



PACKET

STATUS

REGISTER



**Tucson Amateur Packet Radio Corporation**  
A Non-Profit Research and Development Corporation

**Spring 1995**  
**Issue # 58**

**Published by:**

Tucson Amateur Packet Radio  
8987-309 E. Tanque Verde Rd.#337  
Tucson, AZ 85749-9399  
Phone: 817-383-0000  
FAX: 817-566-2544

**Office Hours:**

Tuesday - Friday  
9:00am-12:00, 3:00-5:00pm Central  
14:00-17:00, 20:00-22:00 UTC

**In This Issue...**

<i>1995 TAPR Annual Meeting</i> .....	3
<i>Membership Demographics</i> .....	6
<i>New ARRL CAD Mail Group</i> .....	6
<i>Update on 23 cm RF Hardware</i> .....	6
<i>SIG Reports</i> .....	7
<i>RUDAK-U Contributors</i> .....	9
<i>Commercial Radios For Amateur</i>	
<i>Packet Applications</i> .....	10
<i>DAMA - Demand Assigned Multiple Access</i> ....	12
<i>Overview of the Friday DSP Symposium</i> .....	15
<i>The Pacific Northwest TCP/IP Network</i> .....	16
<i>RUDAK-U</i> .....	17
<i>Review of the TAPR BBS Sysop Guide</i> .....	18
<i>HF Automatic Digital Approved</i> .....	19
<i>APRS Video Problems under Windows</i> .....	20
<i>1995 Special Olympics Summer Games</i> .....	20
<i>*** Connect Request</i> .....	21
<i>Data Speed Tests of</i>	
<i>HF Pactor and G-TOR Modes</i> .....	21
<i>Kit Updates</i> .....	26
<i>PCS Committee</i> .....	26
<i>Beta-Test Request Form</i> .....	27
<i>TAPR Project Proposal Format</i> .....	27
<i>Minutes of the 1995 TAPR</i>	
<i>Board of Directors Meeting</i> .....	28
<i>TAPR Software Library now available from</i>	
<i>ftp.tapr.org</i> .....	29

**President's Corner**

**Remarks on the 1995-96 year:**

I would like to congratulate and welcome the following people who were elected to serve a three year term on the TAPR board: Barry McLarnon, VE3JF, John Ackermann, AG9V, and Jim Neely, WA5LHS. TAPR is fortunate to have these individuals on the TAPR board for the next three years. Thanks also go to Robert Diersing, N5AHD, who was not elected, but put his name in the hat and thus generated an excellent selection of qualified people for the TAPR membership to select from. At the TAPR Board meeting, the officers stayed the same with the exception of VP. Keith Justice, KF7TP, stepped down from the position and John Ackermann, AG9V was elected as the new VP. The board set a number of goals for 1995-96: 1) continue to watch financial position, 2) increase membership (recruit 1000 new members), 3) continue to develop national perspectives, 4) continue R&D efforts in better digital operations, 5) generate closure on current projects, and 6) begin to develop possible directions and identify resources for future RF projects. These goals are ambitious, but very attainable. As my friend Harry Ridenour, N0CCW, has said on numerous occasions, "Only requires Time, Money, Energy, and Manpower."

**Look for TAPR at these Upcoming Events**

Sept. 8-10, 1995 ARRL Digital Communications Conference

**Packet Status Register**  
Tucson Amateur Packet Radio Corp.  
PO Box 51114  
Denton, TX 76206-0114

SECOND CLASS  
POSTAGE PAID AT  
DENTON, TX.

ADDRESS CORRECTION REQUESTED

A few organizational changes occurred at the annual meeting. Dave Wolf, WO5H, stepped down as Chair of the BBS SIG and Barry Buelow, WA0RJT took over as the new chair. Dave did an excellent job as the first chair of the group and I would like to personally thank him for all the time he spent working on its formation. Barry brings a lot of energy, enthusiasm, and goals to the group. We are all looking forward to see what the future has in store for the BBS SIG. Dewayne Hendricks, WA8DZP, will continue to head the FCC Regulatory committee and Gary Hauge, N4CHV, will be the board liaison. Their goal in the next month will be to set a list of deliverables for the committee. A new committee named PCS was formed to begin to examine the technology coming out of the PCS (Personal Communications Systems) area and see what might be available for transfer into potential Amateur digital projects. Barry McLarnon, VE3JF, will be the liaison to the PCS group.

Project-wise, things are progressing on the several kits under development. Details on those can be found deeper in the *PSR*. There are no other projects currently in the pipe. A proposal was made to the board concerning a 1200 baud bit-regen kit. After a discussion with the lead participant during the board meeting, the proposal is being reworked for later review.

TAPR was also proud to introduce its first major publications at the annual meeting. *Packet Radio: What? Why? How?* and TAPR's *BBS Sysop Guide*. These two publications are a first for TAPR and are the start of a future collection of books and publications. As kits become less economical to do and produce less income for TAPR, it is hoped that publications will help fill the gap. The TAPR *Packet Radio* book is part of our current new member advertising effort (see our classified ad in most Amateur magazines) and the *BBS Sysop Guide* has been available as a special membership offer to BBS sysops that join TAPR as a new member.

We are all looking forward to another exciting year. To finish this column — if you didn't make the St. Louis meeting, you missed an all-time great TAPR meeting. The people and discussions were excellent. Plan to attend next year! As always — the more the merrier!

Till next quarter. Cheers - Greg, WD5IVD

Entire contents Copyright © 1995 Tucson Amateur Packet Radio Corp. Unless otherwise indicated, explicit permission is granted to reproduce any materials appearing herein for non-commercial Amateur publications provided that credit is given to both the author and TAPR, along with the TAPR phone number (817-383-0000). Other reproduction is prohibited without written permission from TAPR.

Opinions expressed are those of the authors and not necessarily those of TAPR, the Board of Directors, Officers, or the Editor. Acceptance of advertising does not constitute endorsement, by TAPR, of the products advertised.

**Postmaster:** Send address changes to TAPR, P.O. Box 51114, Denton, TX. 76206-0114. *Packet Status Register* (ISSN 1052-3626, USPS 005-419) is published quarterly by the Tucson Amateur Packet Radio Corporation, 1418 Ridgcrest, Denton, TX 76205. Membership in Tucson Amateur Packet Radio, including a subscription to *Packet Status Register*, is \$15.00 per year in the U.S. and possessions, of which \$12.00 is allocated to *Packet Status Register*. Membership is \$18.00 in Canada and Mexico, and \$25.00 elsewhere, payable in U.S. funds. Membership and *Packet Status Register* cannot be separated. Second-class postage paid at Denton, TX.

**PSR Editor:**

Bob Hansen, N2GDE  
P.O. Box 1902, Elmira, N.Y. 14902-1902  
Internet: psr@tapr.org  
CompuServe: 71121,1007

**Advertising:** Maingate Resources.

Phone: 817-295-6222. FAX: 817-295-6232

**TAPR Officers:**

President	Greg Jones, WD5IVD
Vice President	John Ackermann, AG9V
Secretary	Gary Hauge, N4CHV
Treasurer	Jim Neely, WA5LHS



**TAPR Board of Directors:**

<u>Board Member</u>	<u>Term</u>	<u>Internet</u>
John Ackermann, AG9V	1998	ag9v@tapr.org
Bob Hansen, N2GDE	1996	n2gde@tapr.org
Gary Hauge, N4CHV	1996	n4chv@tapr.org
Greg Jones, WD5IVD	1997	wd5ivd@tapr.org
Keith Justice, KF7TP	1996	kf7tp@tapr.org
John Koster, W9DDD	1997	w9ddd@tapr.org
Barry McLarnon, VE3JF	1998	ve3jf@tapr.org
Jim Neely, WA5LHS	1998	wa5lhs@tapr.org
Mel Whitten, K0PFX	1997	k0pfx@tapr.org

Date is expiration of term on Board of Directors.

The Tucson Amateur Packet Radio Corporation is a non-profit scientific research and development corporation [Section 501(c)(3) of the U.S. tax code]. Contributions are deductible to the extent allowed by U.S. tax laws. TAPR is chartered in the State of Arizona for the purpose of designing and developing new systems for digital radio communication in the Amateur Radio Service, and for disseminating information required during, and obtained from, such research.

**Article submission deadlines for upcoming issues:**

Summer 1995	June 15, 1995
Fall 1995	September 15, 1995
Winter 1996	December 15, 1995
Spring 1996	March 15, 1996

**Submission Guidelines:**

TAPR is always interested in receiving information and articles for publication. If you have an idea for an article you would like to see, or you, or someone you know, is doing something that would interest digital communicators, please contact the editor so that your work can be shared with the Amateur community.

The preferred format for articles is plain ASCII text; the preferred graphic formats are HPGL or PCX. However, we can accept many popular word processor and graphic formats. All submissions on diskette should be formatted for MS-DOS.



## 1995 TAPR Annual Meeting

TAPR's annual meeting was co-hosted by MoAmPS (Missouri Amateur Packet Society) on March 3rd, 4th, and 5th, 1995, in St. Louis, MO. The meeting took place at two locations. The Henry VIII Hotel and Conference Center was used all day Friday and for Saturday evening's events, with the majority of the presentations and workshops being held at the St. Louis Community College at Florissant Valley Saturday morning/afternoon and Sunday. The MoAmPS group did a terrific job in hosting the event and their valuable contribution and dedication to helping organize and manage the meeting was one of the largest reasons for its big success. Since this year's annual meeting was the first held outside of Arizona, the regional sponsors had a lot to live up to. Many thanks to Mel Whitten, K0PFX, and his great group of volunteers. Keith Justice, KF7TP, again collected the papers for the proceedings. Keith did another great job and the proceedings totaled 77 pages of excellent technical papers. Extra copies of the proceedings are available from the TAPR office.

A total of 160 people attended the meeting. Past TAPR meetings have seen between 80-100 people attend. The organizers were a little puzzled at the lower than expected attendance. We had planned on seeing 200-250 people attend the meeting. After some questioning, it was determined that many of the intermediate people that had attended past MoAmPS spring meetings felt that the TAPR meeting would be above their heads. This is something TAPR will work on correcting for future years, since it is very important to get these operators involved with the organization. The weather might have also slightly reduced the turn-out. St Louis had been experiencing nearly spring-like weather the two weeks prior to the annual meeting, but winter returned for the TAPR meeting — to our bad fortune.

The TAPR annual meeting officially began at 12noon on Friday with the opening of the Hospitality Suite and Registration. A majority of participants began to arrive throughout the afternoon and into the evening. The TAPR Board of Directors had arrived the night before (Thursday) and began their board meeting at 8:30am. Full details on the Board meeting appear in this *PSR*.

At 3pm, the DSP Developers Symposium was held in the Windsor room. This was the first time that TAPR had attempted to hold a Friday session. Bob Stricklin, N5BRG, was kind enough to step in at the last minute for Jon Bloom, KE3Z, who was unable to attend and host the symposium as planned. The symposium was well attended and the discussion covered a wide range of topics. The goal of having actual developers meet and discuss on-going work and development was not achieved - something to be set as a goal for next year.

Friday evening, the group met in the Windsor room again for the informal Friday dinner. The group attending devoured in short order the pizza that was delivered. We have to make sure we have more pizza next year (grin). After dinner, the NET-SIG met (details in the SIG area). The meeting was well attended. During the annual meeting, the chairs of the various SIGs (Special Interest Groups) met and it has been decided that a better plan will be implemented next year in regard to scheduling the SIGs — to reduce conflicts and increase participation.

The annual meeting continued early Saturday morning with presentations and papers at the St. Louis Community College at Florissant Valley. The sessions were video taped and TAPR will review them to see if a tape can be produced and made available for distribution.

8:30am: Mel Whitten, K0PFX and Greg Jones, WD5IVD welcomed the group. In addition, Tim Childers, KB9FBI (from Illinois) of the ARRL, and Tom Bingham, of the college, welcomed the gathered group. Keith Justice, KF7TP, conducted the morning session. The attendants enjoyed the fact that a packet radio burst was being used to indicate presentation time was up. Session 1 began with a presentation on DSP-based Multimedia Sound Cards for DSP Development by Johan B. Forrer, KC7WW. Johan discussed the possibilities of low cost PC-based DSP-based multimedia sound cards being used in Amateur applications. Discussion included general considerations, present status of sound cards, and the future direction of work.

An overview of the TAPR/AMSAT DSP-93 project was presented by Bob Stricklin, N5BRG. Tom McDermott, N5EG, overviewed the D93WE Windows Development Environment for the TAPR/AMSAT DSP-93. Both DSP-93 presentations were hampered by the fact that American Airlines had misplaced the baggage with the equipment for the demo. The box was luckily found the following week and returned. Greg Jones, WD5IVD, presented three plaques to some of the development and beta-tester team members that were present: Bob Stricklin, N5BRG, for outstanding contribution as principle designer and co-project manager of the TAPR/AMSAT joint DSP-93 development project. Tom McDermott, N5EG, for outstanding contributions as an alpha/beta-tester and software designer during the TAPR/AMSAT DSP-93 development project. Roy Welch, W0SL, for outstanding contributions as a beta-tester during the TAPR/AMSAT DSP-93 development project. The plaques were very striking, since they included both the face plate of the DSP-93, along with one of the beta-boards.

John Koster, W9DDD, overviewed the TAPR TNC-95 project. There was mixed response from the audience. Some thought it an old design and did not contain enough bleeding edge technology, while others were looking

forward to having it made available as a kit and bare board. In any case, it will be available as the option, as planned, for the DSP-93.

Session 2 began promptly at 10:30am with a paper on Modem Channel Response by Tom McDermott, N5EG. The technical presentation overviewed the importance of selecting the overall frequency response of the modem plus channel. This was an excellent and concise technical presentation and the overheads in the proceedings were outstanding.

Phil Anderson, W0XI, then presented a paper entitled A Simulation of the G-TOR Hybrid ARQ Protocol. Phil outlined what G-TOR was and how he had gone about developing the simulator. The conclusion outlined the simulation results and the expected performance of G-TOR.

Glenn Prescott, WB0SKX, concluded the series of excellent technical papers in this session with a paper on Considerations for Automatic Gain Control in DSP Receivers and Modems. The paper focused on automatic gain control (AGC) in DSP technology. Needs related to the requirements of the analog-to-digital (A/D) converter were discussed using DSP techniques. An excellent technical paper.

The group broke for an hour and half lunch.

The afternoon session was conducted by Jim Neely, WA5LHS. The first presentation was by Keith Sproul, WU2Z, on Advances in APRS Technology. Keith overviewed APRS, what was required, current applications, and where all this technology was going in the future.

James P. Kramper, KB0NMT, of the National Weather Service (NWS) presented a paper regarding the National Weather Service St. Louis, Missouri Packet Weather Wire. James outlined how digital communications was being used to enhance the communications from the NWS to the Amateur. NextRad and other types of information are being provided over packet radio now and these applications greatly enhance what the amateur weather community has for information.

Dave Wolf, WO5H, outgoing BBS-SIG Chair, made a short presentation concerning the adopted recommendations on the BBS Hierarchical Addressing Protocol. Karl F. Larsen, K5DI, presented a short outline on an alternate packet BBS Address Proposal for future consideration.

Barry Buelow, WA0RJT, incoming BBS-SIG Chair, made a short presentation on the goals of BBS-SIG and outlined his future directions for the group. Gwyn Reedy, WIBEL, discussed PacComm activities. Brian Lantz, KO4KS, made a short presentation on TNOS and other related activities. Bdale Garbee, N3EUA, made a

presentation on the current status of RUDAK-U. Greg Jones, WD5IVD, presented a plaque to TPRS (Texas Packet Radio Society) and Robert Diersing, N5AHD, for contributions of \$250 each to the RUDAK-U project fundraising.

After the presentations were concluded, two break-out groups were held. The "HF SIG / HF Digital Issues", conducted by Johan Forrer, KC7WW left the theater and met in the Social Science building. The discussion that took place is outlined in the HF-SIG report. The breakout session on "Current issues in TCP/IP" was conducted by Barry McLarnon, VE3JF. The central theme of this session was implementing effective TCP/IP-based packet radio networks, and achieving a critical mass of users. Barry enumerated three key steps in achieving these objectives:

1. Build a good foundation at level 1. The RF network performance has to be good enough to show the applications in their best light. A full-duplex bit-regenerating repeater at 9600 bps or more is an excellent starting point.
2. Provide lots of useful and interesting services for the TCP/IP users (but don't forget the AX.25 users - give them a taste to entice them!). Examples include DNS, POP, SMTP mail forwarding, convers, NNTP, WWW, etc. An Internet gateway can be a major factor in attracting interest.
3. Give the users lots of help in getting started, using aids such as preconfigured NOS starter kits and installation programs. Explore the various options and platforms available (JNOS, TNOS, Linux, OS/2, etc.) for Amateur TCP/IP experimentation. Use RIP or RSPF to make routing transparent and painless for the end users.

