PACKET STATUS REGISTER

Tucson Amateur Packet Radio Corporation

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In This Issue...

President's Corner

by Bob Nielsen, W6SWE

What's this? A new name on this column?

Yes, that's right. Lyle Johnson, WA7GXD, agreed last year to serve again as President of TAPR, but only for one year. Now, that year is up, and the Board of Directors has asked me to grab the reins. Of course, I'm not really a stranger to most of you, having edited the past five issues of PSR and served as Vice President for Member Services last year. In that role, I certainly acquired a feel for what makes TAPR run and the key ingredient has been — guess who — Lyle Johnson. But now Lyle will be able to back away from the administrative concerns and devote even more time to the technical projects.

Harold Price, NK6K, will serve this next year as Vice President and Greg Jones, WD5IVD, will again be Secretary/Treasurer.

An Executive Committee has been formed, consisting of the officers plus Andy Freeborn, N0CCZ, and Lyle Johnson, WA7GXD.

Starting with this issue, Packet Status Register is being edited by Bob Hansen, N2GDE. Bob worked closely with me on PSR last year and did the layout and typesetting. If any of you have ideas for an article, I'm sure Bob would be happy to hear from you.

I was glad to see so many of you at the Annual Meeting in Tucson on March 2. And I want to invite the rest of the membership right now, to plan to attend next year's meeting, which will celebrate the 10th anniversary of TAPR. We hope to make this a real special meeting. More details on this later.

As you will see elsewhere in this issue, TAPR is raising the price of many of our kits. We regret having to do so, however increases in postage and other costs made this inevitable. In addition, the K9NG 9600 bps modem originally was only a partial kit, with the hard-to-get parts. It is now furnished as a complete kit.

I hope that all members and others who will be attending the Dayton Hamvention this year will drop by the TAPR booth. Kits and software disks will be available for purchase; you may join TAPR or renew your membership, or just come by and say "hello." We will be glad to see you.

Finally, I want to encourage you all to become an active part of TAPR. This is basically a volunteer organization. The more volunteers there are, the more we can do. The problem has historically been one of organization and coordination of efforts. We recognize this and are attempting to deal with it. If you have any ideas for things TAPR might become involved with, we'd like to hear from you. Please write to the TAPR office or you can contact me on CompuServe at 71540,2364.

packetRadio Progress

by Greg Jones, WD5IVD

If you haven't heard any information regarding the progress of the packetRadio — then you are not alone. For the past several months information concerning the project has been kept very low key. Progress on the radio as of last fall, to put it bluntly, had come to a screeching halt. But, new resources were added to the project last November, and since the first of the year, significant progress has been made on RF sections of the radio. This progress has encouraged the TAPR Board of Directors to pass a motion for the continuation of the project. Currently, the most active people on the design team are working on the receiver, exciter, and power amplifier. Plans and goals are being set for this year, and I hope to be able to report on further progress of the packetRadio as PSRs are published. Don't expect to hear much more information on the project until such time as the group has something major to report. We are very much in a development phase of the prototypes, and work will continue in this area to the point of making a decision on the future of the project.

From prior experience with amateur radio projects, you won't get me to announce a completion date or a cost. Look for all that when we get finished.

Modifying the IC22A for 9600 baud operation

by Mike Curtis, WD6EHR and Dave Shalita, W6MIK

These modifications are rather typical for most phase modulated crystal-controlled rigs. Many don't require replacement of the trimmer cap in step 2. Some have a fixed capacitor across the trimmer. Install the varactor in series with this. You may need to replace the fixed cap with one of larger value to have enough deviation from your varactor. Remember that these are frequency-determining components. Try to get parts with a low temperature coefficient. This means it changes value as little as possible as temperature varies. It's possible to minimize effects by using opposing coefficient parts, i.e. NPO, etc.

The IC22A is one of the more difficult rigs to modify — most are even simpler!

This mod. will make your IC22A into a dedicated 9600 baud packet radio. Components with * are added to the crystal board.

1. Remove R-48, C-54. and C-57. This isolates the detector from the audio stage and de-emphasis network. Your speaker circuit no longer will operate. (Dave lifted R48 and C54 to kill de-emphasis and any roll-off, but left C-57.)

2. Remove the trimmer capacitor for the transmit crystal socket you'll be using for 9600 baud. Replace with a 5-20 pF trimmer *C-1. We used a Radio Shack 6-50 pF trimmer in series with *C-1a, a 47 pF fixed. Cut the trace on the bottom of the crystal board to the trimmer and bridge with the 47 pF *C-1a.

3. Install in parallel with the new trimmer an NTE613 22 pF varactor diode, *V-1. The anode goes to ground. (Reverse biased)

4. Install a 50K trimpot *R-1 between ground and the transmit oscillator collector supply. This will be used to bias the varactor at 2.5 volts.

5. Connect 2 47k 1/4 watt resistors *R-2 and *R-3 in series and attach one end to the trimpot *R-1 wiper. The other end goes to the cathode of the varactor *V-1.

6. Connect a .001 (bypass) capacitor *C-2 and a 4 to 10 uF capacitor *C-3 to the junction of the 2 47k resistors *R-2 and *R-3. Ground the other end of *C-2, and connect the other end of *C-3 to the modem TX audio.

7. Connect the modem RX audio to the junction of R-45, R-46, and R-47 on the IC22A. (Dave says: Pick-off audio tones for modem from junction of C54, R44, R46, R48. Left C57 and C1-1 still in place. The receiver audio now functions with this mod. but the BERT error rate improved.)

8. Snip one lead from diode D-12. This keeps the receiver running during transmit. Handy to check your own signal and do internal BERT testing with the G3RUH modem — also improves turnaround time.

9. Turn R-67 (dev. control next to P-1 and P-2) completely counterclockwise. This kills signals that may get into the phase modulator.

10. If you can, changing the CFM455E to an SFH455D or E, or SFG455E or F will give you better group delay and ripple. However, the original filter will work pretty well.

Hint:

Use the K9NG's 4800 Hz "idle" tone to adjust your modulator for best linearity. Using a service monitor, or a receiver with a fairly wide passband, adjust varactor bias for the "best" sine wave. Thanks to Brian Kantor WB6CYT for this tip.

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Visit to Japan

by Lyle Johnson, WA7GXD

Heather, N7DZU (who happens to be my wife of 20 years) has wanted to go to Japan for a number of years. I travel a bit in my job, and managed to accumulate a large quantity of frequent-flyer miles. Tak Okamoto, N6MBM, President of JAMSAT (Japan AMSAT) made the mistake of asking me if I would be able to come to the JAMSAT Annual Meeting and Symposium in March, 1991.

I said I would try and make it and started cashing in some Delta miles!

The long and short of it is that we left Tucson on the 15th of March for Tokyo! We flew on Delta's new non-stop from Los Angeles to Tokyo on an MD-11. The MD-11 has seats for 260+ economy passengers — but the flight only had 34 passengers so we were quite comfortable, thank you.

We arrived in Tokyo on the night of the 16th and went to the JAMSAT Symposium on the 17th. I had the privelege to speak about the joint TAPR/AMSAT DSP project, METCON and the MicroSat launch campaign.

Thanks to yeoman efforts by Harold, NK6K, I had a good set of slides for the MicroSat portion of the presentation.

There is intense interest in the DSP project in Japan. One fellow, upon hearing of the efforts with the Dalanco-Spry Model 10 TMS32010 experiements, wire-wrapped a plug-in board for his Apple II so he could experiment with DSP!

One problem with the present approach of the DSP-1 design is that the IBM PC clone industry in Japan is not high profile. The most popular PC in Japan is made by NEC and, while an MS-DSO machine, uses an incompatible bus structure. PC clones are rather expensive there.

We had a dinner with the JAMSAT gang after the Symposium, then took the Shinkansen (bullet-train) to Kyoto, the old imperial capital of Japan, on Monday. We toured an ancient temple, then had a dinner with the local packeteers. We toured around the Kyoto area for three days (and had a MacDonald's MacTeriyaki burger as well as a traditional Japanese supper served by kimono-clad ladies) then returned to Tokyo.

During the last three days we had an excellent tour of Akihabara, the electronics district. We returned home on the 24th, with the MD11 carrying only 32 people (Delta must have thought 34 crowded us too much on the way over...).

I noticed two outstanding things on the trip, apart from the fantastic time the packet community showed us.

The first is Akihabara. You can find any sort of component you might need to build a project. Cabinets, wire, switches, cables, resistors, capacitors, semiconductors...even tubes! In the States, you have to fight to get parts to build things. Few businesses want to be bothered filling small orders. Homebrew is a dying art here. In contrast, it is flourishing in Japan.

The second is involvement with young people. The gigantic Ham Fair is in mid-summer. There are programs for teen-agers and their involvement is solicited and encouraged. Ham radio is used as an introduction to the fun of electronics. As I toured, hams were showing me their homebrew projects (like the wire-wrap DSP board for an Apple II). In contrast, we hold our big show (Dayton) while school is in session. There is little focus on young people, other than bemoaning the fact that we have so few newcomers to our ranks.

Young people are the focus of many adults in Japan. For example, when we went to the Tokyo Aquarium, there was a walkway allowing the general public to walk above the tanks and look down at the fish! In the States, people would worry that someone would toss poison or popcorn or ??? into the tanks and destroy the exhibits.

