

CHEESE BITS



W3CCX

CLUB MEMORIAL CALL



ARRL
Affiliated
Club

SCANNED TO PDF BY BERT, K3IUV, 2013

VOLUME XXXIX

August 1997

Number 8

THE PREZ SEZ

This is a very busy time of the year for the Pack Rats. The Pack Rat picnic is this month at the Peace Valley Park on the shores of picturesque Lake Galena. Coming up very quickly is the VHF Conference and Hamarama on the first weekend in October. All this will be quickly followed by the January VHF contest in the middle of January 1998. All of these activities require a lot of work that is usually done by just a few people. Now is the time to step up and help with some of your clubs activities. It would be nice if everybody would ask not the time old question of "What are they doing", but instead ask yourself "what am I going to do" to help out. To put it more succinctly: "You be they". Brian, N3EXA is Hamarama chairman this year and John KB3XG is once again willing to tackle the task of running the VHF Conference. The help from the membership the last couple of years has been outstanding. Lets keep it going.

There will be change in the VHF conference location this year. Nothing else for the Hamarama weekend will change, just the conference location. The new location has not been determined at this time, but the one thing for sure is that it will be in the same general area as it was last year. We will let everybody know as soon as possible where the new location will be so that those coming from out of town will have time to make reservations at area hotels. Keep an eye on the Pack Rat web page (<http://www.ij.net/packrats>) for the latest information.

Last months White Elephant sale was very well attended. There had to be at least 50 people there. The flow of "stuff" seems to be never ending. It is interesting that the quality of salable "stuff" has moved up a notch. The once cherished shiny little parts seem to hold little value to the present day Ham. Thanks to WA2OMY for hosting the meeting.

Speaking of shiny little parts, many of the newer members probably never knew of one of the early members of the Pack Rats Mario Fontana, K3UJD (Uncle Johns Draws). "Mario's Raffle", which he started and ran every month, takes its name from the colorful little guy from "Ivyland you know".

Contd on page 3

MEETINGS

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

Pack Rats' **CHEESE BITS** is a monthly publication of the
 - Mt. AIRY VHF RADIO CLUB, INC. -
 Southampton, PA

SUBSCRIPTION RATE: \$12.00 PER YEAR (USA)
 \$12.00 PER YEAR (CANADA)
 \$15.00 PER YEAR (FLSEWHERE)

We operate on an exchange basis with other non-commercial publications. Anything that is printed in **CHEESE BITS** may be reprinted in a not for profit publication, unless otherwise stated, provided proper credit is given.

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

SUBSCRIPTION/ADVERTISING MANAGER:

Bob Fischer, W2SJ
 7258 Walnut Avenue
 Pennsauken, NJ 08110
 (609) 665-8488

EDITOR:

Harry Brown, W3IIT
 3012 Poushop Road
 Norristown, PA 19403
 (610) 584-4846
 hbrown@vf.lmms.lmco.com
 hbrown@voicenet.com

CLUB TREASURER:

Dave Mascaro, W3KM
 1603 Mink Road
 Ottsville, PA 18942
 (215) 795-2648
 dmascaro@gic.gi.com

AWARDS CHAIRMAN:

Bob Fox, W3GXB
 (610) 346-8698

TRUSTEE OF CLUB CALL - W3CCX

Ron Whitsel, WA3AXV
 rwhitsel@aol.com
 (215) 355-5730

PACKRAT 222 MHz REPEATER - W3CCX/R

222.98/224.58 MHz, Churchville, PA FN20LE

OFFICERS: 1997-1998

PRESIDENT:	WA3AXV	Ron Whitsel, rwhitsel@aol.com
VIC. PRES:	WA3EHD	Jim Antonacci, antonacc@pacsibm.org
REC. SECR:	WA3AQA	Walt Zumbach, wzumbach@bellatlantic.net
TREASURER:	W3KM	Dave Mascaro, dmascaro@gic.gi.com
COR. SECR:	KB3XG	Dick Comly, n3aog@compuserve.com
DIRECTORS:	W2SJ	(2 Yrs) Bob Fischer, bnf574@prodigy.com
	AA3GN	(2 Yrs) Joe Landis, landis@nad.com
	N3ITT	(1 YR) Al Sheppard
	N3EXA	(1 YR) Brian Taylor

MONDAY NIGHT NETS

<u>TIME</u>	<u>FREQ.</u>	<u>NET CONTROL</u>
7:30 PM	50.150 MHz	K3EOD
8:00 PM	144.150 MHz	N3ITT
8:30 PM	222.125 MHz	W2SJ/N3EXA
8:30 PM	224.58K MHz	W3GXB
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: N3AOG 215-443-9965
 JUNE CONTEST: N3ITT 610-847-5490
 HAMARAMA: N3EXA 215-257-6303
 VHF CONFERENCE: KB3XG 610-584-2489

PACK RAT BEACONS - W3CCX/B FM29JW

432.298 MHz 903.071 MHz
 1296.262 MHz 2304.034 MHz

THE AMERICAN RADIO RELAY LEAGUE




KAY C. CRAIGIE, WT3P
 DIRECTOR, ATLANTIC DIVISION

5 Faggs Manor Lane
 Paoli, PA 19301-1905
 (610) 993-9623

wt3p@arri.org

THE AMERICAN RADIO RELAY LEAGUE



Bernie Fuller, N3EFN
 VICE DIRECTOR, ATLANTIC DIVISION

17668 Price Road
 Saegertown, PA 16433
 814-763-1529

n3efn@arri.org

STEVEN N. WHITE
 Attorney at Law

2217 PALOMINO DRIVE
 WARRINGTON, PA 18976

Tel: (215) 343-6902
 Fax: (215) 343-6903

Prez Sez Continued

Who can forget the image of Mario in pink shorts and a white T-shirt assembling and operating mysterious microwave equipment during the June contest in Hilltown, PA. Mario was way ahead of his time when it came to homebrewing and in particular building microwave devices that most of us at the time didn't have the foggiest idea of what it was or how it worked. Getting even on the 1296 band in the 60's and early 70's was real black magic, or so it appeared. Mario showed how the magic worked and helped many of us get started on the higher frequencies. Mario passed on many years ago, but he is part of the legacy that makes the Pack Rats the fine organization it is today.