A lively discussion ensued, with many audience members taking part. Some examples where critical mass has been achieved (Ottawa, Seattle) were analyzed. Internet gateways and their security were a hot topic, with interesting commentaries by Bdale Garbee, N3EUA, and other gateway sysops on their experiences. Phil Karn provided an update on the status of his work with NOS, which he assured the audience he was still interested in working on. His main focus will be on making NOS run in protected mode and breaking the 640K barrier, which means getting away from the Borland C compilers.

The breakout sessions concluded around 5:30pm and people began to make the trip back to the hotel to prepare for the evening dinner and meetings. The dinner was held at 7:00pm, with a full crowd of 100 people present. The meal was one of the best in TAPR history with lots of seconds for all those who wanted them. We will be hard pressed to repeat the quality of dinner next year. After dinner, several plaques were presented. Since this was the



10th anniversary of the TNC-2, it was fitting that many of the plaques celebrated long time volunteers and participants in TAPR from those early days. Peter Eaton, WB9FLW, for outstanding service from 1982 to 1993 as an officer, board member, and dedicated volunteer on this 10th anniversary of the TAPR TNC-2. Bill Reed, WDOETZ, for outstanding service since 1983 as an officer, designer, tester and dedicated volunteer on this 10th anniversary of the TAPR TNC-2. Mel Whitten, KOPFX, for outstanding service since 1982 as an officer, board member, tester and dedicated volunteer on this 10th anniversary of the TAPR TNC-2. Ron Bates, AG7H, for outstanding service from 1994 to 1995 as a board member and long time contributor to the Tucson Amateur Packet Radio Corporation.

Awards that were presented to people not present included:

- Jack Davis, WA4EJR, for outstanding service from 1992 to 1995 as a board member of the Tucson Amateur Packet Radio Corporation.
- Pack-It, Inc., for outstanding service to TAPR in kit building and parts inventory from 1985 to 1995 on this 10th anniversary of the TAPR TNC-2.
- Lou Nigro, KW7H, for outstanding service to TAPR as software librarian and Internet services manager from 1991 to 1995.
- Robert Diersing, N5AHD, for outstanding service as an alpha/beta-tester and AMSAT project officer during the TAPR/AMSAT DSP-93 development project.
- Ron Parsons, W5RKN, for outstanding contributions as a beta-tester and software designer during the TAPR/AMSAT DSP-93 development project.
- Frank Perkins, WB5IPM, for outstanding contributions as an alpha/beta-tester and software designer during the TAPR/AMSAT DSP-93 development project.
- Lon Cecil, WB5PKJ, for outstanding contributions as an alpha/beta-tester and trouble shooter during the TAPR/AMSAT DSP-93 development project.
- Mark Hammond, KC4EBR, for outstanding contributions as a beta-tester and software librarian during the TAPR/AMSAT DSP-93 development project.
- Jack Davis, WA4EJR, for outstanding contributions as a beta-tester and helping with parts purchasing during the TAPR/AMSAT DSP-93 development project.

Paul Shuch, N6TX, made a high-energy and very entertaining presentation on SETI (the Search for Extra-Terrestrial Intelligence). Everyone present agreed that Paul entertained, while covering the past history and how the future search should include Amateurs in an important role. If you were not there, it is highly

recommended that you read his paper in the proceedings. Amateurs can play a vital role in the next ten years in the now independent search. It is simple and easy. You can contact the SETI League via the Internet at [info@setileague.org](mailto:info@setileague.org). TAPR was very fortunate to have Paul make this after-dinner presentation.

After Paul had finished, the prize drawing was held. AMSAT and the SETI League helped to provide additional prizes along with TAPR. Numerous small awards were given. Phil Karn, KA9Q, was drawn as the grand prize winner of a TAPR/AMSAT DSP-93. We are all looking forward to Phil getting his unit, especially with his interest in HF related DSP coding. Congratulations to Phil.

After dinner, the APRS-SIG, BBS-SIG, and PCS committee met in different locations. All three discussions will be discussed in the SIG area of the PSR.

On Sunday, two workshops were held. The early morning session was on Error Correction Techniques, by Phil Karn, KA9Q. This was an excellent presentation and everyone attending thought they easily got their money's worth. The second workshop covered the development of hardware/software for the TAPR/AMSAT DSP-93, by Bob Stricklin, N5BRG and Tom McDermott. The DSP-93 workshop was a little hampered by the above mentioned misplacing of the bag containing the workshop materials by American Airlines. Disks and Workshop materials were mailed to the attendees after the materials were returned to Bob. Luckily Bob and Tom had time Saturday evening to get with Roy Welch to set up the necessary equipment to get the demos running. The DSP-93 workshop covered many of the topics required to understand how the unit worked and how to develop for it. Both workshops were video taped and will be reviewed to see if the quality is good enough to make the tape, along with workshop booklet available for each. More on this in a later *PSR*.

An annual meeting evaluation letter will be mailed shortly to all participants. If you attended the meeting, please take a moment when you receive this survey, to fill it out and return it to the office. This feedback is important to the future of our annual meeting. If you have comments or suggestions on how TAPR can improve the meeting, please let the office know.

The 1995 annual meeting seems to be rated as a great success by the many who attended. If you were not able to make it, then we hope to see you in 1996. A location for the 1996 meeting has not been selected yet. Several factors are in play that need closure before a location is selected by the TAPR Board of Directors.

Again, many thanks to the MoAmPS group for all their hard work and effort.

## Membership Demographics (January 1st, 1995)

TAPR reached its goal in 1994 of doubling the membership in the organization. The following breakdown shows TAPR's membership by states within the U.S. and countries outside the U.S. The '% Increase' shows the increase from January 1st, 1994 to January 1st, 1995. The U.S. list is sorted by percentage of member size. The international list is sorted alphabetically. This year TAPR has set out to recruit another 1000 new members. As a TAPR member, help us reach your state to increase the number of TAPR members there! With enough members, we could even start having regional meetings throughout the year at various locations! TAPR has had a traditional low profile in the East, so if you live in the East, you can be a big help telling others what TAPR is all about.

	Jan 95 %	% Increase		Jan 95 %	% Increase
CA	17.24%	49.44%	WY	0.32%	60.00%
NY	7.81%	60.33%	MT	0.32%	40.00%
AZ	7.04%	42.20%	RI	0.26%	50.00%
FL	6.07%	77.66%	MS	0.26%	25.00%
TX	6.07%	58.51%	SD	0.19%	66.67%
PA	4.52%	51.43%	VT	0.19%	66.67%
IL	4.13%	54.69%	NH	0.19%	0.00%
OH	3.81%	47.46%	DC	0.06%	0.00%
MI	3.68%	52.63%	DE	0.06%	0.00%
NJ	3.68%	45.61%			
WA	3.55%	41.82%		Jan 95 %	% Increase
CO	3.36%	44.23%	Argentina	0.32%	80.00%
MN	2.97%	69.57%	Australia	0.39%	50.00%
VA	2.97%	63.04%	Brazil	0.26%	100.00%
MD	2.52%	74.36%	Canada	4.00%	-1.61%
GA	2.39%	62.16%	Chile	0.19%	66.67%
IN	2.39%	62.16%	England	0.77%	33.33%
MA	2.39%	37.84%	France	0.58%	55.56%
NC	2.32%	72.22%	Germany	0.39%	50.00%
NM	2.71%	69.05%	Greece	0.19%	66.67%
MO	2.00%	64.52%	Greenland	0.06%	100.00%
OR	2.00%	48.39%	Indonesia	0.06%	100.00%
TN	1.42%	40.91%	Israel	0.32%	20.00%
IA	1.16%	50.00%	Italy	1.03%	31.25%
HI	1.10%	76.47%	Japan	1.03%	12.50%
KS	1.10%	70.59%	Malta	0.06%	100.00%
WI	1.03%	56.25%	Mexico	0.13%	100.00%
CT	1.03%	-12.50%	Netherlands	0.13%	0.00%
AL	0.90%	64.29%	New Caledonia	0.06%	-100.00%
AR	0.84%	76.92%	New Zealand	0.58%	44.44%
UT	0.84%	53.85%	Norway	0.19%	66.67%
AK	0.77%	50.00%	Portugal	0.06%	100.00%
NE	0.77%	50.00%	ROC	0.06%	100.00%
WV	0.77%	33.33%	S Africa	0.06%	0.00%
SC	0.71%	54.55%	South Korea	0.06%	100.00%
LA	0.71%	18.18%	Spain	1.23%	42.11%
OK	0.71%	18.18%	Sweden	0.06%	0.00%
ME	0.58%	66.67%	Switzerland	0.19%	33.33%
KY	0.52%	12.50%	Thailand	0.19%	100.00%
NV	0.45%	57.14%			
ID	0.32%	80.00%			
ND	0.32%	60.00%			

## New ARRL CAD Mail Group

TAPR is helping the ARRL by sponsoring the ARRLCAD mail group. The following is from the welcome message of the group.

The American Radio Relay League (ARRL) Computer-Aided Design (CAD) email reflector, ARRLCAD, has been setup on TAPR.ORG. This reflector serves as a meeting place for those interested in sharing questions, answers, information and views about ARRL Radio Designer (a Windows-based computer program that does linear, small-signal ac analysis of audio, radio and other electronic circuits) and other Amateur-Radio-related radio and antenna design and simulation topics. David Newkirk, WJ1Z, will be moderating the group (email: dnewkirk@arrl.org).

## Update on 23 cm RF Hardware

Carl Bergstedt, K9VXW

Enough interest has surfaced in the 23 cm hardware since the last issue of *PSR* that we can proceed to the next step. To those of you that wrote in and others that may have an interest, but did not reply, TAPR is now asking for a firm commitment.

The cost of the systems has been determined to be \$490 for the 1.5 watt system and \$540 for the 15 watt system, subject to fluctuations in the current exchange rate that might occur at the time TAPR actually orders the kits from the source in Germany. No TAPR member discounts will apply.

Your firm commitment will consist of a check for the appropriate amount which will be held till an aggregate order of 25 systems is received at the TAPR office. VISA orders will be accepted at a 4% surcharge on the cost. If the count does not reach 25, the order will not proceed and your check will be returned or your VISA charge will be cancelled.

A brief description of the hardware appears in the the Fall 1994 *PSR* issue #56. The prices listed will include commercially manufactured PCBs and tinplate cases, but not the frequency specific crystals for the transmitter and receiver. The PCBs are not drilled nor silk screened, so some experience with PCB work is assumed.

The duplexers will be delivered assembled and aligned to your choice of frequencies if specified on the order. Alternately, they will be aligned to frequencies in use in Germany and so marked.

No TAPR technical support for these kits is planned, but schematics and instructions in English will be provided.



## **New BBS-SIG Chair**

Dave Wolf W05H dwolf@tcet.unt.edu

It's fitting that this takes place at the one-year milestone of the BBS Special Interest Group, a new Chair is announced.

The original plan for BBS-SIG was that I would organize it, give it a sense of purpose and serve as its Chair for an interim period, identify an individual to take the reigns, then bow out as Chair. Although this interim period has stretched into a full year, I am very pleased that an individual has stepped forward to take the lead. Barry Buelow, WA0RJT, is your new Chair for BBS-SIG. Please join me in congratulating Barry in his new role! Barry has been a long-term contributor to BBS-SIG and the author of the new TAPR publication, the BBS Sysop Guide.

As incoming BBS-SIG Chair, Barry has many fresh new ideas. I'll let him share his vision for the SIG and BBS operation with you over the coming weeks and months. He got off to a warm welcome and great start at the just-concluded TAPR Annual Meeting, where news of his appointment was announced.

I am not retiring from BBS operation or packet radio! As Vice-President of the Texas Packet Radio Society, I am the co-chair of the host committee for the 1995 ARRL Digital Communications Conference. This year's DCC will be held September 8-10 in Arlington, Texas, and is co-hosted by TAPR. In addition, I am in charge of organizing the TPRS Digital Forum and Special Committee Meetings at the 1995 HamCom in Arlington, Texas, June 9-11. We've got a lot going on in Texas this year. Y'all come! Incidentally, for those not familiar with Texas, Arlington is smack-dab in the middle of the Dallas/Ft. Worth

Metroplex, and 10 minutes south of D/FW Airport.

Congratulations, Barry, and best of luck in your new leadership role. Thanks to all for the courtesies you've extended to me in the past year as I've had the privilege of serving you as the founding BBS-SIG Chair. The best is yet to come!

---

## **BBS-SIG Report**

Barry Buelow, WA0RJT  
barry@ia.net

About 20 people attended the BBS-SIG meeting in St. Louis, MO. This was part of the TAPR Annual Meeting.

With a small group, it was a nice opportunity to let each person speak about their individual concerns. Comments ranged through the usual Sysop issues. Under the category of long standing problems:

- newer Sysops reported problems understanding BBS docs,
- the size and quantity of header lines was mentioned, and
- problems with forwards to personal mailboxes (TNC built-in feature).

Several new items prompted some discussions. There was interest in having a message type 'E' for emergency traffic. A priority scheme would forward types E, T, P and B in that order. At least one BBS supports multiple message types and most either forward according to priorities or can be configured to do so.

Regarding user interface, it seems that users spend a lot of time listing the large number of bulletins. The 'L' command uses a lot of channel capacity. More efficient mechanisms need to be developed for users to list and search bulletins.

There seems to be little support for redistribution lists. This is the practice of sending multiple personal

messages rather than sending a single bulletin. It was not viewed as an effective use of the network.

For NTS traffic, it was suggested that the BBS prompt the user in a "fill in the blanks process." This would result in more consistent traffic and teach users to use proper formats.

In the area of future systems, brief mention was made of a few new topics being discussed in the Internet BBS-SIG. Of great interest is the discussion of client/server programs. One feature these programs might incorporate would be capturing bulletins being downloaded to other users. In theory, each bulletin would be read only once and all stations would capture it. This is the same scheme that AMSAT is using on the microsats.

Also getting a few comments was the thought of changing the format of the SUBJECT field on current bulletins. A set of standard topics would be created, similar to the newsgroups used on Internet. Users would send bulletins and include the standardized topics in the SUBJECT field. In the future, the BBS or client program would tag bulletins which meet the user's interests.

The next in-person meeting of the BBS-SIG will be held on Saturday evening at the Dayton Hamvention. In order to provide some structure to the meeting, an agenda will be prepared and a number of specific topics will be addressed.

---

## **HF-SIG Quarterly Summary: March 1995**

Johan Forrer, KC7WW

Judging from comments expressed at the recent TAPR annual meeting, the activities of HF-SIG are followed by many and found to contain interesting and useful material. HF digital is one instance where technical advances and its adoption

by the Amateur community, can be made with relative ease. Recent examples of this are CLOVER II, G-TOR, and PACTOR II. Many fields in Amateur radio do not allow this degree of flexibility in adopting new ideas and standards. The challenge of the HF channel offers a unique opportunity to explore and bring together a mix of theory, hardware, and software. Thanks to all your contributions that make this possible.

Recent activities on HF-SIG included several topics of interest:

- HF Channel Simulator,
- HF Modem Technology,
- Error-Control Coding.

### **HF Channel Simulator**

An HF channel simulator is an essential tool for HF modem evaluation. For example, comparing TNC's or testing and tuning algorithms. HF-SIG's simulator effort has been based on a model of HF propagation developed by Watterson et. al. [1]. Simulating the HF channel is a very complex subject — computer models such as IONCAP simulate the nature of the ionosphere from input parameters such as sunspot data, day and time of the year, frequency of operation, also magnetic and geographical location. For our purpose, however, a much simpler approach is followed. A bandwidth-limited, stationary model with operational parameters defined by CCIR recommendations [2] is used. This model is based on work by the Watterson group using actual on-the-air broadband transmissions and found statistically accurate. This is a well-known method used for evaluation and testing purposes. For a description of an actual implementation of such a model, please see reference [3].

Recently, the interpretation of how to generate appropriate fading functions was discussed by Tom McDermott and Alexander Kurpiers.

These functions have to represent two independent complex bivariate Gaussian ergodic random processes, each with zero mean and independent real and imaginary components with equal R.M.S. values that produce Rayleigh fading.

