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In This Issue...

- New President's Corner by Andy Freeborn, NØCCZ
- Dayton HamVention Packet Activities
- TAPR to Coordinate Group Purchase of PS-186 Kits
- Digital Signal Processing: Hardware Developments
- Applied DSP: The Telebit Trailblazer Modem
- Digital Signal Processing: Book Recommendation
- PS-186 Project Status from N6NKF
- Digital Signal Processing: Software Developments
- AA4RE's "In the Mailbox" Column on Packet Radio Bulletin Board Systems
- ROSE Switch Information from RATS
- Software Available from the TAPR Office
- And much more!

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PRESIDENT'S CORNER

by Andy Freeborn, NØCCZ

For the first time since February 1983 TAPR has a new President. Now if you looked at TAPR as a run-of-the-mill ham club you just might yawn at that statement. You shouldn't. Very few presidents of any type of ham club hang in there for five years or enjoy the stature to be repeatedly reelected.

Lyle Johnson, WA7GXD, your President for the last five years, is one of a rare breed of persons who is a highly skilled technician, possesses an intense dedication to the Amateur Radio Service and has been willing to put up with the routine mundane chores of running TAPR which is, in essence, a business.

He has done this, not for just a couple of years, but for FIVE years. He has done it while holding a full time job. He has done it while he and his wife Heather, N7DZU, have been raising a family of six children, the oldest now 16. Lyle, it seems, has packed a whole career into a five year period.

He has gone through the ups and downs of TAPR as its leader. Black Thursday in 1982, when it was discovered that all 174 of the TNC1 beta boards were defective, was a bad period. The long period just before the sale of the TNC2's, when TAPR was incredibly big bucks in debt certainly was a worrisome time. Whenever there was criticism of TAPR it was always Lyle that took the heat.

There were good times, too, as when Lyle accepted the Dayton HamVention first time award for Outstanding Technical Achievement on behalf of TAPR. August 21st 1985 was a great day! At 9 AM the TAPR office, manned by volunteers, started taking orders for the TNC2. Within hours the telephone company called to find out what in blazes we were doing. Hams were calling from all over the country to the single TAPR telephone and had put their system into gridlock. I guess one of his greatest periods must have been when he was able to start signing checks to pay off that debt.

Why would a man put himself through all of this? I think it was because Lyle Johnson wanted to contribute something to the hobby that he loves so much. If that was his motivation, he certainly succeeded.

Lest you think that this is an eulogy, be assured that Lyle is alive and well. Wild horses couldn't pull him away from the hobby (or TAPR). He is now devoting his time, freed of administrative burdens, to the much loved technical side of new and exciting TAPR development programs.

The entire world of amateur radio owes Lyle Johnson, WA7GXD, a huge debt of gratitude.

What an act to follow! Your Board of Directors, in their infinite wisdom, felt that it was time to keep the techies in the tech jobs and a non-techie in charge of TAPR's day to day operations. And that is why you see my name and call at the head of this column.

Continued on page 2

President's Corner
Continued from Page 1

I am a 30 year Air Force retiree. I flew P-47's in WWII in Europe, was shot down on my 39th dive bombing mission in early 1945 and spent the balance of the war as a guest of der Fuehrer. I subsequently spent 20 of those AF years in Communications-Electronics organizations. I got my ham ticket in 1980, then bought a computer and saw the possibilities of the marriage of the two. In early 1982 I heard of a group in Tucson starting to DO something about it. I contacted them and have been associated with TAPR ever since. My wife of 45 years, Vernie, says that if she were a CB'er her handle would be Packet Radio Widow. Now you know more about me than you were ever going to ask.

As President of TAPR I pledge to the membership the best that I can do.

73, Andy - NØCCZ

DAYTON HAMVENTION: Packet Radio Activities

The Packet Forum Moderator for the 1988 HamVention is Bob Neben, K9BL. He reports that the planned schedule of events will be as follows:

Friday, 29 April, Room 3

1:00 "Packet Radio Introduction" by Dave Peterson, N7BHC.

2:00 "Level 1 Discussion - Modems" by Lyle Johnson, WA7GXD.

3:00 "Pacsat and DSP" by Bob McGuire, N4HY.

4:00 "Networking - How to get started" by Dave Toth, VE3GYQ and Chris Sullivan, VE3NRT.

Friday evening packet getogether dinner arrangements have not been made, but is assumed to be at McNasty's.

73 Bert N8NN @ N8NN -sk-

See You at the 1988 Dayton HamVention! TAPR will be represented at the AMSAT booth this year.

NON-TECH TOPICS

by Andy Freeborn NØCCZ

DSP Excitement

As the annual meeting progressed in February, and as more and more information concerning TAPR's Digital Signal Processing work was disclosed you could just feel the excitement building among the attendees. Several folks commented to me that the DSP work could result in an impact on amateur radio as significant as TAPR's TNC1 and TNC2 developments.

TAPR Office Change

In an effort to conserve our resources for ongoing digital development work the TAPR Board of Directors voted to close its present office/warehouse arrangement. The only difference that the membership will observe is a change in office telephone number and P.O. Box address. The office will be located in one of the rooms in the home of our employee, Cris. You will still hear her pleasant voice when the phone is answered. We are able to make this change because the company that has been doing kit assembly for us will also take on some of the functions that required only a small part of the warehouse that we are leaving.

TNC1 Ver 4 Firmware

It is time to put to rest the matter of Version 4 firmware for the TNC1. The Board of Directors has concluded that existing firmware is adequate and that further expenditures of funds or technical talent, in view of the benefits to be obtained, is unwarranted.

What's a TAPR?

Old time packeteers (of at least a couple of years) will recall when the terms TAPR and TNC were almost interchangeable. Since that time the explosive growth of packet radio has brought multi thousands of new packeteers onto the scene. When you ask someone if he is a member of TAPR and he says "What's that?", take the time to explain to him the origin of his TNC2 clone. Be sure to stress that it came from within the amateur community, not industry.

Thanks Terry

The Board of Directors, by unanimous resolution, extended its heartfelt thanks to Terry Price, N6HBB, for the great job she did as Treasurer of TAPR. Terry set up accounting procedures and then prepared quarterly reports for the BoD that are second to none for this type of organization.

