TAPR

PACKET STATUS REGISTER

Tucson Amateur Packet Radio Corporation

President's Corner

by Lyle Johnson, WA7GXD

Four Microsats, two UoSATs and FO-20 have now been in orbit for a few months.

From all accounts, people are having a lot of fun with these birds. Webersat is downlinking images, PACSAT and LUSAT are digipeating, DOVE is getting ready to re-appear on 2 meter FM and the Packet Communications Experiment (PCE) aboard UO-14 is digipeating and broadcasting data. And FO-20 is BBSing merrily away... The only major upset so far is the silent UO-15.

The environment of a satellite is a lot different in terms of RF than most terrestrial locations. Many, many stations can hear the satellite's transmissions (downlink). The satellite can hear from a large number of ground stations (uplink) from its vantage point a few hundred miles up. But, most ground stations can't hear each other; this results in simultaneous transmissions (collisions). Having several uplink frequencies helps, but only a little.

The so-called "aloha" efficiency figure of 18% seems to imply five or six uplink channels would result in near 100% efficiency, but this just isn't so. Study of the "aloha" graphs shows this is a kind of maximum - if you continue to add transmissions (data) to the channel, it quickly collapses and efficiency drops to near ZERO!

(It is this characteristic that prompted Phil Karn to push for "p-persistence" for channel-access on Amateur packet channels shared among many users. This is called "slots" in the TAPR 1.1.7 TNC 2 firmware.)

There are a lot of possible ways to try and regulate the use of the satellite to give ever-increasing levels of efficiency.

But regulating Amateurs is not easy!

So, a proposal has been made by Harold Price, NK6K, and Jeff Ward, G0/K8KA, for a satellite "broadcast" protocol. The idea is that your station can hear a lot of data from the satellite. If the satellite has already transmitted a list of messages, for example, there is no need for your station to query it for the same list. But, if that list consisted of 20 packets and you got all but number 14, your station should be able to automatically determine that and just ask for a repeat of packet 14.

Part of the idea here is to limit uplink collisions by limiting the NEED to transmit to the satellite.

UO-14 has been transmitting information using this protocol in a limited fashion. The MicroSats will begin similar transmissions in the near future. UO-14 has also pioneered in the use of 9600 bps FSK transmissions in Amateur satellite work. The TAPR 9600 bps modem adapter is suitable for copying these transmissions, but it is presently only a half-duplex modem, so it isn't really suitable for satellite use (you would need a pair of them). G3RUH has a full-duplex modem design available from various sources, including Pac-Comm in the U.S.

Upgrading the TAPR unit to a new PCB and making it a complete kit would not be a difficult project. How many of you think we should do this (or think we should not)? I'd like to hear your opinions!

The 1200 bps PSK modem kits are selling very quickly these days. This modem is an excellent unit for use on the MicroSats and FO-20. The signals are strong enough that casual monitoring without elaborate antenna systems is possible. If you are curious about packet satellite work, or just want to "read the mail" you should get one of these kits and warm up the soldering iron!

You will also need a receiver capable of operation in SSB mode, 435 through 438 MHz. This can be as simple as an antenna-mounted receiving converter and your HF SSB rig. At 435 MHz, doppler shift can be significant, so be sure the radio has provision for microphone "up/down" buttons to allow the modem to track and tune your radio! Otherwise, a steady hand will be necessary to track manually...

By the way, if you happen to be in England in late July, the University of Surrey is having a Colloquium on the Amateur Satellite program. The dates are July 26-29. I hope to see you there!

TNC 1, and Upgraded TNC 1 Memory Loss

by Lyle Johnson, WA7GXD

The TNC 1, including units upgraded with the TNC 1 Upgrade Kit, may lose their stored parameters from time to time.

This is primarily due to an unreliable reset circuit.

The mechanism that causes the failure is simple. As the TNC loses power when the unit is switched off, the microprocessor attempts to continue to operate. At some voltage below the nominal +5-volt level, the processor will begin to do strange things. By some fluke of Murphy, it will attempt to write to a protected memory area or the NOVRAM. And, by another fluke of Murphy, sometimes it will succeed.

If you operate your TNC from a computer, the simple patch is to simply include a configuration file that you load to the TNC before you attempt to use it. WA7MBL's "YAPP" packet program does this every time you use it. Just increase the size of the setup file to include your callsign and any other parameter you do not operate the same as the EPROM default.

The article "NOVRAM HINTS" first appeared in the May, 1985 issue of PSR (number 15). It appears elsewhere in this PSR. It is a pair of hardware mods. that will cure, or drastically reduce, the incidence of memory failure in the TNC 1.

If the problem is memory failure in the TNC 1 Upgrade, but not accompanied by a loss of baud rate information (ABAUD and/or HBAUD), then the TNC 1 NOVRAM is not being corrupted. Fix #2 in the "NOVRAM HINTS" article will probably fix the problem, but you may wish to do the following first.

1) Double check the battery voltage from the lithium battery to the DS1210 controller chip. It should be above 2.2 volts. If it isn't replace the battery.

2) The DS1210 chip is programmed to disconnect the RAM from the Z80 processor when the +5-volt line drops below +4.75 volts. It may be that you have a particularly susceptible Z80 processor in your upgrade. Try replacing it with a CMOS Z80A or Z80B chip. This will probably cure the trouble.

3) If the above doesn't solve the problem, it is time for major surgery and Fix #2 from the "NOVRAM HINTS" article. Or, load new parameters from your computer when you fire up the TNC.

NOVRAM Hints

by Lyle Johnson, WA7GXD

(reprinted from the May 1985 issue of PSR)

Have you ever been plagued by the NOVRAM in your TNC 1 forgetting? If you have, and if it is a problem for your station operation, read on!

While the NOVRAM in the TAPR TNC 1 is well-isolated from the 6809

microprocessor (by virtue of being interfaced solely through the 6522 VIA, U6), there are times when the 6809 may "scribble" on the NOVRAM, causing it to lose the parameters you have so carefully stored in it. When this happens, you usually have to reboot the TNC by selecting the "ROM" default and going through the autobaud routine to restore the data lost by the NOVRAM.

In order to understand the nature of the two fixes that are presented below, some understanding of the cause of the problem is necessary.

Why the NOVRAM Sometimes Forgets

The only way to change the contents of the NOVRAM in TNC 1 is to write new data to the RAM portion of the chip (XD221, U27) via lines PA4 through PA7 of U6, then toggling the WE line to the NOVRAM by line PA2 of U6.

Then, the $\overline{\text{STORE}}$ line must be toggled by way of line PA3 of U6.

This can all be accomplished by an incorrect write to the "A" port of U6 by the 6809 microprocessor, U5.

It turns out, that when power is turned off to the TNC, the +5 volt line decays slowly in terms of microprocessor time. Thus, the 6809 has time to continue to operate as the voltage decays. One nasty characteristic of the 6809 (and the Z80 for that matter) is that it will begin to misinterpret instructions as the voltage is lowered below its operating specifications. This may allow it to accidentally write incorrect data to 6522 U6 and thus to NOVRAM U27.

Fix #1

The simplest fix to this problem has been submitted by several TNC owners. It consists of isolating the STORE line of the NOVRAM from line PA3 of U6.

Examine the schematic of your TNC 1, page A-3. You will note that there is a 10k pull up resistor, R5, from the STORE line of U27 to the +5 volt bus. Further, switch S4 is used to disconnect the ARRAY RECALL line of the NOVRAM from the reset bus of the TNC.
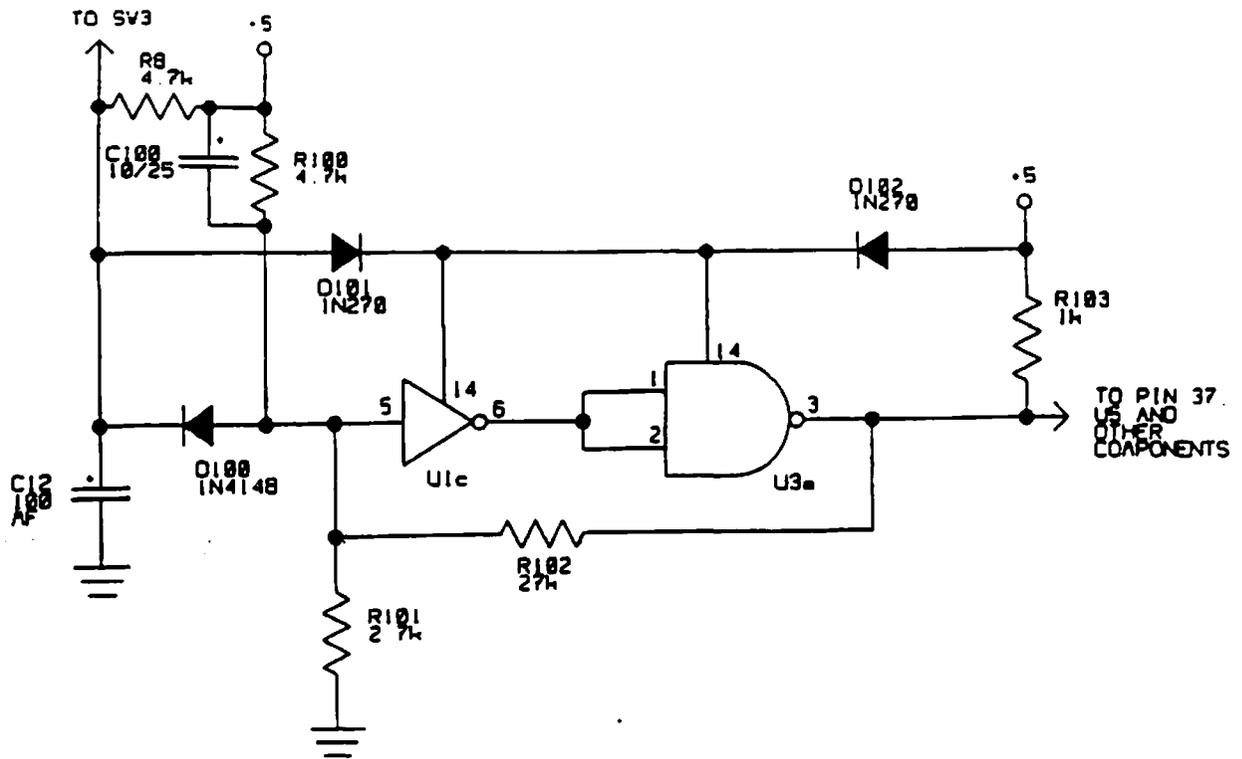
If you have never used the "soft" reset feature of your TNC (and the vast majority of you would never use it), you can use this switch to protect your NOVRAM. If you have the TNC cabinet, it is especially convenient to do this modification.

