PACKET STATUS REGISTER

Tucson Amateur Packet Radio Corporation

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In This Issue...

President's Corner

by Greg Jone, WD5IVD

Welcome to my first column as president of TAPR. I have been thinking about what I was going to write in this column for the last few weeks and now it's time to get it down on paper. There are a number of things I would like to cover in this issue, but will concentrate on the specifics for the upcoming months.

As a start, I would like to welcome the new board members: Bob Hansen, N2GDE, Gary Hauge, N4CHV, Keith Justice, KF7TP, and Jim Neely, WA5LHS. Returning from last year is Jack Davis, WA4EJR, Jerry Crawford, K7UPJ, Bob Nielsen, W6SWE, and Dan Morrison, KV7B. The board meeting at the annual meeting was very successful and I believe that TAPR is moving in a very positive direction for the upcoming years. I would like to give Bob Nielsen, W6SWE, a big thanks for his efforts the last two years, since Bob had only volunteered for being president for one. Bob had his hands full as board members and officers dropped out of service due to personal and job-related reasons. Bob will continue on for the next year as VP in order to help maintain continuity within the executive committee. Jim Neely, WA5LHS, is now treasurer, with Gary Hauge, N4CHV, taking on the position of Secretary. Bob Hansen, now on the board, will continue on in his post as *PSR* editor. The *PSR* really needs information from local and regional groups covering what you are doing and planning. This type of information dissemination helps other organizations and clubs get a feel for what is happening and what they might plan in the future. Please send in your local and regional information for the *PSR*.

The board had very good discussions during their Friday meeting on future directions for TAPR. TAPR will continue to develop kits for Amateur use, but will be expanding more into information dissemination, publications, standards, and so on. I hope this will result in, as a by-product, the increase of membership back above 1000+. TAPR has seen a steady decline in overall membership and activity the last two or three years. We hope to bring TAPR back into the forefront of packet radio and digital communications.

Let me run through a list of things that have happened and are happening within TAPR. Lyle Johnson, WA7GXD, has finished the DevMeter and it is for sale ($90). The board is moving communications from CompuServe (CIS) to Internet. We should have a system available for information requests on-line by the end of April. Look for a posting from Bob Nielsen when the system is operational. The main reasons for establishing an Internet connection is to provide a distribution point for TAPR information and mail. Support for CIS communications will continue to be supported by Bob Nielsen. TAPR is in the midst of making available another run of 150 TrackBox kits. The price and final availability date will be released later. We are hoping for a June 1st availability, but don't contact the office until you see an official message, since any number of things could delay this date before June 1st. Dave Toth and Gary Hauge are working on a report for the Board, by Dayton, concerning the current status of the DSP project. With luck, I will be able to report

something one way or the other on the status of the project by the end of the Summer. At the annual Board meeting Bill Beech, NJ7P, and Doug Nielsen, N7LEM, presented their proposal on an ALAPB protocol (AX.25 version 2.1). A proposal recommendation will be looked over by an ad-hoc committee headed up by Keith Justice, KF7TP. The proposal will then be forwarded onto the ARRL Future Systems Committee for possible adoption. Keith is also working on organizing the TAPR annual meeting for 1994. TAPR will be publishing proceedings for next year's conference and a date for next year's meeting should be in the next *PSR*. We hope to keep the spontaneity that occurs at the annual meeting, but feel that a little organization will help increase attendance and quality.

Now to finish - are you interested in working with or helping TAPR? Well, it's a pretty simple process. Just send e-mail to a board member or a letter to the office and tell us what you have in mind or how you can help. TAPR will only get stronger as more people interact and participate. We hope by having more long-term projects, more people can jump on board and participate. If you need handouts and information for an upcoming meeting, please let Heather know and we will be glad to mail you a TAPR information package.

Here's to a great 1993 and second decade for TAPR.

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 Corp. are:

Greg Jones, WD5IVD	President
Bob Nielsen, W6SWE	Vice President
Gary Hauge, N4CHV	Secretary
Jim Neely, WA5LHS	Treasurer

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TAPR Internet Access Revised

by Bob Nielsen, W6SWE
Internet: w6swe@tapr.org
ax.25: w6swe@kc7cg.az.usa.na

In *PSR* #48, there was a description of how to access TAPR via the Internet. We have made some revisions to the procedure, however, the previous method will still work for the time being. We now have established our own domain: **tapr.org.**

You may send messages to the TAPR office by addressing them to
`tapr@tapr.org`
and to any of the directors at
`callsign@tapr.org`
substituting their call for "callsign."

PSR submittals can be addressed to
`psr@tapr.org`
In addition to e-mail messaging, we now have a file server available at TAPR. This currently has a few information files but is intended to grow considerably in the future. Both text and uuencoded binary files will be available. To get information, send a message to
`file-request@tapr.org`
The subject line is optional, but in the message, type the lines:

```
HELP
DIR
QUIT
```

and a help file and a directory listing of available files will be sent to you giving the commands required to retrieve the desired files from the server.

We can be reached from CompuServe, MCI Mail, America Online and other messaging services by using the appropriate addressing method to send messages to Internet addresses from those services. Contact your computer messaging service for further information.

1993 Annual TAPR Meeting

by Gary Hauge, N4CHV and
Mike Curtis, WD6EHR

You Missed it, The 1993 annual TAPR membership meeting!

In the opinion of all the folks that I have had the pleasure to chat with, the annual meeting was a big success... And YOU MISSED IT!

There were roughly 100 plus or minus in attendance. I was quite impressed with the quantity and quality of the technical interchange taking place outside the meetings. It was interesting to hear someone describe a new idea that was in the works in his part of the world, and the response on how a different approach would work in another part of the world. Many ideas and possibilities were discussed in and out of the meeting... AND YOU MISSED IT!