The subways and buses in Tokyo, population 13 million, have no graffitti or evidence of vandalism.

We walked the streets and alleys of Kyoto late at night with no fear of our personal safety, yet the city has a population in excess of 1-1/2 million.

I think Tak summed things up nicely when he mentioned that in Japan, people are the only natural resource. Everything else is imported.

Sobering.

I want to again thank Tak, JAMSAT and the Kyoto area packet community for the wonderful time we spent, and their enthusiastic support of TAPR. I am sure Heather and I reaped benefits due to our association with TAPR, and she and I wanted to share this experience with all of you through *PSR*.

TAPR Packet Radio Video

by Greg Jones, WD5IVD

The editing of the TAPR 1985 video on "Packet Radio" has been finished. The video covers the history and basics of packet radio. Hopefully, future short videos will be produced covering other areas of interest in packet radio. These could include High Speed Packet Systems, Satellite Operations, and others. The updated TAPR "Packet Radio" Video should be available from the ARRL in the near future and will be available through the TAPR office for either checkout or purchase. Also, we are working on a set of materials that will be sent out with the video to be used for club or organization presentations. This is a good video for non-ham type presentations. Tapes should be available in April. Contact the TAPR office for further information.

PSK Modem Manual Error

by Lyle Johnson, WA7GXD

There is a minor error on page 25 of the 11 March 1990 instruction manual.

The illustration for S3 (Fig. 7) has the GREEN and BROWN wires swapped. The text directions for S3 on page 24 are correct. Please re-label the GREEN and BROWN callouts on Fig. 7, page 25.

Minutes of the Tucson Amateur Packet Radio Board of Directors Meeting

Tucson Az. - Inn at the Airport - March 2nd, 1991

Directors Present:
Andy Freeborn, N0CCZ
Pete Eaton, WB9FLW
Franklin Antonio, N6NKF
Don Lemley, N4PCR
Bdale Garbee, N3EUA
Eric Gustafson, N7CL
Lyle Johnson, WA7GXD - President
Greg Jones, WD5IVD - Sec/Treasurer
Harold Price, NK6K - Exec. VP
David Toth, VE3GYQ
Dan Morrison, KV7B
Bob Nielsen, W6SWE - VP Membership Services

Directors Not Present:
Steve Goode, K9NG
Tom Clark, W3IWI
Jerry Crawford, K7UPJ

Also Present:
Paul Newland, AD7I
Bob Hansen, N2GDE
Phil Karn, KA9Q

A. Minutes of the previous Board of Directors meeting and electronic minutes from CompuServe were read and reviewed. Changes and corrections were made. Harold Price moved that all minutes be approved with corrections. Franklin Antonio seconded. Motion passed.

B. Officers' Reports

Secretary/Treasurer Report - Greg Jones

Office Organization

Greg reported that little had changed in office organization since the restructuring done by Andy Freeborn in 1989. In the upcoming year a number of small handwritten accounting methods will be replaced by an automated entry software package that will be introduced in March. The FAX and answering machine both have been getting extensive usage. A new VISA authentication machine will be added to the office, this reduces our VISA overhead charges and will reduce trips to town with VISA slips.

Heather Johnson, office manager, came in and added to office report. Bdale motioned that the Board commend Heather on her "Quality of Communications" while running the office. Dave Toth seconded. Board approved. Greg Jones raised the office hours issue. The Board discussed and agreed that no change will be made. A point will be made to inform TAPR members that the office hours are limited to the published times.

Financial Status

The end of year figures for 1991 were presented and explained. There were still a number of small changes to be made to the current accounting system, but overall, everything was being reported correctly.

Andy Freeborn and other directors wanted to have a more in-depth study done concerning the current parts inventory number. This number should be lower. The number did not reflect the removal of parts that was done last year. Greg will work on this with Chuck and Heather and report back to the Board with a new number.

Greg reported on the current bookkeeping and accounting situation. In August, TAPR bookkeeping and accounting functions were consolidated; this arrangement costs less, and keeps both functions in one location.

A data entry program will be implemented in March as part of automating TAPR finance. This program will allow the office to mail a floppy disk directly to the accountant, help reduce mistakes, and reduce the amount of time required by the Treasurer to review the figures.

President's Report - Lyle Johnson

There was some question regarding delinquent OEM royalty payments. Lyle reported that all royalty checks had arrived and that other OEM issues had been resolved this past year. No other news to report.

C. Old Business

DSP Project - Lyle Johnson

Lyle presented an updated report on current DSP progress. The TAPR DSP boards are about to be put into alpha test. Lyle discussed expansion issues. Software is still very much an issue. It was projected that the DSP could be available in 3rd quarter 1991. The Board discussed kitting vs. completed DSP boards. The Board decided to allocate time later to discuss DSP in more depth.

packetRadio Project - Pete Eaton and Greg Jones

Pete gave an overview of the project to date. Don Lemley gave a report on the receiver for Don Lemkey, Don Lemkey was not present. The receiver was shown. Eric Gustafson showed the exciter board. Eric explained that he had two stages left to complete, but the board was producing power in the 2-meter band. Lyle reviewed the TNC and digital board. Pete discussed the project further. Much discussion was held on feasibility of project and what impact the project would have now and in several months when actual boards might be available. After much discussion, Harold Price moved that the pR project would continue with Greg as project manager for the next 6 months, with money being allocated as necessary for the project by the Board as requested by the pR group. Lyle Johnson seconded. Motion passed.

Bylaws Changes

The Board continued to review proposed changes and modifications of the TAPR bylaws. Bob Nielsen will post on CIS all agreed on changes. Harold Price moved to accept the bylaws upon the following conditions: 1) the changes will be posted and reviewed by the Board on CIS, 2) sent to our lawyer and approved, and 3) accepted by the state of AZ. Dave Toth seconded. Motion passed by the Board of Directors.

PS-186 Project - Bdale Garbee

Bdale gave an update on the AEA PS-186 project. Currently there has been no progress and little is expected to ever occur. Bdale is no longer involved with this project due to no hardware being available for software development.

D. New Business

Election of Officers:

President - Bob Nielson, W6SWE

VP - Harold Price, NK6K

Sec/Treasurer - Greg Jones, WD5IVD

The Board discussed the need for additional VPs for the organization, and the consensus of the Board was that no other VPs where needed at this time. The VP of membership services was dropped.

Executive Committee

Nominations were opened for additional Board members to sit on the executive committee.

Lyle Johnson, WA7GXD

Andy Freeborn, N0CCZ

Nominations closed by Dave Toth. The Board elected the above directors to the executive committee in addition to the officers.

***PSR* Editor**

Bob Hansen will be the new *PSR* Editor. Bob spoke a moment about *PSR* issues.

MicroSats - Harold Price

TAPR provided money for this satellite. $25,000. TAPR needs to get more public relations out of this fact. TAPR needs to evaluate how PSK modems can be advertised in the next 6 months, and at Dayton to increase revenue from PSK modem sales. Bob Nielsen should work with Doug Loughmiller on this subject to define an AMSAT/TAPR strategy. Andy Freeborn motioned that 100 PSK modems kits be generated for Dayton. Seconded by Franklin Antonio. Board passed motion.

Annual Meeting Report - Pete Eaton

Prices at the annual meeting have gone up. Pete reviewed the costs of this year's conference. The Board felt that we should look over other places in Tucson to hold the meeting.

Dayton HamVention Report - Pete Eaton

Pete checked last year about switching hotels. No way! He gave a report on preparations for this year, everything the same as last year.

FCC Action - Lyle Johnson

Lyle read a message from Tom Clark about the FCC issue. Tom asked the Board to review a list of possible actions. Bdale motioned that TAPR should make a statement concerning the current situation and provide this as a leadership position in this area. A committee would be formed to generate the statement for the Board to review. This statement will be directed to the FCC and other official groups. Seconded by Franklin Antonio. Should be done in all due haste. Motion passed.

Andy suggested that this be announced at the meeting Saturday. The Board agreed. Bob Nielsen appointed a committee of Bdale Garbee, Harold Price, and Dave Toth.

SAREX Report - Lyle Johnson

Lyle read Tom Clark's report on the SAREX project.

Heather Johnson Raise - Greg Jones

Greg asked the Board to review Heather's current salary scale. Dave Toth moved to give Heather a 10% raise. Seconded by Franklin Antonio. Motion passed.

DSP Project - Lyle Johnson

Lyle opened discussion concerning beta phase for DSP. The Board asked what additional money is needed in the next 6 months. Lyle asked for an additional $1500 from TAPR to be matched by AMSAT. Seconded by Dave Toth. Board Passed motion.

packetRadio Project - Greg Jones

The pR group will provide the Board with an outline of how much money will be needed for this summer. In addition a costing of the boards and components will be made available as soon as possible.

METCON 1 Project - Pete Eaton / Paul Newland

Paul discussed the origin of the METCON 1 project. Paul would like to have 25 boards available by Dayton as a beta-test before TAPR modifies the board for a final version. Franklin moved to produce the METCON-1 project with additional funding to be requested later. Bdale seconded. Board passed motion.

FAX Modem Project - Lyle Johnson

Lyle discussed future V.29 FAX modems for future 9600 buad modem technology. The Board discussed future impact and limitations of this technology.

