



CHEESE BITS

W3CCX
CLUB MEMORIAL CALL

ARRL
Affiliated
Club



Volume LI

April 2010

Number 4

PREZ SEZ:

Lenny asked me a few days ago if I had anything to say this month for the front page.

This last month has given me a giant pause to

consider the world around me. The logical place to start was the FUNK & WAGNALLS STANDARD COLLEGE DICTIONARY published by Readers Digest in 1966 to clarify a few key words such as:

AMATEUR – 1. *One who practices an art or science for his own pleasure, rather than as a profession...*

FRATERNITY – 1. *The state of being brothers: also, the quality or spirit of fraternal regard or affection. ... 4. A body of people sharing the same interest, profession, etc.: the medical fraternity.*

Needless to say I have seen the **fraternity** of **amateur** radio respond overwhelmingly to the news of my brief encounter with an attacker and the subsequent extensive head injuries. There is not enough space to list all those who sent cards and e-mails of sympathy and wishes for a speedy recovery, or those that have offered and given a wide variety of assistance. What is even more amazing is just how far into my past the news has traveled and brought very old acquaintances and business associations into the foreground of concern.

Needless to say I am recovering slowly but I am on the air from home and getting a chance to do some of the bulky projects. Sorting junk from good stuff in the shack, putting things away and making room to

do the repairs to the station for the next contest when my vision improves. I will continue to relish the response from each and every member of the PACKRATS, Warminster ARC and ARRL leadership with a heart felt thank you for the fraternity of Amateur Radio.

The PACKRATS have a lot happening in the immediate future. First Phil WA3NUF and his crew have begun to post the equipment from Ernie Kenas' estate on the PACKRAT web page. All postings are open to PACKSRATS only for a short time. After the General meeting this month anything currently posted will be offered to the entire Amateur radio community via an assortment of reflector postings. A lot of the little goodies have been set aside for the Mario Table and the White Elephant Sale in July. All future offerings of equipment will be posted with a short response window before being added to the "open list" so keep an eye on your e-mail and the web page.

Bert K3IUUV and Ron W3RJW have done a terrific job putting together another piece of PACKRATS history with a posting of the Rodantha, N.C 1296 DX-pedition. If your memory allows please let Bert know of any additions you may contribute.

We have begun the process of planning the 2010/2011 reorganization of the PACKRATS BOARD OF DIRECTORS. All positions are open so please consider how you may contribute to the leadership of this terrific "club". The nominating committee is being headed by Phil Theis, K3TUF so let him know you are available as a director or other position. Elections will be held at the June

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222.98/224.58 MHz (PL 136.5) Hilltown, PA

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PACKRAT BEACONS - W3CCX/B

FM29jw Philadelphia, PA
50.080 144.284 222.064 432.286 903.072 1296.245 MHz
2304.043 3456.207 5763.196 10,368.062 MHz (as of 1/08)

MONDAY NIGHT NETS

TIME	FREQUENCY	NET CONTROL
7:30 PM	50.145 MHz	K3EOD FM29II
8:00 PM	144.150 MHz	N3ITT FN20kl
8:30 PM	222.125 MHz	K3TUF FN10we
8:30 PM	224.58R MHz	W3GXB FN20jm
9:00 PM	432.110 MHz	WA3EHD FN20kd
9:30 PM	1296.100 MHz	K3TUF FN10we
10:00 PM	903.125 MHz	W2SJ FM29LW

Visit the Mt Airy VHF Radio Club at: www.packratvhf.com or www.w3ccx.com

meeting at the Senior Center along with a follow-up report on the June Contest efforts.

Preparation is under way for the big effort in June at Big Pocono State Park (CAMELBACK). Phil, K3TUF; Rick, K1DS; and Al, N3ITT are again leading the effort. We are looking forward to more 6 meter enhancement; smooth, failure free operations and a new batch of rovers to help add those valuable grids on the upper frequencies. We need crews for setup on Friday, tear down on Monday and lots of operators to keep key stations on the air through Saturday night.



We are also actively supporting the TRENTON COMPUTER FEST/NEW JERSEY STATE ARRL CONVENTION the week end of 24 April in Ewing New Jersey. Lenny, W2BVH is seeking help tending to the needs of the vendors for the 2 day event. We need 5 or 6 people each morning to get the vendors to their sites and a few to deal with other issues through out each day. Sharing the work load allows everyone to enjoy their day at the fest.

Several PACKRATS are headed North for the N.E.W.S. CONFERENCE on 16 April. We are looking forward to a stop at ARRL HQ and possibly working the EME station from Arecibo, PR. That will be very exciting for me.