The meeting of the General Membership was opened at 9 am by Bob Nielsen, W6SWE and a big welcome to all. Bob gave a quick rundown on the agenda and proceeded with an introduction to all in attendance. We even had a couple of new hams that were awaiting call-signs, and one ham from Sweden, Tommy Bjornstrom, SM7NZB. Tommy read about the meeting on his local BBS in Sweden and rearranged his scheduled trip to Minnesota via Tucson. Bob also gave a review of the board of directors meeting and the new board members that were elected.

Bob then turned the meeting over to Mel Whitten, K0PFX who did an admirable job of introducing all the guest speakers in turn.

TAPR 9600 bps Modem

The first speaker was Lyle Johnson, WA7GXD who gave an update on the progress of the 9600 baud modem. A second disconnect header has been added to allow the 1200 bps PSK and 9600 baud modems to work off of the same TNC. He noted that Mike Curtiss, WD6EHR has done a terrific job of documenting the radio interfaces. An additional note, the 9600 bps modem has been tested at 19.2 kbps with the change of three capacitors. Lyle proceeded to present an in depth design review of the circuitry, followed by a question and answer period.

METCON

Lyle went into his second presentation with a description of the METCON board designed by Paul Newland, AD7I. A description of the theory of operation and other possible uses. Some of the ideas were weather related and to provide deviation information (with the use of the new Deviation Meter) to repeater users upon request. The possibilities for controlling just about anything seems to exist.

(TAPR would like to hear from you with ideas and uses that you might find for the METCON board).

Jon Bloom - HF Automatic Control

For the third presentation, Mel introduced Jon Bloom, KE3Z from the ARRL who gave a description of the HF Automatic Control, the history of the HF STA (Station Temporary Authorization). The new digital committee and the original survey that caused quite a controversy due to the response received from the questionnaire sent out by the ARRL. There is a new digital committee headed up by Dave Speltzs, KB1TJ. They are now reevaluating the STA and are in the process of submitting a new bandplan proposal to the FCC. It might be noted that the FCC is asking for the end to the STA and they want a proposal from the ARRL. Jon presented the considerations for new modes of operation, bandplanning and the related problems that face the Amateur Radio community when the new modes "invade" the band.

Jon continued with an interesting note that a market survey was run and that the results showed that 25% of all Ham radio operators are involved with packet radio.

TAPR Board of Directors

Board Member	Term	CompuServe	Internet
Crawford, Jerry K7UPJ	1994	70521,2356	
Davis, Jack WA4EJR	1994	72356,441	
Hansen, Bob N2GDE	1996	71121,1007	
Hauge, Gary N4CHV *	1996	70127,1765	
Jones, Greg WD5IVD *	1994	72047,3455	
Justice, Keith KF7TP	1996		
Morrison, Dan KV7B	1994	70541,2374	
Jim Neely, WA5LHS *	1995	73760,3675	
Nielsen, Bob W6SWE *	1994	71540,2364	

Date is expiration of term on Board of Directors.
Asterisk indicates member of Executive Committee.

The TAPR Board of Director members "attend" a meeting, which is continuously in session, on a private bulletin board system. The Board encourages input from all interested members. If you have an issue you want addressed, or an idea for a project you would like TAPR to sponsor, contact any Board member, or drop a note to the TAPR office.

TAPR is now accessable through the Internet. You may send e-mail messages (no long files, please) to the TAPR office at
`tapr@tapr.ampr.org`

and to any of the directors at
`callsign@tapr.ampr.org`

substituting their call for "callsign." Also, submittals for *Packet Status Register* may be sent to
`psr@tapr.ampr.org`

in addition to the CompuServe address on the front cover.

Phil Anderson - Kantronics

Mel introduced Phil Anderson, W0XI of Kantronics as the next speaker. Phil gave a presentation on new and interesting things that they are doing. The KPC-3 seems to be quite popular for them. There is also a new enhancement board with several new features. Phil talked about: modifying the G3RUH modem for Kantronics 19k2 mode, PACTOR, and how most packet TNCs are bought by advanced, extra, and technician class licensees.

Phil also gave a very interesting presentation on the "Poulsen continuous spark" radio system, which was patented in 1910. It generated a continuous spark, used FSK, and a commutator audio tone generator after the crystal detector to produce a tone instead of "hiss." This was before they knew about product detectors.

Updated AX.25 Protocol

The fifth presentation was something of a surprise to many. Two gentleman from Fort Huachuca, Doug Nielsen, N7LEM and Bill Beech, NJ7P, have revised the AX.25 protocol. Bill Beech described what they have accomplished and the working system that they brought with them. The last update to the AX.25 was in 1988 and they have revised it to reflect what they have accomplished. This new software is written in "C" code.

New features include: bus architecture, expandable backplane, selective reject, more memory (1 megabyte), segmenter (for smaller packet size), and is compatible with the TNC-2.

Wormhole

Mel Whitten, K0PFX then took the opportunity to present a description of the "WORMHOLE" between Southern California, St Louis, Chicago, Hackensak NJ, New York City and London. This system uses the G8BPQ switch and is a reliable path. They are also looking for stations in the South East to join their network.

We broke for dinner at noon. While at dinner, Sumio Nakane, JH3BJN, the vice president of JAMSAT and his wife Yoriko, JK1BYE arrived and joined the meeting. Sumio and Yoriko were married last year and the honeymoon was delayed due to illness. So they were on a belated honeymoon. We wish them all the happiness.

