

Packet Status Register

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President's Corner

by Lyle Johnson, WA7GXD

The ARRL Digital Committee met in Newington, CT, over the weekend of 23 May. Several issues were discussed, including packet frequencies for HF and VHF, the automated message handling STA for HF, changes to the AX.25 Level Two specification, message handling protocols, and progress reports on networking protocols.

Many of the above-mentioned items are under study by various subcommittees.

One point agreed upon is the means of identifying an HF packet frequency. In the past, many of us have simply used the display frequency when operating lower sideband with the "TAPR standard" HF modem tone pair of 1600/1800 Hz.

In the future, we will be referring to the center frequency of the actual transmitted energy.

Thus, 14.109 MHz of yesterday becomes $14,109,000 - ((1600 + 1800)/2) = 14.1073$ MHz.

The disadvantage is that very few rigs have an FSK mode such that the dial reading corresponds to the energy being transmitted. The Great Social Equalization Factor (GSEF...) is that now everyone can be confused; there is no bias in favor of using "TAPR standard" 300 baud tones for a convenient dial reading!

To add fuel to the fire, yet another set of suggested frequencies has evolved for message forwarding use. (Especially on 20 meters, folks are encouraged to move their QSOs to the standard RTTY area, below 14.1 MHz.)

Message forwarding frequencies of 14.1023 and 14.1083 MHz are suggested in North America. A move to these frequencies will probably occur at the time of the HF STA. Please do not use these frequencies for casual QSOs — they are intended for message handling.

A number of inputs were received regarding modifications to the AX.25 Level Two protocol. They are currently under study and will be reported to the Committee at its next meeting, scheduled for the weekend of August 29 in Los Angeles in conjunction with the 6th ARRL Computer Networking Conference.

(That meeting took place at the Torrance Marriot Hotel. A special meeting is to be convened in early October in the Washington, D.C. area to work on AX.25 Level 2 Versions 2.1 and 3.0. 2.1 will likely be a "bug fix" interim specification, while 3.0 should provide an opportunity to add a whole slew of new bugs... Keep those suggestions coming in!)

Please note that the Committee meetings are open to observers. In fact, the May meeting had only 6 committee members present along with 10 observers!

On to other topics.

The first 200 units of the TAPR PSK Modem kit are in the hands of their builders. The complete kit costs \$100 plus \$10 Shipping and Handling in North America. Bare board sets with instructions will be available for \$30. The second lot of 200 kits is now being

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President's Corner

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produced and should be in stock at the office by the end of September.

Naturally, there is no cabinet included in this kit...

TAPR Director Tom Clark proposed a joint AMSAT/TAPR project for Digital Signal Processing (DSP) applications back in February. Tom requested some seed money to get a number of Amateurs equipped with DSP co-processors for their PCs and clones to begin to develop some serious software for Amateur use. AMSAT has approved some funding for this enterprise and the TAPR Board is currently (mid-June) considering it.

DSP holds a lot of promise for Amateur packet radio, as well as other weak-signal digital modes, digital voice, etc. Please see the "Beginner's Corner" in this PSR for an introduction to his technology.

Speaking of tutorials, several of you have contacted the TAPR office asking for the next installment of the State Machine article presented in PSR some months back. The follow-on is now being written. It may not make it in time for this issue, but should be done in time for the next PSR.

Finally, please check your mailing label. If your TAPR membership expires soon, please take a moment to renew now. Your membership is important.

See you on packet.
Lyle

An Introduction to TCP/IP

Millions of folks have used it in conventional commercial, military and government telecommunications applications. Few of them ever realized it, or really cared.

Since the introduction of TCP/IP into the packet radio world by Phil Karn, KA9Q, we are hearing it discussed more and more frequently. Being the type of folks that Amateurs are, they want to know more about it. Unfortunately up until June 1987 there was little easy-read material available on the subject, unless of course, you were a networking engineer, designer or writer of networking code.

In June Mr. Charles Hedrick at Rutgers University wrote a paper describing TCP/IP in terms that most of us can understand. For those wishing to dig deeper into TCP/IP Hedrick makes many references to documents (called RFC's) which permit one to explore as far as wanted.

A package of two diskettes "Introduction to TCP/IP" (MSDOS, 360K) is now available. They contain Hedrick's paper (about 92k) and most of the RFC's he refers to. (as many as will fit in compressed format on 2 disks, unARC utility also provided).

To augment the Introduction paper Bdale Garbee, N3EUA, has prepared a Preface which introduces the reader to the amateur packet radio version of TCP/IP. Bdale is one of the writers of code for the packet radio application of TCP/IP.

In keeping with the Rocky Mountain Packet Radio Association charter of providing "information and education in amateur digital communications", one of the RMPRA founders is providing this service.

Send: Two dollars to cover costs (foreign add appropriate additional for foreign mailing costs, 2 oz., IRC ok).

A mailing label with your address on it.

To:
Andy Freeborn NØCCZ
5222 Borrego Drive
Colorado Springs CO
80918

DO NOT send mailers, diskettes or postage. But DO send the completed label.

Update on the the KA9Q TCP/IP Software

Announcing an update to the KA9Q TCP/IP software package release of 870526.0, bringing the current release date up to 870829.0. This update adds fixes bugs, and adds some minor functionality. A new release will occur in a couple of weeks with support for 4bsd and sysV unix machines, this version still supports only the PC and PC clone class of machines.

The changes:

- Improved KISS bits for the TNC1 from

Gerard, PA0GRI.

- the ASCII text at the top of one of the TNC2 hex files is gone now.

- Minor tweaks to BM from Gerard, PA0GRI, Phil KA9Q, and yours truly. Biggest noticeable differences are that BM no longer looks at the hosts.net file at all, but instead passes symbolic hostnames to the smtp client in net... and we once again changed the text entry code. It's more like BSD Mail now. Default is a silly text entry routine, a "--e" gets you into your favorite editor, and a "--p" shows what you've typed so far.

- NET.EXE understanding of symbolic hostnames ala the hosts.net file has been extended. You now need to wrap numeric IP addresses in square brackets, as in "[44.32.0.16]", as you can use symbolic names anywhere you need to use an IP address (including in the autoexec.net file!)

- Since BM no longer deals with IP addresses, a "gateway" command has been added to NET.EXE, so that it knows where to send mail that fails the lookup in hosts.net.

- Internal changes and a fix to the ftp server so that it now handles NLST command properly, all from Phil, KA9Q. Bugs that were in the 870526.5 interim release that was only distributed in a limited fashion apparently disappeared with the latest tweaks...

- documentation has (as usual) been updated somewhat.

- some other random tweaks I'm sure I've forgotten...

What to do once you have software, aka "getting an IP address":

Users of this software package become part of the "global IP internet", and as such need to obtain unique IP address assignments for each host they plan to put on the air, or "on the wire". Major metropolitan areas in the US, and countries with active TCP-using groups probably already have blocks of addresses in amateur radio 44.X.X.X block assigned to them. Ask around locally before you go any further.

If there is no local address block in your area, and/or no one is coordinating address assignments for your local net, contact Wally Linstruth WA6JPR. Wally is the global top-level address administrator for the ham radio 44.X.X.X



subnet. Wally may be reached by email at
wally%net1.ucsd.edu@sdcsvax.ucsd.edu
or wally@net1.ucsd.edu
or ...lsdcsvax!net1!wally

or via the new forwarding mechanism I have set up for those sites who know how to reply via mail to this message, but can't reach Wally's machine directly:

winfree!wally
or
wally@winfree.uucp
or
wally%winfree.uucp@flash.bellcore.com

How to obtain the KA9Q Internet software:

- Via uucp, the files are on winfree in tar archives as:

/usr/spool/uucppublic/pub/
ka9q_all.tar.Z 16 bit Compress 4.0

/usr/spool/uucppublic/pub/
ka9q_all.t12.Z 12 bit Compress 4.0

For Anonymous UUCP login, use phone number 303/593-0696, at 2400 baud (it will do 1200 if you send a return to rotate it down), "standard Unix login sequence", username of "Uanon", password of "notFTP". An example Lsys entry ala winfree's uucp would be:

winfree

Any ACU 2400 13035930696
login: Uanon
password: notFTP

I've never run an anonymous login for uucp before, so let me know if I got it wrong!

A reasonable command to issue to pick up the 12-bit distribution would be

uucp winfree!~/pub/ka9q_all.t12.Z /usr/spool/uucppublic

My BBS is currently down with a dead hard drive. If anyone has a spare drive they would be willing to donate to the cause, "please" get in touch with me ASAP! Cashflow around here is a joke... :-{

Normally,

Via Opus, log in to my BBS and download from the appropriate files area. There are several .ARC files for the full distribution, one for each of the directories. SeaDog file requests are ok. I have configured my BBS to allow first

time users ample resources to download the full distribution at 1200 baud. The phone number is 303/593-0766.

If you have any trouble downloading from the BBS, please let me know. Speeds that are supported include 300, 1200, and 2400.

-Via US Snail, Andy Freeborn NØCCZ has agreed to make floppy copies. To get a copy from him, send \$5 AND a completed return address mailing label (orders without a mailing label will be considered contributions to the BBS hard drive fund, see above... :-):

Andy Freeborn, NØCCZ
5222 Borrego Drive
Colorado Springs, CO 80918
USA

What you get for the \$5: 5 floppies, including two of RFC's and IEN's that relate to the code, two that include the actual release, and one that is intended to be a sort of "plug and play" disk for getting on the air immediately...

For those who just want the RFC/IEN disks, Andy will send you just those two disks for \$2 and a mailing label. If you want any particular RFC or IEN, contact Andy to find out what archive it is in (we have them all packed up, one ARC per 360k pc disk), and he will send you that RFC or IEN, along with many others, on a floppy for \$1/disk. You can't mix and match, you get the block of documents that are in a given archive.

DO NOT SEND floppies, mailers, postage, etc... but DO send the mailinglabel!

Andy is also reachable as
winfree!andy or
andy%winfree.uucp@bellcore.com

If you need more information (?). Andy is within an on-air FTP of me, so we should be able to keep his bits up to date!

on the ARPAnet, or attached portions of the Internet, look on
louie.udel.edu

via anonymous FTP for the files in the directory
pub/ka9q

-Within a day or two of a new release, the code should also be available from the following additional secondary distribution points:

from Doug KD4NC in Atlanta, GA
uucp: winfree!kd4nc!dug

from Bob Hoffman N3CVL in Pittsburgh, PA
arpa: rbh@cadre.dsl.pittsburgh.edu
uucp: pitt!hoffman

from Wally Linstrugh WA6JPR in Santa Barbara, CA
arpa: wally@net1.ucsd.edu

from Brian Kantor at UCSD. (via anonymous FTP?)
arpa: tcp-group-request@sdcsvax.ucsd.edu
uucp: sdcsvax!tcp-group-request

Unreleased (read: under development) versions are often available on louie.udel.edu, generally alongside official releases...caveat emptor...

If anyone has any trouble getting hold of a copy of the code, please let me know!

How to contact me:

Bdale Garbee, N3EUA
1433 Territory Trail
Colorado Springs, CO 80919
303/590-2868w,
303/593-9828h

*** go easy on the phone calls please, I'm not getting much sleep! ***

uucp:
{bellcore,crash,hp-
lsd,ncc,pitt,vixie}!winfree!bdale
arpa:
bdale%winfree.uucp@flash.bellcore.com
bdale@net1.ucsd.edu
fido: Bdale Garbee at 128/19, 303/
593-0766, 300/1200/2400 baud, 24hrs
(*DOWN*)
packet: n3eua @ k0hoa

Note from the Editor

I need your help. With PSR back on its own, I need material from packet groups around the country for sharing in PSR. If you've got news to share, articles to contribute, or just want to comment pro or con on something we're doing right or wrong, please send your material to me directly:

Scott Loftesness W3VS
16440 Rustling Oak Court
Morgan Hill, CA 95037

or send it to me via electronic mail:

Packet: W3VS@AA4RE
CompuServe: 76703,407
MCI Mail: SLoftesness
AT&T Mail: SLoftesness



Beginner's Corner: Digital Signal Processing

by Lyle Johnson, WA7GXD

Digital Signal Processing, or DSP, is a hot topic in the world of analog circuit design these days. And its becoming a hot topic in the Amateur world (meaning that the costs are finally getting realistic).

This article is intended to be a very brief overview of DSP - what it is and how it may prove useful to packeteers and other segments of the Amateur community.

DSP - WHAT IT CAN DO

DSP is simply a means of processing a signal by digital means.

Analog processing applications that you may be familiar with include Audio CW filters, speech processors, two-tone generators for SSB transmitter testing and the 1200 baud modem in your TNC.

Some recent modem integrated circuits (ICs) include on-chip DSP. The AMD 7910/7911 "World Chip" modems, such as those used in the Kantronics Packet Communicators and the Pac Comm TNC-220, is an example of applying DSP to packet problems.

In general, anything you want to do to an audio signal, whether it be generation, modulation or filtering, can be done using DSP techniques.

The advantages of DSP include (1) uniformity and repeatability of a design and (2) one general-purpose hardware design can be reconfigured under software control to do many different tasks.

Software???

Yes, DSP allows software hackers to mess around with traditional hardware areas. Is nothing sacred?

Some of the guys playing with the AMSAT/TAPR DSP seed project (notably Tom Clark, W3IWI and Bob McGwier, N4HY) have already done some pretty amazing things. How about a PSK modulator to test the TAPR PSK modem demodulator? Or a PSK demodulator to check the PSK modem demodulator? Or an audio spectrum analyzer? Or a weak signal detector so an OSCAR-10 class station can detect its own MOONBOUNCE signals! These applications have already been tested in at least a preliminary form by these

two!

Want a tracking, adaptive HF modem? How about a WEFAX demodulator? Or a 2400 baud telephone modem? Or a 9600 baud packet modem that will work on your current voice radio?

The list of applications goes on and on.

DSP - WHAT IT IS

A DSP system design consists of an input filter, usually quite simple to perform a function called "anti-aliasing." This is simply to protect the following circuitry from signals far out of the design passband.

Following the filter is an analog-to-digital converter (ADC). This device samples the input signal and converts the amplitude to a digital number. While accuracy requirements of the ADC vary from application to application, a 10-bit ADC driven at about a 20 kHz sampling rate will probably suffice for the majority of Amateur DSP applications.

The output of the ADC goes to the microprocessor (uP). In this case, however, a standard, generalpurpose uP won't do. DSP requires the rapid execution of a small set of instructions.