One thing about Amateur Radio is that there is never a lack of new things to learn and Weak Signal Operations is just a small part of that huge menu of options.. Remember we are the Mount Airy VHF Radio Club and we:

“Listen for the weak ones”
de **Doc Whitticar** W3GAD

Editors Column

Our next meeting will be at the Ben Wilson Senior Center, 580 Delmont Avenue, Warminster PA., on April 15, 2010. The meeting starts at 7:30 pm with a pre-meeting dinner around 6:00 pm at Giuseppe's Pizza 1523 West Street Road (at the shopping center diagonally across from our meeting site). The Packrats usually are in the back dining room.

We will have our **Annual Awards Night** combined with a special presentation by **Sean Kutzo KX9X** from the Contest Branch of the ARRL along with other regional executives from the League. We will also be presenting the **PACKRAT OF THE YEAR** and **THE MARIO FONTANA TECHNICAL ACHIEVEMENT** awards. **Everyone** will be recognized for their contesting efforts in support of the PACKRATS during the 2009 Contest season. Come on down (guests are always welcome too!).

Enjoy this month's Cheese Bits! 73, **Lenny W2BVH**

Converting Surplus S-Band MMDS Equipment to 2304 MHz — PART I

Technical work by **WA2OMY, WA3YUE**

Edited by **K1DS, WA3DRC**

It all started about a year ago (April 10,2009) with an email from Dan WA3NFV to Dave W3KM as follows:

"I'm in Washington throwing 2 GHz 200-700 Watt amplifiers out by the basket, boy does it hurt! All solid state, too! Only 12 years old, with little use. I'm trying to find some hams in that area to come pick-up before the dumpster gets taken away. 115 VAC power, Power output meter on front panel, with reflected power. Built-in phase locked upconverter from 50 MHz."

After some quick organization and a couple of trips down to Maryland, the club found itself with a nice pile of S-Band MMDS transmitters (most, around 45-50 W, a few others much higher power) and matching receivers. They were designed for analog TV (with video and audio carriers) and data transmission (64 QAM). They are by ITS Corporation and are parts of either the model 5574 or model 1750A systems. Many members bought one for not much more than the cost of retrieving them. Both are very rugged, well built, very linear and relatively easy to convert to a 2304 transverter. In fact the only possible negative thing to say about them is that they are rather large, taking perhaps 10" of rack space.

What follows is the first installment of info on how to make one of these beasts into a fine 2304 transverter. If you didn't get one of these, be aware that they come up for auction from time to time on a well known internet site, often at quite reasonable prices. This article can also serve as a specific example of how to approach conversion of any similar MMDS S-Band RX/TX.

Thanks to all the Packrats who worked to obtain and convert these boxes!

--Ed.

Read this entire conversion paper over carefully and inspect your hardware to insure familiarity with the various components before starting. In order to complete this transformation, you will likely need your usual tools, soldering iron and solder wick for removing excess solder and unneeded components. You should also have a digital voltmeter that has a millivolt scale, a microwave power meter, and a spectrum analyzer available for certain of the tuning procedures.

- SMA wrench for all the SMA connectors.
- Small tie wraps
- Connectors desired for station interface
- Male SMA connectors for .141 hardline
- T-R relay (SMA type or N that is good for this frequency). If the relay has a 24-28VDC coil, you will need some additional components to drive the relay closure. In this version, the TCK kit (\$35) from DEMI is used as the transverter controller and can provide the 28 VDC needed for the T-R relay closure.
- Buy a crystal for LO frequency desired (see below). Multiplied crystal, available from International crystal. ICM has xtal cataloged under ITS Transmitter
- If using 1750A- will need to find a preamp

Take a good look at all the components before starting. Have a big sturdy work area and boxes and bins for collection of the removed and re-useable components, mounting standoffs and screws. This is a systematic conversion and various steps will require testing as you go along, so don't try to do all the mechanical conversion and then attempt all the tuning at the end. The cover screws turn 90 degrees to unlock them. Conversion of these units does not have to follow any particular order. The instructions and sequence offered here is suggested based on work completed on a couple of units.

Surplus S band Microwave
Multi-point Distribution
System equipment



Analog Version 1750A

Used for wireless cable
TV and data transmission



Digital Version 5574

Highlights

- 5574 Designed for 64 QAM modulation with Feedforward high power amplifiers
- 1750A used for Analog TV with video and audio carriers.
- Units are translators, have most required components to convert to a transverter
- Crystal based LO, PLL has programming switches.
- 50W in one box
- Modular / Discrete construction, can be modified, parts replaced.
- Modification requires some electronic knowledge, solder, hand tools, test equipment, etc.
- Transmit Units are large and rack mount. 8 3/4" high - 5U. Receive are 1U

Primary Steps

- Change LO to new frequency
- Mechanical modifications
- Install TR control
- Tune amplifiers to 2304
- Install receive components

Initial check out:

Upon receiving the unit, you may want to check out the layout and familiarize yourself with the various modules. Verify that it works before changes are made and wires are cut. After looking over the inside and under the chassis for loose hardware or obvious problems, connect an AC line cord to the back of the unit.

