



CHEESE BITS

W3CCX
CLUB MEMORIAL CALL

ARRL
Affiliated
Club



Volume L

April 2009

Number 4

PREZ
SEZ:

I think that we have found a new “pre-meeting place” at Giuseppe’s. Sixteen of us had a meet-the-speaker dinner with KX9X, Sean Kutzko, the ARRL Contest Manager before our last

club meeting. He got to sample a Philly Cheesesteak with “the works” while others of us enjoyed pizzas, calzones, salads, hoagies and other Italian entrées. The pitchers of beer and other liquid refreshments were also a nice addition, and the prices were reasonable. Perhaps we can have a repeat with Sandy and Steve Costro from DEMI when they come to visit at our April meeting. Even when we don’t have a speaker, the Giuseppe’s spot seems to be a nice venue for club members to meet and dine before the meetings.

During our meeting, several members worked on their 903 amplifier conversions, and the parts kits prepared by K3TUF were very well utilized to change out the front plate and ease the attachment of the coaxial input and output connectors as well as the power and key lines. There is still a chance to get in on this deal--\$20 for the parts kit for conversion, and I believe that the amplifiers are still available on eBay. No excuses for not being heard on 903!

Sean’s presentation to us focused on increasing the participation on the VHF bands, especially from newcomers. He gave some excellent suggestions, and we ought to do some better outreach to the local clubs by making presentations to them. We also need to enhance our efforts at some technical and practical lessons for those who want to learn more about VHF, UHF

and microwaves before making some investment in the gear. It was an informative evening for all attendees, and a nice chance to discuss VHF contesting issues with him. We also appreciate the efforts by Steve KF6AJ who drove him to and from Connecticut to the meeting.

John K3DMA has been doing a fine job in helping to manage the Rowland estate radio gear. He had help from several of the members who live in the area. We have sold several items at deep discounts to club members, and what ever remains will be placed on eBay. We have considered keeping some of the gear to use for contesting rovers and loaners for beginners. Additional items will be brought to the next club meeting for silent auction.

We are steaming ahead toward a full summer program. June VHF QSO Party plans are in full swing. The dates are: **Loading and set up** on Friday, June 12, **Contesting** starts Saturday June 13 at 2PM through Sunday night June 14 at 11PM. **Tear-down**, packing and return is Monday, June 15th. **PLEASE mark your calendars**, clear the dates and make sure you are available to play a role in this year’s efforts. We are making improvements in the computer logging, microwave band switching, and we are looking for more rovers. Our chairpersons K3TUF and N3ITT are counting on your help. Doc W3GAD and George KA3WXV are facilitating the chow, with a Friday evening meal from Carol, XYL of KB1JEY. Let’s get an accurate count and assure we have plenty of help.

The nominating committee is active and soliciting nominees for our elections in June.

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Pack Rats **CHEESE BITS** is a monthly publication of the
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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 FN20KI |
| 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

Editor's Column

Next Meeting: Thursday April 16th, 2009, 7:30pm. At our usual site: the Ben Wilson Senior Center, 580 Delmont Ave., Warminster PA. We will have a guest speaker, **Steve Kostro of Downeast Microwave**. This is a "don't miss" meeting; come on down!

To follow thru on some of the ideas introduced at last month's meeting, the April meeting will be a good opportunity to introduce your friends who are not all that familiar to the allure of vhf+ technology and operating. Please feel free to ask your HF or FM-only friends to come along.

Pre-meeting dinner at Giuseppe's. Details will follow on the reflector

Sincere thanks to Sean, KX9X for his presentation last month and for doing the 8+ hour round trip from CT!

73, Lenny W2BVH

Ps - As always, please send articles, comments, ideas to lennyw@comcast.net

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The meeting will be held at Otto's Brauhaus in the biergarten on Thursday June 18th.

July's meeting will be our White Elephant auction at WA2OMY's, and the August picnic has a new venue—the estate of KB1JEY—complete with pool and patio—so bring appetites and bathing suits. Details to follow. The **Mid-Atlantic VHF Conference** will be on Saturday, Sept 26th at the Mt. Carmel Club with hospitality and housing at the Plymouth Meeting Marriott Suites. We need you to be speakers and send papers for the proceedings. Registration is open now. Send papers to pdrexler@hotmail.com. Of course HAMARAMA follows the next day, Sunday, Sept 27 at the grange. Flyers are available for you to hand out at any other hamfests that you will be attending.