73, Ron, WA3AXV

Calendar of Coming Events - August 1997

- 2-3 **ARRL UHF Contest**. See June QST, page 108 for the rules.
- 11-12 **Perseids Meteor Shower** predicted peak at 1302 UTC.
- 14 **Packrat Board of Directors Meeting** at the QTH of Ernie, W3KKN. Call 215-659-3485 for directions.
- 16-17 First weekend of the 10th **ARRL Cumulative 10 GHz Contest**. See page 107 of the June QST for rules.
- 17 The August meeting of the Packrats will be the **Packrats Family Picnic** with all Packrats, friends, wives, kids, etc. invited. The picnic will be held at the Peace Valley Park, Pavilion #2 near Doylestown, Pa. Call Don Schwarzkopf at 215-674-0405 or 442-0979 if you wish to bring a covered dish to share. Boat rental and a fishing pier are available. See note and map elsewhere in this issue of Cheesebits.
- 16-17 **York Hamfest** will be held at the York Interstate Fairgrounds, York, PA. TI on 146.97. VE Exams.
- 17 The **Delmarva Hamfest** will be held at the Delaware Technical & Community College In Georgetown, Delaware. Talk-in on 147.675/.075, and 224.24/.84.
- 122-24 The **23 rd Annual Eastern VHF/UHF/SHF Conference** will be held at the Quality Inn, Vernon, CT. For information, contact Rae Bristol, K1LXD, at 203-742-8650.
- 24 **Gloucester County ARC Hamfest** at the 4-H Fairgrounds in Mullica Hill, N.J. Talk-in on 147.78/.18, 223.06/224.66 and 146.52.
- 28 **LEAP INTO THE MICROWAVES with the Packrats!** 903 and above. Starting on the 4th Thursday of the month and continuing every 4th Thursday of the month operate from 8 to 10 PM local time on any band 903 MHz and above. For coordination on those difficult long haul contacts 144.260 MHz is the suggested liaison frequency. So here's your chance to fix what broke in the contest and work all those stations you missed.
- 13-15 Sept. **1997 ARRL VHF QSO Party** See the August issue of QST, page 101 for the rules.
- 4 Oct. **21 ST Annual Mid Atlantic States VHF Conference** sponsored by the Mt. Airy VHF Radio Club will be held at a location to be announced.

TID BITS

New member: WA3DRC, Ed Finn, 174 Orthodox Dr. Richboro, Pa. 18954, 215 322 2105 (H), 609-799-5700) X32(W), Xyl = Crystal. Harmonics = Edward & Sierra. Class = Advanced. E-mail at Ed.Finn@ustc.vlsi.com.

The Aug/Sept. issue of the NTMS newsletter "Feedpoint" contains an article by Al, WB5LUA on "Dual Band Feedhorns for 2304/3456 Mhz and 5760/10368 Mhz".

The Midwest VHF-UHF Society newsletter reports a 53 Km contact on 145 Ghz by DL6NCI/P in JO50va with DB6NT/P in JO50xl.

In the July 1997 issue of the N.E.W.S. Letter, Paul, N1BWT has an article "Silver Brazing for Better Microwave Antennas".

New work e-mail address for Phil, WA3NUF: pmiguel@nlvl.gi.com.

21st ANNUAL MID ATLANTIC STATES VHF CONFERENCE - CALL FOR PAPERS

The 21st Annual Mid Atlantic States VHF Conference will again be held at a location to be determined, just north of Philadelphia. This years conference will be held on Saturday, October 4, 1997. Sponsored by the Mt. Airy VHF Radio Club, the conference continues to present a wide variety of technical papers covering all aspects of 50 MHz through light frequencies. Talks on operating, propagation, construction and theory are among those requested. Speakers are encouraged to contact the conference chairman early. The day after the conference, the largest hamfest in the area, Hamarama 97, also sponsored by the Mt. Airy VHF Radio Club will be held.

Contact: John Sorter, KB3XG, Conference Chairman
1214 N. Trooper Road
Norristown, PA 19403
610-999-7658
JohnKB3XG@aol.com

JANUARY 1997 VHF+ CONTEST ELITE

From: JEROME BYRD, K3GNC

Note: Certain individuals are developing a persona, that I have not been able to improve. There will be some characters old, some characters new, some characters borrowed, and some characters blue.

1. **WA8WAZG - "APOCALYPSE"** (From the X-MEN Comics) Puny Vhf+ Contesters. You cannot defeat me. I am the Rocks on the Vhf+ Contest shore. Crash against me and be destroyed!
2. **WA2TEO "THE GODFATHER"** Fellow East Coast Contesters, I love you like brothers, but don't you every think I will let you take my crown away. Don't you realize that I will do everything in my power to keep it!
3. **WC2K - "THE INCREDIBLE HULK"** WZG AND TEO, Please don't make me angry. You won't like me when I am angry. I get Big and Green and Contest Mean!
4. **WA3AXV = "SPIDERMAN"** Spiderman, Spiderman, does everything that the big stations can. Spin a microwave web, Listen bud He's got active microwave spuds - look-out, here comes a microwaveman.
5. **AA2UK - "THE BORG" (From STAR TREK)** Your Contest technologies and tactics are being absorbed. Our microwave technology is superior. All those above me will be defeated. Resistance is futile!
6. **WZ1V - "MELVIN PURVIS - G MAN"** W2FU, K1RZ, WA3NUF, KD1DU, Some of the most fear VHF+ contesters of our day. They said they would never be taken alive, so I didn't try hard either.
7. **W2FU - "THE SHADOW"** Who knows what VHF+ contest potential lurks in the heart of FU. The Shadow knows. MUUUUHAHAHAHAHAHAHAHAHA...
8. **K1RZ - "THE TERMINATOR"** You can't reason with him. You can't discourage him. Vhf+ contesting is what he does. That's all that he does. He won't stop. He will never stop!

(Contd on Page 6)

CHEESEBITS SUBSCRIPTIONS

Cheesebits subscriptions are available to everyone interested in activities and information from the VHF through the microwave frequencies. Subscriptions are for 1 year of 12 issues. For a subscription, send the following information:

Name: _____ Call: _____

Street Address: _____

Town: _____ State: _____ ZIP: _____

Subscription Rate: \$10.00 per year (USA), \$12.00 (Canada), \$15.00 (Worldwide)

August 1997

Send to: SUBSCRIPTION/ADVERTISING MANAGER;
Bob Fischer, W2SJ
7258 Walnut Avenue
Pennsauken, NJ 08110

