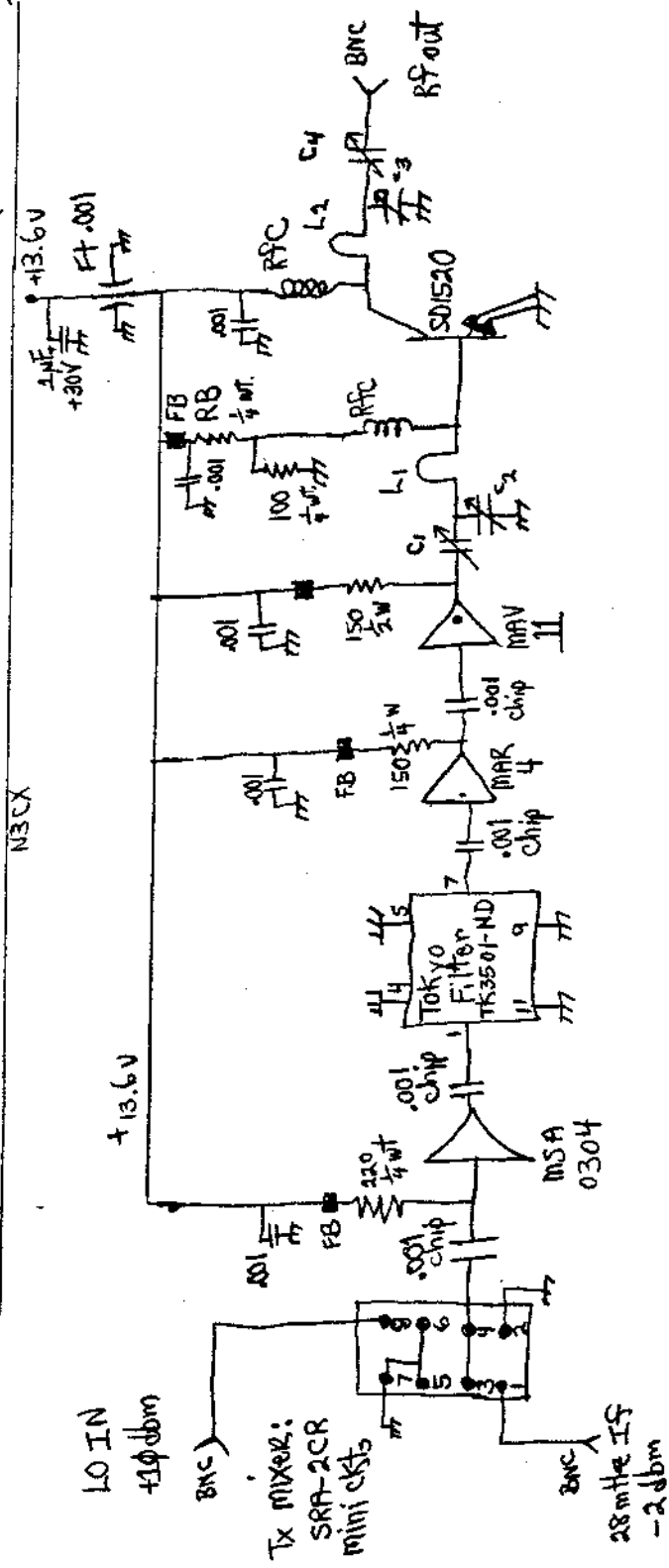
73 and listen for the weak ones.

Dave, N3CX

### World Above 50 MHz Standings

How come more of the Packrats are not listed in the standings listings in QST? I'm sure that many of you have a lot more grids and states than some of the listings in QST. Don't know what is the criteria?, don't have the forms?, haven't gotten around to it? The form is enclosed in this issue of Cheesebits-use it to let others what you've done.

222 MHz TX MIXER & Low Level RF Section - 1 Watt (IMD > -35dbm)



RB: Bias SO1520 on ext  
45 To 60ma. Ht sink  
Required. RB 1200 To 1800Ω

RFC - 4T #22/16 Drill  
L1, L2 - 1T #20, 1/4" ID  
C1, C2, - 15 To 60PF Trimmer (Aeco 405)  
C3, C4 - 40 To 120PF Trimmer (Aeco 406)



## HOME BREW NIGHT RESULTS

Ham Radio home brewing continues to be a well practiced art as was demonstrated by many fine examples at our annual Home Brew Night at the March meeting. The winners in each category and a short description of the projects presented are as follows:

<u>Category</u>	<u>Winner</u>
Best Construction	N2SB
Best Design	N3AOG
Most Ambitious	N3CX
Most Unusual	N3EVV