The procedure is simple.

First, carefully cut the traces to switch S4 pins 4 and 5 (switch position 4). Next, add a small jumper wire from U27 pin 10 to U6 pin 34. This will enable the reset bus from the TNC to force the NOVRAM to recall its permanently stored contents.

Now, cut the trace going from U6 pin 5 (PA3) to U27 pin 9 (STORE). Cut this trace so that resistor R5 (10k) is still connected to U27 pin 9, but not to U6 pin 5.

Add a small jumper wire from U6 pin 5 to S4 pin 4. Add another jumper wire from S4 pin 5 to U27 pin 9.

This completes the modification.

When you operate your TNC, leave switch S4 in the open, or off position. IF you have the cabinet, leave S4 open and leave the "soft/hard" switch in the "soft" position.

Whenever you wish to change the "permanent" contents in either bank of your NOVRAM, place the switch in the closed position (S4 switch 4 on or "soft/hard" in the "hard" position). Issue the PERM command, then return S4 to the off position (or place the "soft/hard" switch in the "soft" position).

Fix #2

For those who desire an "automatic" method of ensuring NOVRAM integrity, the following modification has been engineered by AEA and is part of their PKT-1 packet controller. TAPR extends its thanks to AEA for permission to publish this information.

First, ensure that your TNC is board Rev 3. If it has the TAPR logo on it, it is Rev 3. If your TNC is Rev 2, perform the oscillator modifications listed in PSR number 11 (June, 1984). Then, modify your circuit board to make the changes shown in the figure.

This modification is more complex than Fix #1 and detailed instructions are not provided here. Basically, you have to cut the power traces going to U1 and U3 and jumper around these ICs to provide power to other ICs that are powered by the +5 volt bus after it passes through ICs U1 and U3. Then, add the resistors, capacitors and diodes called out in the parts list below. These are labeled R100-R103, D100-D102 and C100 in the schematic above.

If you have a Rev 3 TNC, remove R87 and install diode D100 in its place. Remove R88 and replace it with R102.)

This circuit senses when the +5 volt bus is falling and asserts the reset line to the 6809 at that time. With reset held low, the 6809 will cease operation, thus preventing it from "scribbling" on your NOVRAM. The reset capacitor, C12, provides power to ICs U1 and U3 through diode D101 to ensure that these TTL ICs perform properly until after the +5 volt bus has fallen sufficiently to ensure that the 6809 will do no further damage to the NOVRAM contents.

Operate your TNC as before.

Parts required for Fix #2

```
D100  1N4148     Silicon Diode
D101  1N270      Germanium Diode
D102  1N270      Germanium Diode
C100  10 uF 25 volt
Electrolytic Cap
R100  4.7k 1/4 watt 5% Resistor
R101  2.7k 1/4 watt 5% Resistor
R102  27k 1/4 watt 5% Resistor
R103  1k 1/4 watt 5% Resistor
```

NOTE: These parts are not available from TAPR and no upgrade kit for this modification will be made available.

PSK Modem Notes

by Lyle Johnson, WA7GXD

This article is a collection of notes from various users of the TAPR PSK modem. These notes have not been checked for technical accuracy and are provided here as a convenience.

If you are the owner of a TAPR PSK Modem, please read these notes and see if any of them apply to your unit!

Power Supply Difficulties

Recent shipments of the PSK modem use an SGS-Thomson LM2930 IC regulator to provide the regulated +10 volts (VR2). Earlier units used the National Semiconductor LM2930T-5.0 regulator.

The SGS-Thomson part is subject to oscillation. The symptom first shows itself when doing initial power tests (page 16 of the March, 1990 edition of the manual). The +5 and +10 volt tests are just fine. Then, a quad op-amp IC is installed (U8) and the +5 volts is again measured. The voltage reads about 300 mV low. If you then check the +10 volts, you will see it is very low. If you look at the power supply lines with an oscilloscope, you will be horrified to see severe, high-amplitude oscillations!

There are two fixes.

Fix #1 is to solder a 0.1 uF capacitor from the center pin of VR2 to an outer pin, then solder another 0.1 uF capacitor from the center pin of VR2 to its other outer pin. This will quench the oscillations.

Fix #2 is to replace the SGS-Thomson part with one from National Semiconductor.

TAPR will be happy to provide you with a replacement IC. Just send us a request along with an SASE.

PLL Calibration Difficulties

Under the section in the manual entitled "Initial PSK Loopback Test" (pages 40 and 41 of the March 1990 edition of the manual) you are directed to loopback test in the PSK and then the Manchester positions of S2.

What is not clear is that you may have to retune the PLL (R33) to effect loopback in the MAN position of S2,

then retune R33 for proper operation in the PSK position of S2.

We have found that use of a Motorola brand IC at U6 (CD4046B) will allow you to perform both tests without retuning.

If you have to retune, this is not an indication of a defective part, just inadequate instructions in the manual! On the other hand, we have Motorola IC's in stock and will replace yours with a Motorola part if you request one. Please include an SASE with the request.

NOTE: We have switched to Motorola ICs for U8 for all units shipped in recent months.

Problems with Tracking Doppler on MicroSats

The MicroSats are in a very low orbit. The result is rapid doppler shift. If your 437 MHz receiver tunes in 10 Hz increments, you may have trouble keeping up with doppler shift on satellite passes that are nearly overhead.

Capacitors C32 and C34 set the maximum stepping rate of the doppler tracking pulse system. They were selected to ensure compatibility with all radios tested at the time the PSK modem was designed (late 1986 and early 1987). Changing these capacitors from 10 uF units to 4.7 uF or 3.3 uF will increase the pulse rate enough to enable you to track the doppler shift of the MicroSats. Don't make them too small, though, or the pulse width may not be enough for your radio.

These capacitors are available from most any electronics outlet, including Radio Shack, and are not stocked by TAPR.

Problems with Audio Levels

The PSK modem doesn't need a lot of audio drive. If you have your speaker connected and want to hear the signal from the satellite, but don't want to add a level control to your modem, you can simply insert a resistor across points 9 and 10 on the main PSK PC board. A value of 47k ohms worked well with Kenwood and ICOM radios used at the MicroSat Lab during satellite testing.

Transmit Audio Phase Distortion

At least one user has found that significant phase distortion results on the transmitted uplink to FO-20 when using the PSK modem. This is due to a time constant problem with the R7/C8 network. This has a phase shift at just under 1 kHz.

Changing R7 to a 2.2k ohm resistor moves this "pole" to just under 10 kHz, safely out of the transmit audio passband.

If you can hear the packet satellites OK, but are having a very low success rate transmitting up to, or through them, try this change!

Again, for an SASE, TAPR will gladly supply this resistor. Future kits will include this value change.

Transmit Audio Level Problems

Many new radios include a "data" connector for directly modulating the transmitter varactor diode to generate an FM signal.

If the PSK modem output level is too low for your radio under this condition, try placing a jumper across JP7. Alternatively, you may want to reduce the value of R5 from 22k to about 4.7k ohms.

Note that the PSK modulator expects some audio filtering from your radio's microphone shaping circuits, so direct modulation may result in a broad signal.

Cabinets

If you bought your PSK modem prior to a few months ago, you may have had trouble locating a cabinet. TAPR has located the source of the original Radio Shack cabinet and has them for sale at $5 plus $3 for surface shipment in the U.S. We have plenty of them in stock. Please be aware that we are losing money on these cabinets at this price, so only order one for your TAPR PSK modem, not for your other projects!