Hello, Secretary/Treasurer Scott

Scott Loftesness, W3VS, the editor of the PSR which you are reading is the new Secretary/Treasurer for TAPR. Scott is taking over a big job from Terry. In addition to his regular job he is also Sysop of HamNet on CompuServe. It seems that folks like Scott, who continually do more than should be expected of them, just keep doing more and more. I am just mighty happy for TAPR that Scott is there.

Our Membership Rolls

TAPR membership has dropped consistently since the introduction of the TNC2. We feel that some of this is due to a relatively low TAPR profile in the recent past (see also What's a TAPR? above). We'll be instituting several new procedures soon to reverse this trend. Included will be membership renewal reminders and a new membership drive program.

Membership Dues and Publication Costs

The Board of Directors has directed the Executive Committee to review the costs of publishing the PSR, the member dues structure and related costs. More on this next issue.

Be sure to note TAPR's new telephone number on the cover of this issue. The phone number change was required as part of the office changes recently implemented in Tucson. You'll still find TAPR's Office Manager, Cris, awaiting your call!

TAPR's new office telephone number is 602-323-1710.

HARDWARE HAPPENINGS

by Lyle Johnson, WA7GXD

Old readers of PSR (or, perhaps I should say, "readers of early issues of PSR...") will recognize this column. It has been out of print in PSR for several years due to my authoring other columns.

Fortunately for all of us, Andy Freeborn is now writing the President's Corner.

Unfortunately, you're not completely rid of me as I plan to keep my finger in the pie by dabbling in various projects and generally stirring things up!

I hope to use this column as a means of disseminating technical information on the hardware aspects of TAPR-sanctioned and -funded projects in which I am involved. In this respect, it may resemble some of the Beginner's Corner articles I have written in the past.

As in earlier years, I also hope to break down some of the major projects into a sort of block diagram discussion, highlighting features and explaining some of the reasons behind design decisions that ultimately affect packet operators and network users.

The big project that will affect you first is the Digital Signal Processor (DSP) initial project, currently dubbed DSP-1. As has been mentioned in recent issues of PSR by Bob McGwier, DSP techniques will allow us to build configurable modems and other analog/digital devices which combinehigh performance with reasonable cost.

A suite of three projects is currently envisioned.

DSP-1 will likely be a standalone device capable of working with most TNCs as an external modem. It appears that it may include an 8088-class general purpose processor to allow it to function as a TNC on its own, as well as operate numerous other modes. If it does include a TNC function, the hope is that it will be capable of really high speed operation, perhaps using a full duplex HDLC port with direct-memory access (DMA) circuitry for performance.

The DSP portion will prpbably be based on a Texas Instruments TMS320C15 DSP chip. With proper software, it should be capable of providing solid performance as a several-hundred bits-per-second (bps) HF modem, as a PSK satellite and terrestrial modem, hopefully as a "K9NG-compatible" 9600 bps FSK modem, as an MSK modem, as a 2400 bps QPSK modem, and as a normal 300 and 1200 baud FSK modem.

In addition, it should be possible to configure it to do a good job demodulating WEFAX and satellite weather transmissions, as well as a multi-grey scale SSTV modem. Then, of course, there's CW, digital voice, and any number of other possibilities.

Software development can be done for it with the Delanco-Spry Model 10 DSP board for the IBM PC. Support for downloading code into DSP-1 will also be provided via a serial port, so anyone can write code for the unit. Hopefully, updated modems can be distributed via your local packet BBS!

It is still too early to give any price or availability estimates, other than to say that design work is proceeding along and prototype units may be in the hands of a few coders and testers by Summer.

In the next issue, I hope to break down the design of DSP-1 in some detail for you.

As good as the TMS32010 is for many amateur applications, there are some applications that simply require more horsepower, more memory or more resolution than DSP-1 can provide.

For this reason, it may be possible to configure the unit to support a pair of DSP processor boards. A more powerful processor board,perhaps based on the TMS320C25 or the Motorola DSP56001, will likely be designed for the DSP-1 after the initial configuration is debugged, placed in service and had a reasonable demand generated for it.

Finally, the DSP-1 project will probably emerge as a joint venture of AMSAT and TAPR, combining the resources from both organizations and benefitting both through kit sales and, hopefully, OEM arrangements similar to that of the TNC 2. The TNC 2 OEM agreements have proven very successful for TAPR, the manufacturers and the Amateur community.

Until next time, keep those bits flying!

TAPR to Coordinate Group Purchase of PS-186 kits.

TAPR is in the process of organizing a group purchase of bare boards and hard to find components for the PS-186 packet switch in order to make this new technology available to the advanced experimenter for software and network development.

The PS-186 is a 5-port high speed (>1Mbit/sec) packet switch that was designed by WB6HHV, KA6IQA, & N6NKF. The card is described in detail in the ARRL 6th Networking Conference Proceedings. Briefly, the PS-186 is built around an 8 MHz 80186 processor and up to a 1 megabyte of memory. I/O support is provided by two 8530 SCC chips which are interfaced with DMA. This provides 4 HDLC/ASYNC/SYNC ports, the fifth port is ASYNC only. Also provided are an SCSI port (for disk or multi-board interface), a real time clock, a watchdog timer, and a remote reset circuit.

Advanced Electronic Applications (AEA) has acquired the rights to produce the card commercially. TAPR is organizing a group purchase of bare PCBs and the necessary PALs directly from AEA.

The kit will include an electrically tested 6 layer PCB, programmed PALs, difficult to find LSI components, and a documentation package. A complete list of the parts is included in the documentation. The package will not contain any of the readily available components such as connectors, LEDs, resistors, or commonly available chips.

Continued on page 7

APPLIED DIGITAL SIGNAL PROCESSING: The Telebit Trailblazer Modem

By Michael Ballard, UNIX Program Manager, Telebit Corp.

[Editor's Note: This article provides some interesting background on real-world uses of digital signal processing technology. It was ported here from Usenet.]