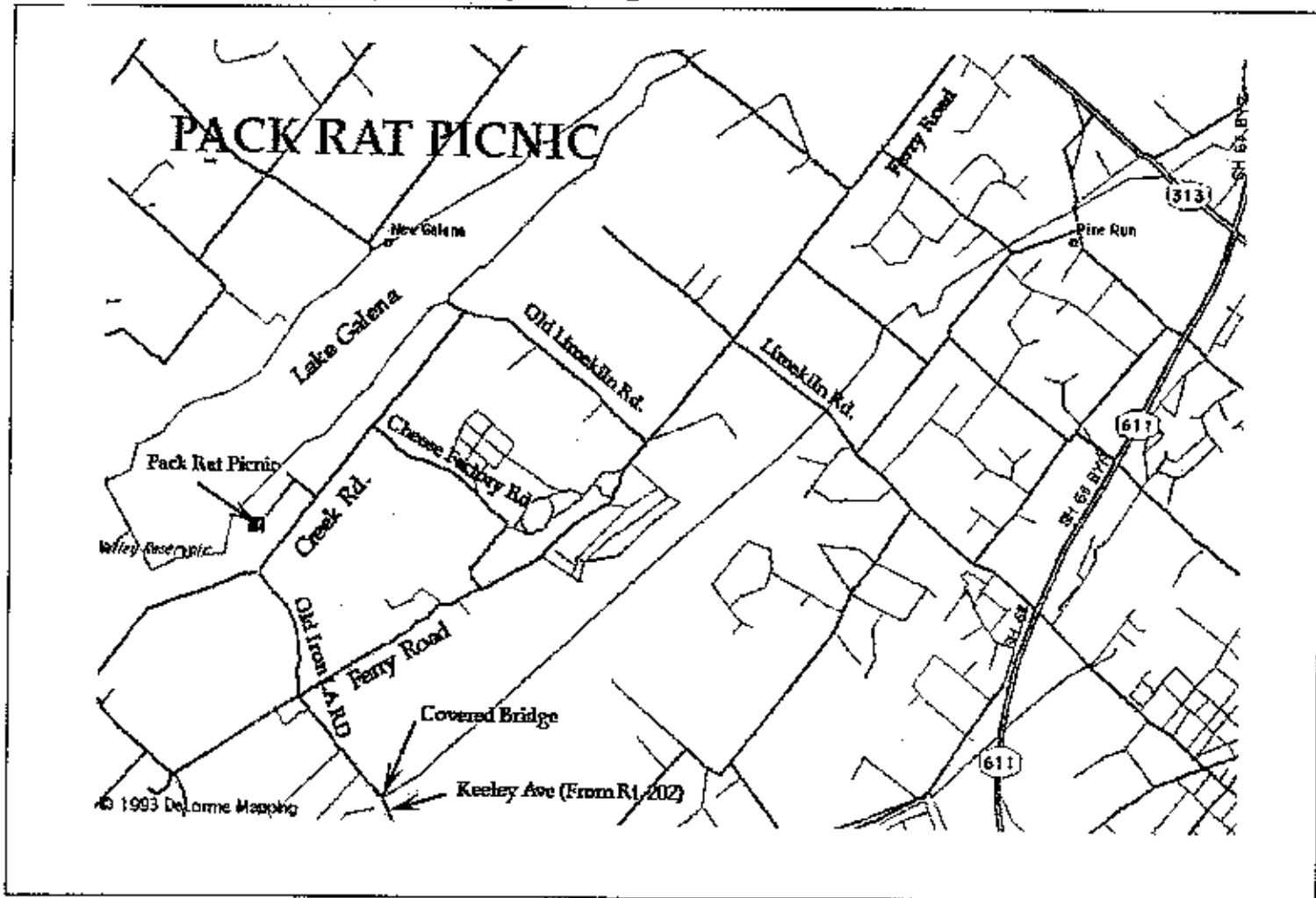
PACK RAT ANNUAL PICNIC AUGUST 16TH AT 1:00 PM

By Bob, W2SJ

The annual club picnic will once again be held at the Peace Valley Park, 230 Creek Road, Doylestown, PA. (Please see map in this issue). This has been a traditional fun event for all in the past and this year will be no exception! Arrive at 1:00 PM for the Championship Horse Shoe Challenge. Who will be the "horses rat" this year?

By popular demand, chefs Don & Al have agreed to fire up the pits and prepare your grilled favorites starting at 3:00 PM. The club will provide hamburgers, hot dogs, corn on the cob and soda. Everyone is asked to bring a covered dish of their choosing, but please coordinate with Don Schwarzkopf at 215-674-0405 or 442-0979 so that we don't end up with 20 bowls of potato salad!

This is a nice, fun, family event. Bring a friend and join us for a good time.



23rd Annual EASTERN VHF/UHF CONFERENCE

The 23rd Annual EASTERN VHF/UHF CONFERENCE will be held on August 22, 23, & 24, 1997 at the Hartley Hotel, 1 Bright Meadow Blvd. (off Rt. 5), Enfield, CT 06082. The hospitality room opens at 4 PM and the Lab Demos Rx Noise Figure Measurements. On Saturday, there is registration, formal talks and the VHF-SHF Bandsession, Lab demonstrations & much more. On Sunday there is the VHF-SHF Swap n sell & antenna gain measuring on 222 & up (bring your VHF-SHF goodies and antennas).

Each regular registrant receives a copy of the proceedings and is eligible for the drawings. Alternative dining is available near-by. Overnight rates, \$54, Mention Eastern VHF-UHF Conference, Call 800-321-2323 or 860-741-2211 for Harley Hotel reservations. Alternative nearby hotel/motels include:

Sheraton Inn, Bradley Intl. Airport, \$99, 860-627-5311, Sheraton Inn, Springfield MA, \$99, 413-781-1010, Super 8 Motel, Enfield CT, \$50, 860-741-3636.

Regular mail registration \$20 and at the door \$25. Sunday only registration is \$5. Extra proceedings are \$15. The Banquet tickets (by mail only) are: Prime Rib \$23, Crabmeat Stuffed Sole \$23 and Chicken Parmesan is \$19. Make check or m.o. payable to Eastern VHF/UHF Society & mail to: Rae Bristol, K1LXD, 328 Mark Drive, Coventry, CT 06238, 860-742-8650.

JANUARY 1997 VHF+ CONTEST ELITE Contd from Page 4

9. **WA3NUF "DIRTY HARRY"** So you VHF+ contesters think you can shoot me down from the Top Ten. Try it! Go ahead and make my day!

10. **KD1DU - "DAVIE CROCKETT"** Perched on a mountain top 600 miles from Tennessee. The greenest grass in the land of the free. He made the Top Ten when he was only 53. His powerful 2 meter array gives him great notoriety. Davie, Davie Crockett, emerging king of the wild 2 meter band.

JUNE '97 ARRL VHF CONTEST RUMOURED SCORES: by WZ1V

CALL	<u>W2SZ/1</u>	<u>K3MOH</u>	<u>AA9D</u>	<u>W3CCX</u>	<u>K3YTL</u>	<u>W4IY</u>	<u>K2TXB</u>	<u>N2YB</u>
GRID	FN32	FM19	EN52	FN21	FN11	FM08	FN02	FN12
CLAS	M/U	M/U	M/U	M/U	M/U	M/U	M/U	M/U
50	677/131	557/121	556/163	537/91	423/92	527/109	396/120	223/71
144	569/48	864/73	368/64	520/56	585/62	521/71	295/64	276/48
222	157/33	185/54	107/40	136/34	118/31	98/43	43/25	97/34
432	303/40	304/59	196/45	241/38	200/40	179/50	89/33	131/37
903	80/23	5/16	30/18	51/20	34/20	23/15	23/17	33/18
1.2	95/21	51/19	56/25	67/21	54/24	38/22	34/24	41/17
2.3	50/14	9/5	13/9	27/	15/10	8/5		11/8
3.4	34/10		15/8	16/8	8/6			1/1
5.7	35/10	2/1	15/7	11/8	6/5			2/1
10G	35/7		10/5	9/7	5/2	1/1	1/1	3/1
24G	20/7		2/2	2/1				
47G	1/1							
LAS			9/2	1/1		1/1		3/1
TOT	2056/345	1997/348	1377/388	1618/297	1448/292	1396/317	881/284	821/237
SCOR	1.16M	929,000	793,072	721,413	596,848	578,000	321,000	297,909
CALL	<u>W2SZ/1</u>	<u>K3MOH</u>	<u>AA9D</u>	<u>W3CCX</u>	<u>K3YTL</u>	<u>W4IY</u>	<u>K2TXB</u>	<u>N2YB</u>