Is there anything else that you would like to see the club doing? Do you have a pet project with which you need help, or something you would like to manage for the club? Let us know. Monthly board meetings are open to all club members with business before the club, and you don't even need to travel as they are available by teleconference.

Spring Sprints start Monday evening, April 6th on 2m and progress up a band and forward a weekday each week after. Check the inside this issue for details.

73, Rick, K1DS

The Why and How of Microwave Transverters Part 2

By Michael Davis KB1JEY

Here is the second installment of Michael's article on "Microwave Transverters", a timely article since Steve and Sandy of Downeast Microwave will be visiting us later this month :

Attenuators. Depending upon the IF rig that you employ, the low power setting might be one watt or as much as 5 watts. Your transverter might be happy with one watt or it might be very unhappy with RF levels above 10 microwatts. Find out how much input power your transverter is designed to handle. Then put in an attenuator with enough db loss to drop the RF energy sent to the transmit chain to a safe level.

A good watt meter / power meter or an Elmer could be helpful in working out what size attenuator is required. Make sure that the attenuator power rating matches your IF rigs output. The attenuation becomes heat. Also, make sure that you are only attenuating in the transmit chain. There is little sense in making weak incoming microwave signals weaker. Note: some transverters have built in variable attenuators that may be adjusted to reduce your IF rigs power to the level needed.

Antennas and Feedlines. Looking at the antennas of hams working microwave bands, you will often see yagi antennas with loops instead of dipoles. This is because it is easier to fashion

loops rather than dipoles that resonate at the higher target frequencies. General practice is to orient the antenna for horizontal polarization by placing the boom above or below the loops. Horn antennas with or without dishes are often used at the higher microwave frequencies.

At microwave frequencies, feedline losses are also more significant. It is a good idea to use better quality coax cable (e.g., 9913 or LMR400). Heliac or hardline should be considered if you have a long run from the antenna to the transverter. After you set up your station, if you have appreciable slack in your feedlines, consider shortening them to minimize your feedline losses.

Amplifiers and Pre-Amps. Another strategy for compensating feedline loss at microwave frequencies is to incorporate amplifiers and pre-amplifiers. A mast-mounted pre-amplifier will boost the received signal before it travels through the feedline and will help you read faint stations. You will have to run power to the pre-amp for it to function. This can be done with a separate cable or with dc power right on the coax, using a simple "bias tee" at each end.

A linear amplifier will boost your outgoing signal. For some bands, surplus commercial amplifiers can often be converted to amateur use for little cost. You'll probably want to also incorporate a 12 VDC relay to key the amplifier and transverter simultaneously. A reverse polarity diode across each relay coil will suppress any inductive kick from the coil and speed the relay drop out time.

How do I know my rig works and is on frequency? Okay, you have hooked everything up and turned on the power. How do you know that your transverter is working and on frequency? Fortunately, the Pack Rats and other clubs operate beacons on all of the amateur VHF, UHF, and microwave bands, up to 10 MHz. Just point your antenna in the direction of grid square FM29JW (more in a bit), and listen for the Morse for the W3CCX beacons.

Chances are that you will find that the frequency displayed on your IF rig is a little off. That is not a problem. Note how many KHz higher or lower the received frequency beacon is. Then add or subtract that differential when tuning to desired operating frequencies.

The beacons are also a good way to verify the aiming of your antenna and the calibration of your rotor. You can use W3KM's "Squares" program to calculate the true heading for the beacon and note the offset between that heading and what your rotor reports. You will want to give and get the six digit grid when aiming your antennas on the microwave bands.

When talking to hams on the microwaves, start on 432 MHz if you can to peak the received signal and zero in on the rotor heading. If you have a key handy, a series of dashes on the microwave frequency will help the other station zero in on the direction of your station when setting up a microwave QSO. If you are still on 432 MHz, you coordinate heading and signal reports on that band to help make that successful microwave QSO.

How do you know that your transmitter is working and your signal is getting out? A good quality watt meter is a start. If you have a scanner receiver handy that receives microwave signals, tune it to the frequency in use and see if you can hear it when you key up the transverter. If the scanner has an accurate digital display (verified by tuning in a beacon), then you can check to make sure that you are transmitting on the desired frequency.

One last caution: Crystal oscillators will drift as they warm up. Let your transverter warm up for at least an hour before you attempt to measure the operating frequency. If drift is a problem, you could attach a thermistor or thermostat controlled crystal oven to the crystal case to stabilize the oscillator.

