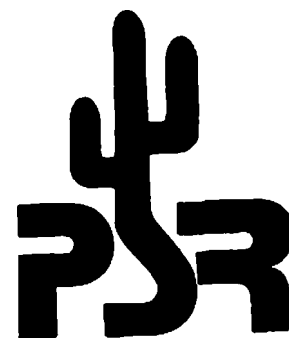


# Packet Status Register

March 1985

Number 14



## Tucson Amateur Packet Radio Corporation

Our booth this year will be in the same location as last, well almost. The Dayton folks have added one more booth space to the end of the row. Since we still want a corner booth we have moved over one space to occupy booth number 351. We are working on a new brochure and Andy, NOCCZ, has dreamed up a nice little poster showing the different books available about packet. Folks won't be able to miss us as we are still using the 4 by 8 foot "Join the Packet Radio Revolution" banner. We are also planning to have two separate packet demos this year, the 1200 baud AFSK stuff plus Steve Goodes 220,9600 baud stuff. Packet should be bigger and better than ever at this year's Dayton Hamvention!

Oh yes don't forget to mention that free "I'm a Packeteer" button-stickers will be handed out!

Pete Eaton, WB9FLW

As a side effect of a project to plot possible PACSAT orbit paths, I now have a program running on the PC that will draw state maps and digipeater paths.

I am willing to become a registry of digipeater paths, and will plot maps. Send me a list of the major digipeaters in your area, the call, lat/lon, altitude, and the other digipeaters they can see.

It may also be fun to do a plot of packet board density by area. The next time you work on your membership list or at your next meeting, get people to give you their lat/lon coordinates or at least a grid square. Send it to CIPRUS (Central Illinois Packet Radio Users Society) PO Box 4143, Peoria, IL 61607. They are compiling a packet user's directory. I'll get it from them. As level three plans progress, demographic information will be useful to network planners.

Harold Price, NK6K

I have recently volunteered to be the Georgia packet activity liaison for the Georgia Radio Amateur Packet Enthusiast Society (GRAPES). Part of my job entails keeping other packet organizations up-to-date on packet happenings in Georgia. I am also responsible for sending out information packages on packet radio to interested amateurs. If it is possible could you publish my name and address in PSR along with a request that those interested parties send \$1.00 and an SASE for the information package. I also took over the editorship of our newsletter The GRAPEVINE recently. Please feel free to use any of our articles in the newsletter.

Bill Crews WB2CPV  
1421 Hampton Ridge Road  
Norcross, GA. 30093

SACPAC (Sacramento Packet Group) is composed of 7 packeteers on the air (145.03) in the Greater Sacramento area. We are currently searching for a low-level (California-style) digipeater site, but learning as much as we can in the meantime.

Eventually, packet will be an integral part of the Sacramento County RACBS/ARES network, and we hope there will be a TNC installed at the Sacramento County Emergency Operations Facility by the end of the year.

If you're in the area, or will be, give us a "connect" on 145.03 sometime. On the air so far is: K6QIF, WA6LZO, WA6NWE, K6PWY, W6SPN and KB6JM. Still looking for that elusive permanent connection into the Bay Area!

Bill Tubbs  
KB6JM

There is a beginning of packet activity in North Alabama. I have 2 GLB's and 2 TAPR boards that will be used for seed hardware, as well as my own station. A WORLI mailbox is in the works and should be on the air in Huntsville in the next month or two. A good high location has been offered. All we need is a radio solid enough to put at a remote (very) location.

WB4ZKX, Alan Forney, also in Huntsville has a TAPR board ordered and will be active as soon as it is finished.

Alabama folk --- let's start working up a packet gettogether at the Birminghamfest in May. We need to start talking linking!

Frank Emens  
W4HPU

Nightly HF experiments are being run between WB6RIJ, Bill in Santa Barbara, and WB6FSK, Steve in Simi Valley, on 28.400 MHz. Currently 110, 300 and 1200 baud 1000 Hz shift is being tried. 1200 baud connects require extreme patience and good conditions to maintain contact. 110 and 300 baud is much more forgiving.

The next step is the addition of the LED tuning indicator at each end. In addition tests are being scheduled for both 40 and 80 meters to find the optimum band for this path.