After dinner Bob Nielsen, W6SWE introduced the newly elected President, Greg Jones, WD5IVD, and Greg in turn introduced the new Board of Directors. As follows: Greg Jones, WD5IVD - President, Bob Nielsen, W6SWE - Vice President, Jim Neeley, WA5LHS - Treasurer, Gary Hauge, N4CHV - Secretary, and Keith Justice, KF7TP. The following board members were unable to attend, Jerry Crawford, K7UJP, Jack Davis, WA4EHR, Bob Hansen, N2GDE, and Dan Morrison, KV7B.

Forward Error Correction

Phil Karn, KA9Q presented his technical discussion on Forward Error Correction (FEC). What it is, what it does, and how it works. He discussed the problems in the San Diego area and how Radar Pulses blank out high speed data transmissions. FEC will allow for the addition of extra bits to the packet and for the correction of errors by retransmitting only the error bits. The discussion included two types of error correction techniques, Reed Solomon (Block) and Convolutional (varying sizes) coding. A very interesting and detailed description of both was followed by a demonstration on Phil's computer.

Error correction is used in CD players, deep space communications, etc. — everywhere but ham radio! If a bit is "lost," it can be fairly easily replaced. Two decoding algorithms were discussed: parallel (Viterbi) and Sequential (Fano, Stack). The latter is generally better suited for packet and filling in small "hits" such as experienced on 70 CM because of radar pulses. A binary "tree" is shown; the algorithm checks a block along this tree; if there's an error, the next steps won't "fit," so it backs up and tries something different.

Hybrid FEC/ARQ is where the receiver tries to decode it. Does the receiver finish decoding before sender times out? If it can, then the next packet is sent, otherwise the first packet is resent. If the channel is very high quality, packets can be sent in simplified form (for speed); if errors are detected, then the system automatically adapts to a more robust format.

This is not suitable for AX.25 protocol — HDLC flags are much too short; it has bad correlation properties. The solution is to use longer "pseudo-random sequences," (e.g. 32-64 bits). This makes it possible for practical "negative ACKs." An 8-bit flag produces a 1 in 256 chance of a bogus packet making it thru; a 64-bit flag reduces this to negligibly small number!

This has been tested (preliminary version) on a 486-33 where it handles 56 kB with ease. The randomizer on a 9600 bps modem would need to be disabled since the signal is already randomized by the FEC coding algorithm; also, a randomizer causes more errors when a "hit" occurs, which is not a problem with AX.25 when a single hit kills packet, but it is a problem when we're trying to recover it.

This particular scheme is designed for 70cm high speed operation in the presence of radar. A radar pulse blanks about 2 bits; this will easily fill these in. Massive errors are not addressed by this.

Does this require an STA because it's "encrypted?" NO!! It's not intended to obscure the meaning, ergo not a "cipher." The FCC encourages experimentation - this is exactly the kind of thing they want Amateurs to be doing - advancing the state of the art - experimenting with new and exciting things.

During the break, KA9Q ran a demonstration of sequential forward error correction. The speed was quite impressive with low percentages of errors - and these packets were fully recovered - NO data was lost! However, when the percentage of errors got to 8%, the program took quite a while (several minutes) trying to reconstruct. This packet would have simply timed out and another would have been sent.

Gwyn Reedy, W1BEL from PacComm

Gwyn presented information on new products, the 19.2 kbps modem, the new Tekk Radio and the E.F. Johnson radio experiment. They have been working with the Motorola 68302 processor this past year, tuning up and refining the product line. They are also testing a 2.4 Ghz system. In part, some of the available technology is not in

Ham radio due to the high cost to produce these items.

The Tiny-2 TNC is in its 8th revision and the Pactor manual is being rewritten. The Pactor box has new packet applique board - once you've experienced Pactor with memory ARQ (stores corrupt packets and tries to fill in), you won't want to use 300 baud packet again!

The diversity reception code is being worked on; it requires only a 2nd receiver and modem. If one radio/modem misses the packet, the other might get it OK. This software will choose the "good" one. Also, part of one packet might be able to fill in errors on the other. The Baypac modem built into a DB25 connector is another new item that is doing well.

PACCOM is also doing some work with the Global Positioning System (GPS) in use by the military and the civilian navigation community. This system works on a constellation of any four satellites to produce accurate location information in the form of latitude, longitude and altitude. They are also working on commercial gear to relay, via packet, information from buoys at sea to track and report on hurricanes.

Deviation Meter

Lyle Johnson, WA7GXD, again took the stand. Lyle gave a very detailed presentation on the design and development of the Deviation Meter project. The need for an inexpensive and reliable deviation meter is now filled. This meter interfaces with an inexpensive Radio Shack scanner. Interfacing information will be made available for other radios as it becomes available.

The Deviation Meter uses the IF from an external receiver and self-calibrates itself. Currently it requires a 10.7 Mhz IF to work properly.

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.

While Lyle was giving his presentation, Heather was selling all the available Deviation Meters they had kitted. This kit was the hit of the day.

Lyle also covered the progress of the DSP project and what state it is in at the moment. TAPR is hoping to produce an affordable kit for DSP work that will have software developer support.

Mike Curtis, WD6EHR - 9600 bps Radios

Mike Curtiss, WD6EHR, described his documentation effort on the 9600 bps modem, and interfacing it with several different radios. He is working on a revision to the 9600 baud handbook, which should be finished soon.

Fundamental crystals are better suited for linear FM. Manufacturers often specify overtone crystals because they're more stable and are less affected by changing capacitance, but we WANT our TX rock to change frequency with changing C. Fundamental cuts are more linear when FM'd than overtone crystals.

Mike showed the TEKK TNET Micro (old KS-900) and the TNET Mini (new TS-960) data telemetry radios. A lot of 9600 baud is being done with these. The new TEKK TNET Mini radio has a couple of additional pins - carrier detect and a relative signal strength indicator output, also the receiver is temperature compensated. People who want to put them on a mast or hilltop will want the TNET Mini.