PACSAT Protocol Suite - An overview

by Harold E. Price, NK6K
and Jeff Ward, G0/K8KA

Since December of 1984, the authors have been struggling with the question: "How can we make the best use of a bandwidth-limited low earth orbiting digital store-and-forward system with a worldwide, unstructured, heterogeneous user base?" In answer, we have proposed the use of a broadcast protocol as the basic downlink method, and a "file server" rather than a BBS application. This document provides a brief overview of these conclusions, the companion specification documents provide the implementation details.

A PACSAT, a generic term which encompasses both the University of Surrey's UO-14 and the AMSAT microsats AO-16 and LO-19, is a bandwidth limited device. The number of up and downlinks is much less than the number of users, and the capacity of the link is much less than the offered load. We feel that this is the critical design driver, and the access methods must be optimized with this in mind.

Broadcasting

A spacecraft is inherently a broadcast device. It transmits from on high, and many users can hear it at the same time.

To optimize the available downlink time, we are recommending the use of a broadcast protocol. This protocol adds information to each data packet to permit many stations to make simultaneous use of a single file download session. When one station in Maryland requests the current orbital element sets, there is no need for stations in Toronto and Miami to do the same, they should be able to make use of the information as it is downlinked to Maryland if they are all in view of the satellite at the same time. To make use of a broadcasted frame of data, each frame must be tagged with the file it belongs to and the position within that file that the data belongs in.

There should also be enough information for a station to determine if it has all of the data belonging to a file,

and if not, to request that just the missing parts of the file be retransmitted. The specification titled "PACSAT Broadcast Protocol" describes a method of providing this additional information.

With a broadcast protocol, a ground station can simply monitor the downlink and accumulate files of data. Since files gathered in this way will have been unsolicited, the format of the contents may not be known to the user. For example, if one asked for a file of NASA format orbital elements, one can make a good guess that the resulting file contains NASA format orbital elements. However, if a "random" file is captured, its contents may not be understandable simply from inspection. Some additional information, such as a file name, data type, description, creation date, etc., may be required. Each broadcasted file, therefore, needs a header in a standard format with this information. The specification titled "PACSAT File Header Definition" describes a method of providing this information.

We hope that the broadcast protocol will maximize the use of the downlink. It should reduce the number of requests for files of general interest. It should also reduce the uplink load, since a broadcasted file does not receive an ACK for each frame or group of frames. In the best case, only one ACK is sent for an entire file, and that would be the request to stop broadcasting it.

File Server

As a data transfer and storage device, a PACSAT can serve a multitude of purposes. It can store telemetry, digitized voice and video images, personal mail, forwarded mail, or anything else that can be stored in a computer file. Mail forwarding is a good example of an excellent use of a PACSAT. AO-16's 1200 baud link could easily be used to transfer 240k bytes of uncompressed forwarded mail in each direction between California and England in 24 hours, with just one morning and evening pass over each location. UO-14's 9600 baud link could move 1.6 Mb of data in the same time. A PACSAT can store up to 8Mb of data. This would make a powerful addition to the current HF relay network.

The problem, however, is that the current amateur network is in a state of flux. New addressing schemes are proposed every few weeks, new routes and new ways of routing are proposed, tried, discarded or modified. This is good. Implementing the software on a spacecraft to follow these shifting designs is difficult, however. The testing required for the spacecraft is more rigorous, especially on the microsats, where the same computer is used for the BBS and to keep the batteries charged. Faulty forwarding code could crash the computer, which could cause damage to the batteries or reduce their life expectancy.

The amount of program memory is limited on the spacecraft as well. To counter the effects of high energy particles above the earth's atmosphere which cause memory bits to be changed, the PACSATs use 12 bits to store 8 bits of program data. The extra bits are used to correct for single bit errors. To keep the cost down, and to reduce the power used (AO-16's CPU uses about 500 milliwatts, on average), only 256k bytes of program space is available.

We have a desire, then, to keep the spacecraft code simple and stable, while still allowing it to be a useful part of the changing amateur network.

We propose that the spacecraft be primarily used as a file server, moving data files from one point to another. The PACSAT would have no knowledge of the contents of the files, nor would it take an active role in the forwarding of mail messages. Groundbased software could, however, make the PACSAT system look like a familiar BBS to the user, and it could intelligently forward mail.

A PACSAT will know how to receive and transmit a standard file format. All files will have a standard header, the same one that is used by the broadcast protocol. It will also know how to select files for transmission based on the contents of the header. This feature can then be used by ground station software to emulate any desired user interface.

For example, assume that a user wanted to send a personal mail message to a friend. In the current terrestrial environment, he would connect

to a BBS, which would lead him in a question and answer session something like this:

```
Remote Computer    User
What do you want?  Send message
To who?            Fred
Title?             Club meeting
Message?           Meeting at 8 pm
What do you want?  Read new mail.
Message #200 ...etc.
```

Using the PACSAT system, exactly the same exchange would take place, except that the conversation is between the user and his local computer. The message is stored for later transmission to a PACSAT. The read new mail request is also stored. The next time the PACSAT comes overhead, the computer does the following:

Builds a file with a standard PAC-SAT header. The header says that the file contains a mail message, from you, to Fred. The file is compressed, and sent to PACSAT. The local computer then sends a message to PACSAT that says "send the next file whose header meets the following criteria: it's a mail message type, the destination is me, and the file number is bigger than x."

"x" is the number of the last file received on the ground, and is kept by the local computer. After the pass, the local computer can now print any new mail received. To the user, it looked pretty much the same.

What about file forwarding? A forwarding gateway would need to know what type of mail it could forward. Let's assume that the routing scheme of the week is based on a hierarchical string containing states, like nk6k.ca.usa, and this gateway handles mail to CA, NV, and OR. The gateway would send a message to PACSAT containing the following request:

"Send the next file whose header meets the following criteria: it's a forwarded message, and the destination string contains '?.ca.?' or '?.nv.?' or '?.or.?', and the download count is 0."

The file would be received, decompressed, and imported into the standard BBS program after the pass.

In this way, the ground program can be as simple or as complex as required, the PACSAT only needs to know how to select a file for transmission based

on the contents of field in the standard file header.

Summary

These two ideas, broadcasting, and file server, are certainly different that the current common usage of packet radio on the amateur bands. We feel that this is the best approach for the special case of a PACSAT, however, and that with suitable ground station software, these concepts can be integrated into the mainstream. A prototype of the broadcast file transfer method has already been implemented by one of us, Jeff Ward, and is currently being tested on UO-14. There is still much implementation work to be done.

Comments on this paper and on the referenced specifications are solicited.

