

# Packet Status Register

March 1987 #26



## Tucson Amateur Packet Radio Corporation

### PRESIDENT'S CORNER

Lyle Johnson, WA7GXD

#### Packet and HF

There seems to be a lot of controversy these days about appropriate modem technologies to use for HF packet work.

In this case, fortunately, much of the controversy can be resolved by careful investigation from a technical standpoint.

In the January/February issue of PSR, Dan Morrison, KV7B (who designs modems and other signal processing devices for a living), and Eric Gustafson, N7CL (who is a careful measurer and observer of radio-based phenomena and is an electronics design engineer by profession), reported on some potentially significant findings they reached regarding HF packet operation.

The summary of the two articles includes the following points:

(1) EVERY MODEM TESTED WORKED BETTER WITH A 500 HZ IF FILTER IN THE RECEIVER'S PASSBAND.

This is for a variety of reasons, the most notable being (a) the S/N ratio is improved (b) the passband matches the spectra of the 300 baud 200 Hz shifted packet signal and (c) interfering signals are kept out of the receiver's AGC system.

Note that tested modems included the phase-locked-loop (PLL, in this case the XR2211 found in every TAPR and TAPR-clone TNC), all-digital units (specifically the AMD7910, found in the various Kantronics Packet Communicators) and the filter/slicer types (in this case, the AEA PK-232).

(2) COLLISIONS ARE A MAJOR REDUCER OF THROUGHPUT ON HF.

Collisions are caused when a TNC decides that no other station is transmitting, so it goes ahead. TNCs depend on accurate data-carrier detect (DCD) information from the modem. PLL demodulators are the most reliable providers of DCD related to packet signals, and better able to reject other signals as QRM (eg, foreign broadcast stations on 40 meters).

(3) Extensive testing in a well-documented manner, operating equipment in strict accordance with manufacturer's instructions, has provided evidence that the lowly TAPR PLL modem, when properly adjusted, will outperform any and all Amateur HF packet modems when operated as described in the articles!

(4) A TUNING INDICATOR IS A NECESSITY FOR GOOD HF PACKET OPERATION (not channelized BBS use, but "real Amateur radio QSO" style operation).

The AMD7910 modem does not provide good hooks for such a tuning indicator. The dual-filter type modems usually have such indicators built-in. The TAPR tuning indicator plugs right in to the TNC 1 and TNC 2 (and clones).

(5) ONE OF THE SECRETS OF SUCCESSFUL HF OPERATION IS TO QSY TO A "CLEAR" CHANNEL.

DO NOT TRY TO HOLD A PACKET QSO ON 14.107, or 14.103, or any other busy frequency. Just because packet users CAN share a channel does NOT imply that packet users must share a channel, or even that they should! The "hidden terminal" is a big problem on HF packet due to ionospheric propagation. Clustering on a single frequency will only aggravate the problem.

So, if you want to have enjoyable HF QSOs on packet, rather than endless frustration and more retries than you can easily count, the rules are simple:

1) Get a tuning indicator;

2) Get a narrow IF filter in your receiver, selectable in the SSB (or FSK) mode;

3) If you see a CQ (or send one) on a busy channel, get the other station to QSY to a clear spot BEFORE you exchange name, QTH, etc;

4) ENJOY!

Lyle

PS - I'll be talking about HF packet operation, and answering questions about this topic as well, at the Friday afternoon Packet session at Dayton this year. See you there!

- FRM -

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 TAPR ANNUAL MEETING  
 February 21, 1987  
 Tucson, Arizona  
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radio operators worldwide by the Members, Directors, and Officers of Tucson Amateur Packet Radio with deepest appreciation.

February 21st, 1987  
 Tucson, Arizona

Reported by Scott Loftness, W3VS, [76703,407]  
 Distributed via HamNet on CompuServe. Distribution of this copy via the Amateur Radio packet network is encouraged.

5. Packet Radio Magazine - Gwyn Reedy, W1BEL

1. Introductions

Individual introductions were done -- about 60 people were in attendance at the beginning of the meeting with another 20-30 joining later in the day. Packeteers from the east coast (Massachusetts, Virginia, Florida, etc.) to Hawaii were present at the meeting.