I would like to provide some background for Unix users considering the use of Telebit's TrailBlazer Plus high speed dialup modem. I served as project manager and principal programmer for Telebit's protocol support developement. The UUCP "g", Kermit, Xmodem and Ymodem protocols are directly supported in the TrailBlazer modem's firmware. Peter Honeyman, co-developer of ATT's HoneyDanBer/BNU UUCP, coded those portions of the TrailBlazer firmware which support the "g" protocol.

The Telebit modem employs a patented multicarrier modulation scheme coined DAMQAM (Dynamically Adaptive Multicarrier Quadrature Amplitude Modulation). A CRC-16 based sliding window protocol with selective retransmission runs on top of this modulation scheme insuring data integrity across the phone line. This telephone line protocol is known as the Packetized Ensemble Protocol or PEP. PEP is the trademark by which all modems employing this technique can be recognized.

This technique (DAMQAM) divides the voice bandwidth into 511 individual channels each capable of passing 2, 4, or 6 bits per baud based on the measured characteristics of the individual frequencies associated with each channel. On a typical phone connection, the modem uses a subset of about 400 of those channels.

Each time the modem connects to a circuit established on the dialup Public Switched Telephone Network (PSTN), the TrailBlazer measures the quality of the connection, and determines the usable subset of the 511 carriers. The aggregate sum of bits modulated on this subset of carriers multiplied times the baud rate yields a bit per second rate that on a local telephone connection (i.e. round trip through your local telco) is 18031 bps. This 18031 bps is then reduced by about 20% to allow for the CRC overhead, to about 14400 bps of data throughput.

Long distance line quality varies with location and carrier, but you can expect this number to be in the 10000 to 17000 bps range under most conditions domestically. By choosing a high quality long distance carrier, you will ensure the best throughput overall.

The modem operates at 7.35 and 88.26 baud, transparently changing baud rates to accomodate the pace and quantity of data traffic. When in "interactive mode" the modem sends data using 11 msec packets (which run at 88.26 baud). Each packet contains 15 bytes of data. In "file transfer mode" the modem uses 136 msec packets (that transfer at 7.35 baud) that contain 256 bytes of data. The TrailBlazer decides which packet size to use on an ongoing dynamic basis. No intervention from the user is required.

At lower speeds, such as 300, 1200, and 2400 bps, the TrailBlazer provides emulation (performed in the DSP section, not by a "chip" modem) to support these standards. The 300 bps standard is called Bell 103C. At 1200 bps, two standards exist, Bell 212A and CCITT V.22. Both are supported. At 2400 bps, the standard is called CCITT V.22 bis. These speeds are all available with or without MNP Class 3 Error Correction.

The TrailBlazer employs a Motorola 68000 and a Texas Instuments TMS32010 digital signal processor to accomplish this performance. Because of this substantial computer horsepower (about 7.5 MIPS), the TrailBlazer is really a communications processor, rather than a conventional modem.

The software defined architecture produces a flexible product platform that allows broad feature development capabilities while allowing the product's installed base to benefit from those developments by installing upgrade EPROM sets.

All four protocols (Kermit, Xmodem/Ymodem, UUCP), V.22bis support, MNP at low speeds, multiple releases to improve the interactive performance (earlier TrailBlazers utilized only one baud rate), a multitude of RS-232 behavior related features, leased line capabilities, remote command processor access, echo suppressor compensation, increased data rates, and a myriad of user requested features have found their way into current production modems and are available to earlier revisioned modems via the EPROM uprgrade kits.

PEP modems provide a full duplex serial interface to an attached computer, however they employ a half duplex implementation on the telephone line. Telebit refers to this half duplex technique as "Adaptive Duplex". As the name implies, the ownership of the line (i.e. the ability to transmit) adapts to the quantity of data available to send at any single moment. Maximum efficiency is achieved by sending data in a nonstop data stream at 19.2Kbps relying on serial interface flow control to moderate the data flow into and out of the modem.

This allows the maximum amount of data to be available every time a transmitting modem takes ownership of the line. In this way the modem, not the DTE, controls the line turnarounds. The protocol provides a ceiling at about 3k of sent data before a transmitting modem must give up its turn and allow the other modem an opportunity to send. A continuous 19.2Kbps data flow into the modem is required to ensure that there is always 3k of data to send each time a transmitting modem takes its turn. The serial interface speed must exceed the telephone line speed, potentially 18,031 bps, or the maximum efficiency of the modems can not be reached).

UUCP's "g" protocol behavior on dialup lines was a clear contradiction of the desired behavior with the PEP protocol. "g" sends 3 small data packets at time and then waits for the remote UUCP to ACK or NAK their receipt. The resulting throughput

when using UUCP and "g" with the TrailBlazer was only a little better than a standard 1200 bps modem. This was unacceptable.

What did we do about it?
The TrailBlazer can be configured to "spoof" the protocol by setting a register (S111) to one of several values. The spoof can support four different protocols: UUCP "g", Xmodem, Ymodem, and Kermit.

"Spoof" means to fool the various protocols into thinking that they are getting their acknowledgment packets from the remote computer, when in reality they are getting them from the modem.

All of these protocols are what are commonly referred to as "send and wait" protocols. This type of protocol builds a packet in computer A, sends it out through the modems, where it is received by computer B. Next, computer B looks at the packet to determine whether or not it arrived intact. If it did, it sends an ACK (acknowledgement) packet back to computer A. If it did not arrive intact, it sends a NAK (non-acknowledgement) packet. In either case, computer A can't send the next packet out until it gets the ACK from the first packet. This is slow!

Since our modems are error-free between the modems, the only place data could get "broken" is between the modems and their respective computers. Let me draw the connection diagram below:

```
Ca <=> Ta <-> Tb <=> Cb

Ca = Computer A
Cb = Computer B
Ta = Telebit Modem A
Tb = Telebit Modem B

=== RS-232 Cable
--- Phone Line
```

When we are running our protocol support, we look at the packet coming from Ca. Ta checks the packet for validity and sends the ACK or NAK.Ca can begin building the next packet immediatly upon receipt of Ta's ACK. This results in Ca building and sending packets as fast as it can..