Address comments to:

```
Telemail:  BPRICE or UOSAT
Compuserve: 71635,1174
Packet:    NK6K @ WB6YMH or
G0K8KA @ GB2UP
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Editor's note: The protocol specifications referenced in this paper are still undergoing changes. As changes are released, they will be available on CompuServe's HAMNET forum, as well as from the authors.

Interfacing the DRSI PC*PA to the TAPR PSK Modem

by Lyle Johnson, WA7GXD

The DRSI PC*PA is a popular packet adapter for IBM PC's and clones. My particular unit, a Type 1, has one port with an internal modem and one designed for an external modem. The external modem commonly used is the DRSI HF*Modem.

However, it is possible to use either port for satellite operation. This article describes how.

Using the Internal Modem Port

This is the easiest port to use in terms of mods. to the PSK modem. It is the more difficult in terms of mods. to the PC*PA.

The cable from the 8-pin DIN connector of the PSK modem should NOT be terminated to the modem discon-

nect header supplied with the PSK modem kit. Instead, wire it directly to the PC*PA board as follows:

* Brown wire (TXC) to 8530 pin 12.
* Black, Red, Shield (GND) to the ground bus of the PC*PA (8530 pin 31).
* Cut the trace from the 3105 modem chip pin 8 to the 8530 pin 13.
* Orange (RXD OUT) to 8530 pin 13.
* Cut the trace from the 74HC14 (U10 pin 6, early Type 1; U6 pin 4, later Type 1) to the 8530 pin 19.
* Yellow (DCD IN) to U10 pin 6 (early Type 1) or U6 pin 4 (later Type 1).
* Green (RXD IN) to 3105 modem chip pin 8.
* Blue (TXD IN) to 8530 pin 15.
* White (DCD OUT) to 8530 pin 19.

NOTE: Instead of cutting traces, you may elect to simply remove the 8530 from its socket, bend the leads out from the body of the chip, and re-install it in the socket. Be sure pins 13 and 19 do not enter the socket. Then, solder the orange wire to pin 13 and the white wire to pin 19 of the IC itself.

You will have to find a path for the shielded cable from the PC*PA to exit the computer.

NOTE: The PSK modem should be wired up for TNC 1 operation using an x32 clock source for operation with the PC*PA. Next, construct a radio cable from the PC*PA 9-pin DE9 connector to the 5-pin DIN connector labeled TNC AUDIO on the PSK modem. Wire this cable as follows:

DE9	DIN	FUNCTION
1	1	Tx Audio
3	4	Rx Audio
5	3	PTT
6-9	2	GND

Finish installing the PSK modem, interfacing it to your radios as described in the PSK manual.

You will be unable to operate your PC*PA without the PSK modem attached, as the receive data and DCD lines will be disconnected between the on-board modem and the 8530 chip.

Turning off the PSK modem will restore your PC*PA to normal operation; turning it on will bypass the on-

board modem and activate the PSK modem.

Using the External Modem Port

The PC*PA external port is buffered to RS-232 levels for interfacing to external devices. In addition, it can provide a limited amount of +12 VDC power to an external modem.

The TAPR PSK modem uses TTL interface levels. It also runs on +12 VDC.

The PC*PA RS-232 level translator chips must be disabled. In early Type 1 units, this means pulling U13 (1488) and U14 (1489) chips. Using a plug-in header, or by soldering jumpers, install the following jumpers:
- 1488 pin 2 to pin 3 (TXD)
- 1488 pin 8 to pin 9 (RTS)
- 1489 pin 1 to pin 3 (RXD)
- 1489 pin 4 to pin 6 (x32 CLK)
- 1489 pin 11 to pin 13 (DCD)

For later Type 1 units, remove the 145406 chip (U9) and jumper it as follows:
- Pin 3 to pin 14 (TXD)
- Pin 2 to pin 15 (RXD)
- Pin 5 to pin 12 (RTS)
- Pin 6 to pin 11 (DCD)
- Pin 7 to pin 10 (x32 CLK)

Due to a change in the number of buffers available, the wiring from the 25-pin DB25 connector on the PC*PA varies between older units and newer units. (See the table for wiring.) Wire the cable carefully!

If you wish to power the PSK modem from the PC*PA, connect the +12 volt power lead from the PSK modem to the DB25P connector, pin 11, and install jumper JP3 (older Type 1) or JP2 (newer Type 1).

You will need to add a PTT keyer in the PSK modem to accommodate the fact that the PSK modem assumes

a PTT keyer in the attached TNC. You may want to use one of the unused wires in the 8-pin DIN cable (yellow or green) and intercept it in the PSK modem. DO NOT wire these connections to the 3PDT switch if you choose to use this approach.

The simplest way to make a PTT keyer is to use the RTS line (pin 4 of the DB25) to drive a VN10 transistor gate. Connect the Source to ground and attach the drain to the PTT line (VHF radio port, 5-pin DIN connector pin 3). Bypass this line with a 0.01 uF capacitor and protect it with a 1N4752 Zener diode. If you expect to run your PSK station unattended, include a watchdog timer on this line.

As in the case above, be sure to set the PSK modem for TNC 1 (x32 clock) operation.

With the PSK modem set up for an external modem port, the PSK ON/OFF switch has no effect. It must be left on to use the PSK modem. Turning it off merely disconnects the PSK modem, but does not re-attach an existing modem.

If you have re-wired the PSK modem's 8-pin DIN connector to accommodate the RTS and/or power lines, your PSK modem will not be interchangeable with other PSK modems for use with other TNCs. This is not a problem, but you should put a label on your PSK modem indicating it is wired in a non-standard manner to prevent someone from attempting to connect it to another TNC at a later date.

There you have it. PSK with the PC*PA. See you on the satellites!

Connecting the TAPR State Machine DCD Upgrade to the DRSI PC*PA

by Lyle Johnson, WA7GXD

The DRSI PC*PA is a very popular packet controller for use with an IBM PC. It essentially consists of an 8530 Serial Communications Controller (SCC) chip and a programmable timer for additional baud generators. The PC then becomes the brains of the packet system.

There are three versions of the dual-port PC*PA available: one has no modems, one a single modem and the other a pair of 1200 bps modems. Since the PC*PA is a two-channel device, channels without modems are connected to an RS-232 driver and the RS-232 levels are then available on a rear-panel connector.

The internal modems used, the Texas Instruments TCM3105, provide good performance for data recovery, but share the poor DCD (Data Carrier Detect) characteristics of all the single-chip telephone modems.

This article will explain how to install the TAPR State Machine DCD Upgrade to all models of the PC*PA.

Physical Considerations

The first problem is one of physical placement. The PC*PA is a half-length card which fits into a standard "ISA 8" (IBM PC) expansion slot.

If you have spare slot space available (perhaps due to a second serial port on an expansion card which takes a back-panel bracket location but leaves the slot connector unused), you can simply attach the upgrade with double-sided adhesive foam.

If you have an original 5-slot PC, you probably don't have a spare slot, but the slots are further apart than in the later 8-slot machines and the same trick should work.

In my case, I have an old AT clone with no slots I am willing to sacrifice. I found that the slot nearest the outside rear corner in my machine had a lot of space between the solder-side of the PC*PA and the outer case. So... I in-

DB25P (old)	DB25P (new)	PSK cable	Function
17	15	Brown wire	(TXC)
7	7	Black, Red, Shield	(GND)
3	3	Orange	(RXD OUT)
2	2	Blue	(TXD IN)
8	8	White	(DCD OUT)

stalled my PC*PA in this slot position and used double-sided adhesive foam tape to affix the upgrade to the "bottom" of the PC*PA.

If none of these methods appeal to you, there is a better solution. The DCD Upgrade PC board is exactly 1/2 the height of the PC*PA. You can use epoxy cement and glue the Upgrade PC board (or boards if you want to use both ports of the PC*PA) to the edge of the PC*PA circuit board. This will simply make the 1/2 length card a 3/4 length card. If you elect to use this method, route the cabling from the circuit side of the Upgrade PC board, soldering it to the component side, rather than the normal cabling method of routing the cabling from the component side of the Upgrade and soldering it to the circuit side.
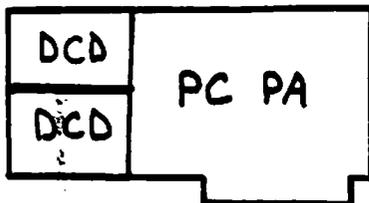
Wiring
Once the physical position has been determined, and the DCD State Machine Upgrade PC board(s) built, you are ready to interface to the PC*PA.

The instructions in the State Machine document describe interfacing for various modems. In this case we will wire it for the 8530 SCC. Any attached modem will have to conform to the requirements of this chip anyway, so this is a safe approach.

NOTE: The optional internal clock is NOT needed with the PC*PA. The 8530 SCC will provide us with the clock signal we need.

Channel A
For the internal modem on the Type 1 PC*PA, and 8530 Channel A on all units, connect the Upgrade as follows:

1) Brown wire (+5V) to 8530 Pin 9 (or anywhere else on the Vcc bus).

2) Red wire (GND) to 8530 pin 31 (or anywhere else on the GND bus).

Break the trace that connects the 8530 pin 19 to the rest of the board. In a Type 1 unit, this is U10 pin 6 (older units) or U6 pin 4 (newer units).

In lieu of cutting the trace, you may simply remove the 8530 from its socket and bend pin 19 straight out from the body of the part.

3) Green wire (-DCD out) to 8530 pin 19 (or directly to the IC pin if you bent it out instead of cutting the trace).

4) Blue wire (CLK) to 8530 pin 12.

5) Violet wire (DCD in) to the device that connected to the 8530 pin 19 before you cut it in the step above (in the case of a Type 1 PC*PA, connect this wire to U10 pin 6 [older units] or U6 pin 4 [newer units]), or to pin 19 of the 8530 socket if you bent the lead out instead of cutting the trace.