Do I have to be rich to get on the microwaves? In ham radio, being independently wealthy is helpful but not essential. A new transverter kit for a given band might run you \$200-\$300 and a fully assembled model might go for \$400-600.

However, early winter is the start of ham club auctions and spring brings the hamfest season. The author picked up pair of working transverters (903 and 1296 MHz) for less than \$50 at the Pack Rat "White Elephant" auction where members often unload surplus gear so they can find new appreciative owners. Pack Rats members also often have spare transverters and antennas for lending to other club members getting started with microwaves and at contest time to bolster the club score. Make your needs known at meetings and on the club reflector. You may be able to liberate the equipment you need to get started at little or no cost.

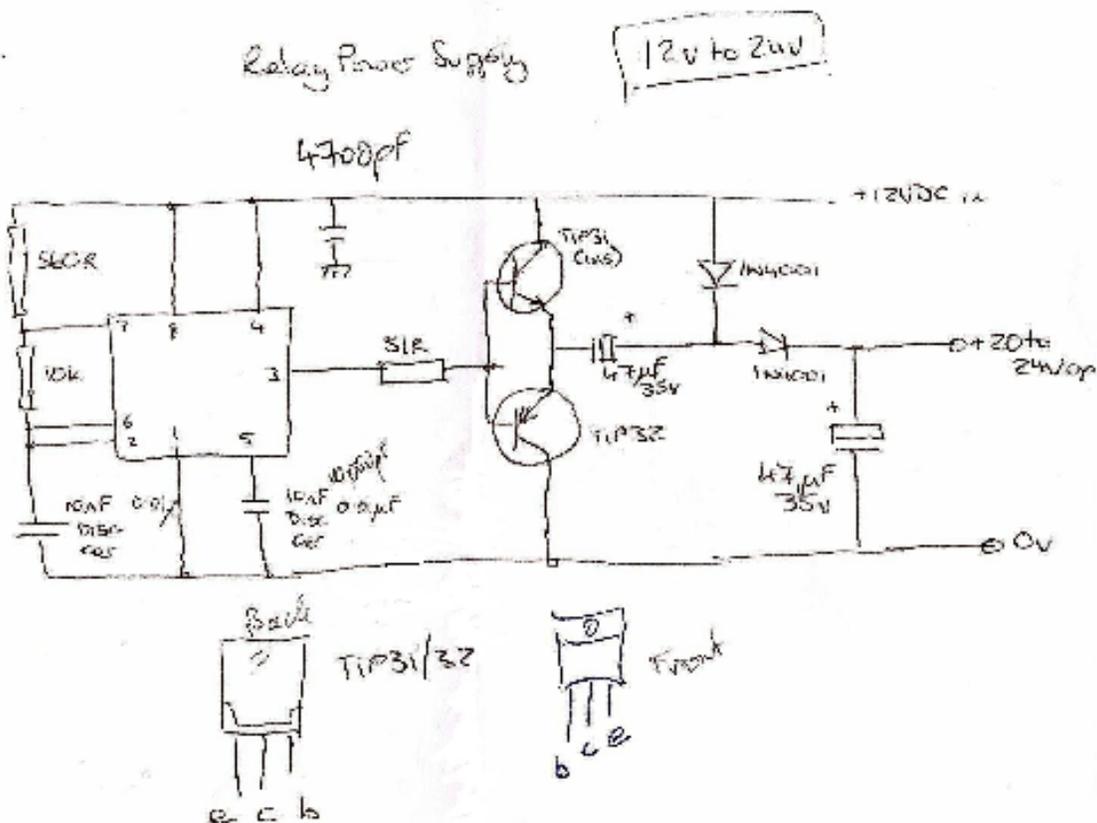
Conclusion. While working the microwaves is not as simple as squeezing the PTT button and talking on a repeater, the challenge of working the higher bands could be the spice that keeps you in the amateur radio game. You'll soon impress other hams with your technical prowess and be able to boost your own and the club scores in the VHF contests.