Many packets are now forwarded to Tb. Tb now delivers the packets to Cb, observing the rules of the protocol. Tb will deliver the next packet or retransmit the previous packet based on the ACK or NAK received from Cb. Cb ACKs and NAKs are then thrown away so as not to return to Ca.

Protocol support can be configured to run in parallel with data compression enabled. The real world result of this is to increase protocol transfers from 2-3 Kbps to 10-19.2 Kbps.

This covers most of the commonly asked questions about the TrailBlazer. If any of the above information is unclear, or you have questions regarding other aspects of modem technology or performance, send mail to:

Richard Siegel
Senior Systems Engineer
Telebit Corporation
ARPA: telebit!modems@ames.ARPA
UUCP:
{uunet,ames,hoptoad}!telebit!modems

TAPR AT DAYTON

TAPR will once again be officially represented at the Dayton Hamvention. We will be sharing a booth through the courtesy of AMSAT. There will be a limited number of PSK modems available for sale, and orders may be placed for additional items, such as the K9NG 9600 baud modems.

We hope that this booth, as well as a booth in the courtesy area, manned by the OHIO PACKET RADIO COUNCIL, will serve as rallying points for packet get-togethers.

Of course, no TAPR/Packet gathering would be complete without a trip to a Malibu raceway, and tentative plans include a trip to the Miamisburg track on Saturday nite. There will be a packet "dinner"/get-together, likely at the now-famous McNasty's (famous only because of our 2 previous bashes! ...

So, be there, or be square! Packet Pete Eaton and Dr. Death (AKA VE3GYQ) will be leading an all-star cast in manning the booth!!!

DIGITAL SIGNAL PROCESSING: Book Recommendation

[Editor's Note: The following message is from the HamNet Forum on CompuServe.]

#: 70570 S5/Amateur Satellites
23-Feb-88 07:53:50
Sb: #70474-#DSP and WEFAX I
Fm: Bill Coleman AA4LR 76067,2327
To: Bill Bard 75366,2557 (X)

I just found a great book on DSP. "Designing Digital Filters" by Charles S. Williams. Prentice-Hall 1986. ISBN 0-13-201856-X. This book is for "the rest of us" who are mathematical wizzos. All that is required is a working knowledge of trigonomitry and calculus. The book even contains a review of complex numbers and an introduction to analog filters. All notational conventions are thoroughly explained before they are used, and the book introduces each new concept with a easy-to-understand example.

The book starts with an overview of the impetus around designing digital filters, discusses the issues associated with digital filtering (aliasing, quantization). The next chapter reviews the mathematical concepts of frequency response. The next two chapters discuss the design and implementation of nonrecursive filters, then two chapters on recursive filters. The final two chapters talk of polynomial modeling of digital signals and the DFT and FFT.

An excellent book for those of us who are not EEs, nor Math majors. In all, a very readable book!

73, Bill

About your membership...

PSR is one of the major benefits of membership in TAPR. If you find PSR of value, please remember to check the mailing label on this issue for your membership expiration date. TAPR does not send you any other notice of membership expiration.

If you want to continue to receive PSR uninterrupted, please check your membership expiration NOW!

DSP UPDATE

by Bob McGwier, N4HY

The DSP project is moving along nicely with basically good news all round. All the hardware for the initial team has been distributed and the software and manuals for that software written by team members was distributed last week. We hope to begin to see some return from the folks in the project soon. Our first tasks are still emphasizing those areas that will have the largest and most immediate impact on amateur radio in general and packet radio in particular. Tom spent his entire week away for Christmas "vacation" putting the initial offering of software together and sending out the final DSP boards. Diskcopying 120 disks, photocopying 20 sets of manuals of one variety or another, is not my way to spend Christmas but Tom apparently survived the worst part of managing a project like this. Courtney Duncan, N5BF, has agreed to take on the documentation and record keeping task for this project. Before we go on, let me tell you who all the team members are that are working on the software.

Tom Clark, W3IWI
Bob McGwier, N4HY
Richard Allen, W5SXD
Mike Parker, KT7D
Dan Morrison KT7B
John Shew, N4QQ
Courtney Duncan, N5BF
Randy Cole, KN6W
John Conner, WD0FHG
Mike Chepponis, K3MC
Phil Karn, KA9Q
Hugh Aller, WD8OBL
Andy Demartini, KC2FF
Junior De Castro, PY2BJO
Alberto Zagni, I2KBD
John Molnar, WA3ETD
Dave Borden, K8MMO
Ned Johnson, K1NJ
Fred Williams, W1FWJ
Ken McGuire, WA2VFN
David Backus, KA8ZLA
Mike Lamb, N7ML
Al Chandler, K6RFK
Barry McLarnon, VE3JF
Rick Hambly, WB2TNL
James Miller, G3RUH
Steve Sagerian, KA0YRE
Dave Truly, NN2Z

These are listed in the order that they joined the project and received the TMS32010 Delanco Spry boards with the exception of Sagerian and Truly; whom I will return to in a moment. We believe with this very strong team, we can produce some very interesting applications for the amateur radio community. We have already told you about the DSP modem software developed for demodulating JAS-1 using an unmodified tnc and about the software that does FFT's to do spectrum analysis (and weak signal work) by myself, Tom Clark, and Richard Allen W5SXD. Modems are still a hot topic with the group and recently I worked out a scheme to use some mathematical tricks that allows you to do modems of several different varieties of phase continuous schemes with minor changes in the carrier tracking algorithms and different clock recovery and bit decision algorithms. The modems that I have tested in the signal processing lab at work are for SSB bandwidth (telephone also). The ones that are working well enough to shout about are

BPSK 1200, 2400 bps
QPSK 1200,2400,4800 bps
GMSK 1200,2400 bps
V.29 4800,9600 (not full duplex)
V.32 9600 (not full duplex)

All of these are done with a new adaptive equalization scheme that is blind and self training and can maintain equalization with channel changes that occur over several bit times (rapidly changing channels such as are guaranteed on HF are not treated YET). We should begin to look at Noncoherent schemes such as M-ary FSK and others with an "eye" towards doing some adaptive EQ. The reader is referred to a recent article in QEX by team member VE3JF, Barry McClarnon. Also upcoming in QEX are a series of articles by team members. The first two are by Tom Clark and myself and are a general introduction to the DSP project and a detailed look at DSP modems. The second (or third depending on the editor) will be about spectrum analysis and weak signal work. The reader is referred to the papers in the 6-th annual Networking Conference by Tom, Barry, and myself. Also you might wish to read the recent Above 50 Mhz column by Bill Tynan on the weak signal applications end of the spectrum analysis code. He outlines how the work that Tom, Richard Allen, and I have been doing could impact the weak signal arena.