What do I mean by rapid?

Well, the 6809 in a TNC 1 runs at a clock of 3.6 MHz and takes an average of about 4.5 microseconds (uS) to execute a typical instruction. The Z80 in a TNC 2 runs at 2.5 MHz and takes about the same amount of time to do something.

The Texas Instruments TMS32010 DSP runs at a clock of 20 MHz and can execute a complex multiply-and-accumulate instruction in 200 nanoseconds (nS). This is about 20 times faster than the general-purpose chips, and even faster when you consider the amount of work done in that special DSP instruction! The next-generation TMS320C25 does even better, taking only 100 nS, or 0.1 uS, to do the same thing.

Of course, like any other microprocessor, the DSP chip needs program and data memory. In your TNC, the program memory resides in EPROM (2764 or 27256, typically) while the data resides in RAM (8k, 16k, or 32k bytes in a typical TNC). The difference with the DSP chip is that it needs FAST memory to keep up with its fast clock.

The DSP system also needs a means of outputting the digitally massaged input

information. This is usually in the form of an analog output via a digital-to-analog converter, or DAC. Like the ADC, a DAC with 10 bits of accuracy and outputting data at a 20 kHz rate (200 kilo-bits/sec), will probably suffice for most Amateur applications.

In addition, an Amateur DSP system should have some sort of serial or parallel I/O to interface with TNCs, computers, etc.

CURRENT PROJECT

The DSP seed project, being sponsored by AMSAT and TAPR, will provide about 20 or 25 Delanco-Spry PC cards. These cards plug into an IBM PC or compatible, and include a TMS32010 processor, 48k bytes of high-speed, dual-ported memory, an input ADC and output DAC, and support circuitry. Normally nearly \$1,000 each, Delanco-Spry is making us a special deal for between \$500 and \$600 per unit.

This project will, hopefully, serve as a software development bed. Tom Clark likens it to the early days of using 8080s in an S-100 bus computer running CP/M. It isn't the latest or the greatest, but it is useful and the algorithms (approaches to solving a problem in software) developed should be useable in later-generation Amateur DSP devices.

Moving towards the front burner is a project to develop an Amateur DSP "engine" tailored to Amateur needs. Instead of expensive 16-bit ADCs and DACs that can clock at 50 kHz, 10-bit ADCs and DACs running at 20 kHz may suffice, saving many dollars. Likewise, including enough, but not too much, fast memory, will save more dollars. Finally, using volunteer engineering, we hope to develop a useful, general-purpose DSP device suitable for a broad spectrum of Amateur applications.

No details are yet available as to cost or exact configuration. My personal goal is to have a TMS320C25 with the aforementioned ADC and DAC capability, a minimum of 64 kbytes of memory, expandable to 128k bytes (the limit of the TMS320C25), sitting on a IBM PC card for about \$500. Maybe less. This is about 1/5 of the cost of a comparable commercial DSP card.

This would be followed by a stand-alone box, with serial ports or perhaps a SCSI bus, probably for less.

Of course, I am a dreamer, and others tell me it would cost closer to \$1,000.

As the technology progresses, the prices will drop.

Watch this space for further developments...

Digital Signal Processing and Amateur Radio

by Bob McGwier N4HY
15 Cherry Brook Lane, East Windsor,
New Jersey 08520

In the past several years, digital signal processing and related areas have made a significant impact on the telecommunications industry and government communication facilities. To date amateur radio has not participated to the fullest possible extent in the benefits made possible by the techniques of digital signal processing mainly because it has been too expensive to include the techniques in our cache of communication tools. In the past few years, the silicon revolution has overtaken digital signal processing and have made it too inexpensive to let it pass us by without using it. Arguably, the most popular family of digital signal processing chips are those produced by Texas Instruments and are the TMS320 family but there are several others, most notably the DSP56000 family by Motorola.

These techniques and chips make possible a wide range of exciting capabilities. Changing modems is as quick as changing the software program you are running on board your computer. A JAS-1 PSK modem is only a software program on the TMS32010 rather than a couple of dozen IC's (TAPR/JAMSAT PSK modem). This same software with a minor modification can be made a many PSK modem[1]. The major win in digital signal processing for modems comes in the ability to do adaptive equalization. This means that we can do something to ameliorate the bad things being done by our unconditioned radios and the path the signal takes in getting to our demodulator. In analog/oscilloscope parlance we can "open up the eye pattern". This process is independent of the radio as it will tune itself to the best pattern it can to clean up the bits being sent to our TNC's (for example).

This magic sounds so good that AMSAT/TAPR have again teamed for the benefit of amateur radio and packet. Tom Clark, W3IWI and I have been

appointed chairmen of a project underwritten by AMSAT and TAPR. The project is to arrange a group purchase at a greatly reduced price of a board for PC-clones that allows digital signal processing software/hardware to be tested and to plan what we will need for the future.

The board we have selected is the Delanco Spry[2] Model 10. This board has a TMS32010 as its DSP "engine". This processor has a 160ns cycle time and has many features that are especially nice for the implementation of digital processing algorithms. This board has a small amount of very fast memory (8K), Analog to Digital and Digital to Analog conversion hardware capable of sampling at greater than 40000 times a second, and sits on a card that fits into a standard expansion slot on PC-clones.

The project is looking for a few proven producers who do not mind spending \$525 for these boards to help the project produce nifty new things for amateur radio. You do not have to be a signal processor or a TMS320 assembler code hack. We would like those types of people to sign up for this project but we are also looking for people who can write applications software in "C" and assembler for the PC. We are currently emphasizing MSC, Turbo-C, and MASM as the development tools for the PC environment. We are even looking for a few proven "beta test" types. If you are one of the types who signed up for beta test packet boards without really understanding what was in them, we also need help from you.

The long range goals are the involvement of TAPR/AMSAT and some amateur industry leaders in the production of a digital processing product for amateur radio. We envision software that will run on this product to include (but not be limited to) modems of many varieties, optimal WEFAX-APT demodulation, voice encoding (LPC-10 and ADPCM for example), weak signal work, and test equipment. We are leaning towards a board with the TMS320C25 on board but the final decision has yet to be made and will probably be put off until we have more from those of you who "join up". We have already been approached by A.E.A. and Kantronics, who are expressing support and a desire to participate and more are sure to follow.

To date we have had some initial but very exciting success with these boards. Tom and I have seen each others echo's off the moon running Fast Fourier Transforms on these boards. Each of us was running an AO-10 class

station without a lot of aluminum in the air. I have written a demodulator which locks to and tracks the JAS-1 PSK downlink quite well. I am putting a remodulator into the code so that JAS1 can be decoded by a stock TNC without modification. The FFT software also acts as a very valuable piece of test equipment, a spectrum analyzer. None of these things are completed and the others haven't even been started. DSP NEEDS YOU! Contact us via callbook address for W3IWI, AMSAT office, TAPR, or myself.

[1] "DSP Modems", Robert W. McGwier, N4HY, 6-th ARRL Computer Networking Conference, Los Angeles, August, 1987.

[2] Delanco Spry, Suite 241, 2900 Connecticut Ave, N.W., Washington, D.C. 20088

[3] "Digital Signal Processing and Amateur Radio", Thomas A. Clark, W3IWI and Robert W. McGwier, N4HY, 6-th ARRL Computer Networking Conference, Los Angeles, August, 1987.

[4] AMSAT-NA, Inc. P.O. Box 27, Washington, D.C. 20044

[5] TAPR, Inc. P.O. Box 22888, Tuscon, Az. 85734

In the Mailbox

by Roy Engehausen, AA4RE
780 Lisa Court
Gilroy, CA 95020

I saw a definition of a "committee meeting" as one where the attendees figure out who is absent and assign the work to them. I guess that's what happened in my case when I was asked to provide some news on BBS happenings.

Latest Software/Hardware

New releases of code have been made recently by WORLIVE3GYQ (Version 3.3), KA2BQE (95c), and WA7MBL (3.20). All three systems now support forwarding thru the various level 3 systems. The executable program and source code for the first two are available from the authors while K7PYK distributes the executable MBL system. All are free with a diskette and SASE mailer. The WORLIVE3GYQ program is also available from CompuServe (in the DL9 Data Library).

An interesting footnote is the fact that a feature has been removed. The current MBL code and the next WORLIVE release

will have the fixed portion of the forward header built in. Too much software is now trying to deduce the origination point of a message via the headers to allow changes to the fixed fields. A header is shown below with just the fixed filed shown. Additional information such as frequency can follow these.

R:870903/0235z@:W0RLI Santa Cruz, CA #:8843 O:YB1BG

The TEXNET people are about to start distributing a combined Level 3 node and BBS system suitable for remote site installation. This is both hardware and software. A complete and thoroughly tested layer 3, 9600 baud network nodes is expected to cost about \$650 to \$700 for the entire node, radios (2), the NCP, parts, power supply and antennas excluding feedline. This cost does not include the BBS. Contact WD5HJP for details.

Developments

One of the biggest complaints I hear these days about BBS operation is that the mailbox is always busy. With forwarding every hour, multiple ports, etc, the availability of a BBS for a given user has been steadily decreasing. Both the W0RLI and KA2BQE systems have attempted to supply some relief by running two copies of the software using a multitasker like DoubleDos but this has always been a kludge.

On the West Coast, two multi-connect systems have been in operation. Mike, W6IXU (of NETROM fame) has had a system on a Macintosh for several years while Eric, WD6CMU has been running one under OS/9 (a 68000 based UNIX clone) for a year or so. Needless to say, the hardware cost involved as compared to a Taiwan PC/XT clone has prevented wide spread acceptance of these mailboxes.

This is about to change. Using the MINIX operating system, Bill, N6FQR, has successfully adapted most of the WD6CMU program to the PC 8088 hardware family. This software will support both multiple ports and multiple connects per port. I have watched W6IXU and WD6CMU forward mail to each other (thru NETROM) simultaneously. The mailbox is not yet in production use nor is it ready for distribution but should be by year end.

Under the current implementation, the TNCs must use the WA8DED (also of NETROM fame) host mode protocol. This is available for both the TNC-1 and

TNC-2 either from the author or CompuServe.

The MINIX Operating System is a variation of UNIX and was written by Andrew S. Tanenbaum as a teaching aid for his text book "Operating Systems: Design and Implementation" (ISBN 0-13-637406-9) published by Prentice Hall, Route 59 at Brook Hill Drive, West Nyack, NY 10995. The book sells for about \$35. Both the executable code and source are also available from Prentice-Hall for another \$80. Yes... I did say the source is available. The package also includes a simple "C" compiler. Updates to MINIX are free via USENET.

There is a dark lining in our silver cloud however. Unfortunately MINIX is its own operating system and will not run MS-DOS applications without extensive rewrite. It uses its own disk format and you will have to take care on how you organize your fixed disk if you wish to switch back and forth between MS-DOS and MINIX. In addition, Tanenbaum used direct interface to the hardware instead of BIOS so MINIX will not run on all the clone variations. This is being slowly rectified.

Food for Thought — One Man's Opinion

The most controversial issues facing BBS operators today is the universal addressing scheme both for regular inter-amateur mail and for NTS traffic. There seems to be two camps of thought: Telephone area codes and Postal zip codes.

One thing seems to be clear though: A separate system is needed for NTS traffic. It is an unfortunate fact of life that amateurs who are interested in NTS are few. Many mailboxes do not have someone who checks in regularly to deliver NTS messages in the local area. Thus the target mailbox for NTS to my home city of Gilroy and the mailbox used by the local hams are different. However we route inter-ham messages we must make provision for routing NTS differently.

At a meeting this summer attending by both packeteers and NTS people in the ARRL's Hudson Division, the scheme of NTSxxx (xxx = area code) was proposed. Discussion of this idea has taken place in many media: voice, mail, packet, and electronic conferences and alternatives of xxxxxN (xxxxx = postal zip code) and NTSxxx (xxx = first 3 digits of zip code) have appeared.

I think the first conclusion is also obvious: whatever is selected for NTS should be used for a general scheme and vice versa so let's discuss a general scheme.

Let's square off zip code versus area code.

First: Zip code is a lot more selective. A single zip can contain a maximum of 30,000 to 50,000 people which would probably fall out to about 100 hams. That would be coverage for one or two BBS. Area codes can cover whole states. If you add the telephone exchange number (e.g. 408847) then you equal zip code's efficiency. The same addressing problem exists if you only use the first 3 characters of the zip code.

Second: Zip code is fairly logical. A station on the East Coast will simply have to know to route everything starting with "9" to the other coast. Both the WA7MBL and W0RLI BBS programs accept "wildcards" to allow this to be done efficiently.

Third: Zip code is in the Callbook. If you wanted to route a message to me, you would simply look up my address in the call book and send the message to AA4RE @ 95020. Thus we have our own "directory". In addition, you can purchase the zip code directory from the Postal Service which shows city and zip code. To find what Gilroy's telephone area code and exchange prefix are is not as easy.

The major disadvantage to zip code is the difficulty of addressing areas outside the US. It can be said that adding the telephone country prefix to the area code, we can address the world. I just tried to look up the prefix for Japan. My phone book says to call the operator for that information. I don't even know what the US prefix is so how can I give it out.

If we put an indicator on the front of the address to show the country, then it will be up to the hams there to decide on how they want to address messages. Lets see what a typical address would be:

W-95020

The W indicates the US. We all know and understand the amateur call sign system both for US and for DX. Lets use it. A Canadian address might be VE-6K7P1M. Some may argue that this exceeds the present day 6 character maximum limitation on the @BBS field but I am sure that the software experts



we have now can solve this problem given a few months.

This then is my opinion: a ten character @BBS field consisting of two parts: a country code and (for the US) a zip code. Country codes should be taken from the ITU amateur radio prefix list. Each country would select an internal addressing scheme. For the United States, we would use the postal zip code. The letter "N" would be appended to indicate that the message is NTS traffic.

Feedback

I would appreciate any comments regarding this article contents or suggestions for future articles. Send them to packet: AA4RE @ AA4RE, CompuServe: 76064,2107 or USMail: 780 Lisa Court, Gilroy, CA 95020.

TAPR PSK Modem Kit Preliminary Manual Errors

by Lyle Johnson, WA7GXD

I can't understand it!

There are actually some ERRORS in the TAPR PSK Modem Kit Preliminary Documentation (dated 05 July 1987).

Shucks, a lot of that manual was gathered together and edited at 2 AM. The sun wasn't even in my eyes!

Presented below is a list of the most blatant, confirmed errors. Please correct your manual to reflect these changes!