When the power switch is thrown on the rear panel, the fan should come on, and some LED's should light on the front panel. For now verify the operate standby switch is in the yellow standby state. If it's not press standby. Look inside the chassis and verify all the green LED's are lit on the power supply in the left rear corner (as viewed from the front). The fan should be running, if not do not leave the unit in operate very long, too much heat will be generated with the cover off!

If everything appears ok, press the operate switch on the front panel, and verify all the LED's go green on the bias control board for the power amplifiers. If one or two do not go on, it does not indicate disaster, it may be ok.

If desired, the bias current can now be checked for each of the power FET's. There are 7 LED's and 7 0.2 ohm resistors on standoff's near the LED on the same bias control board. Measure and note the voltage drop across each resistor, it should be about 0.24 V DC. This value may have drifted over time, for now just note the voltage, if the voltage is too low- ?? the LED will not light for that FET. There are 5 FET's in the power amp and 1 each in the two driver amps.

Disassembling the Receive chassis

If you have the receiver chassis (the 1U high unit), you can remove all of the components and mount the appropriate ones needed to make a 2304 receiver into the larger transmit chassis and cabinet. There's plenty of extra room in the transmit (5U high chassis) to do this). Start by removing all the boards, saving all connectors and cables. Do not cut anything, except the cable ty-wraps. Save all parts in a bin. The chassis can go into your recycling pile and will not be used further. The power supply will not be used either. But it has nice components to use in other projects (we're packrats right?). Keep all of the SMA attenuators connected to their components for future use and **do not** separate them from where they were originally installed. Mark the filter (the part that follows the 2-stage LNA) input and output jacks with a Sharpie before removing. Put aside all of the parts for use later.

Opening the Transmitter

Take the top cover off of the larger (5U high) transmit box, exposing the top chassis and its components. This top chassis has components mounted on its underside that need to be used and they need to be protected against damage when you drill any mounting holes from the top to mount the receive and (Demi) T-R control boards. Using a thin marker pen, outline the dimensions of the underside components on the top side so that any future drilling does not enter into these areas. Leave the Jones barrier voltage terminal strip intact on the top front of the board and remove all other items from the top of the board. Remove all the power plugs from the existing boards. You may carefully cut many ty-wraps. Save the small coaxial (orange-brown) coax for the IF connection and the heavy black wire for a 10MHz reference (if used). Note the 10 MHz reference is not required.

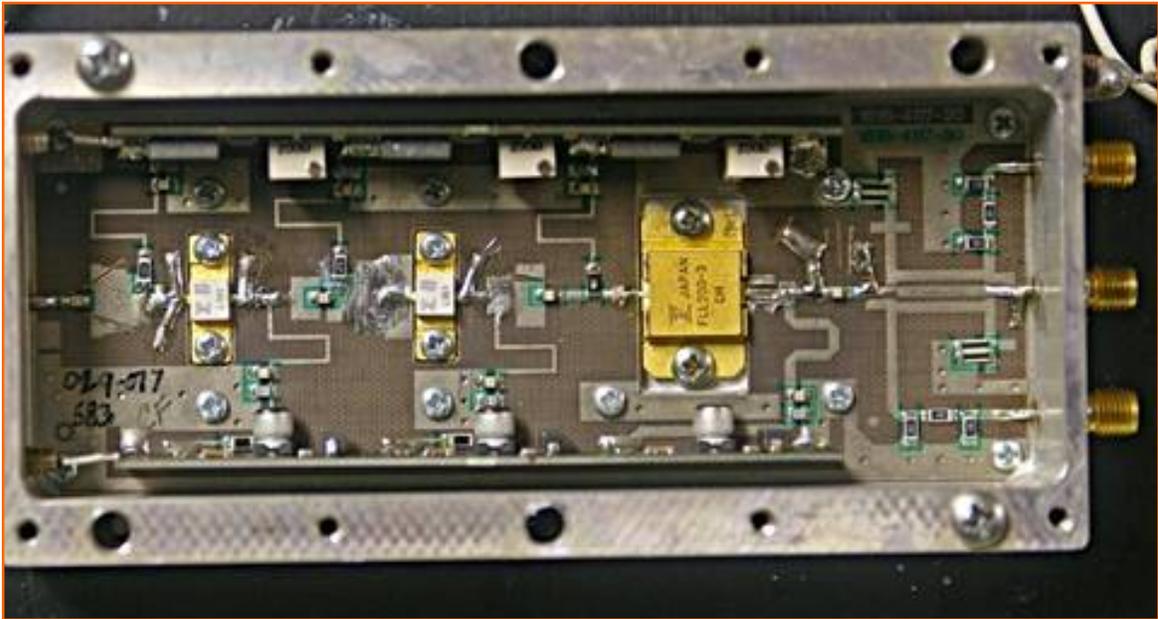
Do not remove the VHF Generator board or LO box from the underside of the top tray.