Tom Clark and I gave a talk at the AMRAD meeting on February 1. The AMRAD group has started a group DSP effort and devoted two talks *in* a row to DSP and half of their most recent newletter.

Phil Karn has become active with the DSP software effort and is working with myself on a 400 bps BPSK modem for Phase III-C. Phil is also working on a program to run in the PC that allow the DSP board and the PC to become a very versatile command station. We are also beginning to work on 2400 BPSK autocorrelation routines that should greatly outperform the technique used for ranging to determine the orbital elements of Phase III-B. Phil also did a very clever spectrum folding trick in TMS32010 software that allowed inverted sideband signal (Donald Duck) to be fed to the DSP board and out comes normal sounding audio.

WB0MPQ, Al Shjarback, recently loaned me a receiver that receives in the range 137-138 Mhz. The sweet sound of WEFAX-APT has been flowing into my DSP hardware. This demodulator is now working. The picture is displayed as false color on an EGA monitor. Both the infrared and visible pictures are shown side by side. This was demonstrated at the TAPR meeting in late February. Meteor (Soviet) WX satellites were were added on 2/10/88.

At the TAPR meeting, a great deal of interest in the DSP project was shown and a great deal of encouragement was given the members of the DSP team.

On the hardware:

Lyle WA7GXD is beginning the layout of the first DSP project to be produced by this group. It is basically the same box described to the audience at the TAPR annual meeting. There are

several design questions being addressed at this time, so the details are still in a state of flux. We believe that the project will be announcing a DSP kit sometime in the near future.

Steve Sagerian, KA0YRE, an engineer with Motorola, Inc. of Chicago has acquired some Motorola DSP56000 development system boards and is working up an A/D D/A board for them. We have also gotten a complete set of software tools for this device at this point in the game including an early release of Motorola's "C" compiler, Assembler, and Linker for the DSP56000 chip. We will be developing code for this chip and the development will initially parallel the TMS320 development effort so that we might compare the two hardware types.

Not to be outdone, AT&T has announced the DSP-32C. Another blistering DSP engine in the same class as the TMS320C25 and the DSP56000. Dave Truly NN2Z and I are writing a proposal to Dave's boss, who is charge of marketing the DSP-32C for AT&T to help the DSP project with at least loans of their development systems so that this may be studied as well as other candidates for the second and much more advanced DSP widget that this project is likely to produce.

Misc:

Tom and I have written installment number one for a series of articles that will appear in QEX magazine. The first installment gave a rapid introduction to DSP and the project followed by a quick tour of a PSK (Costas loop) modem design for JAS-1 and Phase III satellites. Other modems and the wefax APT demod software will be the topic of the second installment. Other installments will concern the Spectrum analysis and weak signal work and the hardware design for the first DSP product after that goes to kit. It should be an exciting series for us all to watch with many folks besides Tom and I now doing this, certainly more neat pieces of software for these versatile signal processing engines will appear in print and probably in QEX.

PS-186 Project Status

as of 3/10/88
from Franklin Antonio, N6NKF

What is it?

The PS-186 is a 4-port high speed (>1Mbit/sec) packet switch designed by WB6HHV, KA6IQA, & N6NKF. It is described in detail in the ARRL 6th Networking Conference Proceedings..

Status:

Checkplots of the Rev-B PS-186 board artwork are now in hand. Found a few things that did not get changed correctly, so it looks like there will be one more trip thru the CAD machine before we build the 2nd round of boards. This will slip our schedule another two weeks, but we want Rev-B to be perfect!

We demonstrated some of the new software for the PS-186 at the TAPR meeting in February. We had two PS-186 boards on hand. One ran Ron Raikes WA8DED's -version NET/ROM code, and the other ran MSDOS supported by Skip Hansen WB6YMH's BIOS. It's great to see real software running on these boards!

We were finally able to document the public-domain status of the PS-186 debugger software last month. The PS-186 debugger is a heavily modified and expanded version of a pre-existing debugger that was produced by a large company. We had verbal ok to consider it public domain over 18 months ago, when we started the modification effort, but we wanted to get something in writing which verified the public-domain status of the software, to protect ourselves, before we distributed the sources widely. We've finally succeeded, so will now distribute the debugger, in source form, with PS-186's. We've had requests that the debugger use certain interrupts, or avoid certain interrupts, or avoid using certain RAM space, etc. Now software developers will have the source code, so can make that sort of minor mod whenever the urge strikes. We hope also that the availability of public-domain source code to an '86 family debugger might assist other amateur projects using this family of processor.

We often get questions about availability of production quantities of the PS-186. Until now, we could only say that we were looking into the possibility. I'm pleased to announce that we have reached an agreement with Advanced Electronic Applications (AEA), of Lynnwood, Washington, whereby AEA is now licensed to produce and sell PS-186's.

73, N6NKF
(for N6NKF, KA6IQA, & WB6HHV)

PS-186 Kit Information

Continued from page 3

This group purchase is being organized for EXPERIENCED experimenters only, neither AEA nor TAPR will be able to offer any repair services. This is not a kit like the TNC-2 with detailed step-by-step assembly instructions. The ability to rework the 6 layer PCB should be considered carefully by the potential builder (sockets are HIGHLY recommended!).

To keep the overhead to a minimum, the "kit" is being offered with only two options: 1) bare board, and pals -or- 2) bare boards, pals, and the hard to find LSI. NO other options are available; individual LSI will not be sold separately.

The current estimate is that Option 1 will sell for $130; Option 2 will sell for $180. The additional parts necessary to build the board up to the minimum configuration would be at additional cost. Bare RS-232 daughter boards for the PS186 will be available separately for $10. Up to 4 level daughter boards may be mounted on the PS186.