Page 2

Change quantity of 0.01 COG capacitors from 10 to 9.
Change quantity of 22k ohm resistors from 02 to 03.

Page 7

The 2-pin header may interfere with mounting the board. You may want to use a wire jumper rather than a push on one here.

Page 14

The two regulator ICs are oriented opposite each other.

Page 18

S2 is upside down.
S2 "pad 2" applies to TNC 1. For TNC 2 use "pad 3."
"All Switches Front View" refers to

the keyway diagram immediately below.

Page 29

UHF Port DIN pins 1 and 3 are swapped. Pin 1 is Common and Pin 3 is Step Down.

Page 36

Pad 2 is for TNC 1.
Pad 3 is for TNC 2.

ADDENDA

Page "3"

Replace switch table with the following:

Switch Ref	Manual	Label
Transmit Mode S2	JAS/PSK	MAN/PSK
AFC S3	UP/DOWN	USB/LSB
Modem S4	PSK/FSK	ON/OFF
Receive Mode S1	VHF/UHF	JOINT/SPLIT

SCHEMATIC

Sheet 1 of 3

J4 - 1 is COMMON.
J4 - 3 is DOWN.
J4 - 5 is UP.

Sheet 2 of 3

No errors reported!

Sheet 3 of 3

See Sheet 2 of 3.

I want to thank the many Amateurs who wrote, called or got onto CompuServe and brought these errors to our attention. The new manual is being compiled and edited as this is written, and everyone who helped point out the errors in the preliminary one will get a courtesy copy.

I am sure there are more errors, but these should be enough corrections to get you on the air with PSK!

Thank you!

Coming Next Issue: A Letters to the Editor column. Be sure to send your comments on PSR, pro or con, to the W3VS at the address listed on the first page. We really do want to hear from you and to share your opinions with the TAPR membership.

Reducing HF RFI from the TAPR TNC 2

by Lyle Johnson, WA7GXD

A number of packeteers have reported interference from their TNC 2s, especially on HF. The problem manifests itself as an unstable, buzzing sort of noise every several kHz throughout the spectrum.

This noise has been investigated and a number of possible solutions proposed. Many of these suggestions have been tried out and this article is a report on the more effective measures.

Even if you haven't had RFI problems, some of these suggestions may result in dropping your TNC's current consumption by several mA, perhaps as much as 20 or so! Read on!

FIRST STEPS

Check that all portions of your station are bonded together and grounded with a low-impedance grounding system. This can have dramatic results, and is just good engineering practice.

While doing all this grounding, be sure to electrically connect the TNC 2 case to the case of your radio.

Use a large toroid and wrap the end of your power cable through it for a few turns just as before it enters the TNC 2.

Similarly, wrap your RS-232 cable through a toroid at the TNC end.

A good toroid to use is the MFJ-701. This is an open-frame, square unit that can simply slip over your cable.

INSIDE THE TNC

Add bypass capacitors of 330 or 470 pF from serial port connector J1 to ground at the following pins: 3 (Rx Data), 5 (CTS) and 8 (DCD). This can be conveniently done on the bottom of the PC board.

Replace R1 (47 ohms) with a 10 uH inductor.

Add a 0.01 uF bypass capacitor from -V (negative terminal of C8) to normal TNC ground (C8 and C9 return to a special "B" ground, as shown on the TNC 2 schematic, page 3 of 3).



556 CHARGE PUMP MODS

Cut the trace joining U2 pin 5 to U2 pins 8 and 12 (pins 8 and 12 must still be joined). Add a 10 ohm series resistor from U2 pin 5 to U2 pins 8 and 12. Apparently, the 556 sections turn on simultaneously for a brief period of time, and this is the major cause of the noise heard at HF. The series resistance seems to delay the slave section enough to prevent this from occurring. The resistor value appears to be critical - much more than 10 ohms and the charge pump doesn't work properly, much less and the noise isn't reduced. Thanks to Eric, N7CL, for discovering this characteristic of the charge pump, as well as this cure.

If not already present, add 0.01 uF capacitors from U2 pin 1 to pin 7 and pin 10 to pin 7.

These mods will dramatically reduce RFI and also reduce current consumption by about 10 mA.

ALTERNATE TO 556

As an experiment, I replaced the 556 charge pump with a Siliconix Si7661 CMOS charge pump. Before you plunge in with this mod, be advised that the resulting current drain is about the same as the modified 556, presented above. And, a 7660 charge pump won't work; you must use the Siliconix part, as it is rated to operate at the input voltage range of the TNC 2.

The circuit is that contained in the Siliconix Data Sheet. I simply rewired some of the socket at location U2 and patched in the Si7661. It works fine, but I haven't been able to verify its performance in a side by side test with Eric's 556 mods. If it turns out to be better, I'll supply the details here in PSR. Right now, the 556 mods look to be the best bet. The Si7661 current drain is about the same as the modified 556!

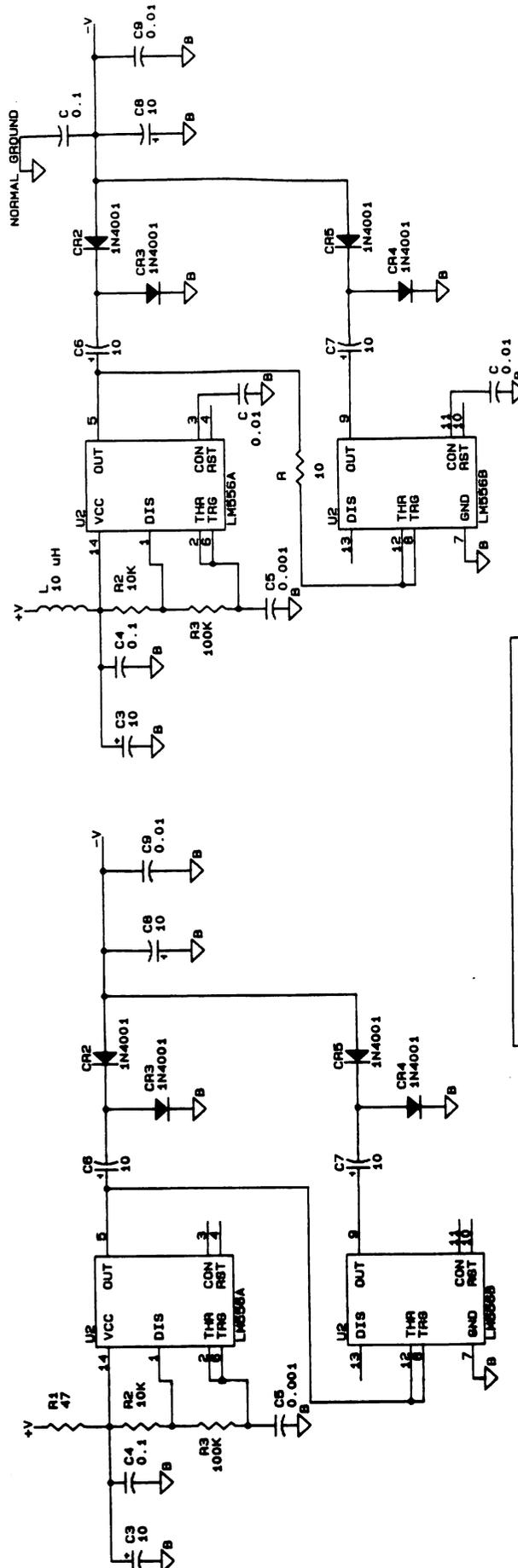
Caveat Emptor!

CONCLUSION

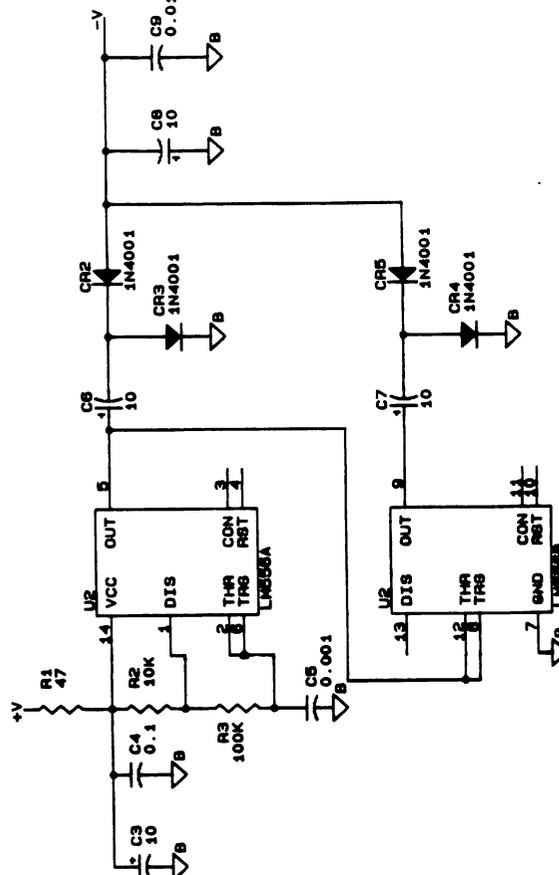
These mods are generally simple and inexpensive to perform. The results are dramatic. If you have experienced any sort of RFI from your TNC2 on HF, these mods should fix it!

See you on a non-forwarding HF frequency!

MODIFIED 556 CIRCUIT



ORIGINAL CIRCUIT



TUCSON AMATEUR PACKET RADIO Post Office Box 22888 Tucson, AZ 85734-2888 (602) 745-1166	
Title	TNC 2 CHARGE PUMP MODS
Size/Document Number	B
REV	A
Date	September 2, 1987/Sheet 1 of 1

TEXNET NEWS!

The Texas Packet Radio Society is very pleased to announce the availability of the TexNet Node Control Processor version 2.1 pc board. We're offering the pc board at our cost to the amateur radio community for non-commercial uses only. This pc board is the unique and primary hardware component for the TexNet 9600 baud layer 3 network system. The Texas members of TPRS will be installing this version of the board in TexNet nodes throughout the state. We have been operating 4 nodes on the air since October, 1986 using the same circuitry as this version 2.1.

Other groups and individuals who desire to install a layer 3, 9600 baud network system can order the pc board and documentation, and an EPROM set containing the system image software by mail. Order information is listed below.

The TexNet node is a stand-alone, totally pre-programmed-in-EPROM system. It is designed to be installed in remote tower locations. There are no user programmable parameters necessary to operate the network nodes. Nobody wants to climb a tower in the dark to replace a dead lithium battery! A local terminal connection to the node is not necessary. The design is of a fail-safe oriented system. A UPS allows the node to operate independently of AC mains for a limited period of about an hour. If the system batteries fail before AC power is restored, all operations return intact after power is restored. If the node software fails thru a fault due to a power circuit glitch (like a near lightning strike!), the node can be forced into a hardware reset via the network link. The only requirement for network link reset is that the network link radio still work and the modem section of the PC board still be operational. A TexNet node will automatically re-build its routing table after power-on system reset.

The system components that are available include:

A> Node Control Processor version 2.1 pc board.

This NCP printed circuit board is offered without parts, it has been silkscreened and soldermasked with plated holes. It has the circuitry traces for a discrete CPU oscillator circuit, Z-80A CPU, 40K of static RAM (84256 & 6264), 24K EPROM (system software,

27C256), 2 Z-80A SIO-0's for three synchronous radio ports and one async terminal port, one 9600/4800 baud modem with state machine (2716 EPROM), one 1200 baud modem with state machine (2716 EPROM), a Z-80A CTC, network trunk hardware reset circuitry (2732 EPROM), modem connector pads and five control points.

Use of the third sync port requires the addition of another modem. Please note that each port can be strapped for 1200, 2400, 4800 or 9600 baud operation. From what we know of the system loading tests, the node can effectively support one 9600 baud network port and a number of slower speed user ports. The other two ports can be a combination of the other three speeds, 1200, 2400 or 4800 and can support either user or network connections.

We will NOT be offering a set of parts. All parts used are standard logic family parts, Z-80A, 74HC-mos, 74LS, and CMOS static rams and EPROMs. Included with the pc board is documentation to assemble the board, tune the modem sections and interface the NCP modems to the RCA series 700 UHF transceiver and the 2m FM transceiver.

B> An EPROM set containing:

- 1) an un-coordinated network system software image (27256)
- 2) state machine image (2716), this is for both the 9600 and 1200 baudmodems.
- 3) reset logic image (2732)
- 4) documentation that describes procedures for: coordinating network nodes, programming node features, nodenames, node numbers, Packet Message Server routing, timing parameters, system digipeater access limits, aliases, connection responses, hardware reset programming procedure and greeting banners and prompts.

The EPROM set purchased by a system installer is registered with TPRS and support is granted only to registered system installers. System installers who have purchased the registered EPROM sets

from TPRS receive update information. Included with the purchase is a license to make as many copies and coordinate as many nodes as is necessary for their system. Again, the constraint is this: the system must be installed and used non-commercially in an amateur radio operated and owned packet network system.

PLEASE NOTE!!! This is NOT source code. The code in the EPROM kit requires a central coordination effort by a group or club. To successfully use the TexNet system software requires the facilities of a personal computer equipped with an EPROM programmer, disk file utilities to read and edit EPROM images. Then software to program the coordinated EPROMs.

C> A daughter pc board containing circuitry for the Packet Message Server interface and 8 more control points. This board uses a Z-80A PIO, a 74LS244, a 74LS245 and a 74LS138 as an address decoder. It plugs into the Z-80 socket and the Z-80 is placed on the daughter board. This separate pc board comes with separate documentation.

Prices—

NCP version 2.1 pc board—\$44
plus \$4.00 shipping & insurance

Interface daughter board—\$10
includes shipping

EPROM set & documents—\$50
plus \$4.00 shipping and insurance

These prices are subject to change. Shipping and insurance is First Class and insured for \$50 via U.S. Mail. No UPS. Cashier's check, money order, or certified check made out to TPRS are all acceptable forms of payment. Personal checks will delay filling your order until they clear. To avoid undue delay, please order via the PO Box listed below, do not use the membership P.O. Box number on the newsletter. Allow 6 to 8 weeks for delivery.

TPRS
P.O. Box 835136
Richardson, Texas 75083-5136

The Texas Packet Radio Society, Inc. is a non-profit charitable organization incorporated in the state of Texas. These printed circuit boards and software are offered only for use in other non-commercial, amateur radio owned and operated packet switching communica-



tions network systems. The buyers of the printed circuit boards and software are hereby notified that the system's performance is dependent on the assembly and installation expertise of the buyer and/or installer and is therefore an experimental system and is offered "AS IS". No license for commercial use is implied or granted through purchase of any of the system components.