On the lower transmit chassis, using a small SMA (5/16") wrench you can disconnect many of the RF mini-hardline cables to make work in this area easier and make components more accessible. Disconnect the cables from the small central box, the amplifier modules and the center front box. Disconnect the SMA connector from the dual peak board on the right wall and clip the ty-wraps that will free this line when the amplifier modules and heatsink are removed. You can remove the board on the rear that has computer connectors right underneath the fan. The circulator can be removed and saved for repositioning with the new output line and T-R relay. There is a center front board that can be removed also as it is not used in this modification. Use a nutdriver on this board for removal.

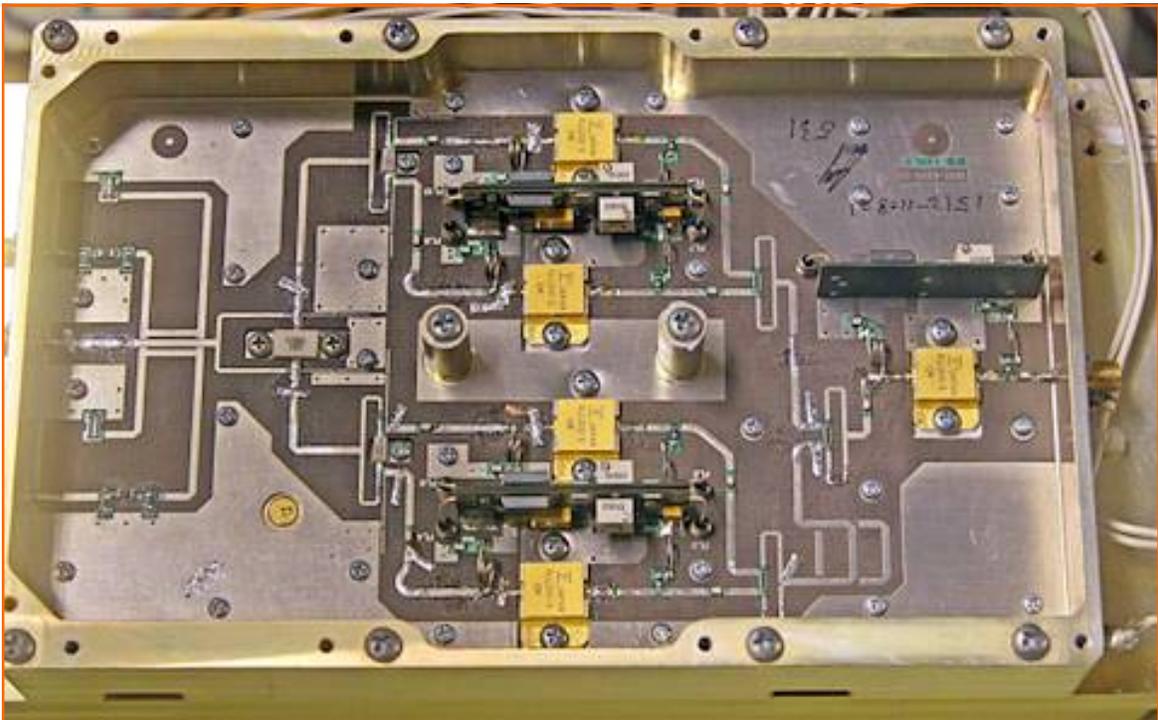
The amplifier modules need to be snowflaked (tuned) to optimize their match / output. This is best accomplished by removing the entire heatsink chassis assembly from the case with the amplifier boards, intact on the heatsink. Gary, WA2OMY has a tuning procedure with power and jumpers available and can do the snowflaking of the amps under the proper microscope magnification on his bench.