If you are interested in participating in this group purchase please send a post card to the TAPR P.O. box indicating the number of "kits" you would like. SEND NO MONEY AT THIS TIME. Once the demand has been determined we will contact all interested parties with firm price and order cut-off date. Naturally there is no obligation until a firm price is determined and an order is placed, but please be realistic about your needs.

TNC-2 VER 1.1.5 WITH KISS AVAILABLE FROM TAPR

The new TNC-2 software version 1.1.5 is now available with the KISS capability from the TAPR office. If you have been using version 1.1.4 with the 32k RAM you will be able to upgrade directly to 1.1.5. For those still using 1.1.3 it will be necessary to install the 32k RAM chips at the same time that you install 1.1.5.

TAPR will program your EPROM's for $2 per TNC-worth plus a prepaid return mailer. If you choose to buy EPROMs from TAPR, we will include the mailer and postage in the purchase price of the blank EPROM. The 32k RAM chips needed to upgrade are also available. Prices as follows:

32k RAM (includes update doc)
$20 postpaid
Blank EPROM (27C256)
$10 add $2 for programming
Blank EPROM (2764)
$5 add $2 for programming
(may be 27C64 if avble)

EPROMs

TNC-2 WA8DED	(27C256)
TNC-1 WA8DED	(2 x 2764)
TNC-1 KISS	(2764)
TNC-2 KISS	(27C256)
TNC-2 1.1.5 w/loader	(27C256)
TNC-2 1.1.5 w/KISS	(27C256)
TNC-2 1.1.5	(27C256)

SOFTWARE

*** New Prices ***

To simplify ordering of diskettes the prices have been revised to an even $2.00 per diskette, including mailer and postage. Do not send blank diskettes or mailers. For orders to be shipped outside North America please add $2.00 per order for airmail delivery.

W0RLI/VE3GYQ C BBS	(1 diskette)
TCP/IP (KA9Q)	(3 diskettes)
Intro to TCP/IP	(2 diskettes)
TNC 1 Source Code	(1 diskette)

PROFILE: LACY R. MCCALL JR., AC4X

[Editor's Note: Lacy is the author of an innovative packet mailbox program (McPacC) written in Turbo Prolog. Lacy can be reached on CompuServe at userid 76137,44.]

Personal: Profession: Architect president of McCall & Associates, Inc. Montgomery, Alabama (Design Commercial and Military projects in SouthEast and SouthWest US). Age: 51 Hobbies: Amateur Radio...DX - Contests - CW - Packet : Computers...started with trs80 - then cp/m - msdos ...programming experience - basic - dbase - framework fred - turbo prolog - limited asm - limited C

Packet Experience: Before mid 1986, I had no interest in packet radio, although like many others, I had casually observed the "packet explosion". Since business demands had kept me from spending much time DXing or Contesting (my favorite ham pastimes), I bought a pk232 as the local hamfest, with the idea that maybe the new mode would re-kindle my fire.

For years, I have had a computer of one sort or another at home, so adding a tnc to my setup was quick work. Not knowing enough about packet to know exactly what I needed other than a terminal program, I fired up the system using Crosstalk and started watching.

The fact that I bought a pk232 with it's multiple modes kept me entertained for a few weeks; however, I found that the Computer/TNC interface was very cumbersome since every change in mode required a typed command. Remembering HamNet on CompuServe, I started searching for a good terminal program for packet radio. A number were downloaded and tested. Almost all were very good programs and satisfied some of by desires. For example, I wanted to be able to program the FKeys. One or more of the programs had that feature. But as it turned out, no one program had exactly what I was looking for.

Keeping all this in perspective, it should be noted that during this early packet experience, I had obtained a copy of MBL's bbs and tried putting it on the air to see how it worked. This completely frustrated me, since MBL looks for pin 8 high at connect and my pk232 didn't have that provision. Also, I had just started trying to learn Borland's Turbo Prolog and found it very confusing to say the least.

The combination of these events all came together when, late in 1986, I ran across the Scott Loftesness (W3VS) prolog terminal routines "SCP" in the Borland Data Library on CompuServe.

Using these ideas, I started constructing a program that would do what I wanted to do. To begin with, the program ignored pin 8...that solved that problem. Then I added FKey customization, threw in a rough mail handling system and wrote the "auto talk-back" routines using some "eliza" routines from my library.

It all worked ok, with a crash now and then. It didn't matter much since it was my program, I used it and I understood the peculiarities of the prolog generated code. Never did it stop changing. Every version added more, was a little more solid, and by early 1987, I sent a copy to AEA for review since the pk232 was the system focus. As a result of that, I have received considerable help during the last year from W2JUP who assists AEA in such matters. It was not long till my pk232 firmware was updated and "my pin 8 would go high".

The final goal was to get the program to a "solid state". Those that have used prolog can appreciate the difficulty where recursion was used in as many routines as possible. Really what I was trying to do was tie a ribbon on the whole effort and get on to learning "C" which is my next goal. Since I simply did not have the time to do all the testing necessary I put the system on CompuServe-HamNet Sig to see if the help would come forward. It did, and I say thanks to a large number of people that have tested and advised me.

The problem was that every letter or

call that listed bugs that needed correction, also contained a "wish list", and that has taken some time to try to incorporate.

My objective from the start has been a "personal system", not a network bbs system. Both MBL and RLI offer very good programs and there is no need for a third. But I do think there is a need for a system that may be customized to the user's content, one that entertains at least a little bit, and one that is not devoted to mail handling. Almost anything that can be done with McPaC can be accomplished in more that one way and that makes it interesting to use. It can be customized to such an extent, that each station gives you completely different messages; and it can easily be used by those interested in a system speaking their local language.

At the present time McPaC has been broken in to TWO PARTS:

The first MPC403 is the same expanded terminal/bbs program.

The second MPC_LAN responds to requests for a system more suitable for LAN operation. The latter uses a series of interlocked programs and has an expanded command language which allows limited mail forwarding, among other things.

The former version will be available on CompuServe soon and the later only by direct request because of the program size.