System Support

The Texas Packet Radio Society will be publishing notices of updates, modifications, or TexNet related components through the TPRS Quarterly Report. A subscription is \$12 per year for at least four issues annually, some supplemental mailouts are made irregularly. Please address your subscriptions to the address listed below:

TPRS
P.O. Box 831566
Richardson, Texas 75083-1566

NET/ROM version 1.1 released 10 July 1987

Version 1.1 incorporates no new features, but corrects three relatively minor problems that were found in version 1.0. We do not feel that it is necessary to update nodes presently running 1.0, except for the relatively few places where one or more of these problems are causing significant difficulty.

Following is a description of the three problems fixed in 1.1:

(1) Destination table entry counter:

When a destination node is deleted from the routing table (either manually or by the automatic obsolescence mechanism), the destination list entry is not deallocated immediately, but rather just marked as a deleted destination entry available for re-use. However, such deleted entries are deallocated when the node is warm-started (for example, if there is a power failure, or if the SYSOP issues a RESET). Version 1.0 has a "bug" whereby the destination table entry counter is not decremented when entries are deallocated during a warm-start. This can cause the count to become incorrect (too large). The count is used to limit the size of the destination table in accordance with PARMS parameter #1. Consequently, the "bug" can result in premature

"Routing table full" messages, or failure to incorporate new nodes from a neighbor node's routing broadcast. **WORKAROUND:** this problem can be avoided either by (1) not warm-starting the node, or (2) setting the PARMS parameter #1 to a high value.

(2) RNR during deferred disconnect

When two stations are connected via NET/ROM and one of them disconnects, NET/ROM's "deferred disconnect" logic causes any in-transit information frames to be delivered to the still-connected station until all such frames have been delivered or until a given period of time elapses (by default, 15 minutes) with no forward progress. Version 1.0 has a "bug" that causes this protective timeout to be ineffective if the connected station's TNC is refusing the information by returning a RNR status.

(3) Fast-learn of paths with two digipeats

NET/ROM incorporates new nodes into its routing table by monitoring the source call sign field in the layer 3 header. Version 1.0 has a "bug" whereby layer 3 frames that arrive via two digipeats cause a routing table entry to be constructed with the digipeater list in reverse order. Version 1.1 fixes this problem, and checks for the existence of the entire path, not just the source call sign.

Clearly, these are rather esoteric problems, and have not caused significant operational problems. We do not feel that any wholesale updating of 1.0 nodes to 1.1 is warranted.

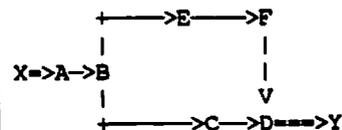
NET/ROM version 1.2 released 14 August 1987

Version 1.2 adds two important new features to the automatic routing system. There are no incompatibilities between version 1.2 and prior versions of NET/ROM. However, the new features in version 1.2 are significant enough that operators of nodes using prior versions may wish to consider upgrading to the latest firmware.

A new command, ROUTES, allows

node control operators to fine-tune the automatic routing system by assigning explicit path quality values for individual neighbor nodes. (In prior versions, only a global channel quality value could be assigned by the control operator, and that value was assumed to apply universally to all neighbors on the channel.) A detailed description of the ROUTES command follows this summary.

NET/ROM's automatic routing algorithm has also been enhanced to prevent a node from getting stuck using a sub-optimal path for long periods of time. The enhancement is most easily explained by giving a specific example:



Suppose user X wants to connect to user Y. He uplinks to his local node A, requests a circuit to destination node D, and then downlinks to user Y. Node B has two alternate routes to D...via node C or via node E. The route through node C has higher quality than the route through node E. NET/ROM prefers to use the optimum route through C; however, if that route fails for some reason, it will use the alternative route through E.

In versions of NET/ROM prior to 1.2, once B starts routing D-traffic through E, it will not even attempt to try the path through C again until the crosslink between B and E is deactivated...which happens when there has been no traffic on the crosslink for (nominally) 15 minutes. In high-traffic areas, however, such a period of no activity might not happen for hours or even days! Thus, node B would become "stuck" using a sub-optimal route for long periods of time.

In version 1.2, the following enhancement has been made. When node B receives a routing broadcast from node C (typically once each hour), it takes a look at all destinations whose optimum (highest-quality) route is through node C. (In this case, node D is such a destination.) If node B discovers that it is using some other (sub-optimal) route to one of these destinations, it deactivates the sub-optimal route and tries the optimal route (through C) once again. Naturally, if the optimal route fails for any reason, it will try alternative routes in descending order of quality, as usual.

The following addition has been made to the NET/ROM manual (following



ROUTES Command

The ROUTES command is used to display or modify the neighbor list of the node's routing table. To display the node's neighbor list, use ROUTES without any parameters:

```
ROUTES
LAS:K7WS-1) Routes:
> 1 K7WS-11 255 5
> 0 WA7GTU-1 192 17
  0 WA7GTU-2 0 15 !
  0 KA6ANT-3 via K7WS-4
    144 2
  0 WB7BNI-1 192 6
  0 AA6TH-1 192 7
```

For each neighbor list entry, the following items are displayed in sequence:

- ">" if an active crosslink exists to this neighbor
- port number (0=HDLC port, 1=RS232 port)
- path to this neighbor (callsign + any digipeaters)
- path quality to this neighbor (255 is best, 0 is worst)
- use count (number of routes via this neighbor)
- "!" if this neighbor list entry is locked

To display this information for just one particular neighbor list entry, use ROUTES followed by the port number and path:

```
ROUTES 0 AA6TH-1
LAS:K7WS-1) Routes:
> 0 AA6TH-1 192 27
```

Neighbor list entries may be created automatically as the result of receiving an automatic routing broadcast, or manually by means of the NODES+ command. When a neighbor list entry is first created, it starts out unlocked and with a path quality equal to the default channel quality (see PARMS command). However, the control operator has the ability to "fine-tune" NET/ROM's automatic routing by modifying the path quality values for specific neighbors and by locking these modified entries.

The ROUTES command supports manual modifications to neighbor list entries, but this capability is available only to a control operator who has previously validated his credentials during this connection by successfully executing the SYSOP command. To modify neighbor list entries, the commands are:

```
ROUTES port nodecall [digicall...] +
```

pathquality

```
ROUTES port nodecall [digicall...] -
pathquality
```

The "+" version locks the neighbor list entry specified by the port, nodecall, and digicall parameters, and sets the path quality of that entry to the value pathquality (255 is best, 0 is worst). If there is no entry in the neighbor list that matches port, nodecall, and digicall, a new entry is created, locked, and initialized with the specified pathquality and a use count of zero.

The "-" version unlocks the specified neighbor list entry. If its use count is zero, the entry is deleted immediately. Otherwise, the entry remains in the neighbor list and its path quality is set to the value pathquality. If the use count of an unlocked neighbor list entry ever becomes zero, the entry is deleted.

The path quality for a neighbor is used by NET/ROM in its calculations of route qualities for all routes through that neighbor. By modifying the path quality using the ROUTES+ command, the control operator can encourage or discourage a node from using paths through a particular neighbor. By setting a neighbor's path quality to zero, the control operator can cause the node to ignore the existence of that neighbor altogether, even to the extent of disregarding the neighbor's routing broadcasts.

**The Radio Amateur
Telecommunications
Society
Information Bulletin
20 August 1987**

To: All Radio Amateurs
Fm: N2DSY @ KD6TH-4/201
Sb: COSI-Switch and RATS Update

The delays in getting out the COSI-Switch have been long and somewhat frustrating for everyone. Things are finally coming together.

What should be clear to everyone by now is that the originally announced X.25 Level 3 code has not arrived.

Something had to be done...

The project has been started from scratch by Tom Moulton, W2VY. He is

getting consultation support from John Howell, N2FVN, Harlan Worchel, KB2CNL, and Gordon Beattie, N2DSY. All of these individuals have previously implemented X.25 switches or Packet Assembler/Disassemblers (PADs). We had a design review on the 14th of August and we are all quite pleased with the progress Tom has made. (Kudos to TOM !)

The revised delivery schedule is as follows:

Oct - Alpha testing of a completed COSI-Switch Level 3 module

Nov - Beta testing of a completed COSI-Switch machine - TNC-2/DR-200 (Any other hardware suggestions ?

Jan - Production shipment begins

All individuals and clubs that contacted RATS regarding this project will receive MS-DOS Disks and EPROMS with the code during each phase of the testing cycle. We got a good deal on diskettes and EPROMs so we will include every-one! The production version will include SOURCE in "C".

As with all the SOURCE we distribute, it is free for non-commercial use.

Support contributions are accepted and commercial licensing arrangements can be made. Contact RATS for details. ALL proceeds go to the enhancement of the Packet Network.

Other happenings:

John Howell N2FVN has produced an implementation of the "Asynchronous Framing Technique (AFT) in "C". This is useful for providing error-checked, transparent HDLC links through asynchronous interfaces. AFT can be run over seven or eight bit networks and handles HDLC frames transparently. It is a nice building-block for the network.

This AFT is a generic implementation (accompanied by a "DOC" file) that includes code that runs under MS-DOS. Distribution of this code, in compressed form, will be via Amateur Packet Radio, Usenet and CompuServe HAMNET. The file name(s) will be based on the string "AFT10" for AFT version 1.0. It will be distributed in compressed form. We'll send it out with the first COSI-Switch test code.

John is working on a matching capability for the TNC-2. This would provide a error-checked link between PCs and



TNCs. Harlan Worchel, KB2CNL (yes, a NOVICE I) is working on porting the code to the Commodore 64.

Brian Riley's (KA2BQE) latest release of the Packet Radio MailBox System, version 95c, supports forwarding through COSI-Switch, GatorSwitch and NET/ROM. It also has the "KT" (kill traffic) feature that will automatically generate a service message when a traffic message is removed from the packet network. It is available from RATS, with the "C" SOURCE CODE. Send a message to N2DSY @ KD6TH-4/201 or KA2BQE @ KA2BQE-4/609 to get a copy of the code.

RATS is currently beta-testing the GLB Netlink 220 19.2 KBps modem/radios. So fast ! Scoo good ! We are also burning-in eight PAC-COMM DR-200s. These will be deployed shortly.

RATS wishes to thank you for your patience. We're not real happy with how we got into the Level 3 COSI-Switch delay, but we think the effort is on the right track. If you have any questions call or send me a message.

Hang tough. We think you'll like the output !

Next update will be sent on or about 15 September.

Vy 73,
J. Gordon Beattie, Jr.

MAIL
Unix: ihnp4lhouxm!hou2d!n2dsy
Amateur: n2dsy @ kd6th-4/201

TELEPHONE
Office: 201-615-2506
Home: 201-387-8896

NNC Project Update

by Dr. David Toth, VE3GYQ

It has been quite a while since members were brought up to date regarding the NNC (Network Node Controller). I think a brief recap of the project is in order.

It became obvious to many people that the packet revolution had arrived, and that we might become victims of our own success. What I mean is that we were likely to see packet fall apart because it was so popular. With the increase in activity, it was obvious that we needed two big things to build the network successfully:

1) HIGH SPEED RADIO MODEMS.

2) A DEVICE TO ROUTE PACKETS AROUND OUR MYSTICAL (MYTHICAL) NETWORK.

Where are we as of this moment in 1987? Well, we have 56 kilobaud modems. Everyone won't need one, but some of the bearded wonders (do Phil Karn and Bob McGwier have beards? nawwww! oh well!) are reproducing the modem designed in Georgia, and you will be hearing big things about it soon.

That brings us back to the NNC. Well, Jay Nugent WB8TKL and his squad in Michigan (including N8BJX and WA1LRL) have got the SCSI interface working and talking to a hard drive. They also gave us a communications program, and that brought us the next major breakthrough. Bob McGwier, N4HY, has been porting the TCP/IP code over to the NNC and we hope to have something to test by the end of October. Our major stumbling block is the C compiler that Bob has to use. It was designed for a Z80, and is limited to the 64k architecture of that chip. The 64180 of the NNC can address more memory, so Bob is hand-patching the assembly code produced by his C compiler so that he can work with the larger memory.

So, if anyone has a lead on a cheap, and good, C compiler for the 64180 that does not use overlays, but indeed does support the 64180 completely, we would love to hear about it.

Bob feels that this can all be married with NET/ROM feeder links so that we can interface to existing parts of the network. Howie is talking with Phil Karn and Bob as to what can be accomplished with a melding of the Virtual Circuit technology with the Datagram stuff of TCP/IP and NET/ROM.

I think that we can safely say that we are beyond the days of squabbling as to whether datagrams are better than virtual circuits, etc. If one looks at the commercial world, one sees a happy smattering of both, and they co-exist. After talking to Howie, Phil, and Bob, I am assured by them that such will be the case in the amateur network.

And while I am discussing the network, I should advise you that the various BBS programs written by WORLI/VE3GYQ, WA7MBL, and KA2BQE are all being modified (constantly) to integrate them into an enhanced network.

I am presently meeting with Chris Sullivan VE3NRT, who has extensive network design experience, in order to design a specification for the next generation of BBSs. This specification will be presented to the software types for scrutiny and criticisms/comments.

So, if there is one message that I can leave you with, it is to go out and line up RF sites so that we can press onward with establishing connectivity. Dust off your copies of Tanenbaum's "Computer Networks" and see what constructive comments you can add.

73,
David B. Toth, M.D. VE3GYQ
NNC Project Manager

New WA8DED Firmware Available

Ron Raikes, WA8DED, recently uploaded the following new versions of his popular TNC firmware to the CompuServe HamNet DL9 Data Library.

TNC1FW.ARC: version 1.3 user firmware for the TAPR TNC-1 and clones. This version adds a full duplex command and a patchable location for 8-bit character sets in terminal mode.

TNC2FW.ARC: version 2.1 user firmware for the TAPR TNC-2 and clones. This version adds a full duplex command and a patchable location for 8-bit character sets in terminal mode. DWAIT channel arbitration has been replaced by P-persistence.

PK87FW.ARC: version 2.1 user firmware for the AEA PK-87. Changes are identical to those in TNC2FW.ARC.

Support TAPR! Renew Your Membership!

With *Packet Radio Magazine* no longer publishing, *PSR* is the only dedicated source of packet radio-related material. And *PSR* is only available as part of your membership in TAPR. Please check your membership expiration date (on the mailing label for this issue) and, if it's 7/87 or earlier, please RENEW! Use the membership renewal form on the back page.