Contributors for this discussion:

Rick Whiting, W0TN,  
Barry Buelow, W0RJT,  
Eric Silbaugh, N2NNP,  
Glen Worstell, KG0T,  
Rick Booth, W6NZK,  
Jon Bloom, KE3Z,  
Hugh Shane, N7UAX,  
Tom McDermott, N5EG,  
Alexander Kurpiers, DL8AAU.

### **HF Modem Technology**

Two objectives are evident: A) High speed modems for eventual application over HF-based networks. B) Robust modems for use under adverse conditions. These two objectives possibly require different approaches and trade-offs have to be made.

Several promising approaches have been proposed. Orthogonal signaling schemes were suggested by Alan Bloom and Phil Karn. These schemes define multiple signaling channels spaced apart in frequency such that these are essentially independent. Occupied bandwidth varies depending on the number of channels and the symbol rate.

The family of MIL-STD-188, 16 and 39 parallel-tone modems, are good examples of multi-tone modems that are already available as commercial products, while ITA21, 6-tone, and ITA52, 12-tone Piccolo modems are examples of implementation of the MFSK approach. Ongoing work by Paul Russell and Pawel Jalocho continues the parallel approach, whereas Adrian Nash is pursuing the MFSK approach. Extensive literature is available on MFSK; reference [4] is a good place to start.

Waveform synthesis for multi-tone signals was reviewed to reduce extreme amplitude situations, i.e., noise-like spikes. Eric Silbaugh has been looking into these using computer simulation. Barry McLarnon pointed us to appropriate literature on the subject. Please refer to reference [5] for further details. Contributors in this discussion included:

Rick Whiting, W0TN,  
Walt DuBose, K5YFW,  
Phil Karn, KA9Q,  
Hugh Shane, N7UAX,  
Barry McLarnon, VE3JF,  
Alan Bloom, N1AL,  
Adrian Nash, G4ZHZ,  
Charles Brain, G4GUO,  
Kok Chen, AA6TY,  
Rolf Sommerhalder, HB9CWP,  
Frode Weierud, F/LA2RL,  
Pawel Jalocho, (SP9VRC),  
Paul Russell (non-ham).

### **Error-Control Coding**

The purposes of error-control coding for future HF modems are evident — dealing with fading, burst errors, interference and power considerations. Phil Karn has been a regular contributor and explained how best to employ block, convolutional, and combined clock/convolutional methods. Pawel Jalocho suggested a novel Hamming code for use with his experimental multi-tone modem. Phil has promised to contribute his efforts of an advanced convolutional coder that would ideally be suited for our future HF digital work. We are looking forward to this.

Contributors in this discussion:

Phil Karn, KA9Q,  
Pawel Jalocho.

### **General**

A growing library of code examples is available in the HF-SIG upload area:



ftp.tapr.org tapr/SIG/hfsig/upload

Example code for the HF simulator, experimental parallel modem, and error-control codes are available. In addition, DSP code for AMTOR/PACTOR using a DSP sound card, also W9GR ported de-noising code is available for experimental purposes.

**Important notice**

As scribe/HF-SIG chair person, this probably will be my last contribution for a while. Life's realities, in my case, my Ph.D work, has required that most everything else must be put on hold. HF-SIG thus requires assistance in this regard.

Please contact Greg Jones if you would like to volunteer to help out. This is a very capable and nice group of people to work with.

Thanks to each and all for participating, good luck, and keep up the good work.

**References:**

[1] Watterson, C, C., J.R. Jurosheck, and W.D Bensema. "Experimental Confirmation of an HF Channel Model". IEEE Trans. on Comm. Tech. Vol COM-18(3). 1970.  
[2] CCIR Recommendation 520-1. "Use of High Frequency Ionospheric Simulators".

[3] Ehrman, L., L.B. Bates, J.F. Eschle, and J.M. Kates. "Real-Time Software Simulation of the HF Radio Channel". IEEE Trans. on Comm. Tech. Vol COM-30(8). 1982.

[4] Ralphs, J.D. "Principles and Practice of Multi-Frequency Telegraphy". Peter Peregrinus Ltd.

[5] Boyd, S. "Multitone Signals with Low Crest Factor". IEEE Trans. on Circuits and Sys. Vol CAS-33 (10). 1986.

---

**RUDAK-U Contributions**

Thanks to the following individuals and groups for donating to the RUDAK-U fund raiser. This group is responsible for donating over \$3000 towards the project. We are still \$2500 short of obtaining the \$6000 goal.

TAPR would like to especially thank Robert Diersing and TPRS for their \$250+ level of donation.

**Certificate Level:**

- Brad Andrews - KB9BPF
- Claude Anderson - AB7G
- Elizabeth Youse - KD7VR
- Thomas L. McDaniel - N0NTX
- Ronald G. Parsons - W5RKN
- Richard W. Doering - WA6CFM
- Keith Justice - KF7TP
- Bill Schreiber - NH6N
- Vincent Risalvato - KD7AI
- Warren E. Gilleran - KD6UD
- Victor Bolstad - WB7OAF
- John Bennett - N4XI
- James Weisenberger - AA7KC
- Diane Foley - KD6AAA
- Larry Kenney - WB9LOZ
- Robert Douglas - W5GEL
- W. C. (Chuck) Hast - TI3DJT
- Gary R. Grebus - K8LT

**Significant Certificate Level:**

- David Wang - N8BMA
- Vince Self - W6FAK
- Ron D. Jones - WB0SOK
- Estill Roberts, Jr - K5XA
- Phil Gray - KA7TWQ
- Van Wert Amateur Radio Club - W8FY
- Fred W. Rollyson - WB6CNO
- Wayne Fleischer - AB6UN
- Harry Ridenour - N0CCW
- Henry Hunt - W1ORI
- Robert R. Adams - W8BKO
- Daniel Walter - NM3A
- Kenneth H. Leiner - N4LC
- David Rogers - N4JGQ
- Paul Newland - AD7I
- Larry Gabriel - WB7PZE
- Earl E Pittman - W6VHU
- Guy Black - W4PSJ
- Joseph W. Connery, Jr. - WA1ZVA
- David Bern - N2AER
- Thomas Laus - KH6ILT
- Northwest Ohio ARC
- Carl Bergstedt - K9VXW

- Presley Smith - N5VGC
- Mark B. Shepherd - ZL1TRE
- Hans F. Napfel - WB2ZZB
- Quicksilver Computer Engineers
- Barry A. Baines - WD4ASW
- Von C. Deeke - WB9KDY
- Alan P. Biddle - WA4SCA
- Grady Griffin, Jr - KR2C
- Paul J. Preston, M.D. - K7ANG
- Don Stiver - N6EEG
- Gene Pentecost - KG6EX
- Hans E Zorn - N5PBC
- Greg Merrell - KC6TYJ
- Bill Mastin - WB7QKK
- Keith Pugh - W5IU
- David J. Medley - KI6QE
- Jack Mathias - W9FMW
- Tom Cain - WB8OUE

**Plaque Level of Donation:**

- Robert J. Diersing - N5AHD
- Texas Packet Radio Society (TPRS)

# Commercial Radios For Amateur Packet Applications

Keith Justice, KF7TP

Internet: kf7tp@kf7tp.stat.com

Amprnet: kf7tp@wb7tpy.az.usa.noam

Fax: 602-461-0716

## Introduction

In recent years, a number of excellent commercial land/mobile radios have shown up at hamfests, due to obsolescence in the original applications. Some of these are particularly suitable for 9600 baud use, and nearly all can be used for 1200 baud. In this article, I will list the advantages and disadvantages of using commercial radios, and describe a few which have found wide use in ham applications. I make no attempt to describe how to convert these radios for Amateur use. That information will be provided in another TAPR publication now in preparation by Mel Whitten, KOPFX.

## Advantages of Commercial Radios

Used commercial radios have the following advantages:

1. They are cheap. These radios sell for from \$5 to \$100 at hamfests, and can be crystallized for as little as \$25 per frequency.
2. Using one for packet will free up your expensive synthesized rig. Many hams operate packet only part time, since they want to use the same radio for voice work. 24 hour packet operation opens up a number of possibilities not otherwise available.
3. For 9600 baud work, instead of taking a soldering iron to your your expensive synthesized rig, you can experiment instead with an inexpensive commercial radio.
4. Crystal controlled radios do a much better job at 9600 baud than synthesized radios. The time required to acquire a signal, and to switch from transmit to receive is much shorter, a few milliseconds vs. several hundred milliseconds.
5. Most have better immunity from strong near-channel interference than do radios designed for Amateur service. For example, if you operate voice adjacent to your packet rig, you will experience less interference from voice transmissions.

## Disadvantages Of Commercial Radios

1. They must be "tuned down" to the ham bands, and, in fact, must be retuned for any substantial change in frequency. In most cases, this does not require any actual hardware modification, just retuning tuned circuits.

2. The older models we are talking about here are crystal controlled. Since most packet users do not require frequency agility, this is probably not an overriding concern. Admittedly, it is nice to be able to change frequencies at will, but seldom is it really necessary, and you can always hook up the synthesized rig for that rare occasion. For habitual frequency surfers, many of the commercial rigs have crystal sockets for 4 channels, or more.
3. Most are big and heavy. See the sizes and weights listed below.
4. They draw a little more power on idle and transmit than an equivalent Amateur radio. This is not really a factor except for solar powered and similar applications.

A comment, not a disadvantage: All of these radios use a relay for T/R switching the antenna, and possibly also for switching the power to the receiver and transmitter. I do not list this as a disadvantage because, contrary to popular belief, the time delay introduced by a relay over pin diode switching is insignificant compared to the time delay required to lock-on frequency for synthesized radios.

## Characteristics Of Some Commercial Radios

The radios on this list are the ones most frequently used by hams, as far as I can tell by casual observation. All of these are Motorola radios, and all are fully solid-state. The "trunk mount" models are capable of power outputs from 30 to 110 watts, depending on the model. The prices shown are what we are seeing at hamfests in Arizona at this time, 1994-1995.

1. **Motorola Mocom-70.** A heavy, trunk-mount radio with remote control head. Available in both VHF and UHF coverage, but for UHF, all but the latest revisions use VHF in the final and a varacter tripler to achieve UHF. Thus, these have low power efficiency, but they work fine. The last revisions have UHF finals, and also use solid state T/R switching for everything except the antenna relay, so they are much quieter than the older models. Mocom-70's work fine at 1200 baud, and pretty good at 9600 baud if the receive modem is a TAPR unit with frequency compensation, or equivalent device. Some constriction of the eye-pattern is seen, even with the TAPR modem, but I and other hams have gotten good service out of them. Conversion for 9600 baud is straight forward. No problems have been experienced in getting the VHF model to tune down to the 2 meter band, nor in getting the UHF models down to 70 cm. Size: 4"x10.75"x16.5", weight: 25lbs, price: \$1 to \$10.
2. **Motorola Micor.** A big flat trunk mount, a more recent design than the Mocom-70, with more integrated cir-



cuits. The VHF version is a favorite of repeater builders, but they also work good on simplex. These are highly modular radios, and are a pleasure to work on.

The UHF version uses a single crystal to control both receive and transmit frequency, with a second crystal for offset. This can cause problems if the offset you want is not same amount and direction as that for which the radio was originally used. The "standard offset" models are set up for a transmit frequency 5 MHz higher than the receive frequency. The "wide-spaced offset" models allow either simplex or the standard offset. But either model can be made to provide a 5 MHz negative offset by changing the receiver from low-side to high-side injection. Be sure you understand all this before you order crystals! The 450 to 470 MHz models tune down to 440 just fine, but transmit and receive helical filters must be modified for lower frequencies. Some transmit filters will not tune below 445 MHz. UHF Micors work great on 9600 baud.

VHF Micors have separate crystals for transmit and receive, so they are less complicated to set up. Some VHF preselectors will not tune down to the low end of the 2 meter band without modification. Try to find radios which were built for the low end of the commercial band, or be prepared to modify the preselectors. They work fine on 1200 baud, but not at 9600 baud unless the IF bandwidth is modified. With the other excellent radios available for 9600 baud applications, I suggest you pass these up for 9600 baud. Size: 3"x12.5"x17.5", weight 25lbs, price: \$40 to \$60.

3. **Motorola Syntor.** This is basically a Micor with a frequency synthesizer instead of a crystal control. The synthesizer is controlled from an EPROM chip which must be programmed by an authorized Motorola service station. It may cost you as much as a set of crystals to get it programmed, but you can get several frequencies put in at once. On the other hand, if you know someone.

4. **Motorola Mitrek.** These are small light-weight trunk mount units. Among the radios listed here, they are the best for 9600 baud. They will work with modems which do not have frequency compensation, such as the K9NG. Modification for 9600 baud is simple, although a few radios require replacement of the IF filters with other readily available substitutes. These radios will tolerate txdelays of a few milliseconds. No problems have been encountered tuning these down to the ham bands, UHF as well as VHF. When used for 1200 baud, an isolation transformer must be installed between the audio output and the TNC, since the amplifier output is balanced to ground. Power switch-

ing is solid state, with the antenna switched by a very quiet relay. Size: 2.5"x10"x12". weight: 10.5lbs, price: about \$40 to \$60 for VHF, \$100 for UHF.

5. **Motorola Mocom-35.** These are dash mount radios with integral control head. Power output is 1 to 10 watts. They will work at 9600 baud, but they are a little narrow in IF response and not very stable in frequency, so I do not recommend them. But at 1200 baud they are fine. Despite their small size, they still include RF pre-selectors, so they should have pretty good immunity to nearby strong signals. Power consumption is low. Radios built for the high UHF band (450-470MHz) tune down to the ham band with no problem. Size: 2.75"x9.5"x8.5", weight: 8lbs, price: \$5 to \$15.
6. **Motorola Maxar.** This is another dash mount unit which has been used with success by hams on UHF. It is a more recent model than the above, and demands a higher price at hamfests, when seen at all. It can be tuned down to the ham bands and works satisfactorily at 9600 baud.

### Acknowledgement

I want to thank David Bray, N0ITS, for the information on UHF Micor and Maxar radios.

### Conclusion

In my opinion, many hams are missing a good bet by not using these fine commercial radios for Amateur packet, and for similar ham applications not requiring frequency agility. Don't let the fact that you have no experience with commercial radios scare you off. At the prices quoted here, you can afford to experiment. All you need is some basic knowledge of RF and receiver design, and some rudimentary test equipment. A little help from an Elmer can usually be solicited if you get stuck. Future articles will provide information on inexpensive test equipment, and general procedures for retuning radios to the ham bands.

---

### Annual Meeting Proceedings

Did you miss the TAPR Annual Meeting? TAPR still has proceedings of the annual meeting available. Contact the office to get your copy of the 1995 proceedings. 77 pages covering all sorts of very interesting and technical topics. Proceedings from the 1994 annual meeting are also still available.

## **DAMA - Demand Assigned Multiple Access**

### **A New Method Of Handling Packets?**

Detlef J. Schmidt, DK4EG

Steinbrecherstr. 22 D-38106 Braunschweig

c/o Peter Gülzow, DB2OS

Allensteiner Str. 5

D-30880 Laatzen

Germany

Translation : Mark Bitterlich, WA3JPY

Reprint : Pierre Cornelis, ON7PC

Lately it seems we are hearing more and more stories about hams who are having trouble using their local node or digipeater. It seems that the user has no trouble hearing the digi, but the digi doesn't seem to hear the user at all. The symptoms almost match those where the receiver at the digi site is either dead or close to it. While that kind of failure is always a possibility, it is not the subject of this article.

The condition that this paper will talk about is one where the above symptoms do actually occur, but not from any lack of receiver sensitivity. Instead it is due to the digi's receiver hearing too many signals all at once and the remote user pretty much gets lost in the "noise."

The reason for this becomes obvious when we consider that while all the users may hear the digi/node just fine, they, in many cases don't hear each other. Thus in some cases, more than one station will transmit at the same time causing packet collisions. This situation is referred to as "a hidden station" problem, and for remotely located users, access to his or her favorite digipeater become difficult to impossible during rush hour periods.

This is not a new problem, and in fact there are other services experiencing the same difficulties. A real world example is ships on the open sea trying to gain access to a communication satellite.

Several different experiments have been made to overcome this dilemma on Amateur packet radio. One possible solution that is being pursued is through the use of full duplex digipeaters, however there are two disadvantages to this approach. In a full duplex system, the hardware expense will normally be much higher, and the system will occupy two frequencies but will only realize the maximum throughput of one. A better approach might be to increase the throughput by reducing the collisions on a single channel system rather than spreading the load onto two channels. It would be ideal if we could incorporate a system that did this with something so minor as software change (such as replacing

the EPROM in a TNC) or by changing some operational parameters.