Almost all upgrades during the last six months are the results of user response and requests. What will happen from here on, depends on what users want. I have reached a practical limit with code size, but that can be overcome if it seems desirable to add more. For those that use the program, I hope you find it enjoyable. If you are a hacker and a ham I suspect it will be fun. Hope it doesn't crash....Lacy McCall //ac4x//

NOTE: I have very specific ideas about the general direction of packet radio and concerns that I think need to at least need to be considered to keep individual operators on the air. The MPC mail files now contain an Editorial which adresses this issue. In addition, the files contain Fabel.Ch1-4 which is know as the "Fabel of the Pipeline Builder", which makes an important point.

ROSE X.25 Switch Update

15 March 1988 (formerly COSI-Switch)

We have been distributing the ROSE X.25 Switch SOFTWARE by electronic and postal distribution systems!

Since February we have been shipping the early beta-release versions of the switch code. Testing has started in Kentucky, Indiana, Tennessee, Maine, New Hampshire, Massachusetts, New Jersey, New York, Pennsylvania, Florida, Alabama, Texas, Missouri, Kansas, Maryland, Virginia, and the District of Columbia.

Overseas activity testing is also underway or about to start in the United Kingdom, Australia, Canada, Costa Rica, Columbia, Ecuador, Philippines, Italy, South Africa and Japan.

By the way we changed the name of the software from "COSI" to "ROSE". "ROSE" is the "RATS Open Systems Environment". The switch software is the "ROSE X.25 Switch". The Packet Radio Mail Box System (PRMBS) will also be referred to as the "ROSErver". These and other systems will comprise a "ROSE LAN".

The reason for the change is a bit involved, but it has a lot to do with a nice organization called the "Corporation for Open Systems". No hassle from them mind you, just a cautious move on our part.

The beta version mass mailing has taken place! Mailings are a BIG job, but we got it done. Folks should be watching their postal mailboxes for our package.

The software has been available for quite some time via dial-up xmodem download from the RATS Unix system. This has helped to speed up the distribution process. The procedures for access are outlined in the file "ROSEU.001". This document should help you through the process. If you have questions please call Gordon, N2DSY or Nancy, N2FWI at 201-387-8896.

The executable software and support files will be made available on Ham-Net. The software is also available via dial-up (1200) with the xmodem or uucp protocols. Read on for more details. The source code is available at no charge for commercial Amateur Radio use only ! Sorry, but this software is only available via the mail or from the RATS Unix system.

The distribution version of the BETA ROSE X.25 Switch software is called "ROSES.001". This is an archive which includes the HEX file for the TNC-2 (and clones) and a PC-based configuration programme.

The ROSE X.25 Switch User Guide is available in the file "ROSEN.001". This document provides basic user instructions for the common user.

The source for the BETA code is available at no charge for non-commercial Amateur Radio use only ! The filenames are listed in the information message that is automatically sent out by the RATS Unix system when a user dials up.Sorry, but this software is only available via the mail or from the RATS Unix system.

There have been some questions about our software distribution and use policies.

Our software use policy is:

1. Free for non-commercial Amateur Radio use ONLY,

Our software modification policy for non-commercial Amateur Radio users is:

You may modify the code all you want, but in order to maintain your right to use the code, you must send us copies of your modified software source. This does not include passwords and encryption keys. The basic policy ensures that the distribution of new features added by others is consistent. It also helps us ferret out bug reports from the field.

2. Commercial licensing is welcome! Executable, source and modification licenses can be obtained for other uses. We believe that this approach will provide a major funding source for the network. Several well-known firms have begun discussions with us. This will help fund the kind of network needed by the Amateur Radio Community.

73, J. Gordon Beattie, Jr. N2DSY @ KD6TH
or ihnp4!hotps!n2dsy-4!n2dsy
Telephone: 201-387-8896

Procedures for Downloading Materials From the Radio Amateur Telecommunications Society

Files may be sent electronically via Xmodem or uucp. If these are unavailable or impractical for you, you may find the files (NOT SOURCE) on Compuserve HamNet. If you would prefer an MS-DOS diskette, contact RATS at the number given below.

Xmodem Telephone: 201-387-8898
login: rats

After logging on the system, the user will receive a long (2 screens) message including the current directory of files. Please capture and print this file to simplify operation. This system will prompt for several pieces of information such as name, call, location, telephone, etc. The system will then prompt for a filename. After these items have been furnished, the system will then start to transmit the file using the Xmodem protocol. When the transfer is completed, type a carriage return.

A prompt for login will follow. Please repeat this cycle for each file downloaded. If you have problems call Gordon Beattie, N2DSY at 201-387-8898.

uucp —— If you would like to have the files uucp'd to your system, contact Gordon Beattie by telephone (see above) or e-mail "ihnp4!hou2d!n2dsy-4!n2dsy". A transfer will be queued for your system and you will then be directed to call in and download the waiting files.

ROSE X.25 Switch User Guide

1. Introduction

The interface to the ROSE X.25 Switch has been designed with the average user in mind. Current users are familiar with networking using digipeaters (C CALLSIGN VIA DIGI, DIGI). We have continued this basic concept in the ROSE X.25 Switch user interface. There are several different ways the user can access the switch and, through it, the network.

2. Local Digipeating

This mode of operation is pretty straight forward and provides a familiar mode of operation to continue WITHIN the local network. The ROSE X.25 Switch will ONLY digipeat frames with just one callsign (its own) in the "via" field of the AX.25 frame.

Within the local network, users may digipeat through the switch by typing:

"C N2FWI V N2DSY-2"

3. Multi-Switch Networking

There is only one new concept for users to learn in order to use the advanced, multi-switch networking capabilities of the ROSE X.25 Switch. Each switch has a unique, local 6-digit "address." This address is made up of two parts: the telephone area code serving the switch's location (first three digits), and a three digit Switch Number.

In order to connect to another station at a remote switch one must know the address for that switch. If KB7UV uses the switch "718874" then to connect to him a user would type:

"C KB7UV V N2DSY-3,718874"

The call request will be routed TRANSPARENTLY to the destination switch and user.