Keep *PSR* coming to you! TAPR thanks you for your support!



NET/ROM Mini-Directory as of September 1, 1987

Location	Call	Ident.	Owner's Name and Callsign	Location	Call	Ident.	Owner's Name and Callsign	Location	Call	Ident.	Owner's Name and Callsign	Location	Call	Ident.	Owner's Name and Callsign
AK Anchorage	AL7CM-5		Pierco, Malt	AL7CM				FL Gainesville	K4DP8-1		Peterson, Richard K.	MS Vicksburg	WB55XK-4		Ford, Bill
AK Anchorage	AL7CM-6		Pierco, Malt	AL7CM				FL Hollywood	WA4WED-2		Webb, Ed	MS Vicksburg	WB55XK-5		Ford, Bill
AL Birmingham	K4FUM-1		Sandidge, Jere T.	K4FUM				FL Hollywood	WA4WED-3		Webb, Ed	NC Cary	K4ITL-1		Stephenson, Ed
AL Birmingham	K4FUM-2		Sandidge, Jere T.	K4FUM				FL Bonestead (N. Keys)	AA47M-1	HST	Bertrand, William G.	NC Charlotte	W48FB-1		Mecklenburg ARS Inc.
AL Birmingham	K4BAL-1		Wingate, Henry A., Jr.	K4BAL				FL Lake Wales	WA47M-2		Bertrand, William G.	NC Fayetteville	W48FB-2		Chilcote, Robert L.
AL Birmingham	K4BAL-2		Wingate, Henry A., Jr.	K4BAL				FL Miami	KB4VMA-1		McKenzie, William A.	NC Fayetteville	W48FLR-9		Chilcote, Robert L.
AL Birmingham	K4BAL-3		Wingate, Henry A., Jr.	K4BAL				FL Miami	KB4VMA-2		Figueroa, Edward R.	NC Fayetteville	W48BVV-1		Edington, Ray J.
AL Birmingham	K4BAL-4		Wingate, Henry A., Jr.	K4BAL				FL Naples	KC5YD-1		Figueroa, Edward R.	NC Greensboro	WB4MOR-5		Layno, J. Charles
AL Birmingham	K4BAL-5		Wingate, Henry A., Jr.	K4BAL				FL Naples	KC5YD-2		Voltaire, Paul	NC Greensboro	WB4MOR-6		Layno, J. Charles
AR Evening Shade	KF5TL-1		McKenzie, Charles L.	KF5TL				FL Naples	KC5YD-3		Voltaire, Paul	NC Greensboro	WB4MOR-7		Inasco, Ron
AR Evening Shade	KF5TL-2		McKenzie, Charles L.	KF5TL				FL Naples	KC5YD-4		Voltaire, Paul	NC Greensboro	WB4MOR-8		MacLeod, James D.
AR Evening Shade	KF5TL-3		McKenzie, Charles L.	KF5TL				FL Orange Park	WS8UQ-2		Moore, John R.	NC Morrisville	WB8OUE-6		Cain, Tom
AR Evening Shade	KF5TL-4		McKenzie, Charles L.	KF5TL				FL Orlando	K4ABO-1		Diggs, James W.	NC Morrisville	WB8OUE-7		Cain, Tom
AR Little Rock	KC5JE-1		Reaves, Donald E.	KC5JE				FL Orlando	K4ABO-2		Diggs, James W.	NC Morrisville	WB8OUE-8		Cain, Tom
AR Little Rock	KC5JE-2		Reaves, Donald E.	KC5JE				FL Orlando	ND48IM-1		LaPointe, Bruce	NC Morrisville	WB8OUE-9		Cain, Tom
AZ Dewey/Hingus Mt.	NE7CF-1	DEMEY	Oliver, Joe	NE7BN1				FL Orlando	ND48IM-2		LaPointe, Bruce	NC Wilson	WE4J-1		Evans, Tommy
AZ Gilbert	NB7QGM-1		Schroeder, Mark S.	NB7QGM				FL Orlando	ND48IM-3		LaPointe, Bruce	NC Wilson	WE4J-2		Warren, Bob
AZ Gilbert	NB7QGM-2		Schroeder, Mark S.	NB7QGM				FL Orlando	ND48IM-4		LaPointe, Bruce	NC Wilson	WE4J-3		Warren, Bob
AZ Kingman	NB7AG-1		Bannan, Joe	NB7AG				FL Orlando	ND48IM-5		LaPointe, Bruce	NC Wilson	WE4J-4		Warren, Bob
AZ Phoenix	NB7BN1-1	PRX	Oliver, Joe	NB7BN1				FL Sarasota	W4IE-1		Sarasota ARC	NC Winterville	WD4JQP-1	PGV	Ross, Wayne
AZ Prescott/Mt. Union	NB7BN1-15	BN1	Oliver, Joe	NB7BN1				FL Stuart	K4MTA-1		Sarasota ARC	NC Winterville	WD4JQP-2		Ross, Wayne
AZ Prescott/Mt. Union	NB7BN1-16	PRC	Oliver, Joe	NB7BN1				FL Stuart	K4MTA-2		Sarasota ARC	NC Winterville	WD4JQP-3		Ross, Wayne
AZ Prescott/Mt. Union	NB7BN1-17	PRC	Oliver, Joe	NB7BN1				FL Stuart	K4MTA-3		Sarasota ARC	NC Winterville	WD4JQP-4		Ross, Wayne
AZ Show Low/Greens Ph	N7GMP-6	FSOM	Oliver, Joe	NB7BN1				FL Tampa	K4LXK-1		Sarasota ARC	NC Winterville	WD4JQP-5		Ross, Wayne
CA Bakersfield	W6CBA-1	CPK	Barlow, Chris	W6CBA				FL Tampa	K4LXK-2		Sarasota ARC	NC Winterville	WD4JQP-6		Ross, Wayne
CA Berkeley (Grizzly Mt.)	AA7B-1	TM	Neal, Terrance M.	AA7B				FL Tampa	K4LXK-3		Sarasota ARC	NC Winterville	WD4JQP-7		Ross, Wayne
CA Big Bear	AA6TB-1	TM	Martin, William	AA6TB				FL Tampa	K4LXK-4		Sarasota ARC	NC Winterville	WD4JQP-8		Ross, Wayne
CA Canoga Park	WA6SBV-1		Martin, William	WA6SBV				FL Tampa	K4LXK-5		Sarasota ARC	NC Winterville	WD4JQP-9		Ross, Wayne
CA Canoga Park	WA6SBV-2		Martin, William	WA6SBV				FL Tampa	K4LXK-6		Sarasota ARC	NC Winterville	WD4JQP-10		Ross, Wayne
CA Chatsworth	K61YK-12		Fortney, James T.	K61YK				FL Tampa	K4LXK-7		Sarasota ARC	NC Winterville	WD4JQP-11		Ross, Wayne
CA Chatsworth	K61YK-13		Fortney, James T.	K61YK				FL Tampa	K4LXK-8		Sarasota ARC	NC Winterville	WD4JQP-12		Ross, Wayne
CA Chatsworth	K61YK-14		Fortney, James T.	K61YK				FL Tampa	K4LXK-9		Sarasota ARC	NC Winterville	WD4JQP-13		Ross, Wayne
CA Del Mar	W6WTF-1		Antonio, Franklin	W6WTF				FL Tampa	K4LXK-10		Sarasota ARC	NC Winterville	WD4JQP-14		Ross, Wayne
CA Del Mar	W6WTF-2		Antonio, Franklin	W6WTF				FL Tampa	K4LXK-11		Sarasota ARC	NC Winterville	WD4JQP-15		Ross, Wayne
CA Eureka	K6MEO-1	EUREKA	Phlegly, John W.	K6MEO				FL Tampa	K4LXK-12		Sarasota ARC	NC Winterville	WD4JQP-16		Ross, Wayne
CA Fresno	W6SAV-1		Post, William R.	W6SAV				FL Tampa	K4LXK-13		Sarasota ARC	NC Winterville	WD4JQP-17		Ross, Wayne
CA Fresno	W6SAV-2		Post, William R.	W6SAV				FL Tampa	K4LXK-14		Sarasota ARC	NC Winterville	WD4JQP-18		Ross, Wayne
CA Garberville	W6GAT-1	FRESNO	Bayle, Vernon L.	W6GAT				FL Tampa	K4LXK-15		Sarasota ARC	NC Winterville	WD4JQP-19		Ross, Wayne
CA Laguna Beach	W6SUU-1		Taylor, Lynn W.	W6SUU				FL Tampa	K4LXK-16		Sarasota ARC	NC Winterville	WD4JQP-20		Ross, Wayne
CA Los Angeles	W6MNT-3	LAX	Pettus, Michael G.	W6MNT				FL Tampa	K4LXK-17		Sarasota ARC	NC Winterville	WD4JQP-21		Ross, Wayne
CA Magalia	K6GMS-1		Corbridge, Robert L.	K6GMS				FL Tampa	K4LXK-18		Sarasota ARC	NC Winterville	WD4JQP-22		Ross, Wayne
CA Mountain View	W6BFC-1	MMORM	Westfall, Brian G.	W6BFC				FL Tampa	K4LXK-19		Sarasota ARC	NC Winterville	WD4JQP-23		Ross, Wayne
CA Mt. Lassen	W6BDM-2	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-20		Sarasota ARC	NC Winterville	WD4JQP-24		Ross, Wayne
CA Mt. Lassen	W6BDM-3	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-21		Sarasota ARC	NC Winterville	WD4JQP-25		Ross, Wayne
CA Mt. Lassen	W6BDM-4	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-22		Sarasota ARC	NC Winterville	WD4JQP-26		Ross, Wayne
CA Mt. Lassen	W6BDM-5	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-23		Sarasota ARC	NC Winterville	WD4JQP-27		Ross, Wayne
CA Mt. Lassen	W6BDM-6	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-24		Sarasota ARC	NC Winterville	WD4JQP-28		Ross, Wayne
CA Mt. Lassen	W6BDM-7	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-25		Sarasota ARC	NC Winterville	WD4JQP-29		Ross, Wayne
CA Mt. Lassen	W6BDM-8	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-26		Sarasota ARC	NC Winterville	WD4JQP-30		Ross, Wayne
CA Mt. Lassen	W6BDM-9	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-27		Sarasota ARC	NC Winterville	WD4JQP-31		Ross, Wayne
CA Mt. Lassen	W6BDM-10	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-28		Sarasota ARC	NC Winterville	WD4JQP-32		Ross, Wayne
CA Mt. Lassen	W6BDM-11	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-29		Sarasota ARC	NC Winterville	WD4JQP-33		Ross, Wayne
CA Mt. Lassen	W6BDM-12	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-30		Sarasota ARC	NC Winterville	WD4JQP-34		Ross, Wayne
CA Mt. Lassen	W6BDM-13	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-31		Sarasota ARC	NC Winterville	WD4JQP-35		Ross, Wayne
CA Mt. Lassen	W6BDM-14	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-32		Sarasota ARC	NC Winterville	WD4JQP-36		Ross, Wayne
CA Mt. Lassen	W6BDM-15	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-33		Sarasota ARC	NC Winterville	WD4JQP-37		Ross, Wayne
CA Mt. Lassen	W6BDM-16	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-34		Sarasota ARC	NC Winterville	WD4JQP-38		Ross, Wayne
CA Mt. Lassen	W6BDM-17	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-35		Sarasota ARC	NC Winterville	WD4JQP-39		Ross, Wayne
CA Mt. Lassen	W6BDM-18	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-36		Sarasota ARC	NC Winterville	WD4JQP-40		Ross, Wayne
CA Mt. Lassen	W6BDM-19	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-37		Sarasota ARC	NC Winterville	WD4JQP-41		Ross, Wayne
CA Mt. Lassen	W6BDM-20	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-38		Sarasota ARC	NC Winterville	WD4JQP-42		Ross, Wayne
CA Mt. Lassen	W6BDM-21	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-39		Sarasota ARC	NC Winterville	WD4JQP-43		Ross, Wayne
CA Mt. Lassen	W6BDM-22	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-40		Sarasota ARC	NC Winterville	WD4JQP-44		Ross, Wayne
CA Mt. Lassen	W6BDM-23	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-41		Sarasota ARC	NC Winterville	WD4JQP-45		Ross, Wayne
CA Mt. Lassen	W6BDM-24	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-42		Sarasota ARC	NC Winterville	WD4JQP-46		Ross, Wayne
CA Mt. Lassen	W6BDM-25	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-43		Sarasota ARC	NC Winterville	WD4JQP-47		Ross, Wayne
CA Mt. Lassen	W6BDM-26	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-44		Sarasota ARC	NC Winterville	WD4JQP-48		Ross, Wayne
CA Mt. Lassen	W6BDM-27	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-45		Sarasota ARC	NC Winterville	WD4JQP-49		Ross, Wayne
CA Mt. Lassen	W6BDM-28	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-46		Sarasota ARC	NC Winterville	WD4JQP-50		Ross, Wayne
CA Mt. Lassen	W6BDM-29	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-47		Sarasota ARC	NC Winterville	WD4JQP-51		Ross, Wayne
CA Mt. Lassen	W6BDM-30	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-48		Sarasota ARC	NC Winterville	WD4JQP-52		Ross, Wayne
CA Mt. Lassen	W6BDM-31	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-49		Sarasota ARC	NC Winterville	WD4JQP-53		Ross, Wayne
CA Mt. Lassen	W6BDM-32	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-50		Sarasota ARC	NC Winterville	WD4JQP-54		Ross, Wayne
CA Mt. Lassen	W6BDM-33	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-51		Sarasota ARC	NC Winterville	WD4JQP-55		Ross, Wayne
CA Mt. Lassen	W6BDM-34	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-52		Sarasota ARC	NC Winterville	WD4JQP-56		Ross, Wayne
CA Mt. Lassen	W6BDM-35	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-53		Sarasota ARC	NC Winterville	WD4JQP-57		Ross, Wayne
CA Mt. Lassen	W6BDM-36	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-54		Sarasota ARC	NC Winterville	WD4JQP-58		Ross, Wayne
CA Mt. Lassen	W6BDM-37	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-55		Sarasota ARC	NC Winterville	WD4JQP-59		Ross, Wayne
CA Mt. Lassen	W6BDM-38	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-56		Sarasota ARC	NC Winterville	WD4JQP-60		Ross, Wayne
CA Mt. Lassen	W6BDM-39	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-57		Sarasota ARC	NC Winterville	WD4JQP-61		Ross, Wayne
CA Mt. Lassen	W6BDM-40	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-58		Sarasota ARC	NC Winterville	WD4JQP-62		Ross, Wayne
CA Mt. Lassen	W6BDM-41	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-59		Sarasota ARC	NC Winterville	WD4JQP-63		Ross, Wayne
CA Mt. Lassen	W6BDM-42	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-60		Sarasota ARC	NC Winterville	WD4JQP-64		Ross, Wayne
CA Mt. Lassen	W6BDM-43	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-61		Sarasota ARC	NC Winterville	WD4JQP-65		Ross, Wayne
CA Mt. Lassen	W6BDM-44	VACA	Rumphrey, Dennis	W6BDM				FL Tampa	K4LXK-62		Sarasota ARC	NC Winterville	WD4JQP-66		Ross, Wayne
CA Mt. Lassen	W6BDM-45	VACA													