One of the methods used that attempts to solve the hidden station problem while still using a single frequency is called DAMA (Demand Assigned Multiple Access). A description of this method follows.

In a connection-oriented protocol environment, an end user will try to connect to the master (satellite) by means of a slotted ALOHA method (channel access without any coordination). Collisions might occur during this phase but they are tolerable since they are relatively rare. In DAMA, once a connect request is recognized by the master, the connecting station's identification is added to the polling list and from this point on the master controls all connected stations. Permission to send data is granted by means of polls which might be included in ACK packets or even in transferred data frames. So in this case a user will only be allowed to transmit after receiving "permission" in the form of a poll sent from the master station. Once permission is granted, several frames might be transmitted in a block. However, if the user does not respond within a given time frame (say around 1/2 second) then the master assumes that the poll got clobbered or the user never received it for some reason. The master then passes permission to transmit to all other active stations and when completed comes back to the first user and gives him another chance.

On the other hand, if the user (slave) actually receives the poll and replies with sent I-frames, the master will not acknowledge them until the next time around after servicing all the other active stations. If, when polled by the master, the user responds with an empty frame (Receive Ready/Final), then the master will reduce the user in polling priority and will skip him on the next time around.

As the activity on the frequency increases, the polling priority of inactive users might be further decreased, but when these stations respond with an I-frame they will again regain their original priority.

If you understand the description just given, you might think that you are reading about AX.25 level 2 protocol and this is why DAMA has a chance of working over Amateur packet radio. AX.25 L2 provides all the protocol elements that are needed to implement DAMA and no new syntax is required. Most of the new functions required could be obtained simply by patching existing operational parameters while the rest could be achieved by making some minor changes to the TNC's firmware.

So how do we actually go about incorporating DAMA using AX.25 protocol ?

Due to the fact that there are no new syntax elements required, the following description will only use standard



AX.25 terms. Since CSMA (Carrier Sense Multiple Access) as well as DAMA is used, please interpret all future references to DAMA as CSMA-DAMA. The term "poll" used throughout this text in no way refers to the poll bit in the control field of packet frames and this bit remains unchanged to ensure compatibility. The different phases of the protocol will be described separately below.

### **Connect Establish**

When a node attempts to connect to a user, the node adds the user's ID to its polling list and begins to send SABMs to that station. If after a certain amount of tries no UA is received, the user is assumed to be inoperable and is removed from the polling list.

When a new user starts a connect sequence to the node, he begins by sending SABMs to the master in a simple CSMA manner duplicating the existing method used today. Collisions are possible during this phase, so it might be necessary to repeat the SABMs several times until the node replies with a UA. Once the node recognizes the user's connection attempt, the user's ID is added to the polling list in a fashion very similar to the one used by TheNet nodes (TheNet userlist) and the node (master) is now in control of the uplink user's station. After the user sends SABMs and the node replies with a UA, the user replies with an RR0 to signal to the node that it had a successful reception of UA.

### **Idle state**

As long as no information transfer occurs between user and node, the node sends its polls as an RR with the corresponding count. If the response by the user is just an RR#, then the time until the next poll to the user will be lengthened to avoid unnecessary channel load. The exact amount of time added is determined by the total channel activity.

If information transfer by other users on the node is high (as determined by the number of I-frames being sent) then the amount of time added before the next poll occurs to an inactive station is longer than in cases where there is only very little channel activity. Thus when the frequency is basically clear, the waiting times are reduced to a minimum so that no decrease in channel throughput takes place. This is the principle of the self-alignment mechanism of DAMA, where a channel is always regulated to insure its maximum possible throughput.

If the node ever fails to receive an RR from the user (due to a collision of the node's poll or the user's RR response) then the node will proceed on to the other stations on its polling list. The node will come back and try this station again after all the other users on its list have been serviced. If after a certain number of transmitted polls this station still has not answered, then it is considered to be unavailable by the node and is dropped

completely from the list. This is analogous to those "keep-alive polls" that we have today.

### **Data transfer : Node to User**

There is no difference between regular CSMA and DAMA in this case. Because it is always up to the master (node) to act first, it could send one or more I-frames or a poll to the user. The user will acknowledge I-frames immediately with an RR#, but could also send its own I-frames with the corresponding count (having to correct the count on the sent I-frame serves the same purpose as an ACK with AX.25). The meaning of the Poll/Final bit remains unchanged.

### **Data transfer : User to Node**

As mentioned before, the node will send polls to all users that are uplinked to it and the user will not respond until it receives this poll or an I-frame from the node. It may be wise to point out that when a user is polled he must always come back with some kind of response, even if it is an RNR#. If the node fails to hear any kind of response from the user, then it assumes something went wrong (such as a collision) and moves on to the next user on its polling list.

This method of always waiting for a poll before transmitting is the central aspect used to avoid collisions in a situation where hidden stations exist. This is in contrast to the usual CSMA method where several stations can actually transmit at the same time. Additionally, the problem of deadtime collisions is resolved. Deadtime refers to the period from when the TNC realizes the channel is free and starts transmitting, to when he has been on the air long enough for other TNCs to recognize his carrier. This is really not a rare case, as exemplified by the case where two or more TNCs are waiting for a digipeater's carrier to vanish so that they can leap on the frequency. Using DAMA the node will not acknowledge received frames the instant it hears them. Instead it will first service all other uplinked stations and then come back with an RR# to the sending stations I-frames along with a poll to that station. This poll basically says "Have you got anything else for me?"

### **Disconnecting**

If the master intends to cut the connection, it will send the usual DISC-frame to the user. The user will then promptly respond with the UA-frame (final bit set). If the node fails to receive the UA and again sends a DISC-frame, the user will respond with a DM-frame. This is identical to the actual CSMA version.

When the user wants to disconnect from the node, he will wait to send his DISC-frame until polled by the master. At this point it makes no major difference whether the node responds to the user right away with a UA or

goes through another polling cycle to do so, however an immediate UA is preferred.

### UI-frames

In CSMA as well as in a DAMA environment, the UI-frames are treated in a special way (i.e.: these frames are used to carry some information besides the regular protocol traffic). Normally UI-frames are never sent from a user to a node, and it is not good headwork to make a habit of making UI-frame direct QSOs on the input frequency of a node. However, in contrast to a duplex system, it is possible to actually do this. So although the rare UI-frames will reduce the throughput to the CSMA value, it will not drop the much lower ALOHA value that would occur with a duplex digi having a QSO on its input frequency. UI-frames originated by the node are no problem since all stations receive these frames.

### Other protocol elements

So, we have gone from the beginning to the end in describing a complete DAMA session. We have not translated each and every AX.25 element into one that has a special significance to DAMA. This is not required since many of them will keep their initial meaning. DM, RNR, REJ, etc. will all be used as they were before. The only deviation from the pure CSMA version is in the fact that the users will only be allowed to transmit these frames after receiving permission from the master (node) in the form of a poll. The node will only transmit these frames after all other users on its list are served by completion of one polling cycle.

### Compatibility of DAMA and CSMA

One advantage of the DAMA method is that it does not require everybody to change everything all at once. However, as additional users convert their TNCs to work with DAMA, the more pronounced the increase in throughput will be. Even stations that are waiting to switch over could help to increase the area's throughput by changing a few operational parameters. For example the delay between the reception of a frame and the TNC's response (sometimes called T2 or DWAIT) should be reduced to a value under 1 second. In addition, the time interval from when an I-frame is sent to when the TNC sends an RR# to ask for a pending ACK, should be set to a value that is clearly higher than the time between two polls of the master (usually more than 30 seconds at 1200 bps).

To fully benefit from DAMA, both the node and the user must work together in the master/slave relationship. Assuming that the user's TNC is capable of both the normal and the DAMA mode, there still remains the problem of how to tell the user to "turn DAMA mode on." There are several ways that this could be done:

1. Automatic detection of the protocol version by means of the protocol identifier byte or reserved SSID-octet-bits of the node (preferred method).
2. Implementation of a channel specific parameter which controls the protocol version.
3. Implementation of a new UPLINK command besides the current CONNECT command.
4. Implement a further protocol element such as a SABM-frame (similar to X.25) so that at connect-time the node could alert the user to the increased features.

In case #1 above it would be sufficient to tell the user to switch DAMA mode only once, at connect time. This state would then remain in effect until disconnect. However since there is no PID field in SABM-frames this information has to be carried in some other way, such as utilizing the dormant bit 5 of the master's SSID address field. It is proposed that DAMA test versions set this bit to 0 to convey the necessary information to the user's TNC.

### Conclusion

The existing AX.25 version was established in 1982 when packet radio was not as widespread as it is today. Most stations in the beginning were pretty much equal and there was no distinction made between DTE and DCE functions. However with the implementation of wide area networks not all stations are performing the same function. In fact, today the network nodes are acting in DCE function considering their control and information exchanging aspects. These functions will be better served with the implementation of DAMA.

The methods discussed in this article could increase the throughput on an AX.25 channel tremendously. One advantage is the avoidance of system breakdown which occurs with channel overload. Using DAMA, the throughput will increase continuously up to its maximum. There is no foldback effect like that which occurs using CSMA where at a special limit (above about 60%) the throughput is actually reduced.

There is also a strong "social" aspect of DAMA wherein even the weak stations can work through the node reliably without being overpowered by stations close to the node.

It is possible to make direct connections with other hams on the uplink frequency unlike that of a duplex system. In addition the user's TNCs still retain the digipeater capability inherent in our present simplex system. All protocol elements keep their original meaning which allows both versions to be utilized on the same frequency, yet throughput increases as more and more users switch over to the new method.



## Bibliography

Fox,T., AX.25 Level 2 protocol specifications AMRAD

Kauffels,F.J. Lokale Netze; R.Muller Verlag

Mahle,C., Hyde,G; Inukai,Th. Satellite Scenarios and Technology for the 1990s IEEE Journal on selected Areas in communication, May '87

Schmidt,D.J. DAMA, ein neues Verfahren fur cq-DL, 4/89 Packed-Radio?

Schmidt,D.J. Synchrone DF-Protokolle mit 6809-Micro-TU-Script BS '81 Computern in heterogenen Sternnetzen

Tanenbaum,A. Computer Networks; Prentice Hall Verlag

### Note by DB2OS:

The full DAMA protocol is implemented in the latest version of TheNetNode (TheNet for PC) as a DAMA MASTER and TheFirmware (WA8DED Hostmode for TNC2) as a DAMA SLAVE by NORD<>LINK. DAMA is also supported by TFPCX, a resident AX.25 software TNC for the PC (only external Modem required, no TNC) and by TFKISS (former TFPCR). TFKISS emulates a TNC with TheFirmware and any TNC can be used if it can be switched into KISS-Mode! DIGICOM and BAYCOM software also now support DAMA. DAMA is now used on several German TheNetNode digipeaters and the results are of great promise.

Marcus Busch (DL1EKC)  
Volksgartenstrasse 194 \* CW forever \*  
D-41065 Moenchengladbach  
Universitaet Duesseldorf

## Accessing TAPR via the Internet

There are several ways TAPR can be reached via the Internet.

### Information Server

The Automated Information Server that TAPR provides allows anyone to request information on TAPR, products, newsletters, and lots of other files. To find out more about this service, send an e-mail message to [listserv@tapr.org](mailto:listserv@tapr.org) with the subject line "Request" and one or more of the following text lines in the body of the message:

help (for a brief set of instructions)  
index -all (for a list of all files by topic area)  
list (for a list of TAPR Mail Groups)  
get tapr taprinfo.txt (for info on TAPR)

### Internet E-Mail

TAPR can be reached by sending mail addressed to [tapr@tapr.org](mailto:tapr@tapr.org)

### World Wide Web

<http://bb.iu.net/infomotion/taprhome.html>

### FTP

The TAPR Software Library is available at 'ftp.tapr.org' in the directory /tapr/software\_lib. Login in as 'anonymous', with a password of 'your\_account@internet\_address'.

## Overview of the Friday DSP Symposium

Bill Reed, WD0ETZ

A DSP symposium was held on Friday prior to the TAPR Annual Meeting. There were 33 attendees. The meeting was hosted by Bob Stricklin, N5BRG. Introductions indicated that most of the attendees were new to DSP and were there to learn. About 25% were DSP-93 owners.

Bob started the meeting by explaining that the design philosophy behind the DSP-93 was to provide a learning and development platform for Amateur radio DSP applications. Many acknowledged that they were involved simply for the learning experience. Several expressed concern that TAPR was not able to release the source code for all their modems.

Much of the technical discussion that followed was focused around the problems associated with high speed (9600bps and up) networking and the potential for DSP to facilitate this. Topics included:

- Can DSP make 9600 networking plug and play?
- Is DSP part of the high speed networking radio problem?
- Can DSP provide some sort of link analysis and automatically optimize performance?

Other comments related to DSP were:

### Commercial Sound Cards

These have the potential of providing cheap DSP. Information about the DSP chips used is hard to obtain. Device drivers have to be reverse engineered.

### Other Hardware Topics

Phil Karn described an HF radio built on an ISA bus card with I and Q outputs for connection to a Soundblaster card.

TI manufactures a \$99 TMS320 evaluation board that is good for experimentation.

## PSR Deadlines

Check page two for upcoming PSR deadlines. The deadline for issue #59, Summer 95, is June 15th, 1995. If you have something for publication, please contact Bob Hansen, PSR editor at [psr@tapr.org](mailto:psr@tapr.org). TAPR is looking for technical articles on the following subjects: information on general digital communications, applications using digital communications, equipment hints or modifications, future directions and standards, tutorials, and any regional packet news or information.

## The Pacific Northwest Amateur Radio TCP/IP Network

Steve Stroh N8GNJ

Copyright ©1995 by Steven K. Stroh

The Pacific Northwest Amateur Radio TCP/IP Group, centered in the Seattle, Washington metropolitan area has built an extremely functional packet radio network based on TCP/IP networking and cellular RF techniques. The TCP/IP network encompasses more than 70 full-time users, four 9600 baud bit-regenerative repeaters, and a full-time Internet gateway. A Frequently Asked Question is Why TCP/IP? Can't you do everything with "regular" packet that you can do with TCP/IP? The answer is: kind of, but not really. The primary thing to realize about TCP/IP is that all the capabilities are inherent — you don't have to combine dissimilar systems to do mail forwarding, file transfers, multi-connect chat sessions, multiple ports, etc. "It's (all) in there." A typical TCP/IP station can do:

- file transfers (including binary 8 bit files)
- electronic mail
- keyboard to keyboard (chat)
- "finger" (similar to having multiple Info commands on a Net/ROM node)
- "pings" (short data packets to test link integrity)
- automatic routing
- accept multiple connections from AX.25, Net/ROM, and other TCP/IP stations
- work as a very capable AX.25
- work as a very capable Net/ROM, TheNET, X1J node, etc.
- access multiple ports simultaneously, including modem, RS-232, terminals, and Ethernet connections

And all of these capabilities are simultaneous. The TCP/IP software is multitasking, even without benefit of Desqview or other DOS multitasking software. What I have outlined above is only a subset of TCP/IP's capabilities.

The group began using TCP/IP because the use of AX.25, Net/ROM networking, and Packet Bulletin Board Systems had become less than exciting. There was very much a sense of "Been There, Done That, Wanna Do Something New and Interesting." One of the most interesting capabilities of TCP/IP was e-mail. Since each TCP/IP station was its own BBS, there could not be a "choke point" in the network for message traffic — each TCP/IP user has the capability to reach every other user from their own station and not rely on a single system or Sysop. The multiple ports capability was liberating too — single, or multiple backbones could be gatewayed to other users that didn't have access to the backbones directly. All of the source code, in C, was available to programmers if you wanted to add a new feature or fix a buggy one.

The original members of the group had been active in other packet groups and had become burned out from the formal duties of a group, such as being an officer, constitutions, dues, a newsletter, etc. A deliberate, conscious decision was made that the TCP/IP group would remain informal in order to concentrate on technical and other "interesting" issues. When funding has been needed for repairs or new equipment, money is donated by members of the group. This arrangement has worked relatively well, but the group did recently decide to get "slightly less disorganized" by requesting volunteers for "Keeper of the Notes," "Keeper of the List of Projects," and "Keeper of the Shekels."

The group communicates primarily through a single e-mail mailing list. Members of the group that wish to pose a question, comment on a previous posting, or share information, send a single message to the list, and that message is automatically forwarded through several layers of "mail exploders." Typically, within a few hours, every user that subscribes to that list has received a copy of the message. It's hoped that in 1995, mailing list functions can be completely automated using Mailing List Server software (listserv) on a Linux system.