4. Local Switching

There is however another option: a user may want to use the advanced functionality of the switch WITHIN the local network. This is just like a multi-switch connection except the Destination Switch Address is that of Source Switch! To do this type:

"C N2FWI V N2DSY-3,201744"

This initially looks like a two hop digipeater connection, but in reality the ROSE X.25 Switch gets into the picture and make the connection more reliable. The ROSE X.25 Switch will receive the request from W2XYZ and then send a connect to N2FWI. After this connection is established the switch will acknowledge the initial connect request. If required, the N2DSY-3 switch will retransmit frames that are unacknowledged. The switch will use its own parameters to determine the need and ideal opportunity to retransmit. The switch will not only automatically determine the port used by "known" users, but will search out the "unknown" user on its user ports.

5. International Switching

There are situations where the ROSE X.25 Switch will be used to make network connections across national boundaries. The procedure is the same as for any other switched call,, but another field is added before the destination switch address which contains a four digit field called a Data Network Identification Code or DNIC. This code is made from the CCITT X.121 Data Country Code and a "0". See AX.121 for further details. This can be found in the Fifth ARRL Computer Networking Conference Proceedings. The example shown below is just like a multi-switch connection except the Destination Switch Address is that of the Source Switch! To do this type:

"C VE3XYZ V N2DSY-3,3020,613744"

See You at the Dayton HamVention!

In the MailBox

by Roy Engehausen, AA4RE

Keep those cards, letters, and packet messages flowing. I can use all the news especially on the non-IBMPC based systems. Please drop me a quick note and share this information with us all.

The Header Wars!

Last issue I announced a poll to see which header was most popular. Well the vote is in: NK6K header format 2; Don't care 1. It was an overwhelming mandate.

CBBS moves again!

Dave, VE3GYQ, didn't last very long as the CBBS support person.With all of his other activities, I was surprised that he took the job in the first place. Now K3RLI, AG3F, and a few others are handling the CBBS program. Version 4.52 is the current one available. You can acquire a copy either from the authors or CompuServe. It includes a few bug fixes on BID's, transparent mode for users, password routine for remote SysOps,and some enhancements to the code.

Hank is back!

Hank, W0RLI, has dropped me a note with regards to his current work. He plans on releasing his version 6 within a month or so. Much of the program has been rewritten from the CBBS days and it is now specific for PC/MS-DOS. The forte of V6 is that it is adapted for use under a multitasker. Not only are the files shared between the various processes (like MBLV4 and PRMBS) but also the ports move between tasks. I think I need to explain the last. At system initialization time, the first task has all the ports. When a connect occurs on any of them,task 1 starts working for the user and task 2 takes up the job of monitoring the ports. When a connect occurs and all tasks are busy then CONOK is turned off. There are two big advantages to this. If you have more ports than tasks, you don't have the problem of a connect on one port busying out another port. For example: 6 ports and 3 tasks can handle three connects from any three of the ports. The other big advantage is that a SysOp doesn't busy a port when he reads his own mail or does maintenance. I can be using task 2 for my own mail and task 1 will monitor all ports. Hank is currently working on an interconnect to TCP/IP and will release V6 sometime after that. The program will be available thru a "regional" distributor who will also be the support person. New versions will flow down to the users and bug reports will funnel up in Hank's support structure. Only the regional distributors will be able to contact Hank. Source will not be generally available.

Oh no! Another BBS program!

Yes and this time from yours truly. Over the past few months, I have been writing my own mailbox program. The distinction of this program is the ability to multi-connect on a port while also allowing multiple ports. DV and DoubleDOS are not used because the program contains an internal task switcher. To simplify TNC interfacing, the WA8DED Host Mode is used. This limits the TNCs to the TNC-1, TNC-2, and PK-87. The program will also run with the PACCOM PC-100 series of TNC cards internal to the PC. I hope to support both AEA and NETROM host modes as soon as I can borrow the needed equipment. Perhaps the most interesting thing is a different way of structuring the forward file. Rather than the current way of having a list of destinations for each route, a list of routes for each destination is used. The data has been broken into two pieces. How to connect with a distant mailbox is in the ROUTE file while the information on what to send is in the PATH file. A line from the latter is organized as: W3IWI W0RLI WB6ASR. This says to send mail for W3IWI mailbox to either W0RLI or WB6ASR. The inherent advantage to this format is that this is much more in the way we think of the routing. Of course, wildcards are supported for zipcodes, etc. The program is still very barebones and is not yet in production so don't send me any diskettes yet. I will be uploading the program to CompuServe when it's ready.

A ROSE by any other name!

The Radio Amateur Telecommunications Society (RATS) has announced that KA2BQE's PRMBS program has been renamed. To show affinity to their newly announced "ROSE" LAN, the mailbox component has been renamed"ROSErver." I dunno how to pronounce that one.

So you want to be a SYSOP?

Thanks to a mention in the ARRL's packet book, I have received numerous cards and letters with regards to setting up mailboxes. Here are some of the tips I give prospective SysOp's. Plan on 15-30 minutes per day for system maintenance. This is based on a moderately active system. The time is required for a review of mail to assure compliance with the rules, cleaning out old messages, and updating the forward path files. If the mailbox is located remotely from your home, you can probably double that time estimate. You should also figure on visiting the beast once a week.You should dedicate both the computer and the RF gear to the purpose. Murphy's law of mailboxes says that as soon as you try to use the equipment for something else, someone will try to connect. You can share the computer somewhat by using DoubleDos or DV. This will allow you to run the mailbox in one partition while you use the other but it certainly slows you down.

Feedback Wanted!

I would love to hear from you. Send any suggestions, comments, new tibits, and hate mail (in good taste of course) to:

Packet: AA4RE @AA4RE

CompuServe: 76064,2107

USMail: 8660 Del Rey Court, Gilroy, CA95020.

MEMBERSHIP APPLICATION

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PO Box 22888, Tucson, AZ 85734

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The officers of the Tucson Amateur Packet Radio Corporation are:

Andy Freeborn, NØCCZ	President
Tom Clark, W3IWI	Executive Vice President
Scott Loftesness, W3VS	Secretary/Treasurer

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