U400	ATLANA	GA	145.0300	870701	K09HT	INDIANHPLIS	IN	145.0300	870701	KAK31W	FORT WASHINGTON	ND	145.0300	860925
UA4UNU	ATLANA	GA	7.0930	870701	K09QB	NOBLESVILLE	IN	145.0100	870605	K3AEE	GLEN BURNIE	ND	145.0100	860925
UA4UNU	ATLANA	GA	145.0100	870701	K09QB	NOBLESVILLE	IN	145.0300	870605	K3AEE	GLEN BURNIE	ND	145.0500	860201
UA4UNU	ATLANA	GA	145.0300	870701	K09LP	PEARU	IN	145.0100	870701	M2FB	GLENWOOD	ND	145.5900	870810
UA4UNU	ATLANA	GA	146.7300	870701	K09LP	PEARU	IN	145.0900	870701	W3FFU	MIDDLE RIVER	ND	145.5500	870810
K4TQL	CARTERSVILLE	GA	145.0900	870701	K09JQ	TERRE HAUTE	IN	145.0100	870605	W3FFU	MIDDLE RIVER	ND	221.0100	870716
U04B	CHICKANUGA	GA	145.0100	870701	W9UXP	VALPARAISO	IN	145.0100	870605	W3TMZ	MOUNT RARY	ND	14.1050	861021
U04B	CHICKANUGA	GA	145.0900	870701	W9UXP	VALPARAISO	IN	145.0700	870605	W3TMZ	MOUNT RARY	ND	145.0100	860204
W4KAU	CONUTTA	GA	145.0100	870605	W9ZRX	WESTFIELD	IN	7.0930	870701	W3TMZ	MOUNT RARY	ND	145.0500	870701
W4KAU	CONUTTA	GA	145.0900	870701	W9ZRX	WESTFIELD	IN	14.1090	870701	KA3T	MT. RARY	ND	145.0900	870810
M4C1	CONVERS	GA	14.1050	860413	W9ZRX	WESTFIELD	IN	145.0100	870701	KA3T	MT. RARY	ND	221.0100	870701
M4C1	CONVERS	GA	145.0100	860413	W9ZRX	WESTFIELD	IN	145.0100	870701	W3YOH	PIKESVILLE	ND	145.0500	870810
K440UX	CONVERS	GA	145.0100	861101	HOFFN	CLAY CENTER	KS	145.0100	870701	KB3MY	SILVER SPRING	ND	14.1090	861121
KF4JF	HAHARA	GA	145.0100	870103	NXOR	DOHNS	KS	145.0100	870701	KB3MY	SILVER SPRING	ND	145.0500	861021
KF4JF	HAHARA	GA	14.1030	870419	NMON	HAYS	KS	145.0100	870701	M400	SILVER SPRING	ND	145.0300	870810
KF4JF	HAHARA	GA	14.1070	870103	MODOT	JUNCTION CITY	KS	14.1050	870605	M400	SILVER SPRING	ND	221.0100	870701
K41CT	MACON	GA	145.0100	870103	WBOREX	OLATHE	KS	145.0500	870701	K302P	WESTMINSTER	ND	145.0300	870810
KD4NC-1	MARIETTA	GA	145.0100	870605	MSDKO-1	WICHITA	KS	145.0100	870701	W3PXP	WHEATON	ND	145.0500	870810
K14X0	MARIETTA	GA	145.0100	870605	K09PU	ELSMERE	KY	144.9500	870605	N1AHH	BANGOR	ME	145.0100	870701
K14X0	MARIETTA	GA	145.0300	870605	K09PU	ELSMERE	KY	145.0100	870605	N1AHH	BANGOR	ME	145.0300	870701
K14X0	MARIETTA	GA	146.1300	870605	K14UH	FLORENCE	KY	145.0100	870703	W10JB-1	BOWDOIN	ME	145.0100	870701
K14X0	MARIETTA	GA	145.0100	860206	K14UH	FLORENCE	KY	145.0100	870701	W10JB-3	BOWDOIN	ME	145.0300	870701
W042NW	MOULTAIE	GA	145.0100	861101	KF4NB	LEXINGTON	KY	145.0100	870707	W10JB-4	BOWDOIN	ME	446.8200	870701
UA4BRO	ROSWELL	GA	14.1070	860413	KF4NB	LEXINGTON	KY	145.0900	870707	W10JB-6	BOWDOIN	ME	28.2750	870701
KF4JF-1	TIFTON	GA	14.1070	870701	W4UMR	LOUISVILLE	KY	145.0100	870701	N1AKR-3	CUMBERLAND CENTER	ME	145.0300	870701
AH6GJ	KRAUPO, MAUI	HI	14.1070	870701	K44BCD	PARK HILLS	KY	144.9500	870803	N1AKR-3	CUMBERLAND CENTER	ME	446.8200	870701
AH6GJ	KRAUPO, MAUI	HI	145.0100	870701	K44BCD	PARK HILLS	KY	145.0100	870803	K1MON	SCARBOROUGH	ME	145.0500	870701
KH6GP1	MAHOLA, OAHU	HI	145.0100	870701	W09TPG	VERSAILLES	KY	14.1090	870707	W2YVUL-4	SOUTH FREEPORT	ME	145.0100	870701
KH6WY	NILILANI, OAHU	HI	14.1030	870701	W09TPG	VERSAILLES	KY	145.0100	870707	ADBY	ANN ARBOR	MI	145.0300	870701
KH6WY	NILILANI, OAHU	HI	14.1070	870701	K0SSL	BATON ROUGE	LA	14.1110	870701	W11AL	BRIGHTON	MI	14.1110	870701
KH6WY	NILILANI, OAHU	HI	14.1090	870605	K0SSL	BATON ROUGE	LA	145.0100	861130	W11AL	BRIGHTON	MI	145.0100	870701
KH6WY	NILILANI, OAHU	HI	145.0500	870701	USX	BATON ROUGE	LA	145.0500	870605	NBBMA	DETROIT	MI	145.0100	870701
NAOP	AMES	IA	145.0100	860204	WBSAA	BREAUX RIDGE	LA	145.0100	870701	NBBMA-1	DETROIT	MI	220.5200	870605
K10Q	AMES	IA	145.0100	870701	WSDVM	LAKE CHARLES	LA	145.0100	870605	NBBMA-1	DETROIT	MI	221.0100	870701
K10Q	AMES	IA	147.5550	860815	WSDLL	LAFAYETTE	LA	145.0100	870701	K0MLD	FARSEA	MI	144.9300	870605
NAOS	AMES	IA	147.5550	860815	RESU	MONROE	LA	145.0100	870701	NBBUX	GRAND RAPIDS	MI	144.9300	870605
W0ARGU	CEDAR FALLS	IA	145.0100	870701	WBSZE	NEW ORLEANS	LA	145.0100	870701	W0BUE	GRAND RAPIDS	MI	144.9300	870701
W0RJT	CEDAR RAPIDS	IA	145.0100	870701	WBSZE	NEW ORLEANS	LA	145.0300	870701	W0BUE	GRAND RAPIDS	MI	145.0100	870701
W0RJT	CEDAR RAPIDS	IA	145.0500	870701	SHHNB-1	SHREVEPORT	LA	145.0100	870724	KJ0C	HOLLAND	MI	145.0100	870701
W0JFS-1	DES MOINES	IA	145.0100	870701	ACTON	ACTON	MA	145.0900	870701	KJ0C-1	HOLLAND	MI	147.5600	870701
W0JFS-1	DES MOINES	IA	147.5550	860815	W11AJ	AGUAWAN	MA	145.0500	870701	W0OLE	MARQUETTE	MI	145.0100	870701
N0HME	FORT MADISON	IA	145.0100	870701	K1B0G	ATTLEBORO	MA	145.0500	870701	KE0DM	MASON	MI	145.0100	870701
KNDN	INDEPENDENCE	IA	145.0100	870701	K1B0G	ATTLEBORO	MA	221.1100	870701	K0P0G	PIMCONNING	MI	145.0100	870701
N0RAN	MCCALLSBURG	IA	14.1090	870701	N1ACA	BEDFORD	MA	145.0100	861130	W00WKA	SOUTHFIELD	MI	145.0100	860204
N0RAN	MCCALLSBURG	IA	145.0100	870701	K10JH	BILLERICA	MA	145.0100	860102	KE0X	TRENTON	MI	145.0500	870701
R10Z	ROLAND	IA	145.0100	870701	N1BGG	BOSTON	MA	145.0100	870605	W0KDX	WALLED LAKE	MI	145.0500	870701
K47RMA-1	BOISE	ID	145.0100	870605	N1BGG	BOSTON	MA	145.0500	870605	W0KDX	WALLED LAKE	MI	220.5200	870701
K7JD	HAYDEN LAKE	ID	145.0100	870701	K3NC	BOSTON	MA	145.0100	870329	N10R	WHITE PIGEON	MI	144.9300	870701
K9HHO	GOODFIELD	IL	145.0100	870605	W10DH	BROOKLINE	MA	145.0100	870701	N10R	WHITE PIGEON	MI	145.0100	870701
K9HHO	GOODFIELD	IL	147.5550	870324	W10DH	BROOKLINE	MA	145.0100	870605	W0C0G	APPLE VALLEY	MI	7.0930	870701
W09CZ1	HILLSBORO	IL	145.0100	870701	W10DH	BROOKLINE	MA	145.0500	870605	W0C0G	APPLE VALLEY	MI	14.1110	870701
K9KYK	HILLSBORO	IL	145.0100	870605	W10DH	BROOKLINE	MA	145.0900	870701	W0C0G	APPLE VALLEY	MI	145.0500	870701
W0LUN	LAKE FOREST	IL	145.0100	870806	K1NER	EAST HAMPTON	MA	14.1110	870605	W0C0G	APPLE VALLEY	MI	145.0100	870701
W0ZTK	MENDOTA	IL	145.0700	870701	W11WU-1	LAWRENCE	MA	221.1100	870605	W0C0G	APPLE VALLEY	MI	145.0300	870701
W09MJN	NAPERVILLE	IL	144.9500	870605	W11WU-1	LAWRENCE	MA	145.0900	870605	W0G0G	LITTLE FALLS	MI	145.0100	870605
W09MJN	NAPERVILLE	IL	145.0100	870605	K1BC	LEXINGTON	MA	221.1100	870605	W0G0G	LITTLE FALLS	MI	145.0100	870605
W0900U	NORTHLAKE	IL	145.0100	870605	K1BC	LEXINGTON	MA	145.0500	870701	W0G0G	ROCHESTER	MI	145.0100	870605
N3RIA	SCHAUMBURG	IL	145.0500	870806	W11CWG	MANOMET	MA	145.0100	870701	W0G0G	ROCHESTER	MI	145.0100	870605
KJ9L	SKOKIE	IL	145.0500	870806	ARIA	MARSHFIELD	MA	145.0100	870701	W0G0G	ROCHESTER	MI	145.0100	870605
KJ9L	SKOKIE	IL	145.0100	870806	W12HC	MATTAPANSETT	MA	145.0100	861130	W0G0G	ROCHESTER	MI	145.0500	870722
K04PS	TRENTON	IL	145.0500	870701	W12HC	MATTAPANSETT	MA	145.0500	870605	W0G0G	ROCHESTER	MI	145.0500	870722
W0CD	URBANA	IL	10.1490	870701	W12HC	MATTAPANSETT	MA	221.1100	870605	W0G0G	ROCHESTER	MI	145.0100	870722
W0CD	URBANA	IL	145.0100	870701	W12HC	MATTAPANSETT	MA	14.1070	870701	W0G0G	ROCHESTER	MI	145.0300	870722
K9CU	URBANA	IL	145.0100	870701	K11NGO	METHUEN	MA	221.1100	870701	W0G0G	ROCHESTER	MI	145.0100	870722
K9CU	URBANA	IL	145.0100	870701	K11NGO	METHUEN	MA	14.1100	870701	W0G0G	ROCHESTER	MI	145.0100	870722
K9CU	URBANA	IL	145.5550	870701	K11NGO	METHUEN	MA	145.0700	870701	W0G0G	ROCHESTER	MI	145.0100	870722
K9JA	URBANA	IL	145.0100	870701	K11NGO-1	METHUEN	MA	221.1100	870701	W0G0G	ROCHESTER	MI	145.0500	870722
K9JA	URBANA	IL	145.0900	870701	K11NGO-1	METHUEN	MA	145.0700	870701	W0G0G	ROCHESTER	MI	145.0100	870722
K9JA	URBANA	IL	145.0100	870605	W10W	MORFOLK	MA	145.0700	870701	W0G0G	ROCHESTER	MI	145.0100	870722
W090Z5	VERNON HILLS	IL	145.0100	870605	K1UGM	WAKEFIELD	MA	221.1100	870701	W0G0G	ROCHESTER	MI	14.1070	870701
W091UB	ANDERSON	IN	145.0100	870701	W03TA1	ACCOKEEK	MD	145.0300	870810	W0G0G	ROCHESTER	MI	145.0100	870722
W091UB	ANDERSON	IN	147.5550	870701	W3UPR	ANNAPOLIS	MD	145.0900	870420	W0G0G	ROCHESTER	MI	145.0500	870722
W08YVA	BLOOMINGTON	IN	145.0100	870605	W3UPR	ANNAPOLIS	MD	221.0100	870420	W0G0G	ROCHESTER	MI	145.0100	870722
W08YVA	BLOOMINGTON	IN	145.0500	870701	W32H	ANNAPOLIS	MD	145.0500	870810	W0G0G	ROCHESTER	MI	145.0100	870722
W08YVA	BLOOMINGTON	IN	145.0100	870701	W04ARP	ANNAPOLIS	MD	10.1490	870420	W0G0G	ROCHESTER	MI	145.0100	870722
K19D-1	DELPHI	IN	145.0500	870605	W04ARP	ANNAPOLIS	MD	145.0500	870420	W0G0G	ROCHESTER	MI	145.0100	870722
K19D-1	DELPHI	IN	14.1110	870701	W03EFG	BALTIMORE	MD	145.6600	870701	W0G0G	ROCHESTER	MI	14.1090	870701
M4X1	EVANSVILLE	IN	145.0100	870701	W03H0X	BALTIMORE	MD	145.5500	870810	W0G0G	ROCHESTER	MI	145.0100	870701
M4X1	EVANSVILLE	IN	145.0100	870701	K3UPZ	BALTIMORE	MD	145.0500	870701	W0G0G	ROCHESTER	MI	145.0900	870701
K09L0N	EVANSVILLE	IN	145.0500	870701	K3UPZ	BALTIMORE	MD	14.1030	861021	W0G0G	ROCHESTER	MI	145.0100	870605
K09L0N	EVANSVILLE	IN	145.0100	870701	W31W1	CLARKSVILLE	MD	14.1110	870701	W0G0G	ROCHESTER	MI	145.0100	870701
K08NH	FORT WAYNE	IN	145.0100	870701	W31W1	CLARKSVILLE	MD	145.0100	870810	W0G0G	ROCHESTER	MI	145.0100	870701
M9BAC	FORT WAYNE	IN	145.0100	870701	W31W1	CLARKSVILLE	MD	145.0500	870810	W0G0G	ROCHESTER	MI	145.0100	870701
M9BAC	FORT WAYNE	IN	145.0500	870701	W31W1	CLARKSVILLE	MD	221.0100	870810	W0G0G	ROCHESTER	MI	145.0100	870701
M9BAC	FORT WAYNE	IN	14.1070	870605	N3CHS	CLINTON	MD	145.0300	861021	W0G0G	ROCHESTER</			