The group meets monthly on a weeknight evening. In keeping with the informal nature of the group, the meetings are "moderated" only to promote "maximum throughput." There is usually plenty to discuss, and formal presentations are rare. Any "burning issues" have typically been discussed on the mailing list prior to the meeting, and since the group is informal, there are only a few "reports." The group has a small advertisement in the local "Computer Paper" which draws in a few lapsed hams and technically curious non-hams.

The network began with a 220 audio repeater used for 1200 baud packet. TCP/IP users used the repeater to link between widely separated stations. The repeater users began to use multiple ports and thus offered a gateway to users that were not in simplex range and were not on the repeater. The network's backbone(s) now are combined UHF 9600 baud repeaters and 2m 1200 baud simplex nodes located on four US West NewVector (US West Cellular) cellular telephone base stations. Each of these sites consist of (or will shortly) a PC running NOS, a TNC with TAPR 9600 baud modem with bit regen option for the UHF repeater, and a 1200 baud TNC for the 2m simplex node. The sites are linked over US West NewVector's landline fiber optic backbone. The RF hardware is conventional commercial land mobile radios modified for repeater and 9600 baud use, duplexers, isolators, lightning arrestors, etc., and a dual-band antenna. A 2m 9600 baud repeater and the original 220 1200 baud (now bit regen) repeater are linked to the network by multi-ported stations that have excellent paths to multiple repeaters.



Many LANs have been formed in the Pacific Northwest by stations being multi-ported to one of the repeaters and a 2m simplex frequency. Network users have gradually adopted the cellular telephone approach of using low power, combined with a low RF profile, and frequency reuse. Typically, the multi-ported station forms the center of a simplex LAN. Any stations joining the LAN are encouraged to be within good DCD range of the other stations on the LAN. This keeps overall performance on the LAN reasonably high, despite the inevitable collisions and hidden transmitters resulting from simplex operation.

AX.25 users are welcome to connect to any TCP/IP station, both to browse around on that particular system or be routed to another system on the network. Some user stations and switches actively encourage AX.25 and telnet connections by having numerous information files, binary files, and BBS areas available. The group, at present, hasn't placed a high priority on interconnection between AX.25 PBBS forwarding and Net/ROM style networking. The group hopes to begin limited interconnectivity between local PBBS systems and TCP/IP users using a single TCP/IP system as a gateway, which will "sort" and forward relevant PBBS messages via a mailing list.

A typical user station consists of a 386 PC using a Tekk KS-900 UHF radio with a beam, an AEA PK96 or MFJ1270 TNC with TAPR 9600 baud modem. The favored 2m 9600 baud radio is a modified GE MVP. The TCP/IP software of choice is the JNOS (WG7J) variant of KA9Q NOS. It is not uncommon for the NOS PC to be configured as a router for other PCs in the household via serial or Ethernet connections to a second PC running "commercial" TCP/IP software, often with a graphical user interface such as Windows/Winsock, OS/2 Warp, or Xwindows on Linux.

The network is linked full time to the Internet via a NOS IP Switch at the premises of one of the largest Internet Service Providers in the Seattle area. The Internet gateway accesses the network via one of the 9600 baud UHF repeaters. The primary use of the gateway is to allow participation in the global Converse Bridges. Amateur Radio TCP/IP users can also telnet, FTP, etc. to Internet hosts, as long as the user has a good connection to the network so the Internet system doesn't time-out from long delays.

The group makes extensive use of subnetting — the third "octet" of the Amateur Radio TCP/IP IP address is specific to a particular LAN. 44.24.103.xxx is an IP address for the 220 1200 baud repeater, and 44.24.101.xxx is an IP address for the 147.60 simplex LAN. RIP (Routing Information Protocol) is used to propagate routes to the network.

The group is working on numerous projects. A primary project is to develop 9600 baud TCP/IP links to other Amateur Radio TCP/IP users in nearby Vancouver and Victoria, British Columbia and Portland, Oregon. It is expected that there will be at least some 56K activity in the area by the end of 1995. Linux systems are becoming more and more common and it is expected that all of the primary IP Switches in the network will soon be running Linux. Linux is especially attractive because it is extremely stable and its TCP/IP capabilities are as robust as Unix itself. The group intends to host a WWW page in the very near future. The group hopes to contribute to the forthcoming TAPR TCP/IP book, since a frequent request of new users is documentation that is relevant to the Pacific Northwest network. The group also hopes to sponsor an annual Packet Radio conference, and soon host an upcoming "floating" TAPR Annual Meeting or ARRL Digital Communications Conference.

The group would really enjoy hearing from Amateur Radio TCP/IP users around the country and the globe that have Internet access. For those of us lucky enough to be running TCP/IP from home stations and have access to the Internet, why not conduct discussions via Amateur Radio TCP/IP with the Internet as wormhole rather than Internet systems being the source and destination?

For more information, please contact:

Steve Stroh N8GNJ, 206-481-5735  
strohs@halcyon.com (Internet),  
n8gnj@sw.n8gnj.ampr.org (Amateur Radio TCP/IP)  
for questions on the Pacific Northwest Amateur Radio TCP/IP Group,

Ken Koster N7IPB, 206-821-8219  
kenk@mdd.comm.mot.com (Internet),  
kenk@algedi.ampr.org (Amateur Radio TCP/IP)  
for questions on the Pacific Northwest Amateur Radio TCP/IP Network,

Terry Conboy N6RY, 206-450-8388  
tconboy@uswnvg.ampr.org (Internet),  
n6ry@n6ry.ampr.org (Amateur Radio TCP/IP)  
for questions on the US West New Vector Amateur Radio Club and the Cellular Base Station systems.

## RUDAK-U

Harold Price, NK6K

Here is a quick summary of the current design (subject to change), from the RUDAK meeting held at SSTL (Bdale Garbee, Chuck Green, Peter Guelzow, Lyle Johnson, Harold Price, Jeff Ward). The RUDAK-U project manager and lead hardware designer is Lyle Johnson.

There will be two processors (one V53, one 386ex). Each processor will have 16mb of memory, 10 serial ports, and 16 DMA channels.

Each processor will have the following modem complement:

- 2 - 9600 baud hardware modems
- 4 - DSP modulators
- 4 - DSP demodulators

The processors will share a 256 Kbit hardware modem.

Each processor will also connect to the GPS receiver and the SCOPE camera, through serial ports, CAN bus, or both.

Each processor also has a path to the internal 400bps IHU telemetry stream. Each processor connects via the CAN to other spacecraft packages, such as the charged particle and total dose detectors.

So, to answer the question, we'll have at least the current digital satellite standard of 9600 baud FM. We can have many other standards with the DSP modems, including the 1200 PSK standard; and as many esoteric standards as someone wants to write code for. Each modulator and demodulator can be running at the same time, appearing on the IF passband at different places. The link margins are such that we'll have to use most of the available digital downlink power to support the 9600 baud downlink, such that the performance into a "standard" 9600 baud LEO ground station is the same for P3D as it is for KO-23. We can appear on more than one downlink band at a time, however, and can simultaneously support other protocols that are more heavily coded and are at lower baud rates, or high speed downlinks to gateway ground stations with larger antennas.

## Review of the TAPR BBS Sysop Guide

Presley Smith, N5VGC

The *BBS Sysop Guide*, by Barry Buelow, WA0RJT, is a well written book that is easy to read and understand. This book covers all aspects of becoming a packet BBS Sysop, from the technical details of what equipment is required, to the emotional and political issues that any BBS Sysop will face. The book also captures the essence of the BBS Sysop experience. The author states in the introduction that "Operating a BBS is a rewarding burden." All of us who have operated packet BBS systems for many years can certainly relate to this statement.

This book contains chapters on getting started, equipment recommendations, short reviews of the various packet BBS software available, details on the operation of a packet BBS, and information on use of servers, and other such add-on features available for most packet BBS systems.

In section 2, the book describes the issues of setting up the BBS. The author states that "Establishing a PBBS which interacts with the local network and users will be a significant event." From my own experiences of starting a BBS, I know that other local BBS Sysops are not always friendly toward a person establishing a new BBS. Some

Azden Advertisement



actually discourage the potential Sysop from setting up a BBS. The author states that there are distinct views of the BBS. The Sysop views it as "his" BBS, the network owner/operator or users of the network may not like the BBS because of increased traffic on the network, and the users of the BBS will expect the BBS to be available "all hours of the day and night." As the author states, "As a Sysop, you should anticipate this situation..." BBS users sometimes forget that ham radio is a hobby and this book describes various way to minimize such problems. One issue not discussed is that the Sysop's family is also making the commitment to this BBS and that the wife and other family members must also understand the commitment.

In chapter 3, there is an excellent description of the equipment needed to have a viable system. I've seen several packet BBS systems that were not successful due to inadequate equipment. This chapter also addresses the issue of backup equipment that should be available in case problems develop. Having the proper backup equipment will minimize the family disruptions described earlier.

Chapter 4 has a short description of many of the most popular BBS software packages that are available. The author notes that "Regardless of the features, a new Sysop should strongly consider using the same software as his neighbors." If this is done, the new Sysop will have an Elmer who can answer questions, and using the same BBS system minimizes forwarding problems. This chapter also details potential problems in setting up the BBS. Manuals tend to be expert friendly. When something goes wrong such as a system hang, the author states "Debugging this type of problem can be time consuming and frustrating." It's important to keep the setup simple at first and then add other features.

The use of the G8BPQ node software is also described in chapter 4. There is a description of the software, but no discussion as to why a BBS system needs to also use this node software. Additional information on the BPQ node and a diagram is found in section 7.2. This is the one area I thought could be better organized and explained in the book.

Operation of the BBS is described in chapter 5. The author claims that "The minimal daily effort to maintain a BBS is about 15 minutes." The Sysop must examine any messages held for review, insure that file maintenance has been performed, check for messages with bad addresses, and other such duties. The book also describes how enlisting additional Sysops can help minimize the effort on any one person. Other issues discussed in this chapter include contingency planning and the current FCC regulations on who is responsible for the content of bulletins and messages. Most BBS systems have logging facilities that keep a record of the connects of various users and other BBS systems. The book states the

"procedure is to close the log file, usually at the end of each month." Some BBS systems keep log files by week. This book does not discuss the volume of information that may be generated in a single month. My F6FBB system generates over 1MB of log data per week, so the Sysop must plan for the disk space required if logging is enabled.

Chapter 6 describes other enhancements that can be added to a packet BBS system such as the use of callsign CD-ROMs, various servers, and interfacing to a DX Cluster. Chapter 7 describes the theory of operation. This chapter has sections on hierarchical forwarding, bulletin flooding, White Pages (WP), and BBS port drivers. In section 7.4, the reader will find a diagram of the hardware and software which would typically be used with ports including both AX.25 ports and phone ports on a BBS system.

The remainder of the book is a collection of various reference information. Included is a copy of the Hierarchical Addressing Protocol that was adopted by the TAPR BBS Special Interest Group. Also included are tables of continent identifiers, country identifiers and regional identifiers organized by county codes. These identifiers are used in the creation of the hierarchical addresses for packet messages. There is also a glossary which explains many packet and packet BBS terms in the book.

In summary, I would like to recommend that anyone who is considering becoming a packet BBS Sysop should read this book. It will help you decide if you really want to become a packet BBS Sysop. Current Sysops will find this book to be a concise description of many of the issues that the active packet BBS Sysop faces each day. This book will also help the user of a packet BBS system understand the effort and commitment the Sysop is providing to the BBS users and to the community. This book takes a short time to read and provides the reader with excellent insight into what is required to be a packet BBS Sysop.

---

## **HF Automatic Digital Approved**

The FCC will amend its rules to permit limited automatic control of digital stations on the Amateur HF bands. The action, in PR Docket 94-59, was announced in a press release. The automatically controlled station must either be connected to another station under manual control, or must transmit within a subband designated for this purpose. Those subbands have not yet been announced. The Commission said it believes these rule changes will allow Amateurs to "contribute to communication technology" and to advance Amateurs' communication and technical skills. More information was in the August 1994 issue of QST, on page 71.

## APRS Video Problems under Windows

For those of you running APRS under windows here are a few hints and kinks on video displays that might help solve some problems. Unfortunately, depending on your hardware and video drivers there may not be a solution to your video conflict.

The first thing to understand is that in this new world of video accelerators, manufacturers have been using broad areas of memory. Blocks of memory that used to be reserved for (or permitted to be used by) DOS (in the days when DOS was the only thing going) have been overtaken. Cries of distress have been heard from both sides of the programming street. So, video problems using DOS applications under Windows can be frustrating and unsolvable.

Do these things in the following order and try running APRS after each one to see if it solves the problem:

1. Many video card manufacturers are using memory areas a000H to c7ffH. If you have a video accelerator card, try excluding these areas of memory from use by the system and Windows. Do this by adding the following at the end of the EMM386 line in your config.sys file: x=a000-c7ff
2. Make sure you have defined a PIF file for running APRS. Have the following set as checked blocks in the PIF file: (First page of PIF editor)—High Graphics and Execution Background. (Advanced page of PIF editor)—Lock Application Memory, High Graphics, Emulate Text Mode and Retain Video Memory. Change both Memory Requirements blocks on page one of the PIF Editor to -1.
3. From the DOS prompt (not in Windows) check the Mem command and make sure that you have more than 500k of conventional memory. If not run Memmaker and try to get your system configured for more conventional memory.
4. If you have a special driver for your video accelerator card trying using the VGA driver supplied with Windows. (Do this only if your video card manual says that the original drivers supplied with Windows will still work with the card.) This option is your last resort, your accelerator card will not be up to speed using the Windows driver but the video lockup and instability may disappear using the Windows driver that doesn't do all the fancy things in memory. With a small amount of effort (when needing the acceleration for Windows graphics applications) you can switch the custom driver back online. Then switching back to the VGA driver when running APRS. (No fun but effective.)

If you got through paragraph 3, and you still have video problems, unless your video card manufacturer has an updated driver you'll have to be satisfied with paragraph 4 if it works.

Video card manufacturers are learning how to get around these problems by designing drivers that overcome these DOS video problems (hint to Microsoft and others) and DOS programmers are learning not to do things with video that encroach on the newly reserved video areas (hint for APR).

If you just want to throw your hands up in the air and not do anything. That's all right too. Windows 95 will ship in about 4 months and it solves all these problems! Or so I've been told.

Have fun, 73, Dave, N3EOY

---

## 1995 Special Olympics World Summer Games

Brian Battles, WS10  
Amateur Radio Liaison

Very good news: Our Personnel Manager for Amateur Radio volunteers at the 1995 Special Olympics World Summer Games, sent me e-mail—yes, Lance Seelbach, NITAN, now has an on-line address! Send messages to Lance at NITAN@MAGIC.COM. Lance lives in West Hartford, Connecticut, and his telephone number is 203-231-7244. Anyone who wants to volunteer to assist with communication on-site at the Yale Bowl or at any other Special Olympics venues (Ocean Beach Park, etc.) should get in touch with Lance. He can direct you to the Project Manager for the area you want to help with, and he's keeping a database of ham volunteers.

### World Wide Web Page

Thanks to the efforts of Paul Curtis, N1LNA, of Greenwich, Connecticut, anyone with Internet access to a World Wide Web browser (such as Mosaic) can check out the information, announcements, and news updates regarding Amateur Radio communication support for the 1995 Special Olympics World Summer Games in New Haven, Connecticut, July 1-9. There's even an on-line form you can fill out to be included in e-mail news updates or to get information on how you can assist as a volunteer at the site of the Games! The URL is: "www.terrapin.com/hamradio".

Please give it a try, if you can, and spread the word!

### Listserv Mailing List

The list is all ready; to subscribe, send mail to listserv@netcom.com with the body (subject is ignored):  
subscribe arrl-special-olympics



Special thanks to Mike Ardai, N1IST, of the Boston ARC, for setting this up!

The Ham Radio-Special Olympics Mailing List was created to carry announcements, discussion and questions related directly to Amateur Radio operators' participation in the 1995 Special Olympics World Summer Games. Although it's mainly useful for hams who expect to assist by providing communication support on-site at the Games, anyone with a serious interest, suggestion or question may post messages to this list. Anything you send to the list is "reflected" (i.e., widely distributed by being remailed as e-mail) to all current subscribers. Please keep that in mind, and post only items that may be of interest or importance to several or all subscribers; don't send one-to-one messages here — use direct e-mail for that.