In order to remove the heat sink and amplifier module assembly, first disconnect the SMA hard line connectors and the flexible mini-coax SMA cables. **DO NOT CUT ANYTHING.** Remove the four large power plugs from the Bias protection board, **making sure to mark where each came from.** Remove the large bottom cover of the entire transmitter box by turning the retainer screws 90 degrees, Remove the four corner screws from the bottom that hold the heatsink module in place. Things should be loose now and the module can be lifted out through the top by lifting the rear part closest to the fan upward first. There will be two 10W 3 stage amps and one 50W amp on the heatsink. One of the 10W amps will be removed as it is not needed.

If you've tuned amplifiers before, here are a couple of pictures that will give you an idea of what pieces of extra copper foil need to be added to tune the amplifier module to 2304 MHz.



Snowflake (tuning) map for 10 W module. If in doubt, consult Gary WA2OMY for additional guidance. (Higher resolution pix are available from the Editor)

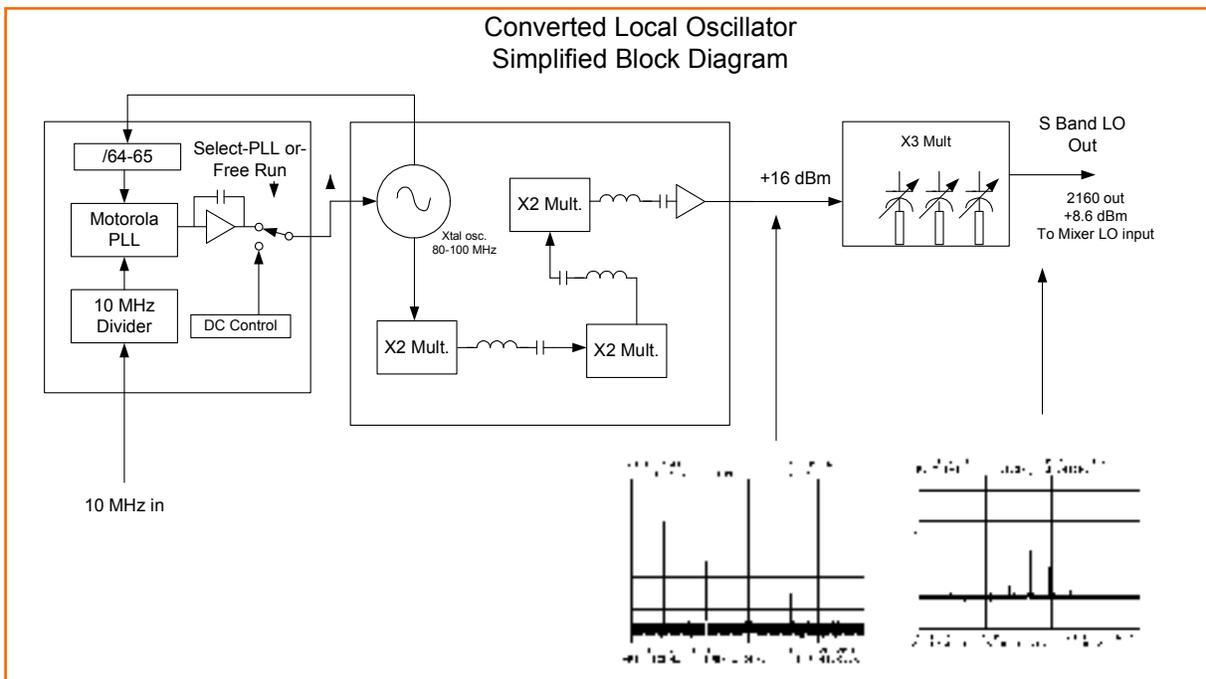


Snowflake (tuning) map for 50 W module

The LO

- 10 MHz Phase lock is a option, but not necessary
- LO is usable for other frequencies and bands.
- Auto switch if 10 MHz is not available.
- Filtered LO output to mixer has **excellent** spur performance

The LO does not require any hardware modification, it should tune to ham frequencies as is, so it is a good starting point for conversion to amateur use. All that is required is the new crystal. If a spectrum analyzer or a vhf frequency counter is available, you may want to check and see if the LO is working before modification. This can be checked at the rear panel LO output port or remove the cable from the x3 multiplier input or output port and check it there. The output of the LO or input to the x3 multiplier would be the best place to check, since that will also be monitored when tuning to a new frequency. See the block diagram which shows the approximate RF power levels and measurement points in the LO chain.



A high resolution version of this diagram is available from the Editor

One note: the current LO multiplier is designed for a total multiplication of 24. The UHF multiplier is designed for a total multiplication of x8. For example for a 144 MHz IF, a LO of 2160 MHz is required, $(2304-2160 = 144)$, $2160 / 3 = 720 / 8 = 90$ MHz. Thus the crystal frequency would be 90 MHz. Other IF's can be calculated using the multiplication described. Other multiplication schemes may work, but modification of the UHF generator may be required, this has not been attempted on any units here so far. We will report on other IF's as experiments are performed.