73, Michael KB1JEY

Speaking of Microwave Transverters

As Michael KB1JEY mentions in his article above, many transverters take an external SMA or BNC switching relay between the xvtr and the antenna or power amp on the xvtr's output side. Similarly on its input side, the transverter sometimes has a separate connection to the transmit and receive string that needs a coax relay from the IF rigs antenna connector. Many of these relays are hamfest "finds" that invariably have 24 or 28 V coils. There has been a lively discussion on the "Microwaves" reflector on how to turn the 12 V shack power into a low power source of 24-28 V for the relays. One suggestion was to fuse and bring out the approximately 21 V on the filter cap of the typical shack's 13V linear regulator. Another is shown below. It is a voltage doubler using a 555 as an oscillator, which chops the standard 12V rig power into pulsating dc and uses a standard diode doubler circuit to make twice the input voltage. This sketch is courtesy of Dave G0DJA who got the design from John, G0EWN. Other designs use flyback converters such as the LT1070 with a small inductor as the source of boosted voltage. If a club member would care to contribute their favorite relay p/s design we'd all like to see what else is available!

--Lenny W2BVH



Cheese Bits Legacy Series: First in a series of past Cheese Bits articles that still have current relevance or true Nostalgic Value. This one is by Dave Mascaro, who at the time was known as one of the "Smith Brothers"

Exacto-Etch PC Boards

by Dave Mascaro, WA3JUF 1989

Exacto-etch is where an Exacto knife is used either to cut away the copper or cut the resist for Ferric Chloride etching. This method only works for artwork that is rectangular (as opposed to circular shaped traces).

Safety notes:

Always use safety glasses!

Always break off a small part of the exacto blade tip before using it. It will always break off anyway, and you don't want to find it later with your hand.

Clamp your board to the work table and never cut towards your flesh.

Use rubber gloves and a face shield when etching boards.

Non-etch method 1:

Use double-side PC board material, so ground vias can be incorporated.

Clean the copper with steel wool or 3M Scotch-Brite.

Draw the artwork on the copper.

Using a steel ruler to guide the Exacto blade, cut along the artwork lines.

With a small soldering tip, solder tin the copper to be removed.

Use the heat from the iron and the knife tip to peel up the copper.

Use fine sandpaper and steel wool to remove all the rough edges. See... this is

why you break off the knife tip.

Non-etch method 2:

Same as #1, only you use a cutting tool that the aluminum siding guys use to scribe/cut aluminum and vinyl. The hand-tool scribes a v-groove in the copper. The harder you press the tool, the wider the gap. This is actually an easier (and safer) method than with the Exacto blade.

Ferric Chloride etch method:

Before I setup a light table to do photo-etching, I used a method where you put a resist layer on the pc board and cut along paper artwork with the Exacto blade.

Clean the copper as above.

Cover the board both sides with the 4-inch wide clear scotch tape (used to close cardboard shipping boxes).

Print your artwork on an Inkjet printer.

Attach the artwork firmly to the pc board.

Cut the artwork with the Exacto blade, going thru the tape resist as well.

Remove the artwork and resist tape.

Clean with alcohol.

Etch the board.

Etching boards:

The processing time of etching boards can be decreased if you:

1. Heat up the etchant – use a crock pot on Low or a heat lamp over a plastic tray. It goes without saying that you cannot re-use the crock pot to cook food !
2. Agitate the etchant – a small motor with an offset rubber bumper slid over the motor shaft can be used to `shimmy` the etching container.

... continued from p. 6

These procedures speed up the process, which minimizes the over-etching due to the etchant migrating under the tape.

Making pc boards for ICs:

You can use expensive proto boards made to accept IC sockets -

Or - use the `groove` method...

I use the aluminum cutting tool to cut grooves in the pc board, spaced for the IC socket pins being used. One cut in the other axis isolates the two halves of the socket. I use wire wrap sockets and bend the leads so I can solder the sockets to the homemade pc board. Then I use small magnet wire to do the inter-connections. Use the magnet wire that the enamel melts off easily when the soldering iron and solder are applied.

My largest proto-board had a dozen sockets for ICs and LED displays and used the `groove` method.