Deviation Meter Project - Lyle Johnson

Lyle discussed the possibility of constructing an economical deviation meter. This device could be sold for under $100.

Baycom - Bob Nielsen

Bob Nielsen has sent a letter to the BAYCOM folks asking if TAPR could distribute their software through the TAPR software library. Also an inquiry has been made about possibly offering a modem kit. The Board felt we should try to distribute the software and possibly help with a modem design.

TNC-3 Project - Lyle Johnson

Lyle discussed future plans of a possible TNC-3. From that discussion arose a discussion about a TAPR license of the TNC-2 for clubs. This would be for clubs inside and outside the U.S. to develop TNC technology for their groups. There was no consensus on this issue. More discussion will be needed. Discussion took place concerning TNC firmware. No consensus on this issue.

TAPR Operating Guide to Packet Radio - Greg Jones

Greg discussed the concept of a 'tome' of packet radio information. It would be distributed by TAPR and contain information currently held by TAPR and other packet organizations. Bdale Garbee motioned that this project become a new TAPR project. Seconded by Lyle Johnson. Board approved. Greg will attempt to have the book ready by Dayton.

TAPR Packet Video - Greg Jones

Greg discussed what he was doing in re-editing the Packet Pete video tape for redistribution to clubs. The goal is to have it ready by Dayton for sale and distribution. Greg is editing out all old information and adding a section at the end on new technology, if possible. Greg moved that the video project become a TAPR project with funding to be determined by the Board later. Pete Eaton seconded. Board passed motion.

Kit Prices - Greg Jones

Greg opened discussion on kit pricing and pointed out that all kit prices should be reevaluated before Dayton for any needed change. No decision was made at this time and Greg will make a further report for the Board to review later.

Submitted by Greg Jones, WD5IVD

Secretary / Treasurer, TAPR

Bits in the Basement

by Bdale Garbee, N3EUA

Hi! This time around, I'm a bit rushed putting this column together. The good part is that I'm rushed because there's lots of interesting things going on... I'll start this time with my impressions from the TAPR annual meeting, and end with what I know about Dayton this year. In between, I'll try to hit a few highlights of activity in the Bit Basement since the last issue.

TAPR Annual Meeting 1991

Probably the first thing that comes to mind when I think back on the weekend spent in Tucson this March, is that the Board of Directors meeting on Friday, was by far, the most calm and straight forward of any that I have participated in, or heard about to date. A couple of obvious factors contributed. We had zero difficulty electing a slate of officers, since Bob W6SWE had already expressed a willingness, if elected to the Board, to serve as President this year. That's been the tough job to fill the last couple of years. We also didn't have any particularly controversial issues on the agenda this year. All in all, it was... shall I say... the "least unpleasant" Board meeting I've been part of.

The one disappointment I might voice about the Board meeting really wasn't part of the meeting at all, but a misperception voiced by a member on Sunday morning. With the exception of brief periods surrounding discussion of commercial licensing agreements and royalties where we have an obligation to the manufacturers to maintain the confidentiality of their sales, plans, and so forth, all TAPR Board meetings are open to the public. You won't find us actively encouraging lots of folks to come sit in, because to be honest, things tend to go more quickly when there's a smaller group present. But we have always welcomed questions and input from the membership, and continue to do so! It's also probably worth mentioning, in case it isn't general knowledge, that the TAPR Board meets in "continuous session" on a private area of CompuServe year-round, so if you ever have an issue you'd like to bring to the Board, a project proposal that you'd like to seek funding for, or anything else we ought to hear... then contact any one of the TAPR Board members certainly including me, and ask us to convey a message to the Board at large on CIS! It's easy, and we'd welcome the input.

The most wonderful and most painful part about an organization like TAPR is that it is no more and no less than the sum of those who are participating members. The next time you find yourself saying "TAPR" in a sentence and meaning someone else... go find a mirror and take a hard look at yourself. You are TAPR, and whether TAPR is working on what you think is important or not is largely a function of whether you are actively involved or not! I've commented in this column before about how amazed I am sometimes at the perception that TAPR is some mystical entity. It really isn't! It's just a bunch of folks like you and me trying to make a contribution to the hobby, and have some fun at the same time...

The general meeting this year included some interesting presentations. I hope someone else will publish a full report, because to be honest I was doing my usual thing, popping back and forth between conversations in the lobby and the presentations. There were two presentations that stick out in my mind, however... and they are related.

Jon Bloom, KE3Z, gave an update on what is happening at the ARRL. Part of his discussion focused on the recent incidents regarding improper content of traffic on the PBBS network. This is an issue that we should all keep our eyes on, because it has the unfortunate potential of doing great harm to the development of serious packet networking on amateur bands in the future.

At this point, I am very hopeful that the issue of responsibility for content of forwarded traffic will be resolved in a way that will not prevent future network development... but on that Saturday in Tucson, the whole discussion was a real downer. N4PCR said something as he started his talk on the Grace PackeTen system about the degree to which this sort of conflict can be a negative motivator to those of us trying to push the edge of technology. I have to admit that my presentation (which followed his) about what was happening with COPA (Colorado Packet Assoc.) and what we hope to build in Colorado wasn't up to my usual standards, because I too was, well, pretty bummed. My apologies to those present, you deserved a more coherent presentation than you got from me!

The other presentation worthy of note was made by Dewayne Hendricks, WA8DZP, who is one of the folks responsible for the Macintosh version of NET, and who has been working with Mike Cheponis K3MC on an investigation of RF hardware being produced under the Part 15 Spread Spectrum rules at 900Mhz and elsewhere. Mike wasn't able to be present because of the imminent birth of his first child... a daughter! Congrats Mike, we missed you, but this time your priorities were clearly in order!

The Part 15 devices are something we as packeteers should keep our eyes on.

The class of device being shown by Dewayne in Tucson is a spread spectrum digital radio, capable of data rates on the order of 100-250kbps. The power output and antenna restrictions imposed by Part 15 rules seem restrictive at first, but some back-of-the-envelope calculations by Phil Karn KA9Q that evening implied that these radios could easily be used for many of the local and intermediate range hops that comprise the functional part of our current network. And the exciting part is that there are no content restrictions associated with the use of Part 15 devices, at all!

For a variety of other good reasons, I very much want to see the Amateur Radio service survive. But as someone who is an RF Network person first, and a ham second, if the environment surrounding packet radio gets too restrictive, it's nice to know that there's somewhere else we can go! Even more important, perhaps, was the realization that if the ARRL is correct in its prediction that packet radio's success or failure is going to make or break the future of the service, and if a new generation of potential ham has the option of going in the direction of a license-free, content unrestricted ser-

vice that for all intents and purposes gives them what packet radio can give them...

Think about it.

I may have more to say next time, and Dewayne hinted at a paper for the Computer Networking Conference this year in the San Jose area surveying the field. Keep your eyes open!

COPA

There's been one Board meeting of COPA since the last issue of PSR. It was held in Denver, and two important things came out of it. First, N0LEU and I have been working on drafting bylaws for the organization. Hopefully, by the time you read this they will be complete and on the way to the rest of the Board for review. All this administrative stuff is a real headache, but we've got to be legal, right?

The second thing is that we have officially recognized a technical standards committee, headed by yours truly, that is working on proposals for such things as consistent parameters for our NET/ROM sites, documentation and possible changes in our frequency usage, and plans for an East-West 10Ghz backbone across the state. I am particularly in need of information about frequency usage across the state for all forms of packet radio operation. If you're reading this and have something to add, please let me know! We can't do this all alone...

56kb Modems

I talked last time about the love/hate relationship I have with my 56kb modems lashed up to DRSI PCPA cards (more hate than love at this point!), and made the point that the world needs a better solution for high speed I/O on PC's. I was suitably chastised by VE3JF for not thinking about the PI card developed by the Ottawa packet working group. It is a two-channel HDLC card for the PC with one port configured for half-duplex DMA using the PC's internal DMA controller, which is easily capable of driving a 56kb modem. Somehow, between not making it to the ARRL CNC in Canada last year where they were introduced, and not having seen one in person, I just plain forgot about the card.

Barry has remedied that situation since the last issue. I have now purchased one of the PI cards to play with, and on first glance it looks like it will allow me to start collecting dust on my PCPA's. At this writing, I regret that I haven't had time to really put the card through its paces. I'll plan on reporting in more detail next issue.

I'm sure that the Ottawa crowd will be at Dayton this year, if you're planning to attend, put them on your list of places to stop!

I also saw Phil Karn KA9Q wandering around in Tucson with a card similar to the PI card from some folks in California. I don't have any more information about it right now, but some is on the way. It looked like a single-port card based on a Western Digital HDLC chip. I'll try to have more to say about it next time. Suffice to say there are some better cards available for lashing WA4DSY modems to PC's than dumb cards like the PCPA these days!

10Ghz Hardware

Things have been crazy enough lately that I just hadn't found time to stuff parts into the first-cut PC boards that Jon KE3Z sent out for me to test from the board shop at the ARRL lab. Two weeks ago, Don N0LEU drove over to the Basement from his home in Steamboat Springs (out in the middle of Colorado, in ski country!) to pick up the bare boards and all the parts I had lying around. He has promised to stuff the boards and try turning them on for me.