If all appears ok, you will be changing the crystal in the LO, which is the sealed box on the underside of the top tray of the transmit board marked "UHF Generator". Remove the screws on the cover plate and set aside. Remove the cover of the crystal oven. Remove the existing crystal carefully saving the insulator that fits on the legs. Install your new crystal where the old crystal was: Trim the crystal legs to match the length of the original crystal and then firmly seat it into place with the insulator between legs. Replace the crystal and oven cover carefully into the pin receptacles making sure the fit is exact.



Crystal oven is the round object in the lower left of the "UHF

LO output freq Tripler output freq
If you want a 144MHz IF, use 90.00000 xtal (x8 =720.0MHz) x3 = 2160 MHz
For a 145 MHz IF, use 89.95833 xtal (x8 =719.6MHz) x3 = 2159 MHz

Calculation for xtal: $(2304 - \text{IF freq in MHz}) / 24$

The LO will need to be tuned and a spectrum analyzer should be used to maximize the output for the 8th harmonic of the crystal. The tuning caps and coils are all exposed with the cover off. (Contact Gary WA2OMY for further assistance if the required instruments are not available).

Power is regulated at +12VDC. The xtal is at 90 MHz and in a oven. There are 3 doubler stages which get to 720 MHz. The doublers are MiniCircuits doubler blocks with MIMIC gain blocks. There are 2 monitor outputs, one at the xtal frequency, one at 8 times the xtal. There is an AFC input from the PLL board. The output at 720 MHz is about +5dbm.

Still to be covered

In issues to follow, we will cover

- PLL dip switch settings for various rig LO frequencies
- Mods for LO rigs other than 144/145
- Transmit Mixer Board and Filter
- More details on modifying the 10 and 50 Watt Amplifiers
- Bias Board Modification
- Interfaces & T-R relay
- Fan Speed Mod
- Receiver Reconstruction
- For the brave of heart we may be able to report on whether the image filter will allow operation with a 28 MHz LO rig
- Final Testing

Stay Tuned!!

ARRL New Jersey State Convention

TCNJ Hosts the Convention in Conjunction with the Trenton Computer Festival, April 24 – 25

(See www.tcf-nj.org for details and tickets)

The 2010 **ARRL New Jersey State Convention** on the weekend of April 24-25 is promising to be an exciting event. Being held in conjunction with the 35th Annual Trenton Computer Festival in Ewing, NJ, it will offer **dozens of commercial vendors, a large electronics flea market, and numerous presentations on Amateur Radio**, electronics and computers.

Tickets for the weekend event are \$12 in advance (purchasable online at www.tcf-nj.org), \$15 at the door, and a \$10 Sunday only admission (only available at the event). Specifics on indoor vendor tables and outdoor flea market pricing can be found at www.tcf-nj.org

Also, Amateur Radio License Exam sessions will be offered at 3:40 PM on Saturday and again at 2:35 PM on Sunday. In addition, a one day "Ham Radio Boot Camp" intensive Technician Licensing Exam Preparation course will be held on Saturday beginning at 10:15 AM and ending with the exam session. **This may be of use to your friends who want to get a license in the shortest possible time.**

Here is a list of hams making presentations that weekend (ham topics in red, computer topics in green). I'm sure you'll recognize some of the names. **We hope to see you there!**