If you're a licensed Amateur Radio operator and are interested in volunteering to help at the New Haven Special Olympics site, please call Lance Seelbach, N1TAN, in West Hartford, Connecticut, at 203-231-7244. Lance is the Amateur Radio Personnel Manager, and he's keeping a database of all ham volunteers who plan to come down and help. Everyone who works as a volunteer must be officially registered no later than April 15, 1995, to be signed up for clearance and access credentials, etc. The GOC requires all volunteers must attend a Special Olympics Orientation session (these will be held in multiple locations throughout the area at dates to be announced). Ham volunteers will also attend a special meeting in advance; date and place to be announced.

This event is not specifically sponsored by the ARRL, but by a group of interested hams with support from the local ARRL Field Organization officials and Members.

---

### \*\*\* Connect Request

The TAPR software librarian advises me that an old version TAPR disk is no longer available so I was wondering if another member might have a copy.

I have need for Disk #39 with the title: KA9Q JNOS Ver 1.08B - Source code (Disk 1 of 2) by Johan Reinalda, WG7J. Be advised that I can ONLY use version 1.08B.

There was a mixup when I originally purchased the disks that I didn't find until it was too late. (FYI - version 1.08b supports a feature the newer versions dropped and I feel is needed.)

Thank you,

Hal MacArgle, W8MCH  
RR1 Box 83 J  
Five Forks WV 26145

---

## Data Speed Tests of HF Pactor and G-TOR Modes

Marvin Bernstein, W2PAT/AFA1DA  
1137 Hope Rd., Tinton Falls, NJ 07712-3162

### Summary

Air Force MARS has used the Packet mode for some years both on VHF and HF to communicate between member stations. The packet mode does not work well on HF, so with Pactor and G-tor now available and currently being used by Amateurs, a decision was made to evaluate these modes for possible MARS use. Two A.F. MARS frequencies were used for these tests and the frequencies were approximately 17.5 and 7.8 MHz. The tests ran for more than four months, and approximately three million bytes of ASCII data were sent from the MARS station in New Jersey to the two other MARS members in Florida.

The test results do show that Pactor is much faster than packet. And that with "good" signals, G-tor is about 70 percent faster than Pactor. With weaker signals, however, G-tor data speed falls at a faster rate than Pactor and it appears that with very poor signals, both have almost similar speeds.

Test data obtained from this extensive period of testing, is shown in the following tables and graphs and explained in some detail.

### Test Methods

The testing procedure during the whole series of data speed tests was for the station in New Jersey to link to one of the Florida Stations and send a prepared file of ASCII data. Almost all of the characters were lower case with the normal few upper case characters at the beginning of sentences, or where otherwise appropriate. After the link was established with the BBS, or MBX of the Florida station, the file was sent and the time required determined with a stop watch. Huffman encoding was used both with Pactor and G-tor tests. The first files were less than 2K bytes in length, but as these early tests showed that the data speed was much faster than packet, file lengths were increased to 8 to 9 kilobytes. Both Pactor and G-tor have a feature that when turned on, shows when the first characters are received. The "/ex" used to close the file at the BBS was used to show the end of the file. Tests made locally, with two controllers wired together (pactor mode only) indicated an accuracy of elapsed time determination of about a half-second.

The first tests were made on a frequency of approximately 17.5 MHz and later tests were continued at a lower one. This frequency is not usable for much of the day because of the present low sun spot cycle. Furthermore, very severe shortwave QRM was noted. For those reasons, permission was granted by the National RTTY Net Manager to use the 7.8 MHz frequency for more detailed testing.

**Advertisement**

PacComm Advertisement



# The *NEW* PacComm PicoPacket

**Compact!** Only 1" x 2.5" x 3". An inch shorter than a pack of cigarettes.

**Powerful!** Z-181 high integration MPU with one megabyte address space.

**Inexpensive!** Only US\$129 (32k RAM model).

**Perfect Beginner's TNC!** Every feature you would expect in an AX.25 1200 baud TNC, plus:

**On-Line HELP!** Type Help and a command name (or part of a command name) and receive the correct spelling, shortest abbreviation, default value(s), acceptable values, and a short explanation of its function.

**Personal Message System** with all the state-of-the-art features.

**APRS** (Automatic Packet Reporting System) compatible **GPS** support built-in. Works with either the standard single serial port or the optional second serial port.

**Terminal programs** for both DOS and Windows included.

**Cables.** RJ-45 serial cable with adapter to DE-9S. RJ-45 radio cable has real wire - solders easily to radio connectors.

**Upgradeable.** EPROM and RAM are socketed for ease in upgrading firmware and increasing memory.



Instruction manual, schematic, Quick Command listing, and power cord included.

**Optional RAM.** 128k, or 512k.

**Battery Pack** model. The case of the battery pack model fits a quick-change 6VDC slide-on/slide-off battery pack which allows continuous operation. The PicoPacket contains a built-in battery charging circuit.

**Full-time GPS port** (2nd serial port) allows both a GPS and computer to be attached to the PicoPacket. The GPS port also provides a real-time clock and 128k RAM.

**Built-in GPS receiver.** The GPS model has a built-in Trimble SVEeSix-CM3 GPS receiver. Total size only 2 x 2.5 x 3.25 inches. Active external GPS antenna provided.

**Companion GPS receiver.** A Trimble SVEeSix-CM3 receiver fits in a separate case the same size as the Pico and attaches via an audio stereo cable. GPS antenna provided.

## Models and Prices:

Some models are scheduled for later introduction. Call for latest availability.

- PicoPacket w/32k RAM - \$129
- PicoPacket w/128k RAM - \$149
- PicoPacket with 2nd serial port, 128k RAM, Real Time Clock - \$189
- PicoPacket Battery pack model with 32k RAM - \$179
- PicoPacket Battery pack model with 128k RAM - \$199
- PicoPacket Battery pack model with second serial port, 128k, RTC - \$239
- PicoPacket/GPS. Same as model directly above plus internal GPS receiver and GPS antenna - \$599
- Companion GPS receiver w/active antenna, data cable - \$399
- Extra battery pack - \$45

## The new PacComm BayMod-9600 is the lowest cost way to get on 9600 baud packet.

- The BayMod-9600 plugs into the parallel port of your PC compatible computer.
- All the packet work is done by your PC.
- Uses BayCom software version 1.60 (provided).
- Requires a 9600 baud capable radio - will NOT work with an unmodified voice radio.
- Includes BayCom version 1.60 software on 3.5 inch disk, 80+ page instruction manual, radio cable, and power supply.

## PacComm offers Gracilis Wireless Communication Products

PacComm now manufactures and markets the Gracilis line of quality wireless communication products. Watch for new additions to the product line.

- The PackeTen multi-port packet switch for TCP/IP systems.
- The PackeTwin dual port HDLC card for installation in your PC.
- The PacComm smt G3RUH modem for the PackeTen and Kantronics DataEngine.

## PacComm Multimode DSP Communication Controller

PacComm has licensed the PACTOR-II design from S.C.S., the German developers of PACTOR and PACTOR-II and will manufacture the unit in our Tampa, Florida factory. We call it the PacComm PTC-II Multimode DSP Communication Controller.

The PTC-II features a powerful Motorola 68360 CPU, 56156 DSP for modem functions, and up to 16Mb DRAM. The three radio channels may operate simultaneously.

Raw HF data rates of up to 750 bps using 16-DPSK modulated dual carriers in a 400 Hz bandwidth. Convolutional encoding with length 9, soft-decision Viterbi decoding for robust data transfer. Language-independent Huffman or Psuedo-Markov compression. Radio control port for automatically tracking the signal in the DSP passband.

Automatic response to PACTOR-II and PACTOR-I, also communicates with AMTOR systems, 1200 and 9600 packet.

## PacComm Packet Radio Systems, Inc.

4413 N. Hesperides St., Tampa, FL 33614-7618  
 +(813) 874-2980 Facsimile: +(813) 872-8696

BBS: +(813) 874-3078 CompuServe: 76576,2003 Internet: infot2@paccomm.com

Orders & Catalog Requests : (800) 486-7388 (24 hour voice mail)

All tests of Pactor and G-tor were made in the "linked" condition with the ARQ system used.

Evaluation of the data speed figures was done both by using the standard deviation (1 sigma) method and also by sorting the speeds from low to high and plotting the distribution values. Another useful graphic method of showing the speed data was to plot the average speed versus the received strength of the signals using the S-meter readings.

## Discussion

There were a series of tests made beginning 27 May 1994 which ended on 22 September 1994. The first tests used the Pactor mode since the intent at that time, was just the evaluation of the speed of this mode. The information obtained with the early tests showed the vastly improved performance of this mode compared to HF packet. Articles in the radio magazines indicated that G-tor was very much faster and better than Pactor, so beginning in July, a test was started using this new mode.

All tests were conducted on the 17 MHz frequency until Mid-August when permission to use the 7.8 MHz frequency was obtained. Also, since this frequency was useful at all hours of the day, schedules were made to begin tests at 7 AM and 9 PM EDT. One other change was to alternate Pactor and G-tor modes during each test rather than the previous method where tests were made for a short period of time on one mode, and then changed to the other mode for more tests.

The use of the standard deviation measure results in improved interpretation of the test data for the two modes. It is very obvious that HF propagation conditions and electrical noise have an effect on the data speed. The result of this noise is that the data is changed so much that the error correcting system used in both modes fails. This frame must then be repeated. With weak signals, this effect was frequently noted. A second kind of statistical treatment of tabulated data is the

use of the distribution of the values. In this technique, data speeds for each test are tallied, and the percentage of tests at each speed are plotted yielding a frequency distribution of data transfer speeds. To be useful, it does require a much larger number of tests, so the final and best data was obtained from almost three hundred separate tests of Pactor and G-tor on the 7.8 MHz frequency.

## Test Results

### Non-radio Speed Test

A series of tests were made to determine the speed of two systems that were connected together with wires, so that perfect audio signals were used. This test requires the use of two computers and two controllers.

Mode	Baud Rate	Speed In Bytes Per Minute
PACTOR,ARQ	200	1555.4 ( HUFFMAN ON, 9K FILE )
PACTOR,ARQ	200	962.2 ( HUFFMAN OFF, 9K FILE )
PACTOR,ARQ	200	1290 (lower case qbf 1850 bytes)
PACTOR,ARQ	200	980 (UPPER CASE QBF 1850 BYTES)
PACTOR,FEC	200	698 (lower case qbf 1850 bytes)
PACTOR,FEC	200	516 (UPPER CASE QBF 1850 BYTES)
AMTOR,ARQ	100	360 (lower case qbf 1850 bytes)
AMTOR,ARQ	100	344 (UPPER CASE QBF 1850 BYTES)
PACKET	300	672 (lower case qbf 1850 bytes)
RTTY	75	541 (lower case qbf 1850 bytes)

G-tor tests of this kind could not be done because only one controller of the Kam plus was available. The QBF files used had 24 lines of the "quick brown fox" RTTY test and each line had 77 characters.

The table shows the information derived from the separate Pactor and G-tor tests. The speed test results from both of the stations in Florida have been combined to provide an improved average value of the data. It should be pointed out that the whole test consisted of 441 separate contacts, and that a grand total of almost 3.5 million bytes of ASCII files were transmitted. This test was an extended investigation which ran for just over four months of elapsed time and covered the period when lightning storms are very

### Summary Test Results

Test Frequency	17.5 MHz		7.8 MHz	
	Pactor	G-TOR	Pactor	G-TOR
<b>Test Mode</b>				
<b>Total Tests Made</b>	80	75	141	145
<b>Total Bytes Sent</b>	276,039	630,433	1,271,783	1,277,979
<b>Average Data Speed (bytes/minute)</b>	1142	1748	1282	1992
<b>Standard Deviation</b>	263	529	185	488
<b>Minimum Data Speed</b>	323	756	626	570
<b>Maximum Data Speed</b>	1501	2702	1541	2797
<b>Slowest 10% Speed, av.</b>	599	829	881	1011
<b>Fastest 10% Speed, av.</b>	1460	2554	1510	2672
<b>Power Output (watts)</b>	80	80	80	80
<b>Test Dates</b>	27 May to 25 July, 1994	14 July to 22 Aug, 1994	15 Aug. to 22 Sept. 1994	15 Aug. to 21 Sept. 1994



frequent in Florida. Observations of the effects of QRN on the speed of any HF data mode indicates that it can be very destructive, and often completely blanked the ACK/NAK response from the Florida stations. The table contains the statistics of the individual series for both modes and both frequencies used during the tests, along with the times of each. All three stations had about the same power output of 80 watts on both test frequencies.

The tests done at the 7.8 MHz frequency were much more rigorously run. Unlike the earlier tests on 17.5 MHz where the HF propagation prevented any kind of scheduled operations, the lower frequency used for this series allowed scheduled tests to run at 7 AM and 9 PM each day.

The four graphs illustrate the distribution of the data speeds after the values had been sorted from the lowest to the highest speeds. One of the useful tools in the statistical evaluation of all types of data, is to plot the grouped values against the percentage in each group. One requirement, however, is that a large number of data values must be used, and that is the reason the much more rigorous test was made on the 7.8 MHz frequency.

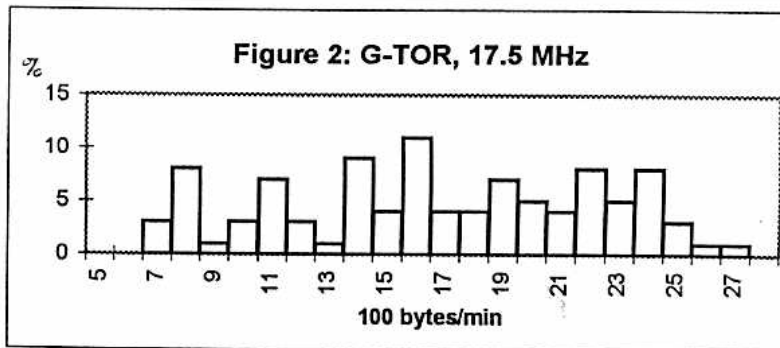
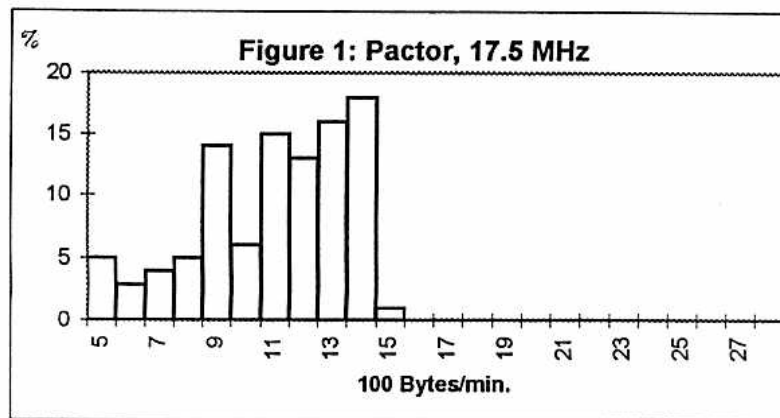
### Figures One and Two

These two graphs can be used to compare the data distributions of the Pactor and G-tor modes; neither graph has a form that could be called a "normal" distribution. The Pactor distribution does show that 62% of the packets are grouped between 1100 and 1400 bytes per minute. Figure Two, G-tor, does not indicate any particular form at all, with the data speeds varying widely from as low as 800 to a high of 2400 bytes per minute. Radio conditions were very poor on the 17.5 MHz frequency and interference from shortwave broadcast stations did cause problems at times. It is believed that much of this wide dispersion of the data speeds was due to these causes.