In L.A., they are going to use a 9600 baud 6 meter duplex repeater (like a voice repeater, with input/output frequencies) to trunk about 10 low level nodes so they will all see one another. End users will be able to work one another in what they perceive to be real time.

TrackBox

Bob Nielsen gave the status on the Trackbox; TAPR sold out of the old boards and are trying to get more kits, but don't want to over-order. Another difficulty is with two of the chips that are only available in Japan, and only in limited quantities. Additionally they are reported to no longer be in production. If we order the boards and parts how many do we order and how many spare chips do we stock? The possibility of 50 additional boards is being investigated. (If you have an interest in obtaining one of the Trackbox kits contact the TAPR office and let your wishes be known. TAPR will decide from the response how many to attempt to obtain.)

The TAPR annual meeting was closed at 4:30 pm. ...AND YOU MISSED IT!.....

DSP Seminar

Sunday was dedicated to Jon Bloom and the seminar on Digital Signal Processing (DSP). DSP can emulate many different analog devices, i.e. filters, oscillators, etc. A big advantage of DSP-based filters is that it's very simple to eliminate phase distortion in software (you don't have to find perfectly matched caps, etc!) Also, it's relatively simple to implement huge filters. The software Jon has been using (PC-DSP) does all the math, allows you to specify the characteristics you want, and comes up with the filter needed to do the job.

The seminar was in itself worth the trip to Tucson. Jon has made a lot of progress on the DSP board, and at the moment has the only known operational board from the TAPR group that is testing them. Jon has three or four modes working at this point and is making good progress. It's interesting to observe a speaker who is excited about his work. Jon, like Lyle, is such a person and his enthusiasm spread throughout the meeting area... AND YOU MISSED IT!

...Well maybe next year

Notes on the TAPR Deviation Meter Kit

by Lyle Johnson, WA7GXD

HELP!

Please let us know which receiver or transceiver you interface your DevMtr to, and what EEPROM default value changes you made, if any. We will then share the information in PSR and in future revisions of the DevMtr manual. Thank you!

Buttons Notes

The directions calling for pressing switch one or switch two are not always accurate. If pressing the specified button does not result in the expected action, try the other button.

Manual Errors

The following contributed by Bdale Garbee, N3EUA.

Page 3:

The color coding for the 470 ohm resistors is wrong. Change from red-red-brn-gld to yel-vio-brn-gld.

The TK1413 inductor designator may be a bit confusing to the novice builder. The units are actually marked TKANS-9447.

Page 6:

If your resistors are supplied on tape rather than loose, be sure to cut the resistor leads to remove them from the tape rather than just pulling them out from the tape. The tape leaves a residue which may result in good-looking but poor-performing solder joints!

Serial Port Notes

The serial port is a 3-wire interface which supports neither hardware (RTS/CTS) nor software (Ctrl-S/Ctrl-Q) flow control. The following tips are for users of MS-DOS-based PCs. If you are using another computer type, or you are using another communications program, consult the program documentation for proper setup for a three-wire interface with no flow control operating at 9600 baud, no parity, eight (8) data bits and one (1) stop bit.

PROCOMM PLUS

If you are using ProComm Plus, perform the following steps to use it with the DevMtr:

( ) Start ProComm Plus
( ) Type ALT-S (hold the ALT key down and then press the letter "S", then release both keys). A Setup Menu appears.
( ) Select Terminal. Another menu appears.
( ) Set Soft Flow Ctrl ON
( ) Set Hard Flow Ctrl OFF
( ) Press the ESC key.
( ) Select the Save Setup Option entry and press ENTER.
( ) At the main screen, press ALT-P.
( ) Select 9600 bps (5) and 8/N/1 (ALT-N).
( ) Select the correct Comm Port for your computer.
( ) Press ALT-S to save these settings.

You are now ready to communicate with the DevMtr.

PROCOMM 2.4.2

If you are using ProComm 2.4.2 (shareware version), perform the following steps to use it with the DevMtr:

( ) Start Procomm.
( ) Type ALT-S (hold the ALT key down and then press the letter "S", then release both keys). A Setup Menu appears.
( ) Select Terminal. Another menu appears.
( ) Set Flow Control to NONE.
( ) Press the ESC key.
( ) Select the Save Setup Option entry and press ENTER.
( ) At the main screen, press ALT-P.
( ) Select 9600, N,8,1 (11) and press ENTER.
( ) Select the correct Comm Port for your computer and press ENTER.
( ) Select Save Changes (24) and press ENTER.
( ) Press ESC to begin operating ProComm.

You are now ready to communicate with the DevMtr.

Windows Terminal

If you are running MicroSoft Windows 3.0 or 3.1, you may use the included Terminal application. To do this:

( ) Start Windows.
( ) Select the Accessories Group.
( ) Double-click the Terminal Icon to start Windows Terminal.
( ) Click Settings on the Menu Bar.
( ) Click Communications on the drop-down Menu to open the Communications dialog box.
( ) Click the 9600 Baud Rate button.
( ) Click the 8 Data Bits button.
( ) Click the None Parity button.
( ) Click the None Flow Control button.
( ) Click the 1 Stop Bits button.
( ) Select the correct COM port option in the Connector box.
( ) Be sure the Parity Check and Carrier Detect boxes are not checked.
( ) Click OK to accept these settings and close the Communications dialog box.

You are now ready to communicate with the DevMtr.

Radio Interfacing Notes

The DevMtr expects the detector output voltage to increase as the input frequency increases (increasing voltage during calibrate). Some receiver detectors operate opposite to this, with lower applied frequencies resulting in higher detector output voltages (decreasing voltage during calibrate). If your DevMtr signs on as Version 1.0, it needs a software patch to work with radios of this type. If you received this notice packed in your kit, the EPROM has been patched even though it still signs on as Version 1.0. If it signs on as Version 1.1 or later, it has the patch.