CALL	<u>WA8WZG</u>	<u>WA2TEO</u>	<u>K1RZ</u>	<u>AA2UK</u>	<u>W3OR</u>	<u>KE8FD</u>	<u>KD1DU</u>	<u>K1RO</u>
GRID	EN81	FN31	FM19	FM29	FM28	EM89	FN31	FN31
CLAS	S	S	S	S	S	S	S	S
50	212/72	295/88	257/68	128/45	180/70	72/33	112/26	265/57
144	209/48	366/48	269/42	182/41	190/40	208/63	322/40	265/31
222	95/36	81/28	75/26	64/28	55/25	69/40	67/25	55/20
432	167/41	150/35	122/31	91/32	105/31	107/43	88/24	84/21
903	42/18	35/19	30/16	27/17	22/11	17/11	23/11	9/6
1.2	76/30	45/19	47/17	50/24	28/14	29/18	33/12	18/8
2.3	25/17	15/9	8/6	19/11	2/1		9/5	
3.4	6/5			9/5	2/1			
5.7	4/4			8/4				
10G	2/2			2/2				
TOT	838/273	987/246	808/206	580/209	584/193	502/208	654/143	696/143
SCOR	395,031	350,000	243,698	209,627	165,208	160,160	135,564	127,127
CALL	<u>WA8WZG</u>	<u>WA2TEO</u>	<u>K1RZ</u>	<u>AA2UK</u>	<u>W3OR</u>	<u>KE8FD</u>	<u>KD1DU</u>	<u>K1RO</u>

CALL	<u>WB2DNE</u>	<u>K8TOK</u>	<u>N8UM</u>	<u>K5MA</u>	<u>N5HHS</u>	<u>AF1T</u>	<u>VE3AX</u>	<u>VE5UF</u>
GRID	FM19	EM89	EM85	FN41	EM10	FN43	FN02	DO61
CLAS	S	S	S	S	S	S	S	S
50	137/41	48/25	203/78	241/53	63/120	181/54	64/40	522/128
144	153/33	160/59	146/45	187/24	106/27	133/22	155/48	2/2
222	56/25	49/32	33/20	56/21		43/16	49/28	
432	78/26	86/40	58/25	106/22	37/13	69/18	57/30	
903	26/18	12/8	7/6			12/7		
1.2	24/12	27/16	7/7			18/7	14/8	
2.3						5/4		
TOT	474/155	382/180	454/181	590/120	506/160	461/128	339/154	522/128
SCOR	109,740	107,100	103,713	90,240	86,880	82,944	72,842	66,816
CALL	<u>WB2DNE</u>	<u>K8TOK</u>	<u>N8UM</u>	<u>K5MA</u>	<u>N5HHS</u>	<u>AF1T</u>	<u>VE3AX</u>	<u>VE5UF</u>

GETTING STARTED ON 24 GHz

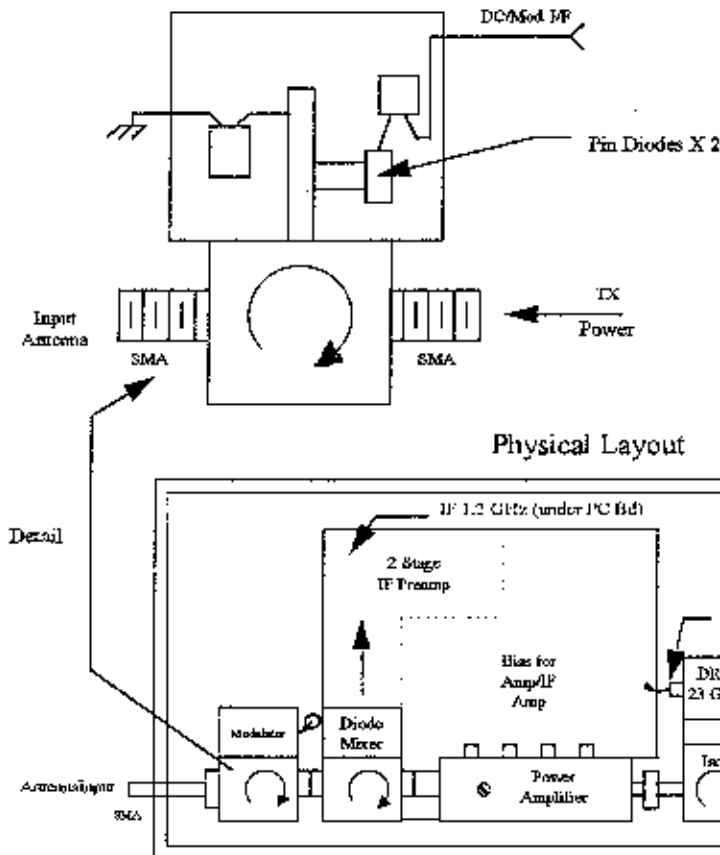
de John, KB3XG and Paul, WB3JYO

Last month I talked about the 24 GHz goodies that Paul, WB3JYO and I managed to scrounge over a 2 year period. The Digital Microwave Corp. (DMC) units appeared to be usable without too much modification.

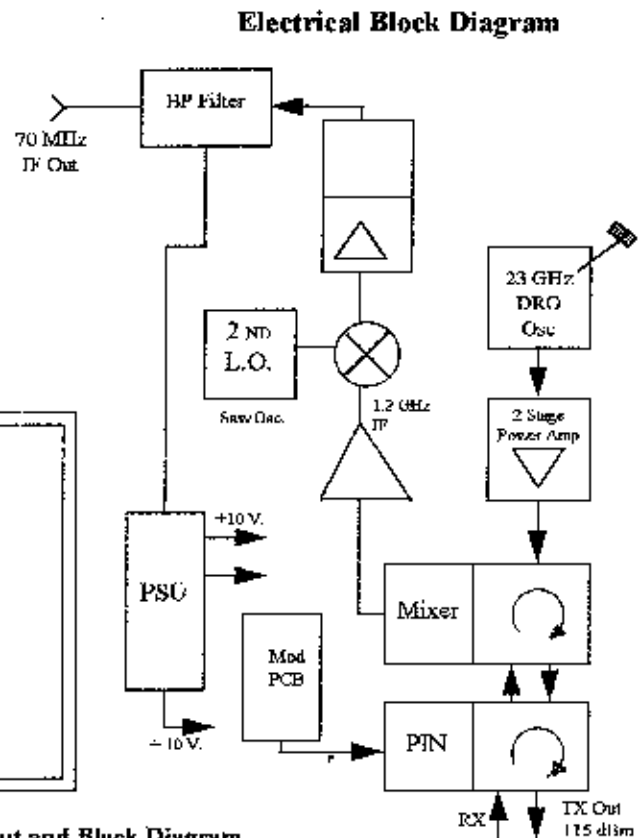
DMC CIRCUIT DESCRIPTION:

The units were designed to operate as short range, full duplex, FM video links in the 22/23 GHz band. Refer to the RSGB version of the DMC block diagram.