This coming weekend Karen and I will be driving to the western edge of the state, to the Packet Racket meeting in Grand Junction, CO. Don should have the initial link assembled if not tested by then, and he's planning to drag it along for me to see, and show. Don, Al WA4HND, and I have committed to putting up at least 4 sites with Grace cards and 10Ghz link hardware to begin building a new backbone for Colorado this summer.

The impact this will have on the rest of the world is that we intend to modify the design for RS-422 I/O instead of the current differential ECL, and then cut PC boards. If we are successful in getting to the PCB stage, we'll try to figure out how to make the useful pieces available. Wander by at Dayton this year if this interests you, and I'll see about making up a mailing list or something.

And if you know of a cheap source of dishes and related hardware that have any chance of surviving winters at 14000 feet for 10Ghz... please tell me!

Dayton 1991

We tend to measure the year at the Garbee household by what was the most recent amateur radio function we attended, and which one is coming next. As I write this, the next "biggie" that is a fixture on our calendar is the Dayton HamVention. If you haven't been to Dayton, you ought to do it at least once in your lifetime... it is, if nothing else, an experience.

The packet forum will again be held on Friday afternoon this year. I am on the agenda with Don Lemley N4PCR to talk about what's happened in high speed packet in the last year. If nothing else, I'm hoping we can pass along a list of the folks you ought to stop by and visit the rest of the weekend, as most of the folks doing interesting high speed things should be around somewhere. If you're one of the folks doing something neat, and particularly if you're going to have a booth or flea market space at Dayton, please drop me a line so I can make sure to remember you for the presentation...

The big change this year is that I will not be working in the TAPR booth. I have been invited by the Grace Communications folks to participate in their booth, lashing up some of our high speed RF hardware to their packet switches (currently the only thing available that will drive some of my toys directly, and what we're planning to base the Colorado backbone on) for what we hope will be an interesting continuous demo. The Grace guys also have some new products they plan to introduce at Dayton this year, which I think will be worth a visit. We'll be in booth spaces 570 and 571, which is an aisle away from the TAPR booth.

I **strongly** encourage everyone to stop by both the TAPR and Grace booths. There should be lots of new things to see and buy, and I'm looking forward to the opportunity to chat at

length about the construction of high speed packet networks with you!

Until Next Time

I appreciate the time some of you have taken to communicate with me about the column, TAPR, and high speed packet widgets. I have to admit, however, that I'm a bit disappointed none of you have responded to my query from the last issue asking "what does it really cost" to put up and support the packet radio shared facilities in your area. This is something I am really very interested in. If you meant to, but just haven't had time to reply, please do so.

And if you have any suggestions for things I can/should talk about in future columns, drop me a line! I still have a couple of good suggestions in the hopper for the hypothetical issue when I've got lots of time to prepare and am not writing after the deadline... but I need more! Keep those cards and letters coming!

I can be reached as bdale@col.hp.com on the Internet, as 76430,3323 on CIS, on the PBBS network as N3EUA@W0LKD, or by paper mail at 4390 Darr Circle, Black Forest, CO, 80908, USA. 73!

Packet Radio used in Desert Storm

From: Jerry Crawford, K7UPJ

Thought you might be interested to know I just had a visit from Hadron, Inc. They showed me a box with a board that said "Licensed by TAPR" on it. The box is called a PRC-6064A packet radio controller, and is a hot selling item for use by Special Forces and a number of other units. The demand is very high at the moment.

I know the TAPR people who did the TNC-2 design work did not have military use as an objective, but is interesting to see how extensive the utilization of the TNC has become.

So, it appears that TAPR is also playing a role in support of Desert Storm, although few people know about it.

Kit Pricing

by Greg Jones, WD5IVD

As treasurer of the organization, it is my responsibility, along with the Board of Directors, to make sure that TAPR stays on a healthy financial footing. In this light, the organization spent a considerable amount of time at the annual Board meeting discussing kit pricing. After looking at the financials for last year and forecasting the increase in postage and office operating costs for this year, the decision has been made that kit prices must be increased. This decision does not come lightly. For TAPR to produce 100 kits that cost $100 to produce each, the organization requires $10,000 in the bank for this project. This cost is over and above the R&D expenses to develop the kit beforehand. The bottom line is that the income from kit sales has to recoup the kit cost as well as the R&D costs.

The prices that the Board accepted, on the executive committee's recommendation, are based on two factors. The first factor is that of keeping the final cost of a kit as low as possible for amateurs, with the second factor being that of recouping the kit production and R&D expenses for any kit done by TAPR. It is very important that TAPR stay out of the red, so that money can be available to further develop new kits derived from continued support of research. Many items impact the final cost of a kit — these include office costs (telephones, FAX, copier, employees), parts cost, postage, kit packaging, documentation, and others. Like almost everything in the last few years, all of these have gotten more expensive. We hope everyone understands the need for a change in pricing.

Also note that some of the older items (e.g.: TNC-1 upgrades, tuning indicator) will no longer be available after the current stock is depleted.

TAPR Office Hints

by Greg Jones, WD5IVD

To help make things run smoother at the office and help you get your 'neat stuff' faster, please look over the ways you can get information to and from TAPR.

Office Hours and Voice Number

The TAPR office is open Tuesday through Friday, 10am - 3pm MST. If you call (602) 749-9479 during office hours, you can expect to be greeted by the friendly voice of Heather Johnson, N7DZU. (It has been suggested that an additional surcharge be added during office hours for this service :-}) On the more serious side, Heather has been answering the phone during non-posted office hours, which has been adding to her already busy schedule. [*PSR* #40 Oct 90 p17] I have asked Heather to stop doing this, since she is busy enough during non-office hours managing the Johnson household.

If you phone when the office is closed, you should be greeted by the recorded friendly voice of Heather Johnson apprising you of the current office hours and any special status of the office (like it's closed). The answering machine is checked regularly, so feel free to leave your order. Remember to follow Heather's instructions on leaving orders.

FAX Number

The Fax machine has been happily operating by itself, for the most part, taking orders and other requests 24 hours a day. The FAX number is (602) 749-5636. International orders are frequently sent by Fax. Fax orders are very welcome, if you have access to such devices.

Last, but not least, the bulk of the TAPR correspondence is received by the trusty U.S. postal system. All four methods can be used to get your request to TAPR and we look forward to receiving all of them very soon.

Please pass around the TAPR phone numbers, but remember to stress the open office hours if you need personal, prompt service with a smile.

Meeting Minutes from the 1991 TAPR Annual Meeting

by Paul Williamson, KB5MU

[Editor's note: This is a shortened version of Paul's 20-page blow-by-blow description. The full text is available on CompuServe's HamNet forum. Look for files BLOWBY.ZIP or BLOWBY.TXT in the Packet Radio Section, DL9.]

Harold Price, NK6K - MicroSat status report

Four MicroSats were launched; one was half funded by TAPR out of the proceedings of TNC-2 sales. The satellites were designed by AMSAT, but the funds came from various organizations around the world.

MicroSats serve as floating BBS stations, and they are optimized for that application. About 9 inches on a side, they weigh 22 lbs and carry 3 transmitters, 6 receivers, a NiCd battery pack, a computer with 8 megabytes of memory, serial ports, and a telemetry and control system.

Question: What equipment is needed to work the MicroSats? Answer: 70cm SSB receiver, 2m FM transmitter, PSK modem. PSK was chosen for reasons of efficiency. Software for ground station use is available via CompuServe, TAPR, and others. The spacecraft can also be used as a simple digipeater for realtime QSOs.

Lyle Johnson, WA7GXD, reading a letter from Tom Clark, W3IWI — SAREX

About 90% of the logs from WA4SIR's operation on the space shuttle have been processed. They amounted to 400K of data plus 4 inches of paper listings. The QSL cards will be ready soon; the Goddard ARC will distribute them. 238 "gold star" 2-way QSOs were logged by the GRiD laptop computer aboard the shuttle. 800 "silver star" QSLs will be awarded for stations heard by WA4SIR and awarded one of the 1700 QSO numbers. The QSO rate averaged about 20 per hour, peaking at 30 or 40 per hour. USA stations were greatly disadvantaged by interference, and by failure to run low modulation. 35 countries were logged, but no European stations were logged except a few SWL reports. It required over 200 pages of documentation to get authorization to carry the SAREX equipment on the flight.

DoD use of packet

Al Dennis, who has some connection to the Department of Defense, spoke up about DoD use of amateur packet equipment. They've been using it since we started. It is used for man-carried single-threaded narrowband links. The packet controllers work naturally with the laptop computers and digital radios they already have in the field. The 18th Airborne Corps has been building up applications. Amateur-like packet is a de facto standard, because it's cheap and give interoperability.

Packet is used both point-to-point and in networks. For logistic information transmission, packet replaces Jeep shuttles. Networking is coming, and interfaces to the DDN. They want to extend the DDN right into the jeeps in the field.

Question: Are you aware of tactical front-line use of amateur packet gear in Desert Storm? Answer: Yes! It is being used between camps in the desert. Then as the frontline troops advance, they outrun the logistics people - and use the packet thin-links to keep in touch.