Jan/Feb issue just mailed (will be 40 pages rather than 20-24 pages), more packet groups joining and providing their local input to the magazine, circulation holding steady at about 2,000, still in process of applying for 2nd class postage permit which will help speed delivery (currently sent via third class). Gwyn has not deleted anyone from the mailing list yet -- if an issue doesn't arrive, it's probably the mail that didn't get through! If you don't get the issue, let them know and they can send a replacement. Done under the sponsorship of FADCA - although separate financially. Bob WA6ERB asked what type of input from the clubs was desired. Gwyn commented that he doesn't get a lot of specific feedback on what people want. People do call if they don't get their issues - so they do care about getting the magazine. Gwyn added that the size limitations (1-2 pages) really make it a place for a club to discuss what they are doing and to share that with the rest of the packet world. It's not especially effective if just directed to their particular club members. Gene, KH6PP, asked if unsolicited contributions would be welcome. Gwyn says yes -- although the problem currently is that there is more material available than can be printed with the current financial structure. He is especially interested in less philosophy and more good technical material. A question was asked about sending sample copies. Gwyn is willing to do this but he can't do so on a free basis (costs over a \$1 to do so).

2. Elections (new directors)

Harold Price, NK6K, and Tom Clark, W3IWI, were re-elected to the TAPR Board of Directors. Three new directors were elected to the TAPR Board: Dianne Marshall, AL7FG; Bob Gregory, KB6QH; and Dave Toth, VE3GYQ.

3. Officers

TAPR officers for 1987 are:

- President: Lyle Johnson, WA7GXD
- Exec. VP: Tom Clark, W3IWI
- Secretary: Dianne Marshall, AL7FG
- Treasurer: Terry Price, N6HBB

In addition, Dianne Marshall was appointed Business Manager of TAPR.

6. Packet in Government - Al Danis, WA6HGF, Chantilly, VA.

4. Tribute to Pete Eaton, WB9FLW

(Note: Pete was unable to be in Tucson due to illness.)

A plaque was presented by Andy Freeborn to Pete Eaton, retiring TAPR board member and Executive Vice-President, on behalf of the TAPR Board of Directors with the following inscription...

PACKET PETE  
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During the period of 1982 to 1987 Peter J. Eaton made outstanding contributions to the hobby of Amateur Radio.

In his position as Executive Vice President of T.A.P.R. he was instrumental in guiding many facets of development of packet radio during its pioneer years.

His unselfish personal sacrifices, dedication, technical competence and management abilities were of major importance in the development of a new amateur communications mode.

Worldwide users of this new communications mode will forever enjoy the results of his efforts.

Presented to Packet Pete Eaton on behalf of amateur

Al shared where the amateur radio contribution has gone. Amateurs are clearly leading the way at the highest levels of government -- as opposed to the usual comments about amateur radio being in the dark ages. Al's background is Army communications. The link between voice radios used for tactical communication and computers has been listening. Concerns about monitoring has resulted in voice radios moving to digital scrambling -- they are digital radios. But can't run standard Bell ... modems over these radios - must go in on digital ports (typically 16kbps). In the UHF spectrum, communications satellites are used but contain high noise levels and high error rates. Had to go to forward error correction to make effective use of these facilities. Also had problems with the relatively long delays (satellite, scramblers, etc.). "Tempest" requirements to limit RF radiation were tough challenges -- requiring placing the packet TNCs in hardened steel boxes. Al brought two of these Tempest shielded boxes containing TNCs (one based on the TNC-1 and the other on the TNC-2). The technology is being used to computer communications for critical communications within the government. Phil KA9Q commented that since the government users

of packet are so grateful, could they exert a little influence with the FCC supporting amateur radio (for example, commenting on the recent 220 MHz rulemaking proposal). The future: ease of use, lighter and smaller units, etc. Al estimated that it would have cost the government \$5 million to have done this development -- if they had even known that the technology was possible/available (vs. paying \$185 for the original TNC-2 that Al purchased). Sell for \$5,000 in quantity 1, 200 units in the field today, expect many, many more to be in the field in the next couple of years.