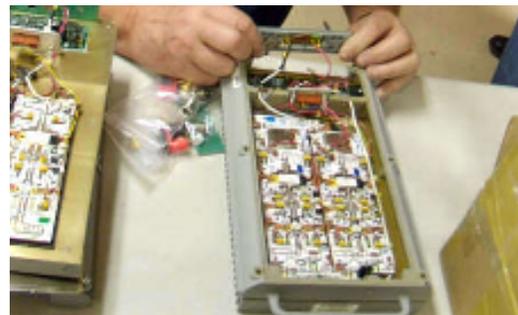
Ed & Dave getting going



If you're really ambitious you do one of each



The teacher and his pupils



Very high build quality in these amps

March Meeting Pix

For those of us who couldn't attend or didn't participate in the 900 MHz power amplifier conversion party at the March meeting here are a few pix illustrating who did what to which amplifier. A bit of background: Quite a few members have obtained a Motorola 150 or 300 Watt 900 MHz solid state **linear** amplifier from that well know auction site. Phil, K3TUF conducted the first of (probably) two hands-on classes in converting these very well built devices for use on 900 MHz. He supplied all required pieces (including a very well machined replacement connector panel) that's needed for the mod, as a kit, for only \$20. The amplifiers are still available at \$19.95 + s&h for 150W or \$49.95 +s& h for the 300 W. If you're interested in participating contact Phil and he'll tell you what model number to order.

EVE !!! - Radio Amateurs bounce a signal off Venus

As reported by the Southgate Amateur Radio Club

Radio Amateurs have achieved the very first reception of amateur signals bounced off the planet Venus, over 50 million km away - EVE (Earth-Venus-Earth)

Peter Guelzow DB2OS, President of AMSAT-DL has provided a description of this landmark achievement.

On March 25th, 2009 a team from the German space organisation AMSAT-DL reached another milestone on its way to an own interplanetary probe towards planet Mars.

The ground station at the Bochum (DL) observatory transmitted radio signals to Venus. After travelling almost 100 million kilometers and a round trip delay of about 5 minutes, they were clearly received as echoes from the surface of Venus.

Receiving these planetary echoes is a first for Germany and Europe. In addition, this is the farthest distance crossed by radio amateurs, over 100 times further than echoes from the moon (EME reflections).

For receiving the EVE signals, an FFT analysis with an integration time of 5 minutes was used. After integrating for 2 minutes, the reflected signals were clearly visible in the display. Despite bad weather, signals from Venus could be detected from 1038UT until the planet reached the local horizon.

The 2.4 GHz high power amplifier used for this achievement is described in the current AMSAT-DL journal. This represented a crucial test for a final key component of the planned P5-A Mars mission. By receiving echoes from Venus, the ground and command station for the Mars probe has been cleared for operational use and the AMSAT team is now gearing up for building the P5-A space probe.

For financing the actual construction and launch, AMSAT-DL is currently in negotiation with the DLR (Deutsches Zentrum für Luft- und Raumfahrt) amongst others, to obtain financial support for the remaining budget of 20 Mil Euros. AMSAT-DL wants to show that low-cost interplanetary exploration is possible with its approach.

The EVE experiment was repeated on Thursday, March 26th for several hours with good echoes from Venus. Morse code was used to transmit the well known "HI" signature known from the AMSAT OSCAR satellites.

73s de DB2OS

Events

Spring has Sprung !

North Jersey Hamfest - April 4. See www.splitrockara.org

JSARS Hamfest - April 5. Toms River NJ. see www.jsars.org

OMARC Hamfest - April 18. Wall Twp. NJ. See www.omarc.org

York Spring Hamfest - April 18. See www.yorkhamfest.org

VHF/UHF Spring Sprints!! - 7-11pm
Local Time. 2M Mon April 6 .. 1 1/4 M Tue
April 14 .. 70CM Wed April 22.. 33CM and
up Sat May 2 .. 6M 2300Z May 9th to 0300Z
May 10th. See www.sysadnet.com/vhfsprintrules.htm

35th Eastern VHF/UHF Conference - April
17-19 Enfield CT. Spr. N.E.W.S. A full line
up of speakers plus NF, SA, VNA and
phase noise measurement equipment to 40
GHz
see www.newsvhf.com/vhfconf.html

13th SVHFS Conference - April 24-25
Charlotte NC. See www.svhfs.org/conf_2009.htm

34th Trenton Computer Festival - April 25-
26. Reduced flea market prices for hams
and increased ham radio presence. Chaired
by our friend AI, K2UYH. See www.tcf-nj.org

SBMS 2+ GHz Contest - May 2-3. Details to
follow.

Warminster Hamfest - May 3. see
www.k3dn.org/hamfest.htm

ARRL June QSO Party - June 13-14. The

countdown has already begun!