Roger Amidon, K2SMN, **Video Games - 2010**
Paul Bergsman, N3PSO, **Controlling the World with PICs**
Brian Boccardi, N2MPM, **Automatic Packet Reporting System**
Robert Buus, W2OD, **A Brief History of the International Telegraph Code**
Robert Buus, W2OD, **Contributions made to Wireless Communication by G. Marconi**
Anthony Carlis, WA2IVO, **Patents, Trademarks and Copyrights 101**
Joe Cupano, NE2Z, **CyberSecurity for the Home User**
Irwin Darack, KD3TB, **From Zone 2, Canada This is VE2DXY -- A Ham Radio Contest DXpedition**
Andy Vavra, KD3RF/VE2DXY, **From Zone 2, Canada, This is VE2DXY -- A Ham Radio Contest DXpedition**
Mike Davis, KB1JEY, **Getting Started in VHF & VHF Contesting**
John DeGood, NU3E, **Chumby Widget Development, and BlackBerry Smartphone Application Development.**
Bill Edgar, N3LLR, **American Radio Relay League Forum**
Douglas Ferguson, KB2JMG, **Let's make a movie - Documenting TCF 2010, Session I and Session II**
Don Fishbein, AB8OH, **Why You Simply Must Time the Stock Market: A Method Using Artificial Neural Networks and Genetic Algorithms**
Dominick Interdonato, NB2F, **History of Computers for Tracking Satellites**
Gerry Jurrens, N2GJ, **Amateur Radio Licensing Exam Preparation Course**
Dr. Allen Katz, K2UYH, **The Future of Computers**
Robert Korn, N2OJJ, **Electric Vehicle Customizing**
Dr. Rebecca Mercuri, KA3IAX, **Weird Antenna Projects of New Jersey**
Dr. Robert McGwire, N4HY, **Open Source SDR (Software Defined Radio)**
Christopher Peckham, N2ZE, **Open Source Systems Applications**
Rick Rosen, K1DS, **Getting Started in VHF & VHF Contesting**
Rick Rosen, K1DS, **The Modular Rover**
Robert Schroeder, N2HX, **Emergency Communications & EMP**
Cory Sickles, WA3UVV, **Marketing Ham Radio - How You Can Help it Thrive Today**
David Struebel, WB2FTX, **ARRL National Traffic System: An Introduction**
Greg Szpunar, N2GS, **ARRL National Traffic System: An Introduction**
Dr. Joe Taylor (K1JT), **WSPR-ing on the HF Bands**
Don Wright, AA2F, **Amateur Radio Licensing Exam Preparation Course**

Also, remember that the Packrats will be supervising the vendors at the TCF Flea Market on both days of the Festival. We have almost enough volunteers for this activity but **we still need a few more. Please consider** volunteering to help with this effort. Contact Lenny, W2BVH at lennyw@comcast.net if you'd like more information or would like to help.

Events

For inclusion, please direct event notices to the editor.

JCDXA Hamfest - (Jersey Coast Chapter of the NADXA) April 10 and Sept. 11, 2010. Details to follow. See <http://nadxa.org> when available.

VHF/UHF Spring Sprints Contest April 12, 2010. 2 Meter Sprint. See <http://groups.google.com/group/springsprints/web/2010-announcement-rules> for details

Eastern VHF/UHF Conference - Sponsored by the Eastern VHF/UHF Society and the North East Weak Signal Group. April 16-18 2010. See <http://www.newsvhf.com/vhfconf.html>

OMARC Tailgate Hamfest - April 17 2010. Project Diana Site, Wall NJ. See <http://www.omarc.org> for details

VHF/UHF Spring Sprints Contest April 20, 2010. 222 MHz Sprint.

SVHFS Technical Conference - April 23-24, 2010. Morehead State University. See <http://www.svhfs.org/conference.html> for details

Trenton Computer Festival / NJ State ARRL Convention— April 24-25, 2010. A combined event. Computer and ham radio presentations, hamfest and computerfest. See article on page 10 for details. Don't miss this one!

VHF/UHF Spring Sprints Contest April 28, 2010. 432 MHz Sprint.

VHF/UHF Spring Sprints Contest May 1, 2010. Microwave (902+ MHz) Sprint.

VHF/UHF Spring Sprints Contest May 8, 2010. 6 Meter Sprint.

Dayton Hamvention Convention / Hamfest - May 14-16, 2010 One of the largest ham events in the US. See <http://www.hamvention.org/> for details.

ARRL June VHF QSO Party Contest - Jun 13-14, 2010 Details to follow at <http://www.arrl.org/contests/rules/2010/june-vhf.html>, when available

Valley Forge Hamfest and Computer Fair Hamfest - July 18 2010. See <http://www.marc-radio.org> for details

CQ WW VHF Contest— 3rd full weekend in July. Details to follow.