Question: How well does it perform? It's not really optimized for this kind of work. Answer: It works well. Better than the other stuff they have. The amateur packet gear is the only error-correcting protocol they have that works on half-duplex radios. They even use it on UHF satellite links, which have just a few poor-quality channels available.

Lyle Johnson, WA7GXD — TAPR/AMSAT DSP Project

TAPR and AMSAT undertook a joint project, spearheaded by N4HY and W3IWI. The idea was to handle the proliferation of different modems for use on HF, MicroSats, RUDAK, and so on. By digitizing the analog signals, a high-speed processor can be used to simulate filter, PLLs, and other modem components. When the next new modem is needed, all that's required is a new program for the DSP board - it's only bits.

In January 1989, after the MicroSat launch, the hardware team was freed up. The DSP project was revived at the 1990 TAPR meeting. After a few months, a new design evolved: a PC plug-in board, based on a newer TMS320C25 processor. By using a PC plug-in, the project can take advantage of cheap IBM PC development platforms, at least for the initial version. This is great except for Japan, where the popular PCs don't have the IBM PC bus. The TMS320C25 is much more capable than the TMS32010 or TMS32015. It was too expensive when the project started, but now there is a version in the high $20's range.

A 6-layer beta test board was displayed. It's fully functional, with just a few white wires. The 4th of a planned 10 beta test boards is currently under construction. The beta test goal is to get some applications running to verify the applicability of the hardware. Then the production phase will begin.

Question: When can I buy one? Answer: Depends on how the beta test goes. Definitely not by Dayton this year, but very confidently before Dayton 92.

Question: What software will be included? Answer: We intend to provide a monitor/debugger, assembler, and applications, hopefully including source code. The intention is to provide the tools required for code hackers, AND at least a minimal set of modems and packet applications for operators. One member of the software team is into images, so expect an SSTV application. Another member proposes to create a spectrum analyzer.

Question: What range of sampling rates can it handle? Answer: Up to about 400 kHz. A fast sample rate like this is useful for non-modem applications, like spectrum analyzers. That was one reason for choosing 8-bit I/O instead of more precise, slower converters.

Question: Other than DSP software gurus, are volunteers needed to help with the DSP project. Answer: No.

Dave Toth, VE3GYQ — BBS Issues

Recent FCC citations (involving a bulletin soliciting support for a political group via a 900 telephone number) have led to a high level of paranoia among BBS sysops. Message traffic may be delayed. Many sysops are killing or at least screening bulletin traffic. The HF forwarding network doesn't handle bulletins anyway, so there is little effect there. 20 meters carries most of the load, followed by 30 meters. 15, 10, and 40 also carry some. All channels are essentially saturated. Retiring BBS stations are not being replaced, in hopes of limiting contention. VHF paths are being substituted where possible, for example between VE3GYQ and W3IWI. 8 to 10 BBS stations per channel might be a reasonable target.

Meanwhile, BBS software developers are working on adding compression of forwarded message data. Some standardization is needed. W0RLI is proposing LHARC, sent in binary form through the G8BPQ software interface. More system are running multiple connections via the G8BPQ software.

Dewayne Hendricks, WA8DZP - Packet in Northern California

The Northern California Packet Association (NCPA) will host the next Computer Networking Conference, September 27-28, 1991, somewhere in Silicon Valley.

NCPA is an umbrella organization over northern CA packet groups. It is tasked with frequency coordination, and is recognized as packet frequency coordinator by NARC, the repeater coordinator for that area.

Nationally, NCPA serves as an educational and information distribution service. It publishes a very nice quarterly newsletter. Expect to see more publications from NCPA. The newsletter is available for $10/year.

Paul Newland, AD7I - METCON project

Packet is an ideal way to transmit low-tech telemetry data. He has developed a simple telemetry monitor program for an 8051 microcontroller.

TAPR has adopted the METCON board as an official project. Pete Eaton is in charge of the development group. Lyle Johnson and Paul Newland on hardware. Kits just might be available by Dayton. Source code for the software is expected to be available, even though that will weaken the user authentication scheme and possibly embarrass Paul by revealing his coding style to the world. New software is welcome.

A prototype METCON board was shown around. A prototype VTF board was also shown. The VTF board can measure temperature directly with the addition of two components. The A/D board is not done yet. A power manager board for battery-powered sites is under consideration.

The device can be used for a remote weather station, or as a very elaborate repeater control system. If everybody used it for repeater control, every repeater control link could be on the same frequency!

Packet Radio Award

Lyle Johnson, WA7GXD, presented a plaque to Harold Price, NK6K, for his contributions to packet radio since 1982. In accepting the award, NK6K said that he sees himself as a link between the experimenters on the forefront of technology and the users of the technology.

Jon Bloom, KE3Z — League Issues

There has been little progress on the proposed version 2.1 of the AX.25 Level 2 protocol spec. The update is still waiting for the specification in "state description language" to be completed.

At the Computer Networking Conference in Colorado Springs in 1989, the community agreed that there was a need for work on HF packet: modems, protocols, diversity reception, and spectrum management. A grant from FEMA was obtained to work on some of these issues. The terms of the grant included a provision that the government would own any intellectual property that arose from the research, and this discouraged people from working under the grant. Since then, FEMA has relented, and participants in the program will now retain all intellectual property rights. $9500 is available for HF experiments; proposals may be submitted informally to Paul Rinaldo or Jon Bloom at HQ.

The FCC citations against BBS sysops for relaying a message with apparent commercial content has received a lot of attention, which seems to have been what the FCC wanted. It is hoped and expected that these particular people will escape any fines. ARRL believes the FCC is taking an inconsistent position. FCC has stated officially that every station is responsible for the content of all traffic passing through it. But in the automatic control docket, FCC acknowledged that it is impossible to screen all the traffic. FCC seems to be resolving the conflict in favor of full responsibility for all stations. Perhaps they would relent if we could provide an audit trail by which the originating station alone could be held responsible.

Mel Whitten, K0PFX - Radios for 9600 bps Operation

Hams in Missouri are trying to build a 9600 bps network on 440 MHz. They obtained a number of Mitrek radios from a water company. They initially looked good for data, but experience shows that they are too narrow-banded for data. Widening the IF (following Mike Schroeder's article from PSR #38) has been a struggle, but it helped somewhat. Three links are up and running now, giving about 2400 bps thruput. These are 30-mile links; 5 to 6 mile links work a bit better.

A company called TEKK makes a very small 2-watt data transceiver that seems ideal for this application. They currently come for commercial frequencies around 461 MHz, but a ham band version is possible. With G3RUH modems, interfacing is easy and bit error rate tests give good results. They run all day without retries. Mike Chepponis, K3MC, has moved a couple of the commercial-band TEKK radios into the amateur band.

Dewayne Hendricks, WA8DZP - K3MC proxy report

One of the TEKK radios, mounted in a chassis with a Kantronics G3RUH modem, was passed around. The TEKK radio costs only $150 in single unit quantities! The radio is tiny. Recovery time less than 8ms. Sen-

sitivity 0.3 microvolts for 12dB SINAD. Crystal controlled, single channel.

He is also working with K3MC on 900 MHz Part 15 spread spectrum devices. A tiny 121kbps 1W 900MHz data transceiver was passed around. It costs about $150. There was a session on wireless networking at the recent Hacker's Conference. They discussed the new no-code amateur license, but weren't very excited about it: the content restrictions imposed on the amateur service are too onerous. They'd rather stick with the Part 15 devices, which may be used to transmit any kind of messages.

Most of the commercial units are direct sequence spread spectrum. One recent unit is frequency hopped instead. Chips sets are becoming available for spread spectrum. More information will be presented at the next Computer Networking Conference.

Apple Computer filed a petition with the FCC a month ago, seeking to create a personal data communications service. The comments deadline is March 11. They don't think Part 15 devices are suitable. They want 1 watt, 1 Mbps, at 1.8 GHz. They want some different tradeoffs between power and antenna directionality. They propose a phase-in of frequencies. The IEEE has formed a committee for wireless LAN issues. WA8DZP (and soon K3MC) is a member of the committee.

Chuck Green, N0ADI - TAPR Production

Did you ever wonder about how all the parts in your TAPR kits got there? N0ADI's wife does all the kitting. His spare room (which was going to be the hamshack...) is the TAPR warehouse. In the early days of the TNC2, the warehouse took over the family room and part of the living room, as well. 2700 TNC-1 kits and 1200 TNC-2 kits were packaged, and countless smaller kits. 2500 kits, all small, were shipped last year.

When a production run ends, TAPR retains a quantity of spare parts. If you need a spare part, they probably have it. Full kits of parts for boards are not available, though.

N0ADI also has possession of a computer owned by TAPR for PC board layout using ProCAD software. It was on display in the meeting room, with the very complex layout of the DSP board on the screen. The DSP board holds 67 ICs. Notice that the bottom rear corner of the board is shaved off to permit insertion from the top of the PC chassis.

Don Lemley, N4PCR - the PackeTen Switch

Why the PackeTen switch? Overloaded networks. Advanced applications are not practical at the low bandwidths currently available. There were political problems. He decided to focus on the digital side of the problem, since that is where his expertise lies. He wanted to provide an off-the-shelf solution that would support the fastest modems and radios available, up to 56 kbps, and future platforms to 1 Mbps. It provides backwards compatibility to the existing users. And at lower cost than the usual configuration of many TNCs.