W2QW Techfest - June 20. See
www.w2qw.org

**ARRL EPA Section Convention +
Firecracker Hamfest** - July 4. Bressler PA. see
hrac.tripod.com

Valley Forge Hamfest & Computer Fair -
July 12. See www.marc-radio.org

CQ WW VHF Contest - July 18-19. Details to
follow

Central States VHF Conference - July 23-25
Elk Grove Village IL. Spr: Central States VHF
Soc. See [www.csvhfs.org/conference/
index.html](http://www.csvhfs.org/conference/index.html)

ARRL UHF Contest - August 1-2. See
www.arrl.org/contests/calendar.html for details.

ARRL 10GHz & up Contest - August 15-16.
See www.arrl.org/contests/calendar.html for
details.

JSARS Hamfest - Aug 16. See www.jsars.org

Mid-Atlantic VHF Conference - Sept 26 with
Hamarama 9/27. Spr. Packrats. Mt Carmel
Club /Mariott Hotel. Details to follow.

ARRL Sept. VHF QSO Party - September 12-
13. See www.arrl.org/contests/calendar.html for
details.

ARRL 10GHz & up Contest 2nd Weekend-
September 19-20. See [www.arrl.org/contests/
calendar.html](http://www.arrl.org/contests/calendar.html) for details.

Red Rose Repeater Assoc Hamfest- Oct 3.
See w3rrr.org

MUD - Oct 25 The Westin, Dallas Fort Worth
Airport 545 West John Carpenter Freeway
Irving, Tx 75063. See [www.
microwaveupdate.org](http://www.microwaveupdate.org)

HAM Radio URL of the Month

This months URL fits in neatly with the discussion of attenuators in KB1JEY's article. Its at <http://www.aubraux.com/design/rf-attenuator-design-tool.php>.

This simple, single page accepts desired terminating impedance and desired attenuation as parameters and produces the 3 resistor values needed to achieve the desired attenuation. Both Tee and Pi configurations are designed for you (sometimes one set of resistor values is easier to achieve than another). What it does not do is calculate the power ratings of the resistors for a given input power level. Perhaps one of our members can do a short write-up on such a calculation. With resistor values and power ratings, just about any pad can be created.

Check it out.

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Odds 'n Ends

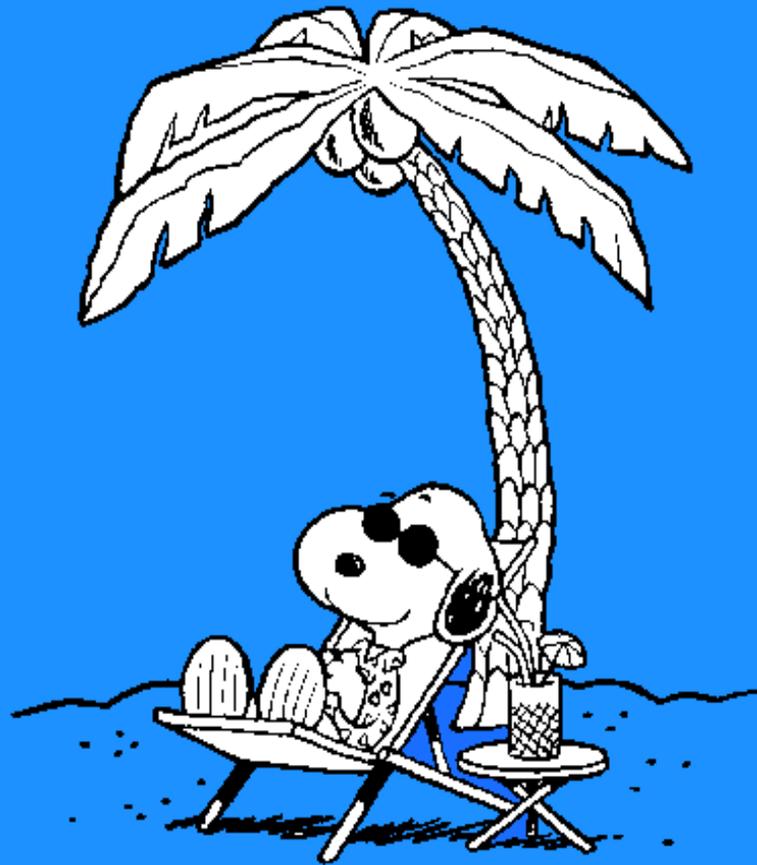
Here are a couple of interesting photos that have accumulated in the editors in box the last few months



What's a good caption for this picture? Send your suggestion to the editor at lennyw@comcast.net; Subject : Doggie Dish. Photo courtesy HAM-MAG magazine.