#### 7. TEXNET - Bill Reed WDOETZ, Dallas TX

(TEXNET is being developed by the Texas Packet Radio Society)

Bill had briefly discussed TEXNET at last year's TAPR meeting -- and a lot has happened in the last year. See the several reports on TEXNET in the December issue of PRM.

#### 8. NET/ROM - Mike Busch, W6IXU

Mike is well known in California for the W6IXU mailbox he operates from Arroyo Grande, California. Mike works with Ron Raikes, WA8DED (Ron is well known for the "DED" ROM's for the TAPR TNC-1). Mike and Ron work together professionally (for their company Software 2000 Inc.) writing professional networking software. They were looking for a break from their commercial activities and decided there was an opportunity to make a contribution in amateur radio networking.

NET/ROM is replacement firmware for the TAPR TNC-2 which transforms the TNC-2 into an NNC. It is designed for hilltop use (not for users at this time) and is intended for use by any AX.25 user station. It supports dual and multi-port nodes. It is written in C providing easy portability. NET/ROM's alpha-test version has been running in California on the 145.01 MHz long-haul digipeaters since January 11th. The beta-test version is scheduled for implementation in late February and will include a 220 MHz backbone plus use of a satellite "wormhole" to Virginia. The first generally available release, 1.0, is planned for general distribution in early April. It will be a commercial product, copyrighted (and not to be copied), and source code will NOT be available. Prices will be \$65 for the initial copy plus \$35 for additional copies for the same callsign owner. Product support will only be available via CompuServe (telephone support will not be available).

NET/ROM was developed to address the serious performance problems being encountered using AX.25 over long paths. NET/ROM implements true store and forward packet switching technology. Mike observed that there hasn't been any significant progress in 3 years, that networking efforts were going very slow and not really addressing the real problems. In addition, there is potential for commercial use of this technology - and amateur use provides an excellent test-bed.

NET/ROM requires an almost off the shelf TNC-2 (32K RAM is required). Running at the higher (4.9 MHz) clock speed is strongly recommended -- especially when running at 9600 bps. An upgrade of U3 is also recommended. A single wire addition is also recommended (it brings out a line from the TNC to a spare line (pin 23) on the RS-232 port).

NET/ROM is designed to be very easy for end-users to learn. A "connect" command is provided similar to that on the base TNC. A "nodes" command identifies nodes on the network. A "users" command (new in the beta version) is also provided which displays everything going on at the node (who's online, who they are talking to, etc.). Additional control operator commands are provided: "sysop" provides support for remote administrators to control a node; a special version of the "nodes" command to permit manual alteration of the network routing tables; a "parms" command is provided to permit the user (sysop) to control detailed parameter changes; an "ident" command permits assignment of a mnemonic code to be assigned to a node.

NET/ROM does include support for existing AX.25 technology including the digipeater functions.

NET/ROM includes automatic adaptive routing. Both manual and automatic updates are done to the network routing tables. A user requests access to a node and NET/ROM selects the "least cost" routing to the node. Dynamic re-routing is also provided -- i.e. a connection will be maintained in spite of a network failure occurs along the way. Nodes can have both callsigns and mnemonic node identifiers -- and the mnemonics can be used as aliases or synonyms for the callsign in any context. The mnemonics are NOT used on the air -- only the callsigns are used on the air.

NET/ROM implements two levels of error and flow control. The normal link layer error and flow control is provided. An end to end flow control at the transport layer is also provided. This is intended to prevent one circuit (user) from "hogging" all the bandwidth. An 8 frame sliding window protocol is used for error control. It implements a selective retransmission facility -- where only the frame in error needs to be resent.

Deferred disconnect logic is implemented in the beta version. It addresses a problem with a disconnect over a long path and handling of inflight information frames. Following a disconnect, NET/ROM will attempt to wait for the all inflight information frames to be received -- or wait for fifteen minutes with no forward progress on the inflight frames.