6) Gray wire (NRZI) to 8530 pin 13.

The orange and yellow wires are not used. The green LED on the PC*PA will not reflect the State Machine DCD output. If you wish it to, cut the trace from green LED D3 to the chip driving it (U8 pin 4 in the case of older Type 1 PC*PAs, and U11 pin 4 in the case of newer Type 1 units) and connect the orange wire from the Upgrade to the LED.

Channel B
For the external port on the Type 1 PC*PA, and 8530 Channel B on all units, connect the Upgrade as follows:

1) Brown wire (+5V) to 8530 Pin 9 (or anywhere else on the Vcc bus).

2) Red wire (GND) to 8530 pin 31 (or anywhere else on the GND bus).

Break the trace that connects the 8530 pin 21 to the rest of the board. In a Type 1 unit, this is U14 pin 11 (old units) or U9 pin 11 (newer units).

In lieu of cutting the trace, you may simply remove the 8530 from its socket and bend pin 21 straight out from the body of the part.

3) Green wire (-DCD out) to 8530 pin 21, or directly to the IC pin if you bent it out instead of cutting the trace.

4) Blue wire (CLK) to 8530 pin 28.

5) Violet wire (DCD in) to the device that connected to the 8530 pin 21 before you cut it in the step above (in the case of a Type 1 PC*PA, con-

nect this wire to U14 pin 11 [older units] or U9 pin 11 [newer units]), or to pin 21 of the 8530 socket if you bent the lead out instead of cutting the trace.

6) Gray wire (NRZI) to 8530 pin 27.

The orange and yellow wires are not used. The green LED on the PC*PA will not reflect the State Machine DCD output. If you wish it to, cut the trace from green LED D5 to the chip driving it (U8 pin 4 on older Type 1 units, U11 pin 12 on newer Type 1s) and connect the orange wire from the Upgrade to the LED.

Final Steps
You may want to alter the shift of the 3105 internal modem(s) on your PC*PA. To do so, disconnect the 3105 modem chip pin 5 from whatever is driving it, and connect this pin to ground. Changing from 1000 Hz shift to 800 Hz shift will more evenly distribute the audio spectrum of your transmission, and narrow it slightly. More importantly, it will speed up the DCD response of receiving units, especially those based on PLL's.

Double-check all wiring, then install the PC*PA in your computer and operate as before. You can now operate open-squelch on VHF using the internal modem of your PC*PA if it is so equipped.

Bits in the Basement

by Bdale Garbee, N3EUA

Hi! I've been pretty busy since my last column... I travelled to HAMCOM in Texas for the first time, had an interesting phone call from JR1VMX of PRUG, and have a few other tidbits to pass along. My apologies if things aren't as smooth this time around, but I'm racing against the clock to get this done before leaving for some vacation time!

What's Up In Japan
I received a surprise phone call the other night from JR1VMX, who was in San Francisco on business. He took advantage of being a non-international phone call away to check in and give me a couple of pieces of information about what's happening with PRUG, the Packet Radio User's Group of Japan, of which he is President. He

expects to be back in the Bay Area sometime later this summer, and I'm hoping we'll have enough advance warning to arrange a meeting, there, or here in Colorado. As always seems to be the case with long distance phone calls, I enjoyed the chat and then realized afterwards how much more I wished I had asked...

Inouye-san reports that experiments with V.29 9600 baud modems continue, with one group using the Yamaha modems in a mode that gives 7200 baud, which they report works a lot better with more off the shelf radios. There are plans for meetings of the group working on 10 GHz hardware in the next month, and he hopes that there will be more to report soon. And most interesting to Karen and me was the news that Sakurai-san, VP of Prug, is engaged to be married this fall! Sakurai-san made the arrangements and met us at the airport when Karen and I travelled to Japan last November for the annual PRUG meeting. Our best wishes for their happiness and success!

Report from HAM-COM

John Conner, WD0FHG, and I travelled recently to Arlington, Texas for HAM-COM. I was invited by TPRS to speak in the packet forum, and to participate in a panel discussion on the future of packet radio. I had been invited last year, but the date had conflicted with an RMPRA function, which eventually got moved to another date, but too late for me to be involved. This year, Karen and I had expected to make a vacation of it, touring through another slice of the desert-southwest, ending up in Dallas/Ft. Worth for the conference. What we hadn't counted on was having as chaotic a travel schedule as we've had this year. So plans changed and I flew down myself for the weekend, with John joining me.

The weather was pretty good all weekend, but we were awfully glad the flea market was all inside! The folks from Houston kept telling me how cool and dry it was, but coming from the high country, we had, shall I say, a "slightly different frame of reference". It was hot, and humid, but that didn't keep us from having a good time!

We arrived late on Friday afternoon, and after driving around some

we found our hotel and the convention center, where we checked in at the registration booth, and "cased the joint" to see what the meeting rooms looked like. Walking across the parking lot to the convention hotel, we ran into Harry Ridenour, N0CCW, and a merry band of TPRS folk all getting into cars to head for dinner at a Cajun restaurant nearby. The food was good, and we took advantage of the long delay at the restaurant to get caught up on news. Saturday we started off in the flea market, which was 400+ tables inside, and were really surprised at just how many people were packed in the facility! We should have guessed from the fact that at a relatively early morning hour we ended up parking several lots away from the front doors, but some things we never learn! Highlights were finding some PC clone pieces we needed really cheaply, and meeting a guy who was selling TWT amps and gobs of other 10 GHz hardware. I didn't buy anything, but got contact info for future reference. After lunch, I made a presentation on building a high-speed network, outlining what I think are some of the key issues, and giving updates on a few projects in progress, notably the "NOSINABOX" software I'm working on with N4PCR to put full IP switch and AX.25 terminal server functionality into several standalone packet switch boards. The audience was a new and different one for me, and very interesting, given that TPRS has run into and had to deal with many of the organizational and group dynamic problems that I think are major stumbling blocks for builders of high-speed networks.

My presentation was immediately followed by the "panel discussion," which really turned out to be another set of mini-presentations, with time running out before we got around to handling any questions from the audience. That was a little strange, but I discovered afterwards that the folks in the audience had enjoyed what they'd heard, so everything worked out OK. All in all, a pleasant trip. It's easy to fall into a rut, travelling to the same conferences and hamfests each year, and seeing the same group of people. We enjoy that a lot too, but it sure is nice to meet a new set of folks once in a while, and see how folks do things

differently in yet another area of the country!

What's Up In the Bit Basement

I mentioned last time that Fred, K0YUM, and I have jointly been building computers based on the National 32532 processor chip. We've spent several Sundays together since the last issue, and now have the machines up and running Minix hacked for the National chipset on 300 meg disk drives. We've gotten to the point where Fred has his box at home up near Denver, and he is wildly hacking away getting more and more stuff working... and I'm ready to get back to work on some other things.

Work progresses very slowly, mostly because of other priorities, on the construction of a cross-band full-duplex 56 kb regenerative repeater using WA4DSY modems and information from the Ottawa crowd. We expect to co-locate the repeater with a 1200 baud full-duplex 2 meter digital repeater near my house, with coverage of Colorado Springs and into a select handful of sites near Denver.

There's a meeting planned of all the Colorado PBBS sysops in late July that I've been invited to attend. In addition to finding out more about what's up in the their world, I'm hoping to talk with the group as the real movers and shakers right now in packet radio across the state, and see what we might be able to do together. RMPRA is effectively dead, and we're trying to figure out what to do with the corpse. It would be really neat to turn around and apply the remaining ergs of organizational strength and ability to forming a new organization focused on building a real network across the state.

NOS-IN-A-BOX

A quick update on the status of TCP/IP based packet switch hardware and software. The Awesome I/O board designed by K3MC has run into problems, of a legal nature, that may prevent it from becoming a reality, at least for a while. That's a shame, but fortunately we are blessed with some alternatives. The Grace Communications PackeTen is one such alternative. It is available either as a 5-port PC plug-in card, or as a 5-port standalone packet switch. Plugging the standalone card onto the plug-in card, you get a