If your radio receiver has a decreasing voltage output during self-calibration (if you lack a voltmeter, the other symptom is that the DevMtr never displays a deviation value), make the following changes to the EEPROM:

( ) Attach a computer or terminal to the serial port of the DevMtr.
( ) Load a communications program and configure it for 9600 bps, no parity, eight (8) data bits, one (1) stop bit. (See Serial Port Notes above for details on communications programs.)
( ) While holding switch S2 closed, apply power to the DevMtr. The following sign-on message will appear from the monitor program in EPROM U9:

```
BUFFALO 3.4 (ext) - Bit User
Fast Friendly Aid to Logical
Operation
```

( ) Release switch S2.
( ) Press the ENTER key of the computer to get the monitor prompt:

>
() Type
```
MM B62B <CR>
```
where <CR> means the ENTER key of your computer.
() The DevMtr will respond with
```
B62B 81
```
() Type
```
85 <CR>
```
() Type
```
MM B62C <CR>
```
() The DevMtr will respond with
```
B62C DF
```
() Type
```
00 <CR>
```
() Type
```
MM B62E <CR>
```
() The DevMtr will respond with
```
B62E 81
```
() Type
```
85 <CR>
```
() Type
```
MM B62F <CR>
```
() The DevMtr will respond with
```
B62F FD
```
() Type
```
1F <CR>
```
The DevMtr is now set up to use a descending output detector.

Interfacing the DevMtr to a Radio Shack 2021 Scanner

by Jeff Angus, WA6FWI

I assume that you have all the manuals required for this in your hands. If not, the catalog number of the PRO-2021 scanner is 20-113. Both replacement Owners Manuals and Service Manuals are available from Radio Shack and may be ordered at any of the local stores. Approximate cost of the service manual is $5.76 and is worth it to prevent costly damage to a scanner that cost over $200 when new.

Step one: Assemble the DevMtr kit per instructions supplied.

Step two: Discriminator output from the scanner is available at TP3. Solder a 10 Kohm resistor into the pad marked TP3. This is also connected to pin-9 of IC2. (TK10402, FM detector sub-assembly) Solder the shielded DISC input lead of the deviation meter to the free end of the new 10 Kohm resistor.

Step three: RSSI output from the scanner is taken off of resistor R96 near IC5. (uPD4069BP, Hex inverter) Remove R96 and replace with a new 22 Kohm resistor. Insert the long (folded) end of the resistor in the pad marked with a circle on the silkscreen (this is pin-12 of the IC). Solder the RSSI input lead to this end of the resistor.

Step four: CAL input to the scanner is connected to the collector of Q14 (2SC2668Y) at resistor R96. Remove R96 and replace with a new 220 Kohm resistor with the long (folded) end connected to the collector of Q14. Solder the 10 Kohm resistor from the deviation meter kit to this end of R96. Connect the shielded lead from the CAL output of the deviation meter to the free end of the 10 Kohm resistor.

Step five: 12 VDC output from the scanner is taken off of the series diode, D40, (1S2076A) leading to the voltage regulator IC10. (S-81250HG). Connect the 12 VDC input lead from the deviation meter to the Cathode end of D40.

Step six: Configuration of the EEPROM values. Press and hold S2 while turning power on at the scanner. The computer should display the debugger sign-on message. Pressing the carriage return should result in a ">" symbol. The values of the EEPROM that have to be modified are listed below.

These 2 are for IF frequency:
B65A was 2A change to 29
B65B was 62 change to CC
This is RSSI polarity:
B626 was A7 change to B2

Note: Check revision number of EPROM. If it is greater than 1.0 follow the patch changes below. If it is not, either TAPR or I will supply you with the code to add to the EPROM. (Between the addresses of $0500 to $055F.) See footnote.

These 4 are for discriminator output polarity:
B62B was 81 change to 85
B62C was DF change to 00
B62E was 81 change to 85
B62F was FD change to 1F

Step seven: Calibrate unit. Press and hold S1 while tuning coil L1 on deviation meter for a reading between 38 and 44. (See page 15 of TAPR manual) Release S1 and Press S2 to reinitiate the deviation meter calibration sequence again.

This completes modification and connection of your TAPR Deviation Meter to your PRO-2021 scanner.

Footnote: The EEPROM patches to locations $B62B and $B62E relocate the calibrate lookup values to a new table. The reason for this is that the PRO-2021 scanner discriminator output changes in the opposite direction than that of the PRO-59. An alternative to the patch values and a new EPROM code is to change the injection frequency in the scanner from 10.245 MHz to 11.155 MHz. You can either change the crystal or remove it entirely and use a Hewlett-Packard 8660C signal generator coupled in through a 0.001 uf capacitor to pin-1 of the detector chip IC2. (A signal level of -40 dBm is adequate :-)

Patching TNC-2 1.1.8 for power-up in CONVERSE/TRANS

by Howard Goldstein, N2WX

Description

A relatively simple patch to the EPROM image will force a TNC-2 (1.1.8 and later only) to power up in the selected CONMODE (default: converse) mode. This patch also inhibits the signon message, although the initial stream indication ("IA") will continue to display on power up.

Procedure

First, make a copy of the old EPROM and store it in a very safe place. Next, load the binary image of TNC-2 firmware into a hex editor and change the bytes indicated below:

(ALL VALUES IN HEX)

ADDR in TAPR 1.1.8	Old value	New value	
0290	CD	CD	
0291	xx	xx	
0292	xx	xx	
0293	20	00	changed
0294	02	00	changed
0295	18	18	
0296	EF	EF	
0297	CD	CD	

The surrounding bytes are provided to enable search/replace in non-TAPR 1.1.8 versions and for TAPR releases subsequent to 1.1.8.