ARRL UHF Contest - Aug 1-2, 2010. Details to follow

ARRL 10 GHz and Up Contest—Aug 15-16, 2010. Details to follow

ARRL September VHF QSO Party Contest - Sept 12-13, 2010. Details to follow

Joel Knoblock W3RFC

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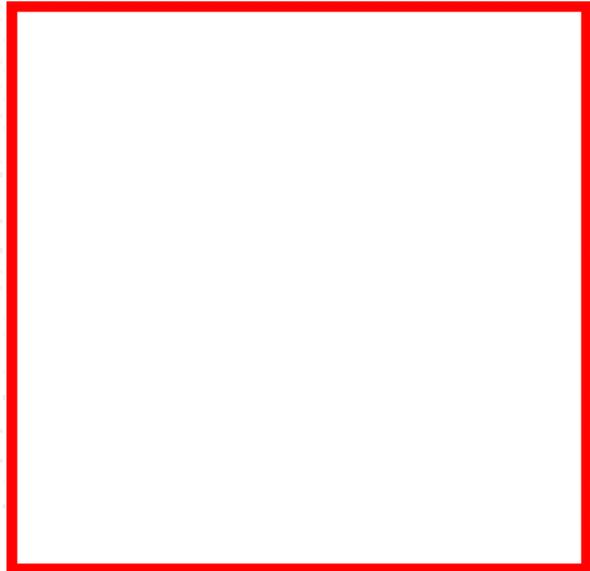
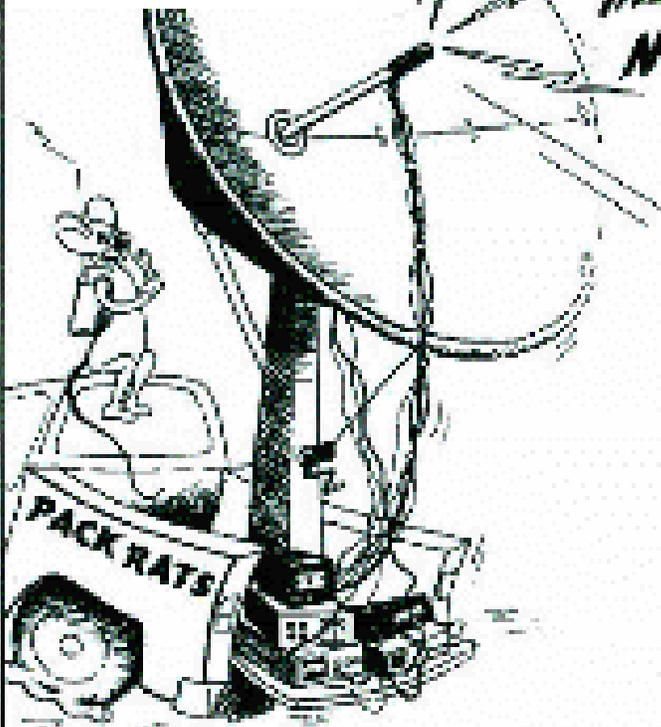
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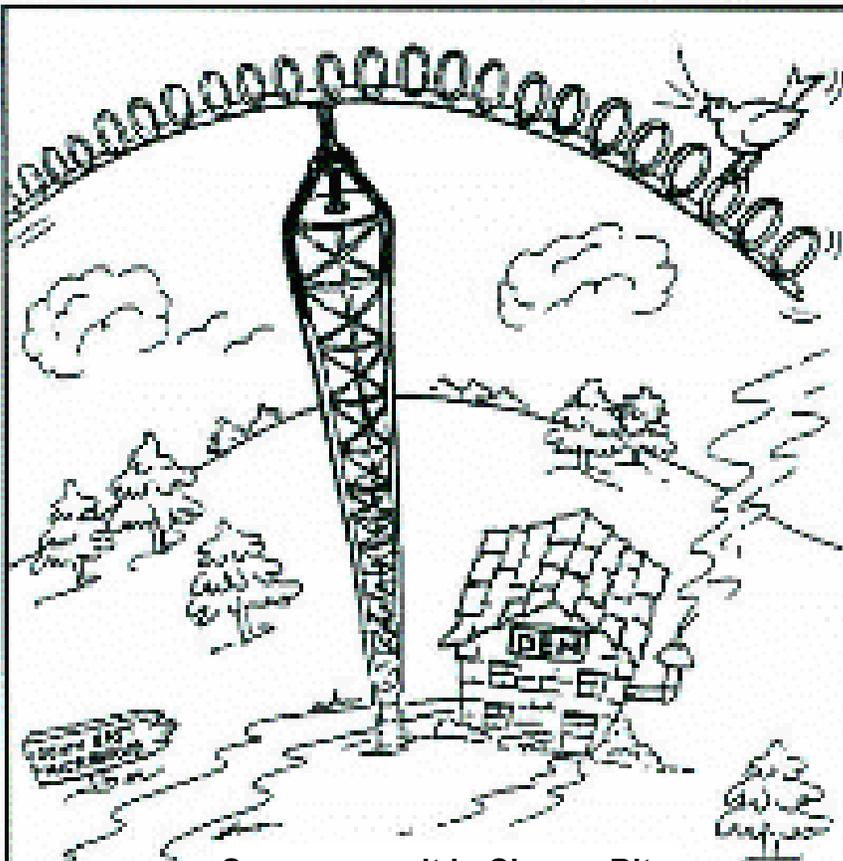
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**MEETING
NOTICE**



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