10-port switch that can live in a PC clone. It's a really neat design based on the Motorola 68302, and you can order one today complete with a preliminary port of NOS. The Kantronics Data Engine appears to be shipping now, and recent communication implies that they really are selling this as an open development platform, with enough information in the manuals to allow anyone to develop software for the platform. I'm working on a port of NOS to the box, which has been limping along since Dayton with little further progress because of other things on my plate. I expect to clean up the code and release it late in August.

AEA has finally announced what I believe is a firm date for shipments of the PS-186, "that mythical piece of packet hardware." I expect to have a very preliminary port of NOS for the board available, also in the late August timeframe, and Mike Lamb of AEA has assured me that he'll have hardware to sell by then! The board is expected to sell for about $700, which puts it squarely in the price range of the Grace standalone card. Each board has some pluses and minuses, hopefully by the next issue of PSR I'll have firmer details to report, and maybe we can find time to put together a "comparison shopper's guide" or something to help everyone understand the values associated with each available platform.

It's also worth mentioning that there has been a flurry of activity on the "cheap 8530 card" front, with various folks working on cards that plug into a PC, have minimum parts count and cost, and are capable of driving at least one 56 kb modem, without "flatlining" the PC as Phil's current DRSI high-speed driver does. Maybe we'll be able to report in more detail on one or more of these efforts next time around.

10 GHz Packet

There has been a flurry of very recent activity in the 10 GHz Packet arena. John, WD0FHG is working actively on touching up the PC Board artwork for the design, and Jon, KE3Z at the ARRL lab expects to run some samples of the boards for evaluation here, at the League, and at N6GN's in California. Look for more information next time around on how this turns out, and perhaps for details on where and

how to get PC boards if you want to play too! In the meantime, hang tight, there isn't much else to tell yet.

Glenn, N6GN, has also commented, on several occasions, that there are a bunch of things he could improve in the 10 GHz design. Remember, this design was an attempt to prove just how cheaply you could build a working microwave packet link at interesting data rates, and at about $125 per end in parts cost, I think we did that quite effectively! But, there's a shade of difference between "cheapest", and "best price/performance." When or if Glenn will have time to prototype the changes he's talking about, or even relate them to someone else to work on, remains to be seen. Meanwhile, I think we can have a lot of fun with the current design, and learn a lot about making things work at 10 GHz!

900 MHz Packet

Glenn N6GN recently posted a note of "recalibration" to the tcp- group mailing list, that made it clear that while he was excited about and making great strides of progress with his 900 MHz digital radio design, it would be very premature of folks to expect to see radios available "for the rest of us" for at least another year.

In part, this is due to the fact that Glenn, probably correctly, believes that we need to do a lot more than invent a new radio to make fast packet radio successful. We need to address the whole range of issues, from designing fast RF platforms, to understanding and accepting the need to use point to point links over reasonable distances with reasonable power levels, to developing routing and link protocols that will provide for efficient and effective sharing of scarce RF resources, to developing qualitatively new applications that will make all this higher speed really worthwhile.

What this means for the rest of us is that the NORCAL experimenters are going to deploy a test-bed of RF hardware this year, and spend a bunch of time doing other things like building polling-based link protocols for local cells, and working out good routing mechanisms between cells. Because they've bitten off a big piece of work to do, it's going to take a while.

The up side is that this will probably result in a lot of new information and ideas for us to chew on once they're done, and will result in a "tested" RF design becoming available. The down side, obviously, is that we can't play now!

Now you understand my renewed interest in the WA4DSY/GRAPES 56 kb modems. Today, it's the only choice I know of for experimenting with building a high speed network, except for the stuff we've been working on with Glenn and friends at 10 GHz. Never mind that "those in the know," myself included, point frequently at 56 kb as the "fastest of the slow modems." We've commented just as often that 56 kb as a user access speed has certain attractions, and based around a full-duplex crossband repeater, we're hoping to have a bunch of fun playing with 56 kb this year in Colorado Springs!

Summary

The call for papers for the next ARRL Digital Networking Conference has just gone out (I refuse to use the word "Computer" in the title... so sue me!). The conference will be held in London, Ontario, Canada this fall. For more information, look for the blurbs in the front of QST, etc. And if you have been working on something, anything, that would be of interest to the rest of the packet radio world, call the ARRL and have Lori Weinberg send you an author's kit. This conference is the best opportunity every year to communicate work done during the year, and since the League publishes the proceedings, a neat way to become famous as well! I expect we'll see some papers this year from at least Europe and Japan in addition to the U.S. and Canada.

As I type this, I'm hours away from leaving for 3 weeks of vacation. I'm hoping it will be a nice break, the only electronic gear I'm taking is a cute little Panasonic world-band receiver. I wonder if I can maintain my sanity for that long without a keyboard or a transmitter nearby? My e-mail will just pile up in my absence, bdale@col.hp.com on the Internet is still the best way to talk to me, followed by the section 9 of HAMNET on Compuserve, or paper mail. Until next time!

DSP Project Update

by Lyle Johnson, WA7GXD

The TAPR/AMSAT Joint DSP Program hardware design has been moving along very rapidly since the launch of the MicroSats.

As outlined in the last PSR, the design has been changed from the earlier "stand alone box" to a plug-in card for the ISA bus (IBM PC and IBM PC/AT bus standard). This is to facilitate software development. A follow-on stand alone box may or may not emerge at a later date (how's that for "no commitments?").

The design is fairly complex, comprising 68 ICs including 9 programmable logic devices (PALS, PLDs, GALs or whatever name you know them by). The PC board was too crowded to get by with four layers, so a six-layer board was designed! This is definitely light-years beyond the humble Alpha TNC that we so laboriously hand-taped eight years ago!

Just to give you an idea of what's involved in this sort of thing, consider the following.

The design has been completely altered from that of 1988. The new design was conceptualized at the TAPR Annual Meeting in late February of this year.

Data sheets were then studied and timing diagrams worked out.

Rough schematics were drawn and reviewed.

People with experience in applying DSP were asked to review the schematics and offer suggestions for features and functionality requirements.

The schematics were revised, and the above cycle of review and revision performed several times.

Logic that could be economically reduced to programmable logic (for reasons of PC board space, raw parts cost or, in some cases, design "security") were identified and logic equations written.

Programmable logic was then simulated and tested, corrected, etc., until it seems either (a) correct or (b) sufficiently correct that the function was assured of fitting in the logic chip.

The schematics were then revised again.

Board layout was accomplished. Sounds easy, but this means MANUALLY placing the parts on the screen of the PC running Computer-Aided Design (CAD) software. Each trace had to be MANUALLY routed from pin to pin on the screen of the PC. All TEN sheets of schematics had to be stuffed onto a 3.9 by 13.375 inch PC board.

The six layers of PC board traces were then plotted in various colors and the traces MANUALLY checked one by one against the schematics and extracted netlists. A netlist is a listing of all the interconnections on the schematic.

Errors were noted, and the PC layout revised, then check-plotted again.

This was done no fewer than three times.

The PC layout software then generated a so-called "Gerber" file which tells a photoplotter how to make the negatives that will eventually be used to produce the PC boards (called "fabrication").

(A photoplotter is a device which directly exposes film to a controlled, movable light source. They are typically accurate to about 1/2 thousandth of an inch. Gerber is the company which pioneered this technology, so "Gerber photoplot" file format is the industry standard.)

Then, the Gerber files are interpreted and displayed on a PC screen and laboriously checked for spacing violations (nothing can come closer than 10/1000" to anything else). The PC software which converts the database describing the printed-circuit board could make an error and mess things up. It has happened before, so all this checking really IS necessary!