Notes from the TAPR Office

All of you know that Lyle and I have six children... Well... the oldest one, Samuel is about to bestow upon me the not-so-revered title of Mother-in-Law. Gulp. I tell you this for two reasons. The first is, if I start to sound grouchy...no, no, I hope not!

The real reason is that the office will be closed from April 22, when we head for Dayton, until May 10. Two days after we arrive back from Dayton Lyle and I fly to Perth, Australia, to attend the wedding!

Further, in mid June the office will again be closed as our third son, James, enrolls at the U.S Military Academy at West Point at the end of the month. We want to spend a week with him on holiday before he leaves to become a Plebe and member of the Long Gray Line.

If you will please mail in your requests during these times, as soon as I return you will be taken care of promptly!

Many things have changed in our office system, all to the better. Our new president, Greg Jones, has been very busy.

One change is in the process of handling orders, and then getting them out. I take the orders, whether by mail, FAX, or phone. Pack-It, Inc., run very capably by Cathy Green, takes the address labels and physically fills the orders, and ships them from her QTH. I just called Cathy and asked her if she had any input for this *PSR*. "Please buy our kits." Clearly put, wouldn't you say!

Talking about kits, the new deviation meter is available, and the A-to-D module, along with the Elapsed Time Pulser for METCON are here. As always, I'm amazed at what a group of volunteers can do!

I had an unpleasant experience the other day. A gentleman called. He had purchased a METCON kit. He had some questions about it. He wanted to talk to an expert, (obviously not me!) and he wanted to talk to this expert NOW. That he could FAX his queries and I would work hard to get the volunteer "expert" to answer them that evening was not acceptable. NOTHING was acceptable. He had "wasted his money." So I suggested that he return the unit, and we would refund the money. No, he didn't wish to do that either. He thinks he hung up on me; I think that at this point, I hung up on him. Anyway, we hung up! I hate to have you fellows upset, so this phone call bothered me, and it made me want to broadcast loudly to everyone interested in one of our volunteer-generated kits, that they are buying from us at their own risk. We try to supply back-up, help, etc., but we don't and can't guarantee it. Then people will be pleasantly surprised at our helpfulness, not expect it as a matter of course!

Our annual meeting was a lot of fun. I always enjoy seeing all of you. Thank you so much for coming. We wish to especially thank our overseas guests for making the effort to be with us. Please come again!

73,
For TAPR,

Heather, N7DZU

NOS intro

CAPRA - the Chicago Area Packet Radio Association has arranged to obtain a supply of Ian Wade's (G3NRW) new TCP/IP primer — *NOSintro*. Reviews of this book have been quite good.

This 356 page book is a hands-on tutorial with documentation regarding TCP/IP and the NOS software version of this international standard as implemented for use with Amateur packet radio operations.

The book contains 35 chapters and 6 appendices. It has over 80 detailed diagrams with "countless examples of commands and screen displays."

Ian Wade, the author, has given CAPRA a quantity discount. The cost to you is $22.50 which is slightly under the total cost which you would have to pay if you ordered directly from the publisher in the U.K.

This is NOT a money making undertaking on the part of CAPRA. Many of us are active on TCP/IP and feel that this is a way to increase the awareness of and technical expertise of others who may be interested in learning about, or who are currently using the protocol in Amateur radio circles.

Send your complete mailing address, a telephone number at which you can be reached should there be a problem, and a check/money order made out to CAPRA in the amount of $22.50. Mail it to:

CAPRA - Chicago Area Packet Radio Association Post Office Box 8251 Rolling Meadows, Illinois 60008

Fuji Remote Packet Operation

by Mike Mansfield, G6AWD

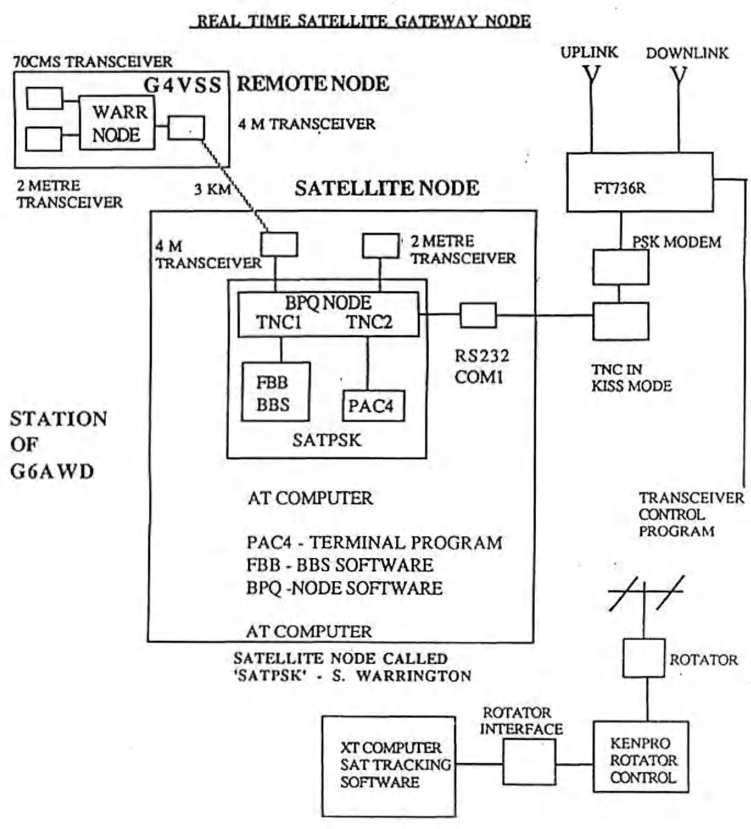
[Reprinted from OSCAR News, Feb. 1993, No. 99, published by AMSAT-UK]

It may be of interest to other AMSAT readers of the details of how my groundstation allows remote packet operation to Fuji Oscar using my equipment in real-time.