Steve N3FTI and his **V**ery **H**heavy **F**ish. Nice Pickerel caught while ice fishing in the Poconos after the January contest. Additional captions welcome for this one too. Use Subject "Big Fish"



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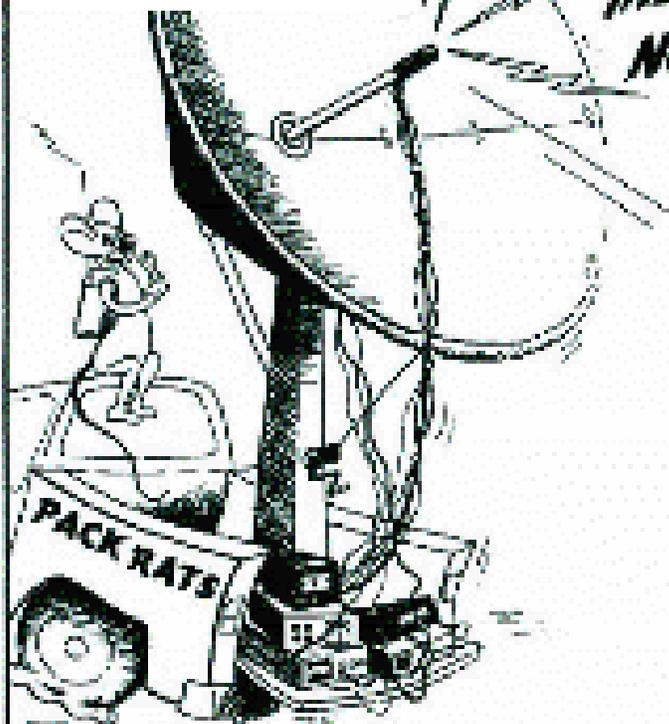
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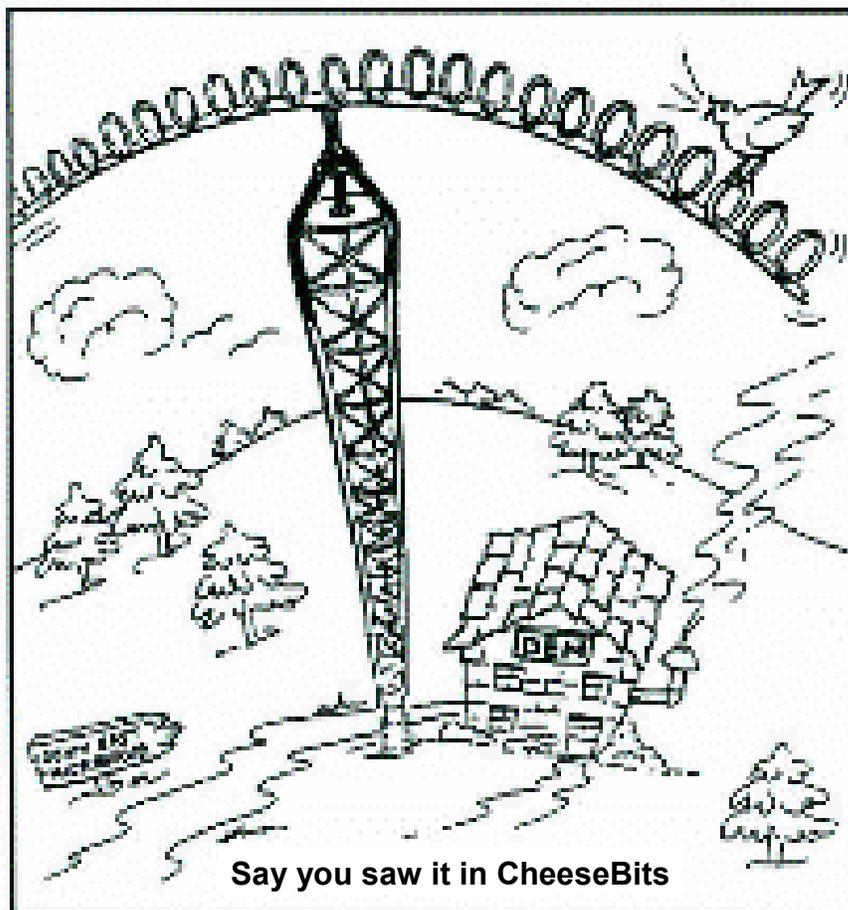
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