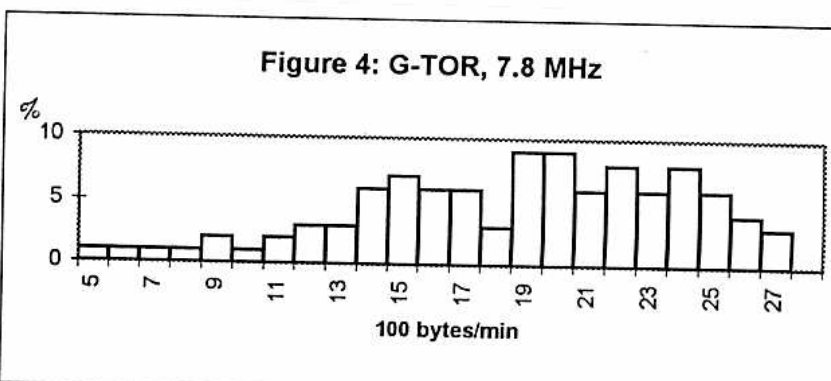
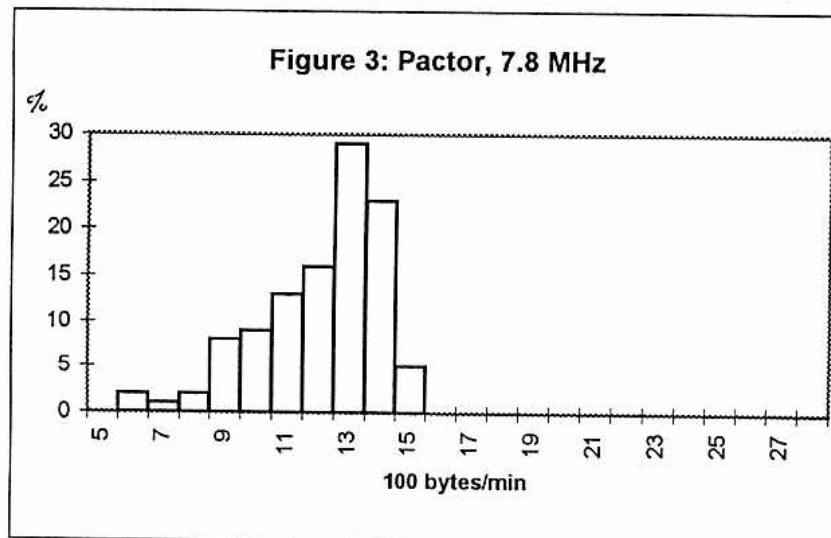
### Figures Three and Four

Figure Three is the distribution of the data speeds for the Pactor mode with the tests performed on the 7.8 MHz frequency. 29 percent of the data speeds are in the range of 1300 to 1399 bytes per minute. And another 16 percent fall in the range of 1200 to 1299 but what is really of great importance is that 23 percent are in the range of 1400 to 1499 bytes per minute. This then shows that 69 percent of the 141 separate data speed tests range between 1200 and 1499 bytes per minute.

Figure Four shows the test results for the G-tor mode. Because of the better conditions on the 7.8 MHz frequency, and more tests, there is a more uniform distribution of the speeds than shown in Figure Two. However, this mode again does not show a pronounced peaking of the percentage like that shown for Pactor. There is a peak of 9 percent for data speeds of 1900 to



2099 and what appears to be a peak at the speed of 1500 to 1599 bytes per minute. This graph shows all the data speed results from the 145 separate test runs which were made in the same time interval as those shown in Figure Three for the Pactor mode.



## Figure Five

This figure shows the received signal strength, as indicated by the S-meter reading, of the station sending the test file. Since many times there was no operator at the BBS, no signal strength readings from the receiving station were possible. It is believed that the received signal readings are a useful estimation of the quality of the transmission conditions. The method used for obtaining this information, was to read back the last few messages contained in the BBS after the file had been sent.

The figure shows that in the Pactor mode a data speed of 900 bytes per minute was achieved at a meter reading of just one S-unit. However, that falls to 700 bytes at 1.5 S-units, so obviously there is some randomness at very low signal strengths. From S-2 units upwards, the speed increases rather quickly to the maximum possible with the Pactor Mode, which is about 1499 bytes per minute.

For the G-tor mode at one S-unit, the speed is slightly slower (than pactor), at 600 bytes per minute. How significant this is can only be determined with more tests because of the randomness of the test results at low signal strengths. It should be noted however, that in the range of meter readings of S-1.5 to 3.5 there is a plateau which does correspond to the secondary peak of distribution speeds shown in Figure 4. It is believed that this is due to the fact that 300 baud data speeds on HF is pushing the limit and as a result, G-tor falls back to 200 Baud and requires the transmission of additional data frames. Another indication that G-tor develops increased speed with outstanding signal strengths, is that the maximum possible speed, of 2499 bytes per minute is accomplished only at S-7 and 7.5 meter readings.

## Conclusions

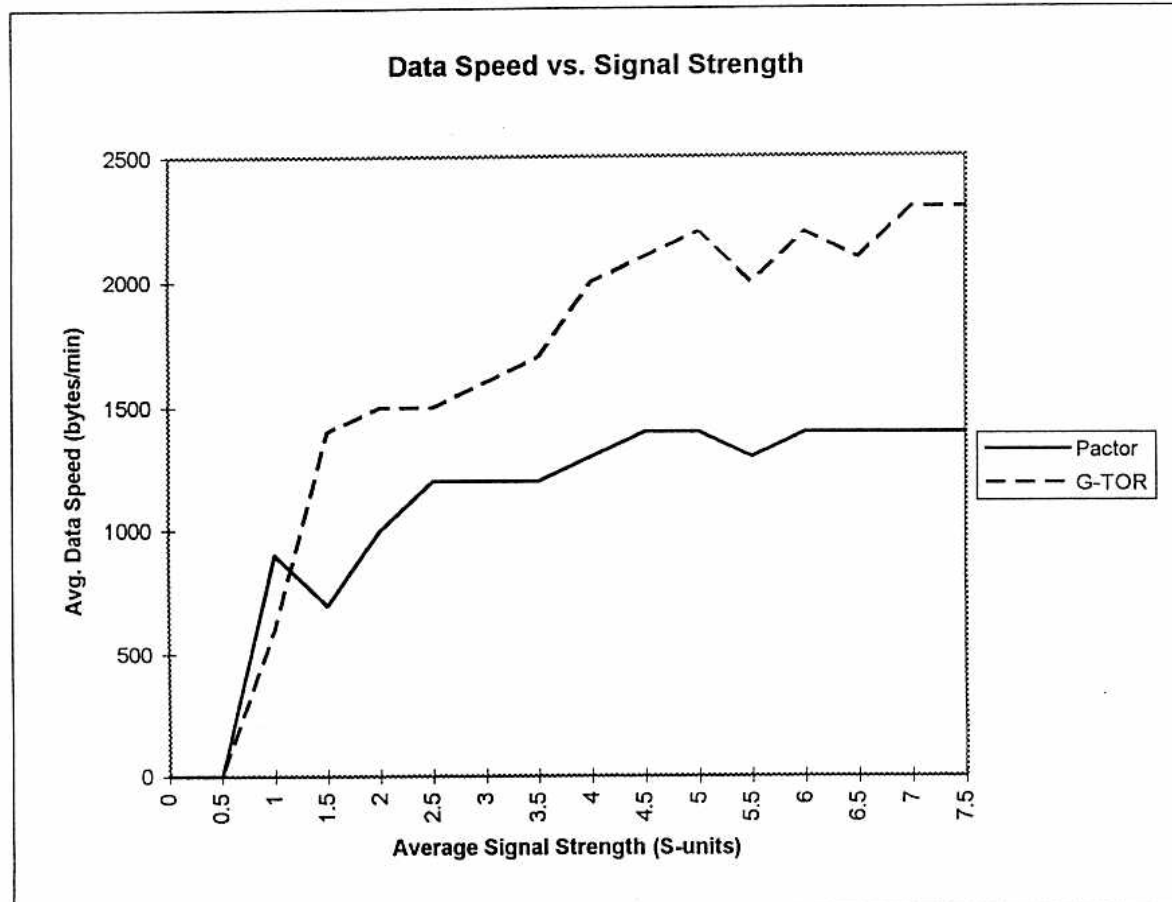
Pactor in its present form, is a faster HF mode than any of the older means of data transmission. This report of the extensive testing has resulted in statistical data useful for evaluation of any future improvements in this system. The average speed of data transmission on HF is probably in the range of 1150 to 1300 bytes per minute with a standard deviation value of 250 with poor signals and slightly less than 200 for moderate signals.

G-tor is an even better system for HF data transmission with an average data speed of from 1700 to 2000 bytes per minute, again much dependent on signal strength. The standard deviation values are larger for this mode, and are about 530 for weak signals and 488 for moderate signals.

As a result of this extensive series of HF data transmission testing and evaluation using statistical means, it is believed that the Pactor mode could have increased speed using longer data frames. Furthermore, it is also indicated that perhaps G-tor could be improved by switching from 300 to 200 Baud more quickly at low signal strengths.

## Acknowledgements

I wish to acknowledge the dedication of Bud Campbell, WB9OML/AFA2FK and Dick Lamberson W4WEB/AFA2QG for their help in making this test possible. These two members showed great effort in meeting the scheduled test times and changing the data modes as required. The series of tests on 7.8 MHz were especially difficult for those members during the last 45 days. Each test day started at 7 AM and required about 30 minutes of time to complete. For part of this series of tests, additional tests of the two modes were made at 30 minute intervals until the last one was made at 9:30 AM. At 9 PM of the same day, the second tests of that day were again run with both stations.



## Publications

TAPR is proud to release two new publications.

*Packet Radio: What? Why? How?*  
Greg Jones, WD5IVD (editor) TAPR  
Publication #95-1, 132 pages ISBN:  
0-9644707-0-5 Cost: \$9.00

*BBS Sysop Guide*, Barry Buelow,  
WA0RJT TAPR Publication #95-2,  
54 pages ISBN: 0-9644707-1-3 Cost:  
\$7.00

## Regional Group Discount

If you are a recognized regional organization, then you can get TAPR books at a discount when bought in quantity. This is done to help regional organizations provide TAPR publications to their membership and possibly generate income at local and regional hamfests. For more information on this, contact Dorothy at the office.

Commercial retailers' pricing available. If you are a retailer, please contact the TAPR office for wholesale pricing. It is our aim with these and future books to open a distribution channel for TAPR publications. Publications are an important aspect of TAPR's future as kits decrease as a revenue generator.

Other titles in the works include *Land Mobile Radio Conversions for 9600 Baud Operations*, *TCP/IP and NOS Primer*, and several others. If you think you might have something that can either become a publication, or might be part of an exciting topic TAPR has, please contact TAPR. Doing publications fulfills a major aspect of the organization's charter.

We are fortunate to have Presely Smith, N5VGC, provide a review of each book for this issue of the *PSR*. Presely has written articles for *QST* and other Amateur magazines and is an active BBS sysop and satellite gateway operator in Dallas, Texas.

## Kit Updates

### DSP-93

The next production of the DSP-93 is scheduled for April shipping. 175 units will be shipped, making the total sales for the DSP-93 at 300 units. Several new software/firmware options should be available at shipping or shortly after. These include enhancements to several of the current modems for better performance and better user interface, fixes to the Macintosh and Windows user/development interfaces, audio filters with a user interface under Windows (probably a Mac interface shortly after), APT user interface (windows) has been under test (might require additional testing before release), and a few other things the development group has been looking into. A new operational manual for the unit should be completed shortly. Also, a DSP-93 developer's package is under development, which should include technical source books, a video tape of the DSP-93 workshop and several other aids in working with the DSP-93 for development. A second production run this year is scheduled for Sept, orders by July 1st, 1995.

### AN-93

The several delays on the board production of the enhanced AN-93 have finally been overcome. Boards have been sent to the board shop and with luck we should be shipping kits by the end of May. We thank all those members who have purchased kits and waited for the production run, despite the unusual delays involved. The kit you get should make up for any delays thus far.

### TNC-95

The final design has been submitted for layout and the layout should be underway as of this printing. A production schedule will

be set after the prototypes are completed. Based on the evaluation of the prototypes, a production schedule can be outlined. Applications are being taken for beta-testers. Contact the office for the necessary details.

### TUC-52

The TUC-52 design has been finalized and the board layout is underway. Latest news is that the basic core board will now be a 4-layer board. Designs are underway for the personality boards to follow. Paul Newland, AD7I, has presented information to the TUC-52 development group regarding the new Intel MCS 251 architecture. A new pin-compatible CPU for the 8051 family that looks like it is really hot. This new processor could provide for some interesting future applications of the TUC-52. Prototyping will happen sometime in the next few months, then a beta-test will happen. TAPR is taking applications for anyone interested in participating in the TUC-52 and personality board beta-testing. Contact the office for the necessary details. For full details on this project, review previous issues of the *PSR*.

---

## PCS Committee

The first face-to-face meeting of the PCS committee was held Saturday night after the banquet during the Annual Meeting. The concept of the committee is to examine new technology that is being derived from the PCS (Personal Communications Systems) commercial industry and determine what can be transferred into the Amateur digital community. The meeting, consisting of about 30 members, had a lengthy discussion on what they thought was needed.

Tom McDermott, N5EG, brought several view-graphs to help in the discussion. This was very



unexpected by the group, but a great benefit to focus things.

Here are the main points that were discussed:

- A 'consumer type' radio was really needed to move from the standstill of 1200 baud to drastically higher rates for the user community
- It should be a 'last-mile' solution. (range of 3-15 miles, maybe 20 on the outside)
- It should be a combined radio and modem (data radio) that is plug-n-play
- Likely frequencies: 2.4GHz and 1.2GHz
- Spread Spectrum or alternate technology is required to help band sharing
- Data Rates should be at least 56Kbps
- Cost should be less than \$500
- There will be a need to have these radios co-exist on bands that we are primary, but not sole users of (i.e. 2.4GHz).
- There was concern that there might be two radios needed: one that would operate in a fixed environment and one that would be robust to handle mobile environments.

Some of the technology issues raised:

- High-IF 10.7 MHz
- Wide Dynamic Range needed
- Fast DDS for frequency agility
- Power Control
- I want to ???

The board liaison for the committee is Barry McLarnon, VE3JF, and the discussion is currently limited to a small number in order to help facilitate focused discussion. If you think you have the technical expertise to help, and want to become an active member in this group, you can e-mail [ve3jf@tapr.org](mailto:ve3jf@tapr.org) to get more details on the requirements for participating on the committee.

## Beta-Test Request Form

If you would like to participate in a TAPR beta-test, please answer the following questions in as much depth as possible. Since there are a limited number of Beta units available for any project, this information will be used to select the best possible group for testing the units. Not everyone is, or can be, selected.

The purpose of any beta-test is to make sure that the kit documentation is correct, hardware problems are nonexistent in more variations not possible during the alpha-test, and that the software is functioning adequately in a wider range of applications. Beta-test units will be made available to those selected at a break-even cost. Beta-testers are required to sign a Non-Disclosure Agreement (Volunteers Agreement) for the project. Last but not least, beta-testers will be responsible for communicating during the beta-test period. Internet E-mail access is a must. Beta-testing typically requires a good amount of time throughout the entire beta-test period.

Submit the following information to the TAPR office, Attention: Beta-Tester Application :

Project Name, Date, Your Name, Call, Address, Home Phone, Work Phone, Fax Phone, Internet Address.

- 1) Please describe in a few paragraphs your reasons for wanting to participate in the beta-test and why you would be a good candidate for this beta-test.
- 2) Do you work for or consult any Amateur or commercial manufacture of packet radio or digital communications equipment? If so, please explain.
- 3) Please describe your background in software (programming experience) and hardware (design or technical support).

## TAPR Project Proposal Format

One of the primary purposes of TAPR is to provide input and support for research, development, and standards for new applications and technology. In order to effectively provide an avenue for new project support we have developed an outline for proposal submissions. This is based on the earlier submission format from a few years ago, but is much more simplified. The main purpose of the document is to provide enough information on the project in question, so that the Board can make an informed decision. Hopefully the form is self-explanatory. The whole submission shouldn't be more than about 5 pages total. Proposal submissions should be sent to the TAPR office or e-mailed to the president. The Board will then discuss the proposal and provide feedback. Again, we hope this will facilitate project concepts and ideas within TAPR. If you have any suggestions or comments on this format or process, please let us know.

1. Cover Page
  - a. Name, Address, Phone, Fax, E-mail of project participants. (please indicate project leader)
  - b. Title of Project or Proposal
  - c. Time Period of Project
  - d. Total Funds Requested
2. Technical Abstract of Project (short overview — less than a page)
3. Research/Project Objectives
4. Research/Project Impact (who this is intended for and what is the potential application/service/function)
5. Research/Project Personnel (briefly describe the participants and what they will be doing)
6. Technology Transfer (what is the potential for something TAPR

would develop, kit, propose, or publish in the future)

- 7. Budget Justification (spreadsheet)
- 8. Attach anything else you think necessary for the proposal.

## **Minutes of the 1995 TAPR Board of Directors Meeting**

**3 March 1995 - St. Louis, MO.**  
*[Edited for publication]*

Board members present were:

- Barry McLarnon - VE3JF, new elected
- Jim Neeley - WA5LHS, re-elected
- Gary Hauge - N4CHV
- Bob Hansen - N2GDE
- Keith Justice - KF7TP
- Ron Bates - AG7H, outgoing
- John Ackermann - AG9V, new elected
- Mel Whitten - K0PFX
- John Koster - W9DDD
- Greg Jones - WD5IVD

### **REPORTS**

#### **Secretary**

Gary Hauge read the activities report for the last year conducted over the internet. Gary proposed to set up a better voting method to provide improved tracking of voting issues over the internet. Also the secretary's report will be issued quarterly to keep board members better informed of TAPR activities.