Terrestrial packet offers mail facilities to all parts of the world using a very simple range of computers, terminals, and transceivers. Unfortunately, the challenge is taken away from the Amateur by the network doing all the work for you. With an ever increasing number of nodes and BBS systems, the local Amateur has no challenge or incentive to improve the method of operating skill or performance of the equipment used. How many Amateurs actually turn the power up when the system gets busy rather than making adjustments to the way in which the TNC is operating?

To operate the packet satellites directly requires patience and a determination to make each new connection an improvement on the last. The challenge has benefits for terrestrial use in that the equipment ends up with a performance far greater than the thrown together system. Front end sensitivity and turn-around delays are optimized, and antenna systems are working at peak performance.

To encourage terrestrial packeteers to start satellite experimentation required a method of enticing users into real-time operation rather than just



BBS mail forwarding. After several discussions with Mike, G4VSS, it was decided to jointly establish a node system that would allow packet operators access to my equipment to work the packet satellites real-time. In practice, this limits the choice to Fuji due to the way in which the software is operated to the other PACSATs. A normal terminal can operate to Fuji whereas software such as PG or PB have to be used for the others. As an experimental system, it was thought that this was sufficient anyway.

The diagram explains operation of the station. The remote packet operator connects to a node which then connects to my node called SATPSK. G4VSS provides a local node within 3 km called WARR. My node then allows the user to make a connect request to Fuji by selecting the relevant port from the menu and typing in the command. My system allocates port 3, so the command required is C 3 8J1JBS-0. The node then attempts to make the connection to the satellite using my equipment. The node software is by G8BPQ and it controls two TNC cards inside the computer.

The antenna is computer controlled and the transceiver is a FT-736R which will eventually have full computer control for each pass. At the moment the development system relies on a manual setup of the start frequency. The PSK modem then adjusts the transceiver to allow for the doppler shift until the satellite is out of range. Several products are available for programming the transceiver and these are being investigated.

May I thank G2BFO (Dave), J. Miller, and the team at Surrey for all the help and assistance that I have nagged out of various people on several occasions on what initially was an unknown quantity.

UO-22. Satgates and Improved Performance.

by Jeff W. Ward, G0SUL/K8KA
University of Surrey

[Reprinted from OSCAR News, Feb. 1993, No. 99, published by AMSAT-UK]

Assessing the present performance of UoSAT-OSCAR-22 is a complicated issue which has sparked heated debates amongst the users. As usual, the programmers (myself and Harold Price, NK6K) have some plans to make more useful bandwidth available. Also as usual, these plans will take time and effort to execute, so the present state of affairs will likely persist for a few months.

Much of the "debate" on the network concerns SATGATES. I still believe that SATGATES and direct end users are equally important to the Amateur Satellite Service. I hope that UO-22 can provide good service for both user groups.

The present problems on UO-22 are dominated by the huge number of files now being uploaded to the satellite. A few guidelines for SATGATE operation might help to ease the problem until a more thorough technical solution is implemented.

Cut Down Use of Directory Entries

Directory entries are, and will always be, a limited resource. UoSAT-5 supports 800 onboard files. Also, because of the directory broadcast protocol, end users have to receive hundreds of SATGATE directory entries in order to receive the few other entries they might be interested in.

SATGATE operators should do everything in their power to reduce the number of files they upload, even if it means uploading and downloading larger files. Small files for several destinations should be combined into a single larger .ZIP file which would be download at all of the destinations. This is not "efficient" in use of downlink, but when the effect of directory usage and directory downloading is taken into account, it is probably a good move.

Until we change the directory downloading system, SATGATEs should only forward traffic once each day. Consider that one 150-byte directory entry broadcast 100 times would take up 15,000 bytes of download time.

Each directory entry saved will make a considerable difference.

Locate SATGATEs Reasonably

New SATGATEs should serve an obvious need of the terrestrial network. This means that two SATGATEs should probably be separated by 6 hours or more of terrestrial forwarding. This is not to say that close Gateways should not use the satelllite to communicate with one another, rather a SATGATE should be in a "cell" separated by 6 hours or more of terrestrial forwarding from all other SATGATEs. This will concentrate mail, reducing the number of SATGATE files on the satellite.

In most cases, it would be sensible to have a backup SATGATE in case the primary went down. But when the primary is working, the backup should not upload mail.

What Developments are Planned?

The next thing that I will be implementing for UO-22 is hole-list optimization. Those following the implementation of PB onboard UO-22 will know that if two stations request the same data at the same time, the data will be transmitted twice. Because the broadcast protocol makes all packets useful for all stations, the data should only be transmitted once. I will add software to make sure that these double transmissions do not take place. This should create more free bandwidth on the downlink and more room in the PB list.

If work permits, I will also work to separate the SATGATE files into their own "directory space." Thus, end-users will not need to receive hundreds of SATGATE directory entries in order to complete their own directories. Sometime this year, we may also experiment with a new type of uploading protocol based on the KISS mode rather than connected mode.

Instructions for end users:

1. Remain calm; reflect on the fact that the TNC, AX.25 and the packet satellite are products of the whole Amateur radio digital communications community, not just AMSAT members with UO-22 stations.
2. Get your station on the air as much as possible to keep your directory in good shape.
3. Make sure your downlink is as good as it possibly can be.
4. Wait for the changes in the spacecraft software.