MK 1 Unit Modulator (Black Label Unit)
from RSGB Notes



DMC 22/23 GHz Video Tx/Rcv Layout and Block Diagram



DMC DRO:

The DRO free runs at 23.24 GHz and has an output power of +14 dBm at $V_{dd} = 5$ volts. The DRO has a screw adjustment above the yig puck which tweaks the frequency. It was possible to tune the oscillator close to 23,289 MHz which is what we needed for a 903 MHz IF. Paul and I briefly experimented with injection locking the DRO with a 11.6445 GHz Frequency West LO brick. The feedback path through the yig puck was too strong to be affected by the injected signal. We tried to remove the puck without the aid of a hot plate. As the yig puck exploded under the force of the needle nose pliers, a fragment of the puck destroyed the active device. The 2nd and 3rd DRO's we played with seemed to slowly die after cycling the power several times. It is a single stage, grounded gate oscillator circuit with a single +5 volt line to the drain. Maybe the DC needs to be slowly ramped up to 5 volts? Paul and I quickly determined that this was not the preferred method of generating LO power.

DMC POWER AMP:

The PA consists of 2 stages of power GaAs FET's. The total gain of both stages was only 6 dB (This is like the old days on 2304 when we were happy to get 3 or 4 dB of gain out of a single stage). The good news is, the amp puts out +20 dBm at 22 GHz. The bad news is, the gain drops to 0 dB at 24 GHz. Tuning a circuit at 24 GHz requires skill and equipment that is generally not available to the average

ham. Opening the lid of the amplifier reveals gold lines on a ceramic substrate with a couple pieces of silicon epoxied to the center connected together with gold wire bonds. Paul had to persuade one of the assembly ladies at work to pluck wire bonds to tune the amplifier up in frequency. With some effort, Paul was able to tune the amplifier to work at 24,192 MHz with 5.5 dB of gain and +20 dBm out. Now the only problem is to come up with a +15 dBm pre-amp.

DMC TRANSMIT PATH:

I'm not certain how the output signal was modulated. It looks like there is a pair of PIN diodes which varies the load on the dump port of the circulator which modulates the DRO carrier directly. The circulator & PIN was an integrated assembly with 2 SMA connectors. You can see that the +20 dBm power amp is needed just to overcome the loss of the transmit and receive circulators. This part of the circuit was not analyzed since our goal was to build a narrowband SSB transverter.

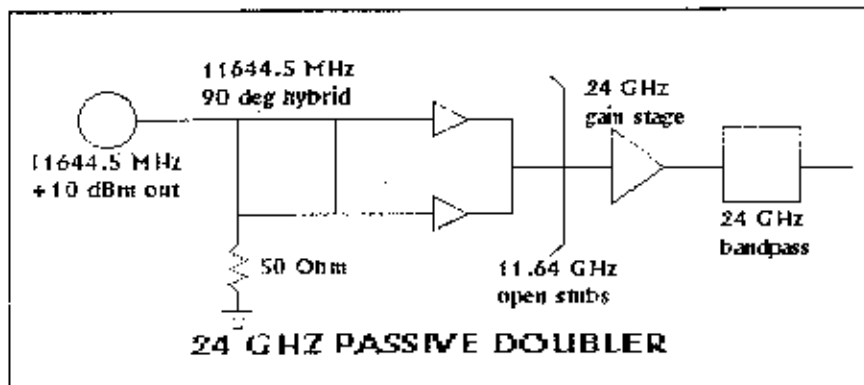
DMC RECEIVE PATH:

This is not like a duplexer where the incoming transmit signal provides the LO for the receiver. The receive LO gets power from the DRO leaking through the circulator from the transmit power amplifier module (Not a pretty design, but I guess it was cheap). The receive circulator, mixer, and 1200 MHz IF stage is also an integrated assembly with 2 SMA connectors. The receiver subassembly could probably be used as is but the circulator provides very poor LO to RF isolation and lots of LO power would be required to leak through the circulator. A filter would be required to knock down the amplitude of the receive LO. There is no LNA included in this receiver lineup. Just a detector and a 1200 MHz post amp. I was afraid to attempt a noise figure calculation.

GENERATING LO POWER:

The job of generating power at 23289 MHz was made a little easier since 10 Gig LO bricks with typical output powers of +10 dBm are easy to come by at hamfests. Two bricks were crystalized and tuned for 11,644.5 MHz. I worked on a passive doubler and Paul worked on an active version.

The passive circuit is a 90 deg branch hybrid with each output port being terminated with a diode. A pair of 11.64 Gig open circuit stubs at the output helps to suppress the 11.6 gig input signal. I bought a 10 Gig transverter mixer board from DownEast, cut out a single mixer, and mounted it to a test fixture. After extensive tweaking, I was able to improve the conversion loss from minus nothin' to -20 dB. (+10 dBm in, -10 dBm out) This is not good! I suspected that the plastic surface mount SOT-23 diode package (HSMS-2822) was contributing to the high loss. I tried a couple of diodes I saved from my 10 GHz transverter job. The conversion loss with the good microwave diodes was -15 dB. This is not acceptable since gain at 24 GHz does not come easy. As a sanity check, W3IIT found an 18 GHz doubler in an old Watkins Johnson catalog which advertised a typical conversion loss of -10 dB. The -15 dB of loss that I measured is probably not far from what can be expected from a passive doubler at 24 GHz.

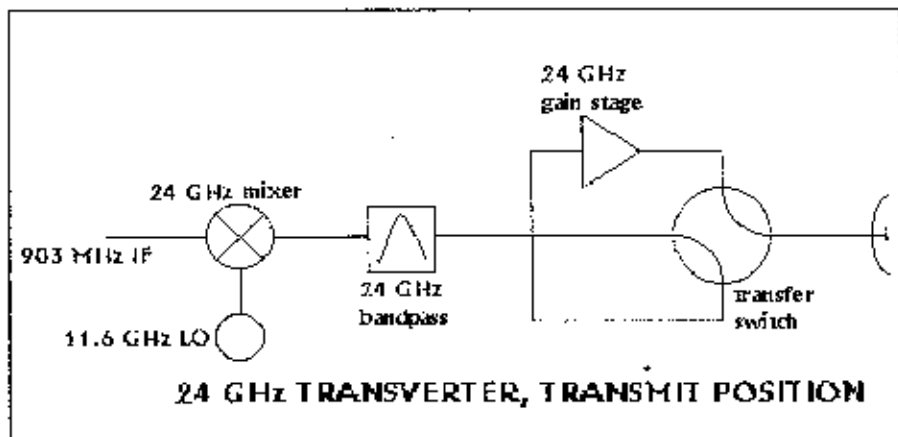


Paul had better luck using the DMC PA modules. The unmodified DMC PA modules were designed to operate at 23.4 GHz which is very close to our desired LO frequency. Without changing the input match, Paul jammed the signal from the 10 gig LO brick into the PA module and decreased the gate voltage while monitoring the output power at 23,289 MHz. A conversion loss of -5 dB was achieved (Pin = +10 dBm @ 11,644.5 MHz, Pout = +5 dBm @ 23,289 MHz). This is not the most eloquent approach but the contest date was rapidly approaching and time was running out.

SYSTEM DESIGN & INTEGRATION:

Our initial box of goodies was now reduced to 2 dishes and 4 low gain amplifiers. It was necessary to go into the beg, borrow, or steal mode to complete the design. I was able to procure a pair of mixers and some waveguide transitions from an undisclosed aerospace subcontractor located in Valley Forge, PA. A block diagram of the transverter is shown.