On the 18th of June, all of this was done and the films were sent to a prototype house to make the first five "alpha" DSP PC boards. By late next week, the bare boards should be fabricated and back in Tucson for initial parts soldering work.

As you can imagine, all of this takes literally hundreds of man-hours.

The folks who have put in these hours for you include Chuck Green, N0ADI, Dan Morrison, KV7B, Mike Parker, KT7D, and Eric Gustafson, N7CL. In addition, ideas have come from many others including Bob McGwier, N4HY, and Mike Brock, WB6HHV.

We hope to have these boards operating in early July so they can be made to do wonderful things and brought to market so you can enjoy them, too! Before I get misquoted, I never said they would be available in July! With luck, it will take a few more months to wring them out thoroughly, correct the inevitable errors in the PC board and schematics, get the manuals written (remember the paperwork?) and figure out how best to sell them.

And, with a 6-layer board, kitting these may not be possible. We may have to have them pre-assembled and tested — not my choice, but perhaps a choice based on necessity. Not too many people have the equipment and the eyesight needed to solder approximately 2,000 connections and not make a mistake or damage the board. If you only mess up one solder joint in a thousand, you will have two errors. And then you have 2,000 to inspect and re-heat to find the two...

Stay tuned, this project isn't staying still!

Notes from the TAPR Office

by Heather Johnson, N7DZU

It was a real pleasure to be with those of you that were at Dayton! Hopefully, next year the rest of you will be there... or, before that event there's the Annual February TAPR meeting that we look forward to seeing you at.

Since the last PSR the office has undergone some changes. All for you, the members' benefit. The office used to fit in a closet of a room, now it's in one of the largest rooms of the house! Everything fits efficiently and comfortably.

We have a dedicated FAX line into the office. That new number is 602-749-5636.

No matter which method you use to contact us, our attempt is to respond to your requests that day, if possible. Your wait should never be over 2 weeks, unless we have become backordered, in which case we will let you know the expected date of delivery. Periodically I have helpers assist me in the office to assure you get the service that you deserve. As time goes on, please keep us informed of any improvements that you think of, and we will definitely consider them.

When I came to the office one of my largest concerns was for you folk who had legitimate queries, or problems that were too technical for me to answer, and the volunteer [Lyle] didn't have enough hours in his already 26 hour day to take care of.

Well, you super fellows have taken care of it!

I can now refer you to more than one source of excellent help. These are individuals who offered to field technical questions, and even fix your units. Any money matters are strictly between them and yourselves as they do not work for TAPR, and TAPR is simply making their service known to you. However, I would publicly like to thank these men for doing such a good job!

David Medley, KI6QE
1450 Bayview Heights Dr.

Los Osos, CA, 93402
805-528-4956
David's expertise is with the PSK units, the State machine DCD kits, and the PK-232 Modem Disconnect kits.

Ron Bates, AG7H
621 East Windward Circle
Tucson, AZ, 85704
Ron has much experience with the TAPR TNC kits, both TNC 1 with its upgrade kit, and TAPR TNC 2, with its XR2211 DCD kit. Ron suggests that you contact him by the mail, as he is not always available to answer the phone.

Jack Mathias, W9FMW
721 South Meadow Road
Evansville, IN, 47715
812-477-4799
Jack is willing to tackle anything, and has had much experience with the TAPR TNC 2 and clones, the TAPR PSK Modem, and the G3RUH 400 baud Demodulator.

Leslie Hamman, WB8MBM
Route 2, Box 67
Exeter, MO, 65647
417-652-7591
Leslie says that if you have a good schematic, he can fix it!

If you are looking for TCP/IP for the Amiga, Chris Wachs, WA2KDL, has Louis A. Mamako's implementation of the KA9Q NOS (TCP/IP) software available. To obtain a copy, send two double-sided disks with a self-addressed, stamped return disk mailer to:

Chris Wachs, WA2KDL
15527 Lemoli Avenue
Gardena CA 90249-4459
AX.25 mailbox is WA2KDL@N6YN.CA.USA.NA. To see if there's an update, look at AMIGA ALL US.

If there are any others of you that would like to offer your assistance, we will be glad to add you to this list. Of course, you can still contact us here at TAPR. Many things we can help you with immediately, as once we are made aware of a problem, the answer can quickly be repeated to the second person whose unit is manifesting the same glitch!

Lyle is taking me to England and Switzerland for a holiday this summer, therefore the office will be totally closed during this time. You may con-

tinue to order by mail, and I will have the person picking up the correspondence from the PO Box, date the envelopes as to when they came in. When I return, I will work hard and take care of your needs!

Have a great summer!

73s, Heather, N7DZU

Office Closed!!!

The TAPR Office will be closed for the second half of July. The last day of business in July will be Friday the 13th!

The office will re-open on Tuesday, August 7th, 1990.

Please use the PO Box for orders or correspondence, and recognize that there will be a couple weeks delay in getting your orders out and correspondence answered due to the closure and the subsequent mountain of work upon Heather's return. Unlike most jobs, no one else does her's while she is away...

FAX News

The TAPR office FAX has a new telephone number. It is (602) 749-5636.

This is a dedicated, 24-hour-a-day FAX line. The FAX machine is a Panasonic UF-170A, which is compatible with Group II and Group III FAX standards. It is capable of error correction and has all the bells and whistles for resolution and gray-scale.

We have found that over half of our FAX's come from Europe and Asia. This is an efficient way to place an order, ask a technical question, etc.

Try it, you'll like it.
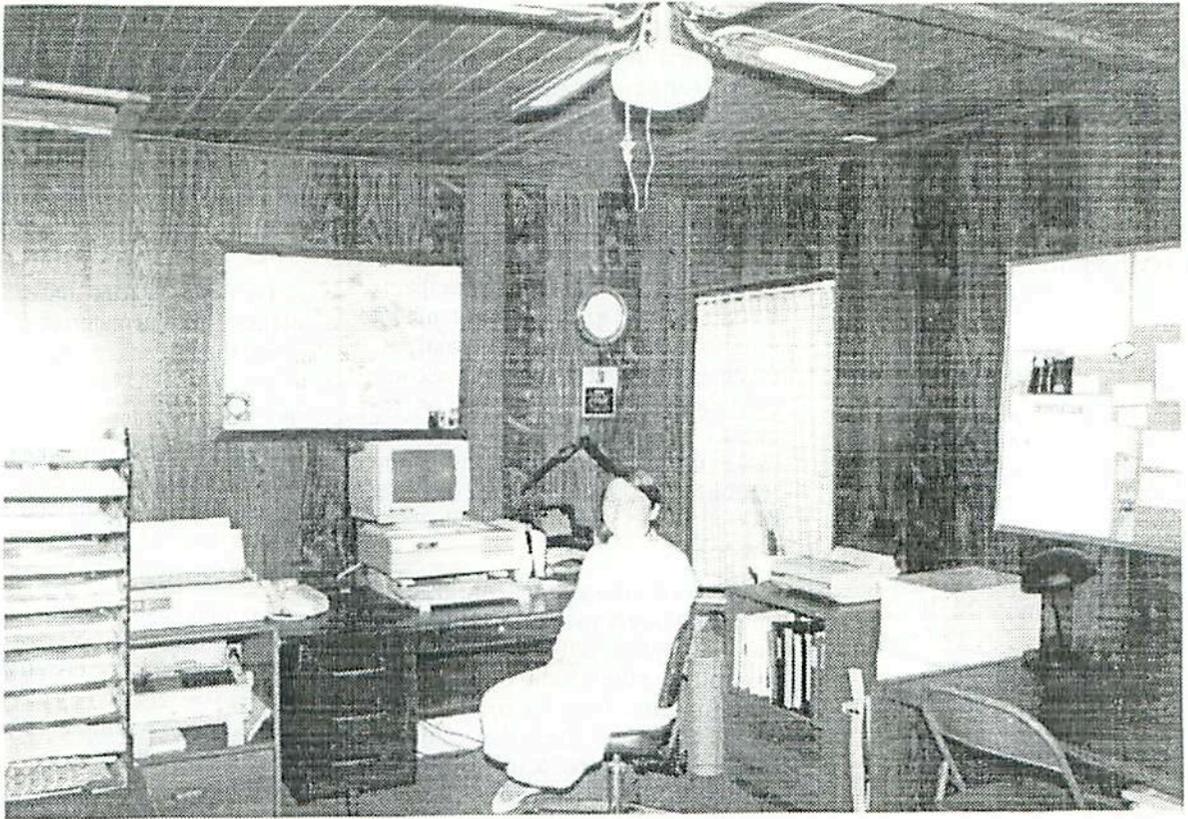
Heather Johnson in the office

Lots of kits and disks to fill your orders

Photos by Eric Gustafson

9th Computer Networking Conference

The American Radio Relay League

The Canadian Radio Relay League

Plan to participate in the 9th Computer Networking Conference, jointly sponsored by ARRL and CRRL, to be held this September in Canada — the country that first brought you packet radio! Here are the details:

TIME AND DATE:
9 AM to 5 PM
Saturday, September 22, 1990

LOCATION:
London Regional Art Gallery and Museum
421 Ridout Street North
London, Ontario

REGISTRATION:
SUS 20 or SCDN 25.

Registration fee includes a copy of the conference proceedings and a catered hot lunch.

A word about the location: London, Ontario, population 270,000 is located in Southern Ontario midway between Detroit, Michigan, and Buffalo, New York (or Toronto, Ontario). London is accessible by car via Highway 401, rail or air. While no major airlines have direct service to London, excellent commuter service to Toronto and Detroit is provided by Air Ontario (Air Canada) and Canadian Partner (Canadian Airlines International). ComAir (Delta) provides connector service from Cincinnati and Cleveland, Ohio. For those in the U.S. that might want to take in a bit of countryside, flying to Detroit or Buffalo, or to Niagara Falls, New York, and renting a car for the 2-3 hour trip to London can be a cost-effective alternative to flying directly. Check with your travel agent for details. The London Regional Art Gallery and Museum is located in downtown London, overlooking Harris Park at the forks of the Thames River. There is adequate free parking nearby.

A word about accommodations: Conference organizers have negotiated a special flat rate of SCDN 85 a night (no limit to the number of people allowed to stay in one room) at the 322-room Radisson Hotel, London Centre, located about four blocks from the conference site. it is highly recommended that conference participants stay at this hotel to facilitate organizing Friday-night dinners and informal get-togethers. (A list of alternate accommodations can be furnished on request.) Conference participants must make their own reservations at the Radisson. Use the toll-free number (800) 333-3333 and mention the conference.

A word about the conference: Past computer networking conferences have attracted 120-150 participants from all over the US and Canada—and occasionally from beyond. Conference speakers share the results of recent work at the leading edge of packet radio. All participants hear all speakers—there are no concurrent presentations. Is this a place to find out how to get into packet radio? We would say no. But if you're a beginner and you do attend, you're certain to develop an enthusiasm for this wonderful mode. Is there anything to look at or buy? Not really—it's a conference, not a hamfest. Of course, that doesn't preclude a few interesting displays or demonstrations—or the deal of a lifetime made in the parking lot! What about Saturday activities after the conference? Conference organizers will make arrangements so that everyone who wishes can have dinner together and a night out at a popular restaurant—a good way to end the conference.

How to register:

Send SUS 20 or SCDN 25 to:

9th Computer Networking Conference
c/o Harry MacLean, VE3GRO
500 Riverside Drive
London, ON N6H 2R7