The PackeTen features a MC68302 special-purpose processor running at 16 or 20 MHz. 3 high-speed synchronous or asynchronous channels, with an aggregate thruput of 2 Mbps. Clocking is software configurable. EEPROM memory stores configuration info. CMOS is used for low power. 2 megabytes each of RAM and ROM can be installed.

The card comes in two versions: standalone and PC plugin. The PC plugin card has a very fast dualport memory interface to the PC. It can use an 8 or 16-bit interface to the PC bus.

The PackeTen runs a customized version of the KA9Q NOS networking software ("NOSINABOX"). This version supports NET/ROM for backwards compatibility with NET/ROM networks and users. And of course, TCP/IP users can use its more sophisticated features.

Question: If the Chicago group was like most, the original network resources were owned by a variety of clubs and individuals. How did you deal with this when upgrading the network? Answer: The IP users group put together the funds to build the new network. When it was up and working better than the old network, the other stuff just faded away and the users switched to the new network.

Bdale Garbee, N3EUA - Colorado report

They are focussing on east-west linking across the mountains, instead of the former emphasis on north-south linking along the front range. A new backbone is planned for this summer. The current network works so poorly that backwards compatibility isn't much of an issue.

Not everyone understands the distinction between an occasional path and a reliable path. Many of the paths currently in use rely on knife-edge propagation, which is not suitable for high-speed data links. Site selection and service goals were the main issues. It was necessary to use point-to-point line-of-sight links of less than 50 miles. 300-mile links between 14000 foot peaks were the wrong answer.

Phil Anderson, W0XI - Kantronics

Last year, the market was depressed, but since September volume has been up surprisingly. Commercial customers are buying TNCs for HF and VHF, and even some 2400 bps QPSK units. Amoco and Tennessee Gas are using TNCs for sending data to operators in mobile units.

The latest product from Kantronics is the TelemetryUnit. The TU hooks up between instruments and a TNC to relay telemetry. It features screw terminals on the back panel to ease field installation. Firmware is available that supports an anemometer, wind direction sensor, ratiometric A/D converter, temperature sensor, and rain gauge. This firmware gives a text-based human interface on the data port. The operator specifies the sample rate, and it automatically collects the data. You then ask it for a report, and it dumps the data to you.

Kantronics is developing the D4-10 data transceiver. They will be seeking FCC Part 15 approval soon. It has microphone, analog data, and digital data interfaces. Two channels, crystal controlled. They have some tricks to make TX/RX switching fast.

Gwyn Ready, W1BEL — PacComm

PacComm's EM-NB96 9600 bps data communications line is growing.

The modem has a new feature: the modem disconnect is brought out so that other modems can be chained onto the same TNC. The NB96 modem can be connected directly to the TEKK radio; PacComm worked with TEKK as a beta tester for data applications. They work very well on good RF paths. The TEKK radio *will* be available on amateur frequencies.

The TINY-2 PLUS is an add-in board for the TINY-2 TNC. It's aimed at experimenters, with other features intended to encourage volume sales. It has open squelch DCD, a hardware clock, room for 512K of extra RAM, and 3 extra EPROM sockets. The ROMs can be selected by software. You can put RAM in the EPROM sockets and download code to it. The serial ports have LEDs for debugging. A mini-BBS and remote commanding are supported by the standard firmware. A monitor EPROM is available.

One of the first PacComm Handi-Packet TNCs was recently delivered to the Soviet space station Mir. There seems to be a bit of a problem with user training; the cosmonauts don't understand all of the features.

Steve Hall, WM6P — HF Diversity Reception

Experiments with diversity reception for HF packet have been carried out. The scheme used two separate antennas, receivers, and modems. Software provided by Kantronics was used to keep statistics on packets copied by both TNCs and packets copied by one but not the other. The receivers were mostly listening to the 20 meter BBS forwarding channel. This provided a variety of locations, signal strengths, and angles of arrival.

The results were surprisingly consistent: A second receiver gave about 50% improvement in packets received. For instance, if the A channel receives 4000 packets correctly, typically the B channel would receive an additional 2000 packets that A didn't copy. This performance level was largely independent of the quality of equipment used on the B channel. Even relatively inferior equipment (R390 and R388 surplus receivers with random wire antennas) provided about 50% additional packets, even when relatively first-class equipment (TS940S receiver on a monoband beam) was used on the first channel.

The results were also largely independent of the antenna configuration used. The only pair of antennas that didn't exhibit good diversity was a pair of horizontal dipoles at right angles with co-located feedpoints. Parallel dipoles spaced a half wave apart gave good results. Comparative tests were difficult, since ionospheric conditions changed performance more radically that antenna selection.

In light fading, diversity improvement fell to about 20% additional packets. When fading was heavy, diversity improvement was larger, since the two channels tend to fade independently.

So far, the diversity combining tests have been a laboratory curiosity. The next step is to make a combiner box that will allow two TNCs to handshake and do diversity receiving automagically. He has talked to manufacturers, with lukewarm results. Jon Bloom, KE3Z, is interested, and they plan to move ahead with a prototype that will interconnect two KISS TNCs.

Phil Karn, KA9Q - NET/NOS status

Anders Klemets, SM0RGV, has evolved the simple mailbox is NOS into a fullscale BBS.

The RSPF (Radio Shortest-Path-First) protocol has been added to NOS. It's more stable than algorithms like the one NET/ROM uses when paths go up and down. Each node only keeps track of the routes to his neighbors. The information is distributed by flooding, and each node is able to compute a map of the network. RSPF mirrors OSPF, an Internet protocol.

PPP, the Point-to-Point Protocol, has been implemented by Katy Stevens. This serves as a replacement for SLIP (like KISS) on wired links. She has also implemented TCP header compression, which replaces the usual 40 bytes of header overhead with 3 bytes. This is especially interesting when sending a lot of single-character packets, as when doing remote keyboard echoing. Anders has ported the compression to the AX.25 module, but it's not as exciting there because of the AX.25 header and keyup delay overhead.

Anders has implemented stream compression based on the LZW algorithm. This scheme is transparent to applications. It works reasonably well for large file transfers, but isn't very useful for small files like mail messages.

NOTE: A lot of work on NET/NOS has been done by others, but KA9Q gets lots of gripes and questions about parts of the software he didn't write and may never even have seen. Please don't call him unless you're sure it's his part of the code that's a problem.

KA9Q has implemented a scheme for transmitting passwords over the air. The method is misnamed MINK, for Master InterNet Key. It's based on the idea of a one-way function: a mathematical function that is relatively easy to compute, but whose inverse function is very difficult to compute. The standard crypto system DES is an example of a one-way function.

MINK uses a one-way function called MD4. MD4 produces a 128-bit output from any size input. The scheme is to take your (secret) key, and apply MD4 to it many times, say N times. Call this result F[N](x), where x is your password. Since the inverse of MD4 is hard to compute, it will be hard to compute F[N-1](x) given only F[N](x). So it's safe to transmit F[N](x) over the air, provided that in the next session you use F[N-1](x), and F[N-2](x) in the one after that, and so on. Since MD4 itself is easy to compute, the server you're logging into can easily verify that the password you're using now, F[N-1](x), corresponds correctly to the one you used last time, F[N](x), by simply computing F[1](F[N-1](x)).

This scheme is secure (to the extent MD4 is really hard to compute) against passive eavesdroppers, who only try to learn your password by listening to what you transmit. It is not at all secure against an active attacker, who may transmit messages of his own in an attempt to gain access to your account. Also note that the computer itself doesn't have your current password; it only has your previous password.

Question: Doesn't this assume that the users have local computers that can

compute the encrypted passwords? Answer: Yes, that is a potential problem. Perhaps the users could be asked to have smart cards to compute passwords. For the user who does have a computer, he needn't worry about MINK at all. The telnet program he uses to log into the remote computer can easily respond to the MINK password prompt automatically.

Question: If you have a password with many bits, don't you have a problem with users mistyping a long numerical password? Answer: A standard way around this problem is to use mnemonic words. You assign a list of, say, 2048 standard common words. Each word can then be assigned a unique 6-bit number. So if your password is 66 bits long, you just have to remember (and type in) a sequence of 11 common words.

Question: Doesn't this system demand that you always log in from the same place? Answer: No. The server computer maintains all the state information. When you try to log in, it tells you what N it expects you to use. For example, a login dialog might look like this:

```
login: karn
MINK 99 KA9Q1
Password:
```

So you have N, and the input to the function. You just run MD4 with your secret key N times on the seed "KA9Q1" and type the result back to the computer. If you're on a secure link instead of a radio link, you can also type your regular (plaintext) password.

Tours

Ron Bates, AG7H, works at NRAO with the radio telescopes on Kitt Peak. He invited interested parties to go on a tour of the telescopes after the meeting. Provided the road isn't blocked by a rockslide!

Renew Your Membership!

TAPR doesn't send out constant reminders when your membership has expired. Our only way of communicating your expiration date to you, is the date on the address label for this issue. Please check it and renew if required. Your membership is very important.