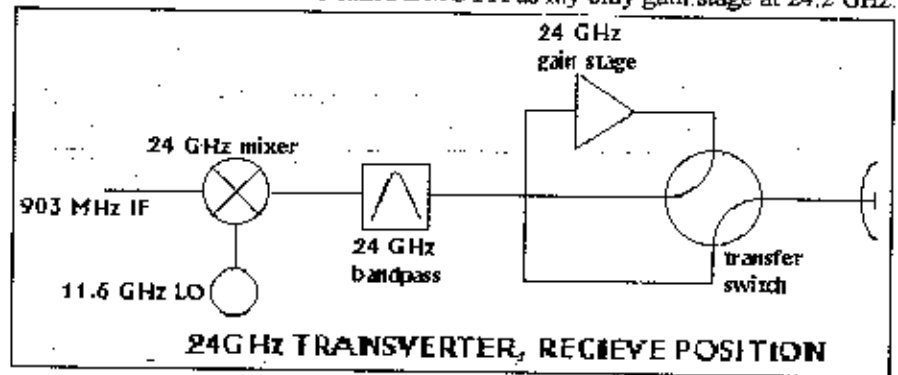
The 1st transverter using the WR-42 transfer switch went together with no problem. The transfer switch reverses the direction of the gain stage and allows me to get away with using a single mixer and a



single gain stage. I used an unmodified DMC PA as an active doubler and a 2nd re-tuned DMC PA as my only gain stage at 24.2 GHz. I purchased several sequenced GaAs FET power supplies from DownEast to supply the DMC modules with DC. With 0 dBm in at 903 MHz, I got 0 dBm out at 24,192 MHz. There was detectable receive conversion gain noise at the 903 MHz receiver port.

The 2nd system did not work as well as the 1st. The block diagram is the same except the transfer switch is a coaxial type with SMA connectors. Transco rates this relay up to 18 GHz. The output power of the 2nd system was 5 dBm less than the 1st system and I could not audibly detect any receiver conversion gain noise. I found that the Transco transfer relay had a through loss of -4 dB. I slipped a 1/4" stainless steel lock washer over each of the threaded barrels of the 4 female SMA connectors.

This acts as a spacer which prevents the connectors from being snugly fit together. The loss through the relay improved from -4 dB to -1 dB. The P_{out} of the 2nd system was -1 dBm with detectable receive conversion gain noise. Both transverters worked well enough to make a 40 over 9 "parking lot" contact in FN21.



SMA CONNECTORS:

The lock washer trick is not as mysterious as it may seem. I mentioned the fact that the VSWR of SMA connectors degrades rapidly above 18 GHz in last month's installment. Harry, W3IIT found a HP app note which shows how the VSWR and through loss significantly degrades above 18 GHz. HP warns "The user should be cautioned that above 24 GHz this type of connector will support higher order transmission modes that may interact with other components in the system." The connector manufacturers (Ma/Com and CDI) are careful not to list VSWR graphs for their connectors but show VSWR plots for different types of cable. Both UT-085 and UT-141 semi rigid cable is rated up to 26 GHz. Ma/Com (Omni-Spectra) offers a few connectors rated to 27 GHz. CDI infers that their connectors are rated to the same specifications as the cable they are designed for.

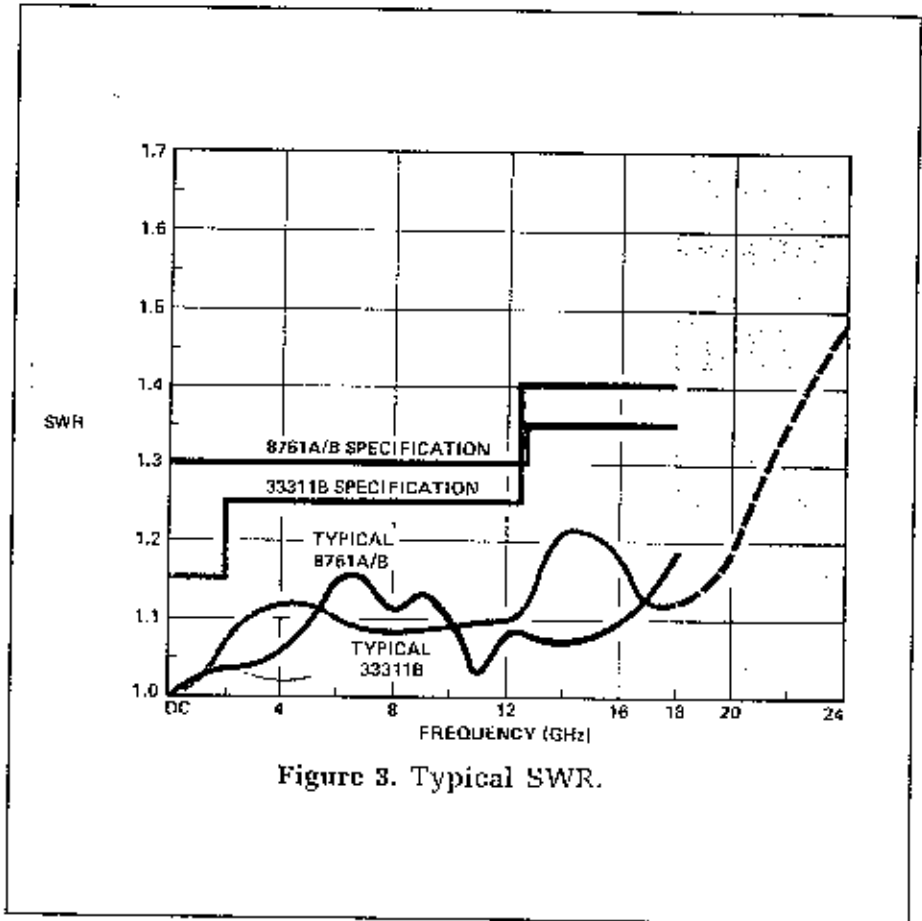
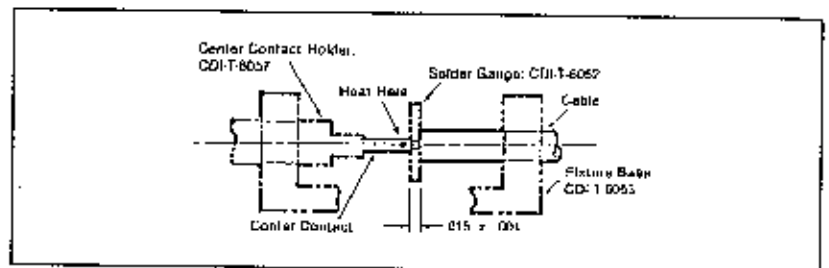


Figure 3. Typical SWR.

Chris Zielke, of Advanced Semiconductor, told me of a little known connector assembly tip that allows operation up through 26 GHz. From what Chris understands, there is an impedance bump in the barrel of a SMA connector at 24 GHz. The impedance is low (less than 50 Ohms) and capacitive. The application note (CDI #A1-111) instructs the cable assembler to use a "Solder Gauge" during the soldering process (see diagram) to maintain a 0.015" space between the end of the teflon and the bottom of the SMA pin.