Include your name, address and call (if any). You will receive a confirmation in the mail, along with maps and additional information related to the conference.

TAPR Summer Sale!

TAPR has a number of items that were being stored. Well, to save membership dollars we have emptied the shed and eliminated the expense of storage.

On the other hand, the office is now so full of unused materials that we have to sell them to make space for Heather to get to the telephone to answer your calls.

The following items are offered for sale on an as-is, no warranty basis. The descriptions are believed to be accurate, but TAPR takes no responsibility for errors.

To purchase an item in this list, please write or FAX the office (no verbal orders can be taken) and list the item(s) you wish to buy along with the price you are willing to pay. This is a "sealed bid" auction.

On Tuesday, September 4th, Heather will open the bids and notify the successful bidders. In case of a tie, the earlier postmark (or FAX date and time stamp) will prevail. (If this doesn't solve the tie, a coin toss will!)

If successful, you will be notified and, upon receipt of payment, the item(s) will be shipped to you by the method you specify.

Bids do not include shipping cost, all items are sold F.O.B. TAPR's office in Tucson, Arizona, U.S.A.

Items not sold, will be disposed of either at a hamfest or a dumpster, depending on the item. (Yes, you can bid zero dollars, but that won't help us fund too many projects...)

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

Sale Items

QTY.		Price Paid	Date
	COMPUTER		
1	Commodore 64 Computer	277.00	05-84
	includes RS232 adaptor and communications software		
1	VIC 20 Computer	70.00	05-84
1	Xerox 820, board only	85.00	05-84
	worked last time it was checked		
1	NEC 8201A Lap Computer	250.00	10-84
	like RS Model 100, no modem, 32K RAM, 8 line 40 char LCD display		
1	Radio Shack Color Computer 2 w/disk drive	705.07	01-84
	64K with enhanced BASIC, single-sided drive		
1	Ciarcia SB-180 Computer	590.00	09-85
	intermittent operation		
1	Elpac MASS-210 switching power supply	50.00	02-85
	5V, +12V, +12V, -12V outputs (4 total) - 210 watts (from Xerox 820)		
2	Xerox 820, Qume 142 1/2 ht floppy drives	125.00	02-85
	360k black face		
1	Xerox 820, monitor	25.00	05-84
	monochrome, no case		
1	Commodore, NAP monochrome	70.00	05-84
	12" monitor (for C64), green screen		
	FLOPPY DRIVE		
1	IBM PC Tandon F/D (came w/PC, replaced by HD)		07-84
	fullsize 360k drive, used		
3	Mitsubishi MF501A-318U	90.00	01-86
	1/2 ht floppy drive (360k), beige face		
	MISC		
2	Radio Shack NP55 ampl. speaker	20.00	03-85
1	NSC 888 Evaluation Board-	495.00	09-84
	leftover from DCE/GAS can		
	PRINTER		
1	Toshiba P351 Printer	1,383.02	08-85
	24-pin, wide-carriage, graphics,		
	sometimes generates alternate character sets		
	TRANSCEIVER		
1	Yaesu FT230R xcvr	175.00	08-84
	(modified w/cable for TNC-2)		
1	Yaesu, FP12 Power Supply, 12V/6A	50.00	08-84
	SOFTWARE		
1	IBM Macro Assembler 2.0	75.00	10-85
1	Wordstar 2000+ V1.0	477.49	01-85
1	Tango-PCB Series II, CAD system	618.00	01-89
	latest version!		
1	Schema 1	502.90	10-86
1	Smartwork	905.00	03-85
1	IBM Pascal V 2.0	300.00	10-85
1	Borland Editor & Toolbox	143.43	12-85
1	Turbo Pascal (Z-80)	63.62	01-86
	NNC PROJECT LEFTOVERS		
12	NNC PC boards, assembled, with 96K RAM,		
	some with SCSI adapters, were working when last checked		
5	NNC Floppy Controller PC Boards,		
	3 are complete and worked when last tested		
11	NNC Modem boards, more than 90% assembled, untested, no ICs		
	Plus various bare or partially assembled NNC boards		

We would like a single bid for all the NNC project leftover assemblies.

Software Library Update

by Bob Nielsen, W6SWE

Since the listing of the TAPR software library was published in the last issue, the following disk has been added to the library:

27. SV7AIZ BBS - A multiuser, multiport BBS with YAPP binary file transfer for use with WA8DED or AEA host mode, DRSI card, or for TNC's running the G8BPQ switch code under KISS.

Additions to the software library are always welcome, however we do request that they be submitted either by, or with, the expressed permission of the author. TAPR attempts to provide the latest versions of all software, but please realize that we are not always aware of revisions. Updates are appreciated, either to the TAPR office or to myself at the address shown on the cover of PSR. Upon request, TAPR will supply authors with blank disks and mailers for updating. TAPR reserves the right to screen any submissions and restrict the library content as necessary. Both freeware and shareware are acceptable.

As of the deadline for this issue (June 22), the current versions and dates for the disks in the TAPR software library are as follows:

1. APLINK, ver. 3.94, 1-1-90

2. AA4RE BBS, ver. 2.10, 5-20-90

3. CBBS, ver. 6.6, 3-9-90

4. EZPAC, ver. 1.1, 1-9-89

5. MONAX, 10-30-87

6. WB6UUT PKTSHARE, 4-9-89

7. W9ZRX BBS lists, 4-24-89

8. R95, 9-1-89

9/9a ROSERVER PRMBS, ver 1.01, 11-19-89

10. ROSE switch, 2-3-90

11/11a/12/12a KA9Q TCP/IP, ver. 890421.1, 5-8-89

13. TNC1 source code, 5-30-84

14. TNC2 notes, 3-28-90

15. WA7MBL BBS, ver. 5.12, 8-7-88

16. W0RLI BBS, ver. 11.11, 5-5-90

17. YAPP, ver 2.0, 12-18-86

18/18a Intro to TCP/IP, 9-9-87

19. LAN-LINK, ver. 1.55, 1-1-90

20. ARESDATA, ver. 1.2, 3-9-90

21. MSYS, ver. 1.07b. 2-17-90

22. G8BPQ switch, ver. 3.57, 4-8-90

23. Compression utilities-

   ICE (LHARC), ver 1.14, 7-15-89

   PKARC, ver 3.6, 6-1-88

   PKZIP, ver 1.10, 3-15-90

   ZOO, ver. 2.01, 8-25-88

24. THS, ver. 2.50; 11-11-89

25. VE4UB NTS, ver 1.55, 5-8-90

26. NM1D DOSGATE, ver 1.14, 11-29-89

27. SV7AIZ BBS, ver 3.24, 4-5-90

New Prices and New Items

Effective August 1st, VISA and MasterCard orders will carry a 4% surcharge rather than the 3% we have been charging. The bank is charging us this amount and has been for some time now. We regret having to pass this increased cost on to you.

Complete sets of PSR from Issue #1 to the present are now available in limited quantities from the office. The cost is $20.00 per set plus $5.00 for shipping in the U.S. Please contact the TAPR office for shipping charges to other countries.

ORDER FORM – Kits – Firmware – Software – Membership
(All prices are payable in U.S. funds and include shipping and handling except foreign air)
Please allow six to eight weeks for your order to be shipped

KITS

Qty.   Total

PSK Modem	$110.00	....	___	___
Cabinet for PSK Modem	8.00	(5.00 when ordered at same time as modem)	___	___
K9NG 9600 Baud Modem	25.00	....	___	___
TNC 2 Tuning Indicator	25.00	....	___	___
XR2211 DCD Mod.	11.00	....	___	___
State Machine DCD Mod.	17.50	....	___	___
State Mach. DCD w/Internal Clock	21.00	For Packet Communicator, KPC2 or ANY other TNC	___	___
PK232 Modem Disconnect Upgrade	17.50	....	___	___
TNC 1 Upgrade to TNC 2	59.00	....	___	___
• TNC 1 Upgrade Memory kit	20.00	....	___	___

• When purchased w/TNC 1 upgrade. Includes 32k RAM and 1.1.7 w/KISS EPROM

FIRMWARE

32K RAM w/TNC2 update docs	15.00	....	___	___
TNC 2 ver 1.1.7 w/kiss (27C256)	12.00	(Includes new 1.1.7 Commands booklet)	___	___
TNC 2 WA8DED (27C256)	12.00	....	___	___
TNC 1 WA8DED (2x2764)	12.00	....	___	___
TNC 1 KISS (2764)	12.00	....	___	___
TNC 2 KISS (27C256)	12.00	....	___	___
1.1.7 Commands booklet	3.00	(The full TNC2 command set for 1.1.7)	___	___
-NEW- PSR sets, Issue #1 to present	25.00	(20.00 plus 5.00 shipping/handling)	___	___

SOFTWARE - Please circle disk numbers requested (all in 5-1/4" MSDOS format).

Disk #

1. APLINK - W5SMM - Runs MBO & BBS	15. WA7MBL BBS - WA7MBL - BB system
2. BB - AA4RE - A multiconnect Mailbox	16. W9RLI BBS - W9RLI - BB system
3. C-BBS - K3RLI/AG3F - BBS w/sources	17. YAPP - WA7MBL - Terminal program
4. EZPAC11 - M. Imel - NTS formatter	18/18a INTRO TO TCP/IP - Much info on TCP/IP (2 DISKS)
5. MONAX-NK6K/WB6YMH-Gathering system stats	19. LAN-LINK - G3ZCZ - Terminal program
6. Packet S/W - WB6UUT - for PK 87,88,232	20. ARES/Data - WN6I,N6KL - Emergency data system
7. PBBS Lists - W9ZRX - Master PBBS lists	21. MSYS - WA8BXN - BBS System using KISS
8. R95 - WD5IVD - Binary conversion utility	22. NODE - G8BPQ - Packet switch/BBS networking pkg.
9/9a ROSESERV-KA2BQE-BB and server for ROSE	23. COMPRESSION/ARCHIVING Utilities, .ZIP, .ARC, .ZOO & ICE
10. ROSE Switch - W2VY - The ROSE executables	24. THS-HB9CVV-Term. program for TNCs w/WA8DED firmware
11/11a TCP/IP Plug & Play - KA9Q - (2 DISKS)	25. NTS Traffic Generator - VE4UB
12/12a TCP/IP Sources - KA9Q - (2 DISKS)	26. NM1D DOSgate - NM1D - Remotely operate PC via packet radio
13. TNC-1 Source code - TAPR - TNC-1 Sources	27. SV7AIZ BBS - SV7AIZ - Multiuser, multiport BB system
14. TNC-2 Software notes - N2WX - 1.1.0 thru 1.1.7	

We attempt to provide the latest versions of all software.   Total disks circled (9, 11, 12 & 18 are 2 disks ea) ____ x $2 =   _____

TAPR is a non-profit, volunteer operated amateur radio organization. Membership in TAPR, including a subscription to Packet Status Register, the TAPR newsletter, is $15 per year in the US and possessions, $18 in Canada and Mexico, and $25 elsewhere. Membership and PSR subscription cannot be separated. $12 of the dues is allocated to Packet Status Register.

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add 5% tax   _____

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Membership   _____

For AIRMAIL orders to be shipped outside North America, see separate S&H charges attached, as published in PSR, or contact TAPR.

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JULY 1990

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