MetCon1 Project Kit Status

by Lyle Johnson, WA7GXD

METCON1 (teleMETry and CONtrol, version 1) is a versatile remote input/output interface for use on a packet radio link. It allows the operator to monitor various analog values (including temperature, voltage, and frequency) as well as digital values (switch closures and the like). In addition, there are up to six (6) "dry contact" relay outputs for controlling various devices.

For a complete overview, see the January 1991 issue of PSR.

The "Alpha" kits are being brought together as this is written. A new PCB layout has been done, and an initial unit constructed. The layout has been tweaked and a first production of fifty (50) units is now in progress.

Metcon is based on the 87C51 chip, a microcomputer with EPROM, RAM, timers, I/O and so forth on a single chip. The Alpha units will have a windowed part, so the EPROM can be erased and re-programmed. Production units will include a plastic-cased one-time-programmable (OTP) 87C51 to reduce the cost.

Alpha units will be sold to folks who want to experiment and help develop applications for METCON. They will cost a little more than the production units, due to the windowed EPROM part.

Our goal is to have them available in time for Dayton. The price will be determined and announced at Dayton.

We are looking to get a number of folks involved in this effort.

What sorts of applications might METCON be used in?

With the reduction of the 220 MHz band, it may be feasible to put multiple repeater control links on a single packet channel. The more common way of doing repeater control is to have a dedicated control channel with touch-tone pads. In a metropolitan area, this inefficient approach eats up a LOT of spectrum, and 220 MHz is a popular control link band for 2-meter and 70-cm repeaters. Packet has at least as much security as touch-tones, and METCON provides a limited password access scheme.

METCON is a simple and inexpensive means of applying packet to control and monmitoring instead of simply communications. Join us in the fun!

Deviation Monitor

by Lyle Johnson, WA7GXD

One important aspect of setting up a packet station is proper setting of the deviation of your FM transmitter. This applies to normal 2-meter and 70-cm operation as well as the 2-meter uplink to the MicroSats, FO-20 and AO-21.

Unfortunately, this is one of the more difficult tasks to perform without proper test equipment. I say unfortunately, because overdeviation is common and leads to unnecessary retries, clogging busy channels at best, and frustrating a lot of operators who simply don't know what their transmitter's deviation is, much less the negative impact it can have on a station's ability to communicate.

Many packet newcomers simply don't understand why they can hear the local BBS, and copy it just fine, but can't connect to it reliably, if at all. Many times, the culprit is overdeviation.

Until manufacturers of radios come to grips with the fact that their products are being used for data communications, and provide a connector with some sort of standard voltage and impedance levels (how about 0 dBm into 600 ohms, or about 2-volts peak-to-peak for transmit input to result in 3 kHz of deviation with a 2200 Hz tone, or 1.6 kHz of deviation with a 1 kHz tone?) this problem will persist.

In recognition of this, a project was proposed at the TAPR meeting to come up with a deviation meter that is self-calibrating, easy to operate, and can be sold as a kit for a maximum of $50!

A number of ideas surfaced.

The project is being pursued and we expect to be able to report on the design of the unit in the next *PSR*. Stay tuned!

DSP Hardware Update

by Lyle Johnson, WA7GXD

There are now four (4) DSP-1 Beta-level boards built. All but one of them worked immediately upon completion of wiring; in other words, no troubleshooting!

Of course, the one which didn't work is the one I built! Turns out that in spite of electrical testing, there was a short on the board which forced the DSP chip to remain in a HALT condition. I hooked up a 12-volt lead-acid battery across the points that should not have been connected and one current surge later they were disconnected! The board then worked without further protest...

The assembly instructions have been revised to reflect the experiences of the builders of the four Beta-boards.

The plan is to print the revised instructions and complete packaging up the remaining six (6) Beta units. Once software exists to allow these units to be useful packet devices, the six will be sent out for construction and testing. Beta test will then continue during additional software development.

Tasks remaining after the current Beta units are sent out are:

1) The rear bracket for the PC must be designed and ordered.

2) The PC board layout must be revised to reflect the minor errors that still exist.

3) Accurate costing must be made to determine whether we can offer this unit as an assembled and tested device. Assembly costs will likely be under $25 to get the boards commercially wave-soldered and stuffed. Testing costs are as yet undetermined.

4) Feedback from Beta testers is required to determine if the unit can be offered as a kit or if this option is just too demanding on the "average" builder.

5) FCC qualification will be required under Part 15 regulations since the board has an I/O connector on it.

We're still hopeful that we can get through all of this during the summer and make the DSP-1 available as soon as possible after that. I'm terrible at predicting release dates, but I want you to be able to obtain this unit by early Autumn or sooner! I'll do all I can to ensure this happens...

Oh yes! During the TAPR Annual meeting I took a Beta DSP-1 out of its protective anti-static bag and passed it around the group (about 100 people). It worked just fine upon re-installation in my PC!

Notes from the TAPR Office

Hello again!

So much has gone on since we last communicated that it's hard to know where to begin!

We enjoyed meeting many of you again at the annual meeting! Thank you for attending. Next year will mark TAPR's 10th birthday, so plan to come, it should be quite special!

The board of directors advised me on two subjects that will affect you.

The first is that I am not to answer the TAPR phone at any time other than the official hours which are: 10 A.M. to 3 P.M. (Mountain Standard Time), Tuesday through Friday. This is so that I can process the mail orders efficiently after and before the phone begins to ring! It may seem like this is only going to make life harder on you, but I believe that the bottom line will be better service.

The second is that there has been an increase in the cost of our products... You will be able to see the damages to your pocket book in the listing included in this *PSR*!

There are so many of you that have given of your time and talent throughout the years that deserve acknowledgment! This year Harold Price was singled out as particularly deserving. He received a plaque that reads:

Tucson Amateur Packet Radio
Harold E. Price NK6K

In recognition of his significant contributions to the advancement of Packet Radio.

Since 1982, Harold has been at the forefront of Amateur Packet development, giving unselfishly of his time and considerable talent to ensure the success of this mode.

Presented with gratitude on March 2nd, 1991 at Tucson, Arizona.

Thank you Harold, and also thanks to Terry Price, N6HBB. We appreciate all of the hours that you freely put into TAPR in the financial area, as well as putting up for so many years with Harold's second love, (even though radio may somedays have seemed like his FIRST, we know better than that!).

Office Trivia: This past year approximately 2400 orders channeled through the office. Of these, 300 came from countries other than the United States. Here's the breakdown:

Canada 105,
England 37,
New Zealand 25,
Germany 22,
Italy 17,
Spain 15,
Australia 14,
Japan 12,
Switzerland 11,
France 8,
Israel 7,

The rest were ones and twos to other countries all over the globe.

Within the U.S., every state was represented, with California bringing in the greatest volume. We thank you for your patronage this past year, and because the volunteers have been busy, I imagine that we'll hear from many more of you this year!

Now I want to explain why between March 15 and 22 you could not get ahold of us at the office, and why your orders were delayed in being turned around! Lyle and I were in Japan! And what a tremendous time we had!

It would take a lot of time to tell you about all of the wonderful people that we met, and sights that we saw. If you come to Dayton, say that you want to hear about it and I'll be delighted to oblige! We were at the JAMSAT Symposium in Tokyo, and then went on the Bullet Train to Kyoto... Just ask me!

All the best to you.
73s from your TAPR Office,
Heather Johnson, N7DZU

XR2211 DCD Modification Kit Note

by Lyle Johnson, WA7GXD

There is a minor error in the documentation for the XR2211 DCD kit (all releases). If you are installing the upgrade in a TNC-1 or clone, all is well. If you are installing it in a TNC-2 or clone, read on!

The TNC-2 uses positive-true DCD from the XR2211 chip rather than negative-true DCD. Installing the DCD kit according to the insturcions will provide hysteresis in the DCD decision, but the important hang-time is not active.

The fix is simple.

On the bnottom of the TNC-2 PC board, add a jumper from U20 pin 5 (XR2211 chip) to the junction of R38/R42/CR13 anode.

This will prevent you from using the RF-DCD input on the radio connector if your external signal on this line goes below 0 volts. Most people don't use this signal at all, and for those that do a negative voltage level is very uncommon.

We apologize for any inconvenince this may have caused you.

Young Folks and Packet Radio

by Travis Wise, KB8FOU

[This article originally appeared in the Winter 1990 issue of the NCPA Downlink.*]*

[Editor's note: Travis is an active 15-year old ham who is working hard to encourage other young people to check out Ham Radio. You may have seen him on a recent TV news broadcast that reported on the Shuttle Columbia contact (WA4SIR) made by the Children's Discovery Museum, or maybe you've seen his packet notes that he distributes on the packet BBSs. We expect great things from Travis!]

My interest in packet started two years ago in Ohio when a friend handed me a copy of WB9LOZ's "Introduction to Packet Radio." Before reading that, packet was some ham activity that made those weird noises on 145.05, but after reading that, I was all ready to get on packet! So the UPS man had just pulled away, and I sat in the driveway unpacking my TNC. There it was! That clean white KAM! But wait, these wires.. Larry didn't say much about this...

I put my TNC on top of my computer, plugged it in as well as I could, but I had to leave those 4 wires (the ones that connect to the radio) alone, because I didn't know what to do with them. One year later, I moved to San Jose, and I bought a book called "Packet Users Notebook." Amazingly, there was the diagram of how to connect those wires! I got the necessary resistors, wired 'em up, and then I was on packet. That was a wonderful day!