<u>Call</u>	<u>Home Brew Projects</u>
N3CX	Two separate 222 MHz Transverters. See Cheesebits for write-ups. Both use high level mixers and have 28 MHz if's, One has 10 watts out linearly and 20 watts saturated using a SD1278, W1JR oscillator, MGF1302 preamp and TOKO helical filters. The second uses a hybrid module for power with 26 watts out when operated linearly and 32 watts out saturated.
N2SB	5760 MHz Transverter using only hamfest parts. Total cost under \$100.00. 432 MHz if and +34 dBm output. Uses W/G filters, adapters, circulators and a WB5LUA preamp.
WA3JUF	Two meter IF/Attenuator for interfacing high power rigs with transverters. 5700 MHz HB transmit active mixer. Uses a GaAs fet with 30 to 40 mw of LO power and a 2 M IF for 1 mw output.
N3AOG	Homebrew Waveguide for 5760 MHz. To reduce transmission line losses of 15+ dB using Belden 9913 coax, 80 ft. of homebrew waveguide using 1x2 inch aluminum tubing was constructed. Homebrew transitions between 20 ft. sections was used to avoid flexing problems. Total loss lowered to approx. 4 dB. More details in an upcoming Cheesebits article or conference paper.
KB3XG	Dual 222 MHz and 432 MHz Transverters using DEM 903 no tune boards as the basic board. 144 MHz Transverter using a DEM 903 no tune board as the basic board. IF Switch using a passive power splitter on transmit and a multi throw coax switch for receive. 80 dB of transmit to receive isolation provided.
WA3AQA	903 MHz NE720 GaAsFET Preamp.
WA2OMY	Packaged WA3JUF Power Amp for 60 watts output. 432 Power Amp using a Motorola MRF163 FET for 20 watts output saturated. 432 Driver Amp using two fet stages. 0 dBm input for 1 watt output.
WA3JYO	432 MHz Transverter using DEM no tune 432 boards modified to use a +17 dBm LO input high level surface mount mixer. Also eliminated one stage of receiver gain to reduce overload potential. Uses a 5 watt brick power amp. 903 MHz Transverter version of the DEM 903 MHz no tune design but constructed using "dead bug" techniques. Uses UT141 coax filters and a Thompson 903 MHz brick amp.
N3EVV	DC supply for a cavity amplifier. Phase locked oscillator with 5 kHz steps for use in a radio controlled model airplane telemetry transmitter.
KE3HL	6 meter FM rig (transmitter section so far). Uses a Motorola MC145158 serial input synthesizer chip and MC1648 VCO on a single HOMEBREW pc board. A 2 watt MRF 229 output driver and 40 watt MRF244 amp will be integrated into the transmit section later.



# World Above 50 MHz

## VHF/UHF/Microwave Standings Boxes Report Form

Call \_\_\_\_\_

Name \_\_\_\_\_

Date \_\_\_\_\_

Address \_\_\_\_\_

Grid (to six characters if known)

\_\_\_\_\_

\_\_\_\_\_

Use this form for updating World Above 50 MHz Standings Boxes. Six Meter DX Standings and EME Annals have separate reporting forms. Totals need not be confirmed by QSL cards, but confirmations are necessary for WAS, DXCC, and WAC awards. Send your update at least once a year to World Above 50 MHz, Box 100, Lebanon, CT 06249 USA, to insure listing.

Band (Non-US allocations may differ)	US States	DXCC Countries	Call Areas	Grids	WAS ?	WAC ?	EME Used?	Best non-EME DX (In km)
2 meters (144-148 MHz)								
125 cm (222-225 MHz)								
70 cm (420-450 MHz)								
33 cm (902-928 MHz)								
23 cm (1.240-1.300 GHz)								
13 cm (2.300-2.310 & 2.390-2.450 GHz)								
9 cm (3.300-3.500 GHz)								
5 cm (5.650-5.925 GHz)								
3 cm (10.000-10.500 GHz)								
1.25 cm (24.000-24.250 GHz)								
0.6 cm (47.000-47.200 GHz)								

Call areas are: VE call areas + US call areas + XE call areas + KH6 + KL7 + additional DXCC countries.  
 Km = miles × 1.609.

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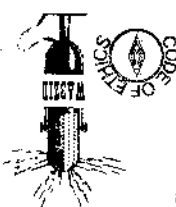
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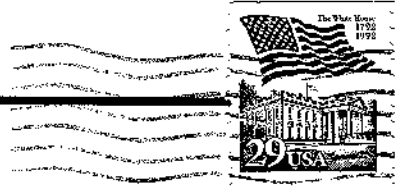
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