Instructions for SATGATE operators:

1. Make sure your SATGATE or planned SATGATE is 6 hours of terrestrial forwarding away from the other nearest SATGATE.
2. Combine small files into bigger files.
3. Upload once per day.
4. Be prepared for a new version of PB to support separate SATGATE and end user directories. (End users will not have to change.)

I hope that these are sensible suggestions, and that by the time you read them some technical progress has also been made. Amateur radio is, and has been, a self-regulating communications service. It is not so easy to make a bandplan for a digital transponder as for an analog one — and even the analog satellite operations planners have heated debates with the users.

Statistics

In December 1992, UoSAT-5 had 228 active Amateur radio stations making 4748 user logins, uploading 6444 messages, averaging 208 messages per day, totalling 19.7 Mbytes of data uploaded. These statistics do not reflect users who only downloaded files, nor do they include the CPE, CCD, and WOD files.

On the download side, 285,474 message and directory download requests were received, of which 180,686 requests were serviced (the others were rejected), resulting in 573 Mbytes of data being broadcast, meaning an average of 3.2 Kbytes of data transmitted per request.

UHF MICOR Radio at 9600 bps

by Hartley J. Gardner,
W1OQ @ N7MRP.AZ

[This modification is courtesy of the Arizona Network Intertie Group.]

Some time ago, I sent out a message wondering if anyone had found a way to modify a Motorola MICOR (UHF) radio for 9600 bps operation. No one had, but several folks wanted to know if it turned out to be workable. Well, it is!

With thanks to Dan, N7MRP, who implemented the modifications and tested them out, here it is:

First, the MICOR was modified for "stand-alone" operation (without a control head) — on P901 (the big connector in the front), pin 11 is jumpered to pin 1 (gnd), pins 8, 3, and 22 are connected together and to a 2 amp fuse connected to the big A+ feedthru going into the PA. All these jumpers are done on the control (interconnect) board, except for mounting the fuse itself. Connect the large A- lug at the feedthru to chassis ground (you CAN solder to the plated steel frame). Unless you want speaker audio to listen to, there is no need to install volume or squelch pots, and the audio amps are not used in this application. The only connections used in P901 to the "outside" are A & B (the big A+ and A-), PTT (pin 16), Discrim Audio (pin 20) and TX Mod input (I use pin 27). Internally fused A+ is available on pins 3, 8, and 18 (adjust your internal fuse to suit). Fuse the 12v main at 20 amps (up to 45 watt operation) or 35 amps (75 or 100w radios).

Second, we did a couple of mods. that seem to help prevent problems before they arise: add a capacitor (at least 20 microfarads, I use 220 uF) across C903 on the control board (this is the tubular electrolytic located just to the rear of the 9.6v regulator transistor heatsink). Add a diode (1N4001 or better) from P901 pin 16 to any of the A+ pins (3, 8, and 18) with the banded end to the A+ pin (this is a "spike" suppression diode).

Third, one mod. on the Audio/Squelch board: replace C203 with a 1-10uF electrolytic/tantalum - I

recommend at least a 20v rating. This improves the low frequency end of discriminator audio.

If your radio has a CTCSS encode board plugged into the exciter, remove it. Install JU304, which is located immediately adjacent to the encoder board connection on the exciter. Depending on which exciter you have, the encoder will have either 7 or 11 pins - in either case, the pin you will use to inject transmit "audio" is the one adjacent to the big square hole, towards the outside edge of the radio (pin 6 for 7-pin, or pin 10 for 11-pin ones). Connect a shielded lead from this pin to an unused pin on P901 (I use pin 27). On the exciter, trace the land from the pin you just connected to and you will find an 82K resistor - replace it with a 10K resistor (1/4 watt) and a 10 uF capacitor in series. (Some exciters already have a 6.8uF capacitor in series - if you are SURE yours has the capacitor, you don't need to add another!) Remove the Mic amp IC (IC401)

On the receiver RF/IF board, remove the two crystal filter "cans" that come after the IF amp IC (Y103 and Y104), and replace them with 1000 pF disc caps (not critical). Note that the caps DO NOT connect to the center ground pin! This mod, is CRUCIAL to making the receiver work at 9600 bps!

That's ALL there is to it. Naturally, you need to tune the radio up, but I figure you already know that! Connect your transmit audio to whichever pin you connected the jumper to, receive audio (discriminator) is on pin 20, PTT is pin 16, and 12v goes to the big pins in the middle (pins A and B).

I would advise obtaining a service manual for these radios if you plan on using them - it is Motorola part # 68P81015E70, and you should be able to order one through any Motorola service shop.

A few further notes on UHF MICORs: as they were built, they are set up to transmit either on simplex or 5 MHz ABOVE the receiving frequency. If this works for you, tune it up as the manual calls for - if you would rather have the transmitter BELOW the receiver, you can "invert" the offset scheme by placing the local oscillator frequency ABOVE the desired receive frequency instead of below it. Order a crystal for a frequency 23.4 MHz ABOVE your desired receive frequency and tune the radio up accordingly. This trick also allows you to use common UHF business frequencies to implement 438-440 MHz simplex frequencies - but you need to know that the image will get into the receiver if you are located very near one of these transmitters! Another trick we have used is bypassing some of the final stages if you want less power than the radio you have is rated for - if you examine the PA boards, you will see that each stage has a 50 ohm point distinguished by a short piece of .141 semi-rigid coax. You can install a jumper from the end of the coax going toward the output to these points to get much better efficiency at lower powers. Typically, the controlled stage (the first transistor) puts out from .5 to about 8 watts, the pre-driver between 5 and 20 watts. If you do this modification, remove CR604 (an SCR) from the power control board to disable the low-power shutdown feature.

Membership Application

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