#### 9. HF Modems - Eric Gustafson, N7CL

Eric has been doing a series of tests to 300 and 200 hz shift HF modems (see December '86 issue of PRM for more background). The results were published in the January/February '87 issue of PRM.

Eric's tests indicate only an 8% difference between the best and worst modems -- not a major difference in performance. His tests included the PK-232, the

PM-1, the AMD7910, and a reference demodulator using the Exar PLL chip.

Bottom line: spend your money first on an IF filter for your radio and on a tuning indicator! Modem differences aren't as significant as getting the IF bandwidth down.

10. TCP/IP Networking - Phil Karn, KA9Q

The TCP/IP protocols (also known as the Internet protocols) were developed to unify multiple systems/networks into a single network (from a user's perspective). TCP/IP was funded by DOD and has become a government standard. It also has become one of the defacto standards for commercial networking.

The notion is that network gateways are provided to actually accomplish the network interconnection. The approach has been to pick the least common denominator and use that to implement the network. It provides a uniform addressing scheme independent of any particular subnetwork. Fundamental transmission unit is the "Internet Datagram". IP Datagrams are switched by IP Gateways.

Phil reported on his TCP/IP for amateur application development work.

11. PSK Modem - Tom Clark, W3IWI

Tom has been working on a new 1200 bps PSK modem, designed for use with the Japanese JAS-1 amateur satellite. Tom reported on the design work (which has been completed) and announced that "95% complete (no cabinets or mechanical parts provided)" kits for building the modem will be available from TAPR soon at a cost of less than \$100. TAPR will be making an official announcement about modem availability, prices, etc. shortly.

Tom had a complete demonstration of the modem set up in the meeting room using the two initial prototype units of the modem.

12. TAPR Treasurer's Report - Terry Price, N6HBB

Terry presented the annual treasurer's report for TAPR. 1986 was essentially a "breakeven" year for TAPR with net income amounting to \$1,370.

13. Generic 'C' BBS - Dave Toth, VE3GYQ

Dave and Hank WORLI have been doing development work on a Packet BBS written in a portable development language suitable for porting to a variety of host computer systems. The BBS is getting close to an initial "production" release. Beta test versions have been available in the Compuserve HamNet DL9 Data Library and "testers" have been encourage to download the code and implement it on their own systems. Feedback on problems and suggestions for improvements are encouraged. The bulk of the work to date has been done on the IBM PC using the Microsoft C Compiler, but additional ports are being done by others for the Apple Macintosh, OS9 and other systems.

14. PAKGRAM - Jay Nugent, WB8TKL

PAKGRAM is a program (written in 8080 assembler running on CP/M) intended to provide easier, automatic, and unattended operation for handling radiograms when sent through packet networks. Jay has defined a standard message definition protocol. Jay gave an update on his activities over the last year.

- PRM -

FCC - continued from page 5.

number of club members, geographical area served. If you are an individual, perhaps your technical qualifications and/or experience will help.

The second paragraph usually sets the stage with background and an outline of your position. Referencing the Known position of others (the ARRL or other organizations) can help to show the unified stance of amateur radio or conversely, the unified stance of the opposition. The argument itself may be part of this paragraph if not too long or may follow in as many pages as needed.

The final paragraph should summarize your position and clearly state what you want the Commission to do. (no, not in those words!) On long documents, you may consider a summary as the second paragraph, with the final paragraph as the suggested FCC action.

Respectfully submitted,

name or name of club

address

Signature and title

date

- PRM -

HAPN - continued from page 6.

3. The instructions will include an updated DISK1 with AX25 software that allows switching between 1200 and 4800 baud under program control.

4. We suggest participants to send a check or money order to HAPN of 50\$CAN or 40\$US for cost of the parts, diskette update, instructions and mailing.

5. For participants returning worthwhile feedback within 8 weeks (10 weeks outside of Canada) we give a 15\$Can (10\$Us) refund. If feedback is not received within this time the money will go into the general club funds.

We hope that you can participate and share in the excitement of building something to the advancement of packet radio and your fellow hams.

- PRM -