WA8HGL	FAYETTEVILLE	NC	145.0100	870701	KMSD	CORRALES	NM	145.0100	870605	WB0LS	DELAWARE	OH	144.9300	870701
WD4M0-1	GREENSBORO	NC	145.0100	870701	MS1CC	LAS CRUCES	NM	145.0100	870605	WB9AM0	ENON	OH	145.0100	861130
K400	GREENVILLE	NC	145.0100	870701	KMS2EC-1	LAS CRUCES	NM	145.0100	870120	NBET	FINDLAY	OH	145.0100	870701
KF4M0-2	LUMBERTON	NC	145.0100	870701	KE0JC	LOS ALAMOS	NM	145.0100	861130	WB8JXM	FOREST PARK	OH	144.9100	870701
KF4M0-3	LUMBERTON	NC	14.1070	870701	MS5A	ROSWELL	NM	145.0100	870701	WB8JXM	FOREST PARK	OH	145.0100	870701
KF4MJ	MONROE	NC	10.1490	870701	MS6GC	SANTA FE	NM	145.0100	861130	WB8JXM	FOREST PARK	OH	221.1100	870701
KF4MJ	MONROE	NC	145.0100	870701	W7LHD	SANTE FE	NM	145.0100	870605	NBFIS	FRENONT	OH	145.0100	870701
AA4L	RALEIGH	NC	145.0100	870120	W7LHD	SANTE FE	NM	145.0500	870605	MK0T	LOVELAND	OH	144.9500	870701
WA1LPD-1	RALEIGH	NC	145.0100	870701	KD7PK	LAS VEGAS	NU	145.0100	870605	MK0T	LOVELAND	OH	145.0100	870701
WA1LPD-1	RALEIGH	NC	147.5400	870701	M2EZG	ALPINE	NY	145.0100	870805	WBNE-1	MANFIELD	OH	145.0100	870701
WASSZL-1	RALEIGH	NC	145.0100	861101	M2EZG	ALPINE	NY	145.0700	870805	KAB0CM	MARTIN'S FERRY	OH	145.0100	870701
WB0VHU	DEVILS LAKE	ND	14.1070	870701	M1BCK	BALDWINVILLE	NY	145.0100	870605	WBBLUP	POLAND	OH	14.1030	860204
WB0VHU	DEVILS LAKE	ND	145.0100	870701	M1BCK-4	BALDWINVILLE	NY	145.0900	870605	WBBLUP	POLAND	OH	145.0100	870701
WADLAE	GRAFTON	ND	145.0100	870701	K2APL-4	BRIARWOOD	NY	145.0500	870701	WBGAG	SHAKER HTS.	OH	145.0500	870701
WADLAE	GRAFTON	ND	146.7000	870701	K2APL-4	BRIARWOOD	NY	141.0000	870701	KCBJN	WINTERSVILLE	OH	145.0100	870605
WDLHS	WEST FARGO	ND	14.1070	870701	WB2UPH-2	BROCKPORT	NY	145.0100	870805	WB5ROH-1	FORT GIBSON	OK	145.0100	870716
WDLHS	WEST FARGO	ND	146.7000	870701	M2EPO	CHURCHVILLE	NY	145.0300	870805	WB5ROH-1	FORT GIBSON	OK	145.0900	870716
AG0M	BAYARD	NE	145.0100	870825	KC2A2	ELNIRA	NY	145.0100	870805	WB5RZX	HORNAM	OK	145.0100	870701
AG0M-5	BAYARD	NE	14.1070	870825	NA2A2	ELNIRA	NY	145.0700	870805	KFSUY	ROFF	OK	145.0100	870710
WA0PKM	WASTINGS	NE	145.0100	870803	KC2EQ	ELNIRA	NY	145.0700	870605	MS4X-1	TULSA	OK	7.0930	870716
WB0K0K	LINCOLN	NE	145.0100	870803	WA2UPY	ELNIRA	NY	145.0700	870701	MS4X-1	TULSA	OK	145.0100	870716
WB0K0K	LINCOLN	NE	145.0700	870803	W2DUC	FRIARPORT	NY	145.0100	860102	K71FG	PORTLAND	OR	7.0930	870807
K0TAJ	MCCOOK	NE	145.0100	870605	W2HPPM	FARMINGVILLE	NY	7.0930	870701	K71FG	PORTLAND	OR	14.1070	870807
K0B0Y	OMAHA	NE	145.0100	870803	W2HPPM	FARMINGVILLE	NY	14.1110	870701	K71FG	PORTLAND	OR	145.0100	870807
NF0M-2	SIOUX CITY	NE	145.0100	870701	W2HPPM	FARMINGVILLE	NY	145.0700	870701	W7M	PORTLAND	OR	145.0100	870120
NF0M-2	SIOUX CITY	NE	145.0100	870605	W2HPPM	FARMINGVILLE	NY	221.1100	870701	K57Y-1	PARTRIE PEAK	OR	145.0100	870120
NF0M-2	SIOUX CITY	NE	147.5550	870522	W2JUP	FARMINGVILLE	NY	7.0930	870603	N3ET	ALLEN TOWN	PA	145.0100	870813
WB1DSW	EAST KINGSTON	NH	14.1090	870605	W2JUP-4	FARMINGVILLE	NY	14.1110	870701	N3ET	ALLEN TOWN	PA	221.0100	870813
WB1DSW-1	EAST KINGSTON	NH	7.0930	870605	W2JUP-4	FARMINGVILLE	NY	144.9700	870603	KB3L	BEAVER FALLS	PA	145.0300	870701
WB1DSW-1	EAST KINGSTON	NH	145.0500	870605	W2JUP-4	FARMINGVILLE	NY	145.0100	870701	WA3001	BEAUVIC	PA	145.0300	870701
WB1DSW-1	EAST KINGSTON	NH	221.1100	870605	W2JUP-4	FARMINGVILLE	NY	145.0700	860803	WA3001-1	BLOODSBURG	PA	145.0100	870701
KE1G-1	GOFFSTOWN	NH	145.0100	860102	W2JUP-4	FARMINGVILLE	NY	221.1100	870701	KB3UD	EAST BANGOR	PA	144.9700	870701
WA1FH0	MARLOW	NH	145.0100	870701	W2JUP-4	FARMINGVILLE	NY	411.0000	870701	KB3UD	EAST BANGOR	PA	145.0100	870701
N1DRK-1	SALEM	NH	145.0100	870605	W2JUP-12	FARMINGVILLE	NY	1297.5000	870603	KB3UD	EAST BANGOR	PA	221.0100	870701
N1DRK-1	SALEM	NH	145.0700	870605	A120-4	FREEPORT	NY	145.0100	870701	W2X0	GIBSONIA	PA	145.0100	870605
W1PW	WINDHAM	NH	221.1100	870701	A120-12	FREEPORT	NY	221.0100	870701	W2X0	GIBSONIA	PA	145.0300	870605
KC2TH	ATCO	NJ	14.1090	870701	KC2PH	HEARLEA	NY	145.0500	870805	WB3AFL-1	GREENSBORO	PA	145.0100	870701
KC2TH	ATCO	NJ	145.0100	860204	M2AUK-1	HOWARD BEACH	NY	411.0000	870701	AK3P	HAMELSTOWN	PA	145.0100	870701
KC2TH	ATCO	NJ	145.0300	870701	N1DL	HUNTINGTON	NY	14.1090	870701	AK3P	HAMELSTOWN	PA	145.0500	870701
K31HA	BARGAIN TOWN	NJ	145.0900	870701	N1DL	HUNTINGTON	NY	145.0100	870701	WB3EVB	HARRISBURG	PA	145.0100	870322
N20SV-4	BERGENFIELD	NJ	145.0700	870701	N1DL	HUNTINGTON	NY	411.0000	870701	WA6YBT	HARRISBURG	PA	145.0500	870701
N20SV-4	BERGENFIELD	NJ	411.0000	870701	WA2AKN-2	HYDE PARK	NY	145.0100	870701	AK3PU	HARRISBURG	PA	145.0100	870415
WA2VKH	CARLSTADT	NJ	145.0100	860204	WA2AKN-2	HYDE PARK	NY	145.0700	870701	KB3ZU	HONESDALE	PA	145.0500	870515
K3GVS	CROFUT	NJ	145.0100	870701	WA2AKN-2	HYDE PARK	NY	220.5500	870701	KB3ZU	HONESDALE	PA	145.0900	870419
K3GVS	CROFUT	NJ	220.0100	870701	WA2AKN-2	HYDE PARK	NY	221.1100	870701	WA3TSW	HONSHAN	PA	145.0900	870716
KF4TT	EAST BRUNSWICK	NJ	145.0100	870701	KD2GB	JOHNSON CITY	NY	145.0700	870805	WA3TSW	HONSHAN	PA	221.0100	870716
WB2EHA	EAST WINDSOR	NJ	145.0100	870701	NA2B	MASSENA	NY	14.1110	870805	N3ERE-15	LAPORTE	PA	145.0100	870701
WB2EHS	EAST WINDSOR	NJ	223.4000	870701	NA2B	MASSENA	NY	145.0100	870805	K3DSM-5	MALVERN	PA	145.0700	870701
K2ADJ	EDGEWATER	NJ	145.0100	870701	K2AAA-4	MONTRAU	NY	14.1090	870103	K3DSM-5	MALVERN	PA	221.0100	870701
WB2DAD	EGG HARBOR	NJ	145.0100	870701	K2AAA-4	MONTRAU	NY	145.0100	870701	KA30RW	PITTSBURG	PA	145.0100	870605
WB2PAG	ENERSON	NJ	145.0100	870701	K2AAA-4	MONTRAU	NY	145.0700	860803	KA30RW	PITTSBURG	PA	145.0300	870701
WA2SMA-1	HAUTHORNE	NJ	145.0100	870701	K2AAA-4	MONTRAU	NY	221.1100	870701	W3UC	PITTSBURG	PA	145.0100	861130
WA2SMA-1	HAUTHORNE	NJ	221.0100	870701	WB2ACU	NEW BERLIN	NY	145.0700	870805	N3ACL	RED HILL	PA	145.0100	870701
KA2B0E-4	INDIAN MILLS	NJ	145.0700	870701	N2MH-4	NEW YORK CITY	NY	145.0100	870605	K3PGB	ROSLYN	PA	145.0100	870701
KA2B0E-4	INDIAN MILLS	NJ	221.0100	870701	N2MH-4	NEW YORK CITY	NY	411.0000	870701	K3PGB	ROSLYN	PA	145.0500	870701
WB2HB2-1	KINHELO	NJ	145.0500	870605	W2IC2	NIAGARA FALLS	NY	7.0970	870701	N3ACL	ROYERSFORD	PA	145.0500	870701
KY2D-2	LITTLE SILVER	NJ	145.0100	870701	W2IC2	NIAGARA FALLS	NY	145.0100	870605	N3CHX	ROYERSFORD	PA	145.0500	870605
WB2HMF	NEDFORD	NJ	145.0100	870301	KA2BHB	ROCHESTER	NY	145.0300	870701	WA7SS0	STATE COLLEGE	PA	145.0100	870701
WB2HMF	NEDFORD	NJ	145.0300	870701	KA2BHB	ROCHESTER	NY	145.0100	870324	AG3F	TOUANDA	PA	14.1110	870701
WB2HMF	NEDFORD	NJ	221.0100	870701	WA2UHX	SARATOGA SPRINGS	NY	145.0500	870322	AG3F	TOUANDA	PA	145.0100	870701
NH22-4	NEPTUNE	NJ	145.0500	870605	WA2UHX	SARATOGA SPRINGS	NY	145.0100	870805	WA3CY0	WASHINGTON	PA	145.0100	861101
NH22-4	NEPTUNE	NJ	221.0100	870605	KC3B0	SKANEATELES	NY	145.5500	870701	WA3UAT	WASHINGTON	PA	145.0100	870605
KB1BD-4	PLAINSBORO	NJ	145.0700	870701	KC3B0	SKANEATELES	NY	145.0100	870605	F3RLI	WILKES-BARRE	PA	145.0100	870701
KB1BD-4	PLAINSBORO	NJ	221.0100	870701	M2AYV-1	SOUTH GLENS FALLS	NY	145.0500	870605	K3RLI	WILKES-BARRE	PA	145.0500	870701
WB2GWD	READINGTON	NJ	145.0100	870701	M2AYV-5	SOUTH GLENS FALLS	NY	145.0500	870805	F3KLI	WILKES-BARRE	PA	221.0100	870416
WB2GWD	READINGTON	NJ	221.0100	870701	WA2TUE-4	UTICA	NY	145.0100	870814	KB3UN	WILLIAMSPORT	PA	145.0100	861015
WB2COP-2	RED BANK	NJ	145.0300	870701	WA2PUU	VALATIE	NY	7.0930	870814	W3GWS	YORK	PA	144.9500	870701
WB2COP-2	RED BANK	NJ	221.0100	870701	WA2PUU	VALATIE	NY	145.0100	870814	N1DKF	CRAWSTON	RI	145.0700	870605
M2EUV-4	TRENTON	NJ	145.0700	870701	WA2PUU	VALATIE	NY	145.0500	870814	N1DKF	CRAWSTON	RI	221.1100	870605
M2EUV-4	TRENTON	NJ	145.5700	870701	WB2JA-4	WHITE PLAINS	NY	145.0500	870605	N1SU	WARWICK	RI	146.0700	870701
WB2RUW	TRENTON	NJ	145.0100	870605	WB2JA-4	WHITE PLAINS	NY	221.0100	870605	KA4YEA	ANDERSON	SC	145.0100	870701
W2UY-1	UNION	NJ	145.0100	870605	WA2EKE-4	WOODSIDE	NY	145.0500	870701	WA4S2K	FLORENCE	SC	14.1090	870701
W2UY-1	UNION	NJ	145.0500	870605	WA2EKE-4	WOODSIDE	NY	221.0100	870701	WA4S2K	FLORENCE	SC	145.0100	870701
M4JS-4	VINELAND	NJ	10.1490	870701	WBBERQ	BLANCHESTER	OH	145.0100	870701	KA4YEA	GREENVILLE	SC	145.0700	870701
M4JS-4	VINELAND	NJ	144.9700	870701	KCBTU	CINCINNATI	OH	144.9100	870605	KF4EF	MONCK'S CORNER	SC	145.0100	870701
M4JS-4	VINELAND	NJ	145.0900	870701	KCBTU	CINCINNATI	OH	145.0100	870605	W0PUF	RAPID CITY	SD	14.1070	870825
WB2RUX	VOORHEES	NJ	145.0100	870605	ADB1	CIRCLEVILLE	OH	7.0930	870701	W0PUF	RAPID CITY	SD	145.0100	870825
WB2RUX	VOORHEES	NJ	220.0100	870605	ADB1	CIRCLEVILLE	OH	14.1090	870701	WB400C	CLEVELAND	TH	145.0100	870701
KA90-1	WARREN	NJ	145.0100	870701	ADB1	CIRCLEVILLE	OH	145.0100	870701	WB400C	CLEVELAND	TH	145.0900	870701
WB2UXT-4	WATERFORD MILLS	NJ	145.0700	870701	ADB1	CIRCLEVILLE	OH	145.0500	870701	K4JKR-1	GERMANTOWN	TH	145.0100	861118
WB2UXT-4	WATERFORD MILLS	NJ	221.0100	870701	KB8CI	CLEVELAND	OH	14.1070	860204	WB7B0X-1	JACKSON	TH	145.0100	870701
KD6TH	WYCKOFF	NJ	221.0100	870424	KB8CI	CLEVELAND	OH	145.0100	870701	W4X5	JOHNSON CITY	TH	145.0100	870701
KD6TH-1	WYCKOFF	NJ	145.0700	860803	KB8CI	CLEVELAND	OH	145.0500	870701	W4X5	JOHNSON CITY	TH	145.4800	870701
WB2ARS	ALBUQUE RQUE	NM	145.0500	870701	WB8CQ	COLUMBUS	OH	144.9300	870605	K4E1D	KNOXVILLE	TH	7.0870	870701
KASBEA-1	ALBUQUE RQUE	NM	145.0100	8										