My dad (who lives in Ohio, and is now the SysOp of the N8LJX BBS) and I started using packet to communicate. Messages took about a week to get there, but we didn't mind the wait.

Six months ago, I sent out a message to the entire country to see if there were any other young hams on packet. I got about five responses. In August 1990, I sent out another such message. I got an overwhelming response, and one young ham suggested that I publish a newsletter about young hams. I thought about this for a while, and started gathering articles for the first edition of "The Packet Racket," which I sent out in September. It was a big success! I got replies from all over the country telling me that it was about time someone started a newsletter for young hams. I have continued to send it out once a month to YOUTH@ALLUS. Unfortunately, I have been told that some BBS SysOps kill ALLUS messages, so it doesn't reach some parts of the country, but it does seem to be getting very wide distribution.

Over the past few months, you may have noticed messages from teachers requesting "Packet Pals," a kind of electronic pen pal, for their students (some licensed, some not). I have counted (so far) seven such schools. I have been corresponding with about fifteen other young hams nationwide also. As several older hams have pointed out to me, these young hams are the future of ham radio, packet radio included. Taking this into consideration, I am puzzled as to why I have gotten messages from SysOps (only two so far) telling me that packet radio is not the place to be sending out a newsletter for young hams who are on packet. Is this logical?

I think it is absolutely terrific that we have ham radio stations (packet stations in particular) in schools and in children's museums. I hope this activity will not be stopped by SysOps who think that ALLUS bulletins should be banned, or think that packet radio is not the forum for a youth bulletin.

Well, I'm having a lot of fun with packet radio! I mostly just sit back and "read the mail" when I'm not checking into the N6IIU BBS. I mostly am a "BBS user," but I also enjoy sending messages to friends via their private mailboxes.

In the near future, I hope to get on 9600 baud, and maybe TCP/IP.

73 de Travis
KB8FOU@N6IIU.#NOCAL.CA.USA.NA

A Note from the Editor

Packet Status Register is looking for articles on all aspects of packet radio. If you're doing something interesting locally, even if it seems like old hat to the local crew, it can make an interesting PSR article. Examples include: database applications, video to packet systems, 9600 baud radio interfacing, regional activities, networks with special features, DX nodes, WX nodes. Ghost writers can be provided if you're afraid your prose isn't ready for prime time. PSR also accepts would-like-to-get- in-touch-with and help-needed notes.

We are also willing to participate in a newsletter exchange with any other packet-related organization. We are in the process of assembling a directory of regional packet-oriented organizations. If you would like your group listed, please send a note with the following information to the PSR editor.

1. Name of group
2. Address / Contact person
3. Purposes of organization
4. Region or area served
5. Dues
6. Is there a newsletter?
7. Any other information appropriate for a directory listing.

SOFTWARE LIBRARY UPDATE

by Bob Nielsen, W6SWE

Here are the current versions of all the disks in the TAPR software library, as of March 22, 1991. For ordering information, see the order form enclosed in this issue.

Disk No.	Name	Version	Date
1.	APLINK	VER. 5.03	02-22-91
2.	AA4RE BBS	VER. 2.11	03-06-91
3.	CBBS	VER. 6.6	03-09-90
4.	EZPAC	VER. 1.1	01-09-89
5.	MONAX		10-30-87
6.	PACKET_SHARE		08-22-90
7.	W9ZRX BBS LIST		04-24-89
8.	R95		09-01-89
9.	ROSERVER PRMBS	VER. 1.47	11-05-90
10.	ROSE SWITCH	VER. 901111	11-15-90
11/11A	KA9Q NET	VER. 890421.1	05-08-89
12/12A	KA9Q NET SOURCES	VER. 890421.1	05-08-89
13.	TNC1 CODE		05-30-84
14.	TNC2 NOTES		03-28-90
15.	WA7MBL BBS	VER. 5.14	02-11-90
16.	WRLI BBS	VER. 12.00	03-13-91
17.	YAPP	VER. 2.0	12-18-86
18/18A	INTRO TO TCP/IP		09-09-87
19.	LAN-LINK	VER. 1.58	09-28-90
20.	ARESDATA	VER. 1.5	01-20-91
21/21a	MSYS	VER. 1.10	01-01-91
22.	G8BPQ NODE	VER. 4.02a	12-27-90
23.	UTILITIES		
	PKARC	VER. 3.6	06-01-88
	PKZIP	VER. 1.10	03-15-90
	LHA	VER. 2.11	03-03-91
	ZOO	VER. 2.01	08-25-88
24.	THS	VER. 2.50	11-11-89
25.	VE4UB NTS	VER. 012891	01-28-91
26.	NM1D DOSGATE	VER. 1.14	11-29-89
27.	SV7AIZ BBS	VER. 3.24	04-05-90
28.	TEXNET	VER. 1.5	09-01-90
29.	INTRO TO PACKET RADIO		11-04-90
30.	MICROSAT GROUND-STATION SOFTWARE		01-09-91

TAPR attempts to supply the latest version of all software, however we cannot distribute what we do not have. Authors are invited to send updates to their software (and new offerings) to the TAPR office. The office can provide disks and mailers for updates upon request.

TUCSON AMATEUR PACKET RADIO

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602-749-9479 (VOICE) 602-749-5636 (FAX)

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Please allow six to eight weeks for your order to be shipped

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			Qty.	Total
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Cabinet for PSK Modem	8.00	(5.00 when ordered at same time as modem)	____	____
K9NG 9600 Baud Modem	35.00		____	____
TNC 2 Tuning Indicator	25.00		____	____
XR2211 DCD Mod.	15.00		____	____
State Machine DCD Mod.	20.00		____	____
State Mach. DCD w/Internal Clock	25.00	For KPC2 or any other TNC w/o 16X or 32X internal clock	____	____
PK232 Modem Disconnect Upgrade	20.00		____	____
TNC 1 Upgrade to TNC 2	60.00		____	____
* TNC 1 Upgrade Memory kit	20.00		____	____
* When purchased w/TNC 1 upgrade. Includes 32k RAM and 1.1.7b w/KISS EPROM				
32K RAM w/TNC2 update docs	15.00		____	____
TNC 2 ver 1.1.7b w/KISS (27C256)	12.00	(includes 1.1.7 Commands booklet)	____	____
TNC 2 WA8DED (27C256)	12.00		____	____
TNC 1 WA8DED (2x2764)	12.00		____	____
PK-87 WA8DED	12.00		____	____
TNC 1 KISS (2764)	12.00		____	____
TNC 2 KISS (27C256)	12.00		____	____
1.1.7 Commands booklet	5.00	(The full TNC2 command set for 1.1.7)	____	____
PSR sets, Issue #1 to present	25.00		____	____

SOFTWARE - Please circle disk numbers requested.

1. APLINK - W5SMM - Runs MBO & BBS
2. BB - AA4RE - A multiconnect Mailbox
3. C-BBS - K3RLI/AG3F - BBS w/sources
4. EZPAC11 - M. Imel - NTS formatter
5. MONAX-NK6K/WB6YMH - Gathering system stats
6. Packet S/W - WB6UUT - for PK 87,88,232
7. PBBS Lists - W9ZRX - Master PBBS lists
8. R95 - WD5IVD - Binary conversion utility
9. ROSESERV - KA2BQE - BB and server for ROSE
10. ROSE Switch - W2VY - The ROSE executibles

11/11a TCP/IP Plug & Play - KA9Q*

12/12a TCP/IP Sources - KA9Q*

13. TNC-1 Source code - TAPR - TNC-1 Sources
14. TNC-2 Software notes - N2WX - 1.1.0 thru 1.1.7
15. WA7MBL BBS - WA7MBL - BB system
16. WØRLI BBS - WØRLI - BB system
17. YAPP - WA7MBL - Terminal program

18/18a INTRO TO TCP/IP - Much info on TCP/IP*

19. LAN-LINK - G3ZCZ - Terminal program
20. ARES/Data - WN6I/N6KL - Emergency data system

21/21a MSYS - WA8BXN - BBS/TCPIP/node System using KISS*

22. NODE - G8BPQ - Packet switch/BBS networking pkg.
23. COMPRESSION/ARCHIVING Utilities, .ZIP, .ARC, .ZOO & .LHZ
24. THS - HB9CVV - Term. program for TNCs w/WA8DED firmware
25. NTS Traffic Generator - VE4UB
26. NM1D DOSgate - NM1D - Remotely operate PC via packet
27. SV7AIZ BBS - SV7AIZ - Multiuser, multiport BB system
28. TEXNET Applications - Software for use with TEXNET packet switch by Texas Packet Radio Society
29. INTRO TO PACKET RADIO - WB9LOZ - Tutorial
30. MICROSAT Ground Station Software - NK6K/K8KA

* Indicates two-disk package (one disk in 3-1/2 in. format). We attempt to provide the latest versions of all software.

Total disks circled - 5-1/4 in. MS-DOS format (11, 12, 18 & 21 are 2 disks ea) ____ x $2.00 = ____

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For AIRMAIL orders to be shipped outside North America, please contact TAPR.

Arizona Residents add 5% tax ____

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The officers of the Tucson Amateur Packet Radio Corp. are:

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Harold Price, NK6K	Vice President
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