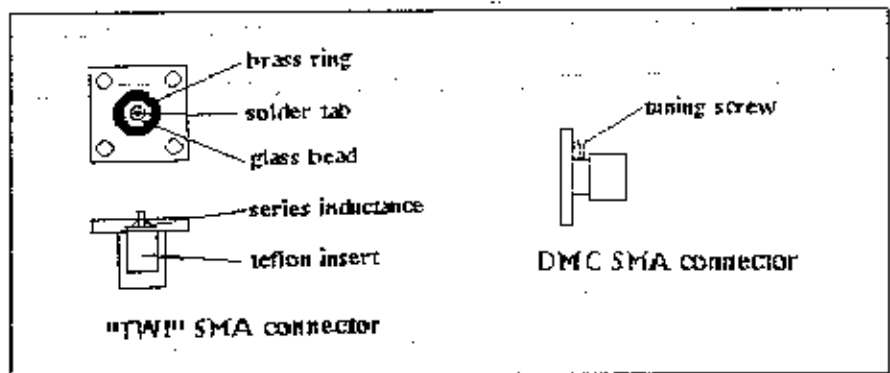
This small section of exposed center conductor looks inductive and brings the impedance back up towards the real line of the Smith Chart (Ma/Com probably builds this inductance into their line of 27 GHz connectors). My use of 1/4" lock washers gave me the series inductance I needed to "match" the transfer relay at 24 GHz. I don't recommend the lock washer trick except in a pinch. The connectors freely spin even after tightening since there is no back pressure of the teflon insert against the back ferrule of the male connector.

I feel compelled to stress the importance of choosing the correct connector for the 24 Gig band. As many of you know, Paul and I went through the design, layout, and fabrication process for a no-tune board for the 24 GHz band. It was by sheer luck that one day I happened to pass by an open cabinet full of old, unwanted, unmarked, test fixtures in need of a home. The fixtures were built for the 12 to 18 GHz military band and had high frequency SMA-



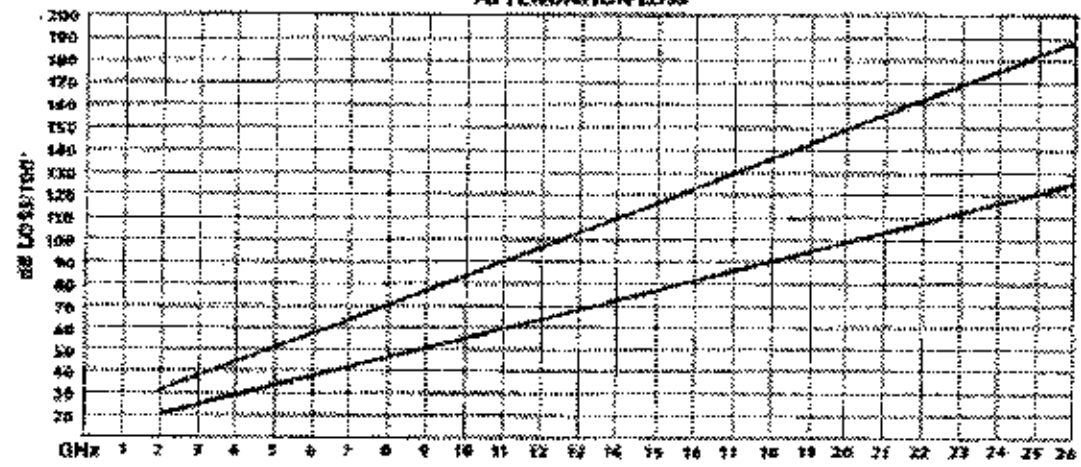
connectors attached. These connectors have the logo "TWI" branded on the outside surface of the flange. From the front end view they appear to be standard SMA connectors.

Viewing the connector from the back (see diagram) shows that the 0.022" wide solder tab is held in place by a glass bead. The glass bead is 0.020" below the surface of the flange. The solder tab extends 0.025" beyond the surface of the flange. Perhaps this gives the series inductance needed to overcome the impedance bump? The solder tab is very short and easily breaks if too much force is applied. There is a copper ring pressed into the stainless steel flange which allows direct soldering to a baseplate or test fixture. No tweaking was required at the launch interface between these connectors and our no-tune transverter PC boards. Obviously the manufacturer of this connector designed it for operation above 18 GHz.



As another side note, I recently dis-assembled, categorized, and stored away some of the DMC modules in my 24 GHz junk box. All of the connectors in the DMC modules were SMA's. After removing all of the RTV from one of the circulators, I found that DMC went to the trouble of modifying a standard SMA by drilling and tapping a #0-80 hole in the shaft of the SMA connector (see diagram). The tuning screw was used to tweak the VSWR at 23 GHz. I guess this was cheaper than buying the correct connector for this band?

ATTENUATION LOSS



141 VSWR @ 23 GHz 1.20 MAX 75.0 - 24 GHz 1.50 MAX .055 NERVE DL - 18.0 GHz 1.30 MAX 18.0 - 26 GHz 1.31 MAX

SMA CONCLUSION:

As you may already have surmised, the selection of the proper connector can make or break your 24 GHz project. It is important that you devise a method of testing each and every component before installing it in you 24 GHz transverter box. Unfortunately, many hams do not have access to 24 GHz HP test equipment. Paul or I will touch on this subject at a later date.

SYSTEM CONCLUSION:

Our 1st attempt at a narrow band transverter was a little disappointing, but disappointment often leads to renewed enthusiasm. Next month's article will begin discussion of a transverter board designed specifically for the 24 GHz ham band.

REFERENCES:

- Peter Day, G3PHO
RSGB Newsletter
- Chris Zielke
Advanced Semiconductor
7525 Ethel Ave.
North Hollywood, CA 91605-1912
- Connecting Devices catalog
P.O. Box 92619
Long Beach, CA 90809-2619
(213) 498-0901
- Omni Spectra / MaCom catalog
40 Fourth Ave.
Waltham, MA 02254-9101
(617) 890-4750

<u>Ma/Com 27.0 GHz Connectors</u>		
<u>Description</u>	<u>UT-141</u>	<u>UT-085</u>
Straight Cable Male	2701-7941-00	2701-7985-00
Straight Cable Female	2702-7941-00	2702-7985-00
Bulkhead Cable Feedthru	2704-7941-00	2704-7985-00
Female Panel Mount	2752-1201-00	
Male Panel Mount	2751-1201-00	
Female Barrel	2780-0000-00	
Connector Saver	2782-0000-00	
Male Barrel	2781-0000-00	

(302) 478-2757

Since 1977

AMATEUR & ADVANCED COMMUNICATIONS

Amateur and Shortwave
Closed Sunday & Monday

GISELE
K3WAJ

3208 Concord Pike Rte. 202
Wilmington, Delaware 19803

609-541-0120
FAX 609 541-2546

Bob Fischer Company, Inc.