#### **Treasurer**

Treasurer's report was read by Jim Neely. Revenue is up and noted that the budget was followed very well this past year.

#### **Newsletter**

The PSR report was read by Bob Hansen. Photographs will be added to the PSR soon.

A general motion to applaud Bob for his outstanding work on the PSR was made and a unanimous applause was given.

#### **Internet Server**

The TAPR internet service provider report and status was presented by Greg Jones. The TAPR server grew so popular that it finally crashed the U of A system. It was moved and is now located in San Antonio, TX.

### **SIG REPORTS**

The BBS SIG Report was presented by Dave Wolf. Dave is stepping down and turning his chair over to Barry Buelow. Barry has new ideas, approaches and a good understanding of BBS operation in real time. Dave will continue to provide assistance when required.

The Board applauded Dave's efforts.

NET SIG Report was presented by John Ackermann. John noted that there is a fair amount of technical discussions as well as ELMERing taking place. Future plans are to focus on information and documentation.

Johan Forrer gave the status of the HF SIG. There are a number of high level discussions taking place and the SIG overall is a success. Phil Karn has been very active and the SIG format seems to be well suited for this topic.

APRS SIG report was given by Greg Jones. This forum has been very active.

### **COMMITTEE REPORTS**

Dwayne Hendricks was delayed and not available to report. Greg Jones presented what was available to him. Observation was that the ARRL Digital Committee was not very active.

Ron Bates suggested that maybe TAPR should publish a "Hints & Kinks" type of document. No action was taken at this time.

### **OFFICE REPORT**

The office report was given by Dorothy Jones. Dorothy presented an office log of all telephone activities. She is now on the internet and getting acquainted with its functions and uses.

Greg Jones gave a review of 1995 sales. Some items have now been discontinued due to very slow sales. Curious observation was that the TNC-2 bare boards are still in demand. TAPR may make available another run of boards. Greg presented several items of supporting documentation for his presentation.

Goals are to improve advertising and increase membership. Possible video tape and new books will be made available. The new TAPR BBS Sysops Guide was presented as well as the new Packet Radio Introduction book.

### **CONVENTIONS**

John Ackermann will help set up TAPR activities at Dayton along with the Miami Valley Frequency Modulation Association (MVFMA). The Packet Bash will be moved to another location from McNasties. Agenda will include Buffet Dinner Speaker and SIG meetings along with a raffle.

TAPR and TPRS will jointly host the ARRL Digital Conference in Dallas, TX this year. Looking for an assistant in the Dallas area to help set up activities. Generating ideas on how to draw interest and provide good presentations. TAPR would also like to pursue an annual TAPR/DCC joint conference.

### **ELECTION OF OFFICERS**

Jim Neely volunteered to conduct the election process. Election results:

Secretary: Gary Hauge  
Treasurer: Jim Neely  
Vice President: John Ackermann  
President: Greg Jones

### **PROPOSED BUDGET**

Greg Jones presented the proposed budget with supporting documentation. John Ackermann will check with Tucson to verify that the legal activities and corporate address is maintained.

### **TECHNICAL PROJECTS UPDATE**

**DSP-93:** Bob Stricklin presented status. There are 180 kits out so far including the Beta Kits. Support is good and lots of activity on the DSP-93 internet group.

**TNC-95:** John Koster presented status. The design is Z-180 based and will fit the DSP-93 board format. There will also be a PC version with possibly 4 sync channels on a 16 bit card.

**TUC-52:** Still establishing priority goals. Work is progressing.

**AN-93:** Original design was for HF radios capable of FSK operation. Circuitry has been added to allow operation with any HF radio.

**1200 Baud Regen Kits:** Motion was presented to pursue continuation with caution.

**9600 bps Kits:** What to do with the kits? Commercial manufacturers are now producing at, or near, our price. Do we continue or not. The general concensus was to track sales and defer decision until a later date.

**23cm Kits:** Proposal to proceed on subscription basis per 25 orders. More information will be published in the upcoming PSR.

### **TAPR 96**

Several ideas were presented by board members as to what location should be set for next year's annual meeting. Originally Tucson was to be set for 1996, however due to the success of this year's meeting, opinions have changed somewhat. Keith Justice proposed that if we do not go to Tucson, we should at least return to Arizona. Phoenix would be a good location. Additionally, if we co-locate the meeting with the DCC possibly a larger site might be required. The board decided to make a decision by the Dallas, DCC meeting in June. As there was an agreement last year to hold every other meeting in Tucson, there were a few board members that want to honor that decision.

### **Goals For The Coming Year**

- Provide better documentation support
- Improve contacts with regional packet groups

**Gary N. Hauge, N4CHV**  
**TAPR Secretary, 1995**

## TAPR Software Library now available from ftp.tapr.org

Bob Nielsen, W6SWE

With the introduction of a new Internet server for TAPR use, the TAPR software library has now been made available for anonymous ftp from **ftp.tapr.org**. The previous library provided by Bill Beech, nj7p at ftp.hereford.ampr.org will not be maintained by TAPR. Thanks to Bill for having provided this service to TAPR and its members.

The ftp.tapr.org server has been provided by Lee Ziegenhals, N5LYT and is located in San Antonio, TX. In addition to the TAPR software library, there are several other areas which contain information of interest to TAPR members. These are located in directories under the main /tapr directory.

The software library can be found in /tapr/software\_lib. Files are grouped in the following subdirectories:

bbs	Packet BBS software programs
misc	Miscellaneous programs not fitting elsewhere
sat	Programs related to satellite operation
switch	Programs related to packet switch operation
tcPIP	TCP/IP software and support files
terminal	Programs for operating a TNC with a user terminal
tnc	TNC EPROM images and related software
utils	Binary-to-text and file compression software

Additionally, there is an upload directory, which can be used to submit software for inclusion in the TAPR library.

See the latest software listing in this issue for specific locations and file names. An updated list can be found in /tapr/software\_lib/listing. For those not familiar with anonymous ftp, log onto ftp.tapr.org (204.96.214.85) giving 'anonymous' as the user name and your e-mail address as a password. Please direct any questions to softlib@tapr.org.



## TAPR Software Library

Current as of 29 March 1995.

Items with \*\* notation have been updated since the last listing in PSR.

Disk No.	Name	Version	Filename
1.	APLINK	Ver. 7.01	/bbs/apl701.exe
2.	AA4RE BBS	Ver. 2.12	/bbs/bb212.zip
3.	CBBS	Ver. 7.30**	/bbs/cbbs73.zip
4.	EZPAC	Ver. 1.1	/misc/ezpac11.zip
5.	MONAX		/misc/monax.zip
6.	Ham Comm	Ver. 3.08	/misc/hco308.zip
7.	TNC-2 Manual and EPROMs	Ver. 1.18A	/tnc/eproms.exe /tnc/hostmode.exe /tnc/tncdocs.exe
8.	Text conversion Utilities		
	R95	Ver. 4.0	/utils/r9540.exe
	7PLUS	Ver. 2.02	/utils/7plus20.exe
	UUENCODE/UUDECODE	Ver. 5.21	/utils/uuexe521.exe
9.	ROSERVER PRMBS	Ver. 1.73	/bbs/rsrv173.zip
10.	ROSE X.25 SWITCH	Ver. 3.3	/switch/rosesw33.zip
11.	KA9Q NET	Ver. K34	
	Executable and Documentation		/tcPIP/netk34ex.zip
	Source Code		/tcPIP/netk34sr.zip
12.	WXN Weather Svr.	Ver. 5.11	/misc/wxn511.zip
13.	TNC1 CODE & TNC2 Notes		/tnc/tnc1src.zip /tnc/tnc2not.zip
14.	WINLINK	Ver. 1.1**	/bbs/wmlink11.zip
15.	WA7MBL BBS	Ver. 5.14	/bbs/mb1514.zip
16.	WORLI BBS	Ver. 18.05**	/bbs/rli1805.exe
17.	YAPP	Ver. 2.0	/terminal/yapp.zip
18.	INTRO TO TCP/IP		/tcPIP/tcpintro.zip
19.	LAN-LINK	Ver. 2.32	/terminal/ll232.zip
20.	ARESDATA	Ver. 1.6	/misc/aresdata.zip
21/21A.	MSYS	Ver. 1.18**	/bbs/msys118.zip
22.	G8BPQ NODE	Ver. 4.08a	/switch/bpq408a.zip
23.	UTILITIES		
	PKARC	Ver. 3.6	/utils/pk36.exe
	PKZIP	Ver. 2.04G	
	LHA	Ver. 2.11	/utils/lha211.exe
	ZOO	Ver. 2.10	/utils/zoo21.exe
	UUENCODE/UUDECODE	Ver. 5.21	/utils/uuexe521.exe
24.	THS	Ver. 2.50	/terminal/ths.zip
25.	VE4UB NTS	Ver. 091891	/misc/ntsve4ub.exe
26.	NM1D DOSGATE	Ver. 1.14	/misc/dosgate.zip
27.	SV7AIZ BBS	Ver. 4.51**	/bbs/aiz451.exe
28.	TEXNET	Ver. 1.6	/switch/tpsr16.zip1
29.	Intro To Packet Radio, A Tutorial	05-07-93	/misc/intropkt.zip
30.	MICROSAT Ground-station Software		/sat/microsat.zip
	PB	04-30-92	
	PG	02-25-92	
	PFHADD	03-24-92	
	PHS	12-21-90	
31.	No Longer Available (see 38/38A)		
32.	PAMS-Personal AMTOR Mailbox	Ver. 2.09	/bbs/pams209.zip
33.	TNC-2 Z-80 Monitor	Ver. 2.00	/tnc/monz80.zip
34.	GIL (Graphics Interchange Lang.)	Ver. 1.03	/misc/gil1-03.zip
35/35A.	PAKET	Ver. 6.1	/terminal/paket61.zip
36/36A.	F6FBB BBS	Ver. 5.15	/bbs/f6fbb515.zip
37.	TPK	Ver. 1.82	/terminal/tpk182.zip
38.	JNOS (Executables, docs.)	Ver. 1.1011**	/tcPIP/jnos110i.exe /tcPIP/docs110i.zip
39/39A.	JNOS (Source Code for 38)	Ver. 1.1011**	/tcPIP/jn110i1.zip
40.	SP Packet	Ver. 6.50**	/terminal/sp650.exe
41.	TAPR Deviation Meter Source and Tools		/misc/devmtr.zip
42.	PCTOR/PC-PACTOR	Ver. 3.02A	/terminal/pctor302.zip
43.	METCON ROM Code	Ver. 1.07	/misc/metcon.zip





**Tucson Amateur Packet Radio**  
 8987-309 E. Tanque Verde Rd #337  
 Tucson, Arizona • 85749-9399  
 Office: (817) 383-0000 • Fax: (817) 566-2544  
 Non-Profit Research and Development Corporation

# Order Form

**March 1995**

All prices subject to change without notice and are payable in U.S. funds. Members receive 10% off on Kits and Publications.  
 Please allow six to eight weeks for your order to be shipped. For specific information on kits, see Product Description flyer.

Office Hours: Tue-Fri 9am-12pm, 3pm-5pm CST

## Kits / Firmware / Publications

Qty	Item	Unit Price	Total Price	Kit Code	Information
_____	DSP-93 w/ wall transformer (US) .....	\$ 430.00	_____	16	check with office on ship date, <u>no discount</u>
_____	DSP-93 w/o wall transformer .....	\$ 420.00	_____	16	for international orders only, <u>no discount</u>
_____	AN-93 HF Modem .....	\$ 90.00	_____	3	limited kits available.
_____	TAPR 9600 bps Modem .....	\$ 80.00	_____	6	
_____	Bit Regenerator .....	\$ 10.00	_____	1	used for regenerative repeater operation
_____	Clock Option .....	\$ 5.00	_____	1	used for regenerative repeater operation
_____	PK-232 Modem Disconnect .....	\$ 20.00	_____	2	simplifies connection of external modems
_____	PK232MBX Installation Kit .....	\$ 20.00	_____	2	for installation of 9600 modem in PK-232MBX
_____	XR2211 DCD Mod. ....	\$ 20.00	_____	2	
_____	State Machine DCD Mod. ....	\$ 20.00	_____	2	
_____	State Machine DCD w/Int Clock .....	\$ 25.00	_____	2	For KPC2 or other TNC w/o 16X or 32X int cloc
_____	Trak-Box .....	\$ 195.00	_____	6	<u>member discount \$10.</u> limited kits available.
_____	METCON-1 Telemetry/Control .....	\$ 85.00	_____	6	includes 8 input, 4 outputs. limited kits available
_____	4 additional output ports .....	\$ 15.00	_____	1	
_____	Voltage-to-Frequency module .....	\$ 30.00	_____	3	
_____	Temperature-to-Freq module .....	\$ 40.00	_____	3	
_____	A-D Converter .....	\$ 45.00	_____	3	
_____	Elapsed Time Pulser .....	\$ 35.00	_____	3	
_____	32K RAM w/ TNC2 update docs .....	\$ 20.00	_____	2	
_____	<b>TNC-2 1.1.9 w/KISS EPROM</b> .....	\$ 15.00	_____	2	includes 1.1.9 Commands booklet (below)
_____	1.1.9 Commands Booklet (only) .....	\$ 8.00	_____	2	full TNC-2 command set for 1.1.9
_____	TNC-2 WA8DED EPROM .....	\$ 12.00	_____	2	8 connect version for ARES/Data standard
_____	TNC-1 WA8DED EPROM .....	\$ 12.00	_____	2	
_____	TNC-2 KISS EPROM .....	\$ 12.00	_____	2	
_____	TNC-1 KISS EPROM .....	\$ 12.00	_____	2	
_____	PK-87 WA8DED EPROM .....	\$ 12.00	_____	2	
_____	<b>Packet Radio: What? Why? How?</b> .....	\$ 9.00	_____	2	130 pages. TAPR's Packet Radio book.
_____	<b>BBS Sysop Guide</b> .....	\$ 7.00	_____	2	60 pages. by: Barry Buelow, WA0RJT
_____	TAPR's 94 Annual Proceedings .....	\$ 7.00	_____	2	Papers from the Annual Meeting (Tucson)
_____	TAPR's 95 Annual Proceedings .....	\$ 7.00	_____	2	Papers from the Annual Meeting (St Louis)
_____	PSR Set Vol 1 (#1 - #17 '82 - '85) .....	\$ 20.00	_____	5	
_____	PSR Set Vol 2 (#18 - #36 '86 - '89) .....	\$ 20.00	_____	7	
_____	PSR Set Vol 3 (#37 - #52 '90 - '93) .....	\$ 20.00	_____	7	
_____	NOSIntro, Intro to KA9Q NOS .....	\$ 23.00	_____	5	Ian Wade, G3NRW, TCP/IP over Packet Radio
_____	ARRL CNC Proceedings 1st - 11th .....	\$ call	_____	.	Individual Proceedings, call for prices
_____	Entire Set ARRL CNC 1st - 11th .....	\$ 80.00	_____	36	9 Proceedings from 1981 to 1993
_____	TAPR Badge .....	\$ 10.00	_____	0	include Name and Call for badge
_____	3 1/2" Disk from TAPR Library .....	\$ 3.00	_____	0	\$3 per disk. See TAPR Software Library List

**Sub-Total Kits/Firmware/Publications/Disks:** \_\_\_\_\_

**:Added Total of Kit Codes**

(Example: 9600modem w/ BitRegen: 6 + 1 = 7)

**:Member #** (Place New, if joining)

**Members 10% Discount (Kits & Publications):** \_\_\_\_\_  
 (Except were noted)

**Total Sales** (Sub-Total minus Discount)

**Texas Residents add 7.75% tax**

**Membership** (New or Renewal)

**For Total Kit Codes between:**

<b>1 - 3</b>	<b>4 - 7</b>	<b>8 - 15</b>	<b>16 - 27</b>	<b>28 - 55</b>
Add \$2	Add \$3 <sup>50</sup>	Add \$4	Add \$5	Add \$6

Kit Codes above 55 or INTERNATIONAL orders  
 Please call TAPR for Shipping & Handling Amount

**TOTAL Order Amount** \_\_\_\_\_

**Credit Card #** \_\_\_\_\_  
 (Visa/Mastercard Only)

**Expires:** \_\_\_\_\_ **Signature:** \_\_\_\_\_

**Name:** \_\_\_\_\_ **Callsign:** \_\_\_\_\_ **City, State:** \_\_\_\_\_

**Address:** \_\_\_\_\_ **Zip, Country:** \_\_\_\_\_