W4HHY	NASHVILLE	TN	145.0100	870701
K84MK	OLIVER SPRINGS	TN	145.0100	870710
K4NJK	PIKESVILLE	TN	145.0100	870710
KC401	POWELL	TN	145.0100	870701
KC401	POWELL	TN	147.4800	870701
KD4MC	SWEAT MTN	TN	145.0100	860204
AE51	ABILENE	TX	145.0100	870710
K85PH	AUSTIN	TX	145.0100	870701
W85ZOS	BRYAN	TX	145.0100	870102
K85KTH	CLEAR LAKE CITY	TX	145.0100	870806
W85PUC	DALLAS	TX	145.0100	870710
W85JXY-1	EL PASO	TX	145.0100	870701
W85JXY-1	EL PASO	TX	145.0500	870701
W85NWD	GARLAND	TX	10.1450	870710
W85NWD	GARLAND	TX	145.0100	870710
W5X0	GAUSE	TX	7.0930	870701
W5X0	GAUSE	TX	14.1090	870701
W5X0	GAUSE	TX	145.0100	870701
W85BBW	HOUSTON	TX	145.0100	870806
W85BBW	HOUSTON	TX	145.0900	870806
W85JLI	HOUSTON	TX	145.0100	860204
KF5SE	PALESTINE	TX	145.0100	870701
AF5U	RICHARDSON	TX	145.0900	870710
KC5FK	SAN ANTONIO	TX	149.0900	870701
W5IFP	SAN ANTONIO	TX	145.0700	870724
W5IFP	SAN ANTONIO	TX	145.0900	870724
W5LL	SAN ANTONIO	TX	145.0100	870701
W85QZ1	SAN ANTONIO	TX	7.0930	870701
W85QZ1	SAN ANTONIO	TX	14.1110	870701
W85QZ1	SAN ANTONIO	TX	145.0100	870701
W85QZ1	SAN ANTONIO	TX	145.0900	870701
W84EUU	SPRING	TX	14.1070	870806
W84EUU	SPRING	TX	145.0900	870806
K87TY	BLANDING	UT	14.1070	870701
K87TY	BLANDING	UT	145.0100	870701
W7HQK	CEDAR CITY	UT	145.0100	870120
W87MBL	LOGAN	UT	145.0100	870803
W87MKZ-2	LOGAN	UT	145.0100	870410
KE7AU	OREN	UT	145.0300	870111
W87BEG	PROVO	UT	145.0300	870111
W87TRX	SALT LAKE CITY	UT	145.0100	870701
W87UZO	SALT LAKE CITY	UT	145.0100	870120
W84TFZ-2	CHARLOTTEVILLE	VA	145.0100	870802
K4HGC-1	DALE CITY	VA	145.0100	870802
K4HGC-1	DALE CITY	VA	145.0700	870802
K4HGC-2	DALE CITY	VA	221.0100	870802
W84D	FRONT ROYAL	VA	145.0100	870802
W84OHX	HANPTON	VA	145.0100	870802
W84RTS	LYNCHBURG	VA	145.0100	870802
W84RTS	LYNCHBURG	VA	145.0500	870802
W84TSC	MIDDLEBURG	VA	145.0900	870802
W84TSC-1	MIDDLEBURG	VA	145.0100	870802
K8NM0	OAKTON	VA	14.1110	870802
K8NM0	OAKTON	VA	145.0700	870802
W84ONG-10	RICHMOND	VA	145.0100	870819
W84ONG-10	RICHMOND	VA	145.0500	870819
W84QOJ	ROANOKE	VA	145.0500	870802
W84MI2	VIRGINIA BEACH	VA	145.0100	870802
W84MI2	VIRGINIA BEACH	VA	145.0500	870802
W4KZL	WYTHEVILLE	VA	145.0100	870802
W4KZL	WYTHEVILLE	VA	145.0900	870802
KD1A-1	MILTON	VT	145.0100	870701
W87DCH	ENUNCLAW	WA	14.1090	870701
W87DCH	ENUNCLAW	WA	145.0100	870701
K87UEE	EVERETT	WA	145.0100	870701
K87UEE	EVERETT	WA	145.0900	870701
KE7OM	NORTH BEND	WA	7.0930	870605
KE7OM	NORTH BEND	WA	14.1110	870605
KE7OM	NORTH BEND	WA	145.0100	870701
W87NTF-1	SPANAWAY	WA	144.9900	870810
W87NTF-1	SPANAWAY	WA	146.9800	870810
W7HFZ	SPOKANE	WA	145.0100	870701
W7HFZ	SPOKANE	WA	145.0300	870701
W7FYA	TACOMA	WA	144.9900	870810
W7FYA	TACOMA	WA	146.9800	870710
K87UKB	TACOMA	WA	145.0100	870701
K87UKB	TACOMA	WA	145.0300	870701
W89DH1	CEDARBURG	WI	14.1090	870712
W89DH1	CEDARBURG	WI	145.0900	870712
W9EQP	EAU CLAIRE	WI	145.0100	870424
W89QWH	FRANKLIN	WI	14.1070	870712
W89QWH	FRANKLIN	WI	145.0100	870712
W89U	GREEN BAY	WI	145.0100	870605
W89LST	KENOSHA	WI	145.0900	870712
W9LZQ-1	LA CROSSE	WI	145.0100	870716
W9LZQ-1	LA CROSSE	WI	145.0900	870716
W9WI-1	MADISON	WI	145.0100	870605

W9WI-1	MADISON	WI	145.0700	870605
W89TYT	MILWAUKEE	WI	14.1070	870712
W89TYT	MILWAUKEE	WI	145.0100	870701
W89AHY	NEW BERLIN	WI	145.0900	870712
W89KEC	NORTH PRAIRIE	WI	145.0100	870605
W89KEC	NORTH PRAIRIE	WI	145.0900	870605
W9ZBD	SHIMELANDER	WI	7.0930	870701
W9ZBD	SHIMELANDER	WI	14.1110	870712
W9ZBD	SHIMELANDER	WI	145.0100	870712
W8FJB	BAKERTON	WV	145.0100	870701
W88N1K	KINGWOOD	WV	145.0100	870701
K81SY	TEARRA ALTO	WV	145.0100	870605
W7ZAC	CASPER	WY	145.0100	870825
K831DN	CHEYENNE	WY	145.0100	870701
W87TJU	CHEYENNE	WY	145.0100	870825

Please let me know of any corrections, deletions, additions or verifications to this file. Send them to me - K4HGC @ K4HGC via one of the Packet Radio PBBS mailboxes. If you publish or maintain a Digipeater/PBBS listing, please forward a copy of them to me so that they may be added to this list. Insure that the station you are correcting is marked Digipeater or PBBS. Any call signs listed on this list will be purged if the Update date exceeds 2 years, therefore verification is necessary. The Master list contains over 1000 call signs, of which 55% are digipeaters and 45% are PBBS's. Please do not forward maps or listings which do not indicate if the station is a user, digipeater or PBBS.

73's Don Bennett - K4HGC
15016 Carlisbad Road
Woodbridge, Va 22193
(Home) 703-670-4773
(Office) 703-274-9355/56
(ARRAD BBS) 703-734-1387
(ARRANET) dbennett@aac-hq
(CompServe) - 72310,263

TONIO

01 September 1987

To: All TAPR Members
Fr: Lyle Johnson, President
Re: PSR

Last September, *Packet Status Register (PSR)*, the TAPR newsletter, merged with *Packet Radio Magazine (PRM)*. This resulted in your receiving up-to-date packet radio information on a monthly basis.

By February of this year, *PRM* was in serious trouble. Gwyn Reedy, W1BEL, Editor of *PRM*, lost the valuable assistance of Brad Voss, and was unable to secure additional volunteer help to continue the publication. Feeling the responsibility of continuing the magazine while he searched for help, Gwyn attempted to continue the effort virtually single handedly.

Unfortunately, the combined workload of editing *PRM*, continuing an active role in TAPR and FADCA, and the growing pains of his company (which he also "inherited" when he and his partner parted ways), proved to be too much. After getting the March and April issues of *PRM* out, Gwyn realized he was unable to do everything and still do a good job. Thus, reluctantly, he has stepped down from his directorship of TAPR, the Presidency of FADCA and ceased editing *PRM*. This decision occurred in late July.

Of course, this meant that TAPR had to locate an editor for, and attempt to revive, *PSR*.

I am happy to report that we have been successful in this effort. Effective immediately, Scott Loftesness, W3VS, TAPR Director and CompuServe's HAMNET Chief Sysop, has agreed to edit *PSR* for us. Scott is well qualified for this volunteer post, and we are grateful for his willingness to serve the TAPR membership in this way.

Scott desires that *PSR* be a meaningful publication for packet radio, and this means that he needs technical and operational articles. Please assist us in bringing a quality publication to you by submitting material to him. Material may be sent to the TAPR office at the address indicated on this letterhead, or submitted directly to Scott via CompuServe (upload on the DL7 database), or you may mail information to him at:

Scott Loftesness, W3VS
Editor, *PSR*
16440 Rustling Oak Court,
Morgan Hill, CA 95037.

The "July" cover-date issue is being assembled now, so any submissions you make will be for the next issue.

A final note. TAPR dues were raised last year from \$12 to \$15, partly to cover the additional expense of providing *PRM*. Since the dues were set in 1981, this has been the only increase. Providing the office, supporting packet development, and general costs to maintain the organization have resulted in costs greatly in excess of those anticipated 6 years ago. Therefore, the dues structure will remain as it currently is.

Thank you for your patience with us during this time of turmoil, and please join me in welcoming Scott as your new *PSR* Editor.

Happy Packeting!

Lyle Johnson, WA7GXD
President

MEMBERSHIP APPLICATION

Tucson Amateur Packet Radio Corporation
PO Box 22888, Tucson, AZ 85734

Name: _____

Call License
Sign: _____ Class: _____

Address: _____

City & ZIP
State: _____ Code: _____

Home Work
Phone: _____ Phone: _____

If you wish to have any of the above information deleted from publication in a membership list, please indicate which items you wish suppressed:

I hereby apply for membership in TAPR. I enclose \$15.00 dues for one year's membership dues.

Signature: _____ Date: _____

The Tucson Amateur Packet Radio Corporation is a non-profit, scientific research and development corporation. TAPR is chartered in the State of Arizona for the purpose of designing and developing new systems for packet radio communication in the Amateur Radio Service, and for freely disseminating information required during and obtained from such research.

The officers of the Tucson Amateur Packet Radio Corporation are:

Lyle Johnson, WA7GXD	President
Tom Clark, W3IWI	Executive Vice President
Dianne Marshall, AL7FG	Secretary
Terry Price, N6HBB	Treasurer

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Packet Status Register - July 1987

**Tucson Amateur Packet Radio Corp.
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Check your address label for membership expiration date. Your renewal is important!