AERIAL LADDERS · CRANES · MANLIFT EQUIPMENT

BOB FISCHER
PRESIDENT

2765 LINCOLN AVE.
CAMDEN, N. J. 08105



HARRIET SOLTOFF
TRAVEL CONSULTANT

616 SOUTH THIRD STREET
PHILADELPHIA, PA 19147

(215)
RES. 947-4483

THE R. F. CONNECTION

*"Specialist in
R F Connectors and Coax"*

Joel Knoblock
301/840-5477
Fax 301/869-3680

Order Line 800-783-2666
Suite 11, 213 N. Frederick Ave.
Gaithersburg, MD 20877

Graphic Design Illustration Production



Lynne D. Whitsel

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

RICHARD E. COMLY



TOOL DIE & MACHINE CO., INC.
2065 BENNETT RD. PHILA., PA 19116



(215) 676-1300
FAX 934-5237

(215) 745-6173
(609) 266-3668
(800) 5-EASY-DO



COMPU-SIMPLE, INC.
COMPUTER APPLICATIONS FOR SMALL BUSINESS

ELLIOTT T. WEISMAN
Consultant

P.O. BOX 7161
WILMINGTON, DELAWARE 19803

AUTHORIZED DEALER
ROHN TOWERS

TEL 908-776-2522
FAX 908-776-3635

TELEX-HY-GAIN
ANTENNA SYSTEMS
ROTATORS
TOWERS

PILOT ELECTRIC CO., INC.
1300 HWY. #35
NEPTUNE, N.J. 07763

GENE PILOT



(215) 288-0325

W3HK

GEORGE S. VanDYKE, JR. P.E.

1737 Scattergood Street
Philadelphia, PA 19124

(805) 288-0736

RICHARD CONNOR



RECON Communications

- COMMUNICATIONS TOWER MAINTENANCE
- ANTENNAS, FEEDLINES, TOWERS INSTALLED
- TOWER PAINTING, RE-LAMPING, RE-GUYING
- RF SYSTEM TROUBLESHOOTING
- LIGHTNING PROTECTION, GROUND SYSTEMS

Emergency Service

412 Carranza Road
Tabernacle, NJ 08068

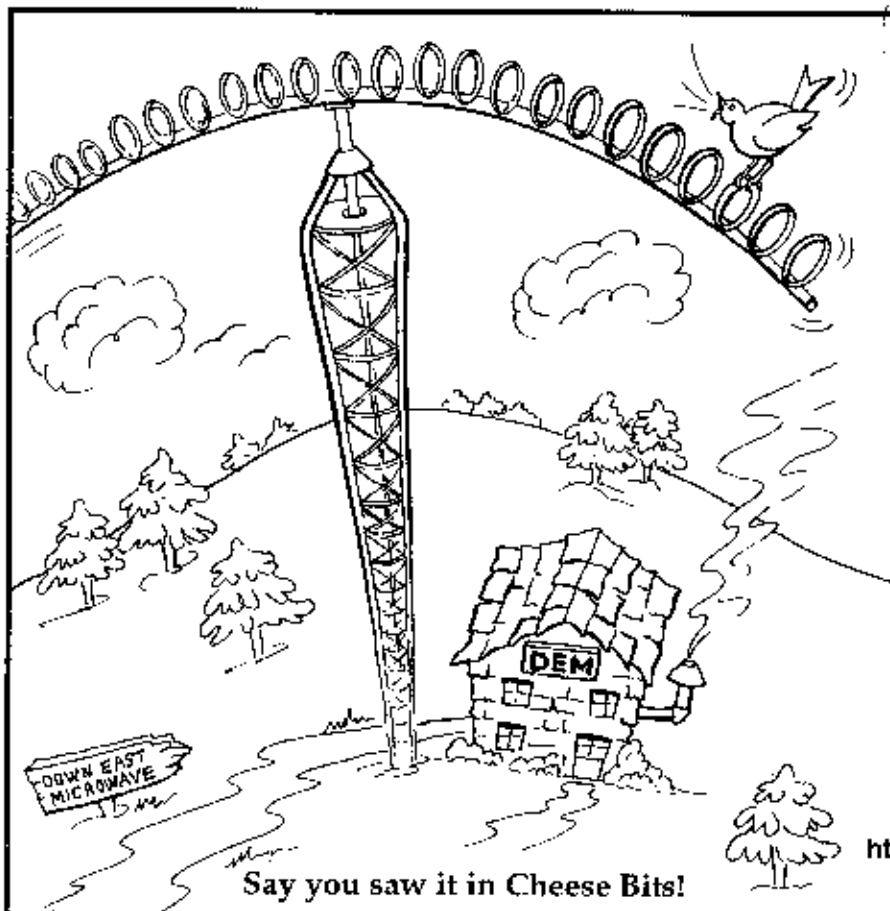
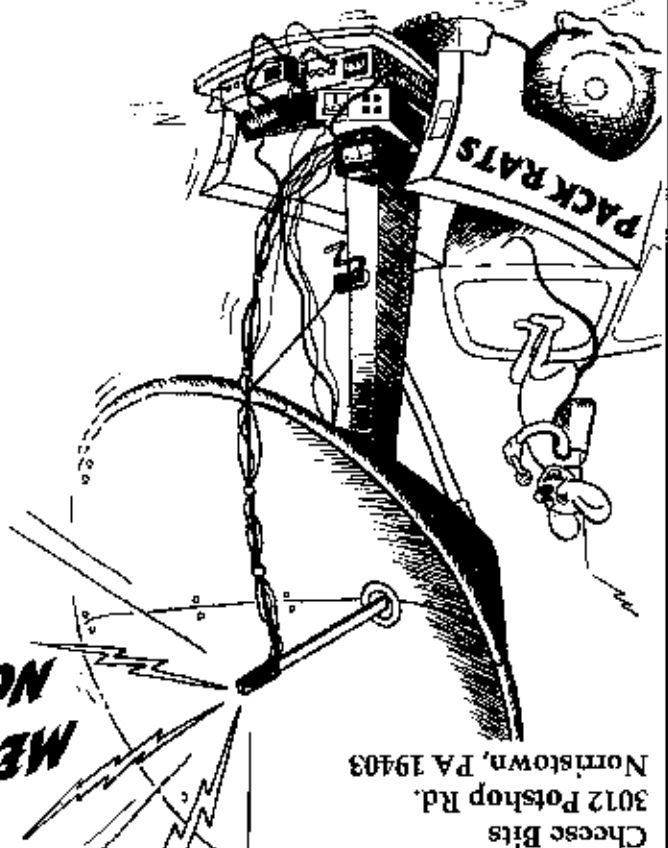
12/97

DICK HUNTZINGER
W3FD
130 FAIRHILL RD.
CHURCHVILLE, PA 18966



MEETING
NOTICE

Cheese Bits
3012 Potshop Rd.
Norristown, PA 19403



Say you saw it in Cheese Bits!

DOWN EAST MICROWAVE

Manufacturers and Distributors
of VHF/UHF/SHF Equipment and Parts
50 to 10,368 MHz

- Microwave Loop Yagis
- VHF/UHF Yagis
- No-Tune Linear Transverters
- Linear Power Amplifiers
- Low Noise Preamps
- Coax Relays, Coax Cable, Connectors
- Crystals, Chip Components, MMICs, Transistors, RF Modules

For All Equipment & Antennas:
Steve Kostro, N2CEI
954 Rt. 519
Frenchtown, NJ 08825
Tel.. 908-996-3584
Fax. 908-996-3702

<http://www.downeastmicrowave.com/index.html>