We would welcome others to contact WB6FSK, 664 Bristol Ave., Simi Valley Ca. (805) 526-1120 if you have an interest in joining our HF experimentation.

Attention N.Y. Metro Area, Long Island and New Jersey packet-teens.

Lets have an "eyeball" breakfast, brunch or what have you, get together soon at a location mutually agreeable for the purpose of sharing.

Please send name, address and telephone number to me. I'll be in touch.

Fred Weidenhammer W4SDL/2  
332 Blacksmith Rd.  
Levittown, NY. 11756  
(516) 796-8342

# Presidents Corner

by Lyle Johnson, WA7GXD

The TAPR Annual Meeting was an unqualified success, if comments by the attendees are any indication. There were over 70 people in attendance. There were some significant demonstrations of packet equipment. If next year's meeting is anything like this year's was, plan to attend! It will occur on Saturday, February 8, 1986.

Some folks have asked that the meeting be held someplace else for wider exposure... and cheaper air fares! Phoenix or Los Angeles were brought up as possibilities. It was also pointed out that there should be some organized activity on Sunday. This year your Board of Directors met on Sunday, rather than an all-nighter on Saturday.

What are your thoughts?

Your participation in the balloting this year for five Board members was more than doubled over last year. The five successful candidates were:

|               |    |        |
|---------------|----|--------|
| Mike Brock    | -- | WB6HHV |
| Andy Freeborn | -- | NOCCZ  |
| Skip Hansen   | -- | WB6YMH |
| Dan Morrison  | -- | KV7B   |
| Bill Reed     | -- | WDOETZ |

The other candidates received strong support. In many cases the decisions were based on one or two votes. With a field as qualified as this year's, it was a very difficult choice indeed.

As to the significant demonstrations...

The Rocky Mountain Packet Radio Association has developed a 12-volt DC power supply for the TNC based on a switching module available for around five dollars (!) from Radio Shack an other sources. For detailed modification instructions, write to

RMPRA Power Supply Experiment  
3775 East 115th Avenue  
Thornton CO 80233

and BE SURE to enclose an SASE!

Heathkit has introduced the HD-4040. This is a "TAPR clone" and as such is totally compatible with the TAPR TNC hardware and software. The real significance is not so much that we have another vote of confidence from the traditional Amateur manufacturing community (AEA produces a wired version of the TAPR TNC), but that Heath is in a strong position in the personal computer market as well as the educational marketplace.

This means that Heath is in a unique position to reach many potential packeteers, and indeed potential radio amateurs, that might otherwise be unexposed. The Heath representative, Mr. Wayne Wilson, indicated that Heath would be exploiting this uniqueness in their marketing. He also indicated that Heath might offer bundled

TNC/transceiver packages using radios of another manufacturer!

Finally, Heath indicated availability in the April/May time frame and a price class of \$300. For those who keep track, this is a "two-evening" kit...

We certainly welcome this entry to the packet radio revolution!

The development which gained the widest attention, however, was the demonstration of Steve Goode's 9600 bps direct FSK modem. Steve, K9NG, of the Chicago area, has designed a fairly straightforward adapter that can be used with an unmodified TAPR TNC (via the modem disconnect) and a modified FM transceiver. Steve demonstrated the use of the Hamtronics FM-5 transceiver and the T51/R76 transmitter and receiver strips on 220 MHz.

The radios turn around in about 12 milliseconds. We did several disk dumps from a Compaq computer and measured a data throughput rate of just at 8,000 bits per second!

It turns out that there are some undesirable characteristics that the FM-5 may manifest when operated in this manner that make it necessary for a person doing the conversion to have access to some fairly sophisticated RF test gear during tuneup. Thus, the modem probably won't be generally available until a suitable radio system is developed. Don't be dismayed, however, TAPR has a high priority on getting just such a radio developed this year. Watch this space!

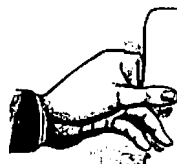
At the Board meeting it was emphasized that Network development is TAPR's number one priority. Digital hardware, RF decks and higher-speed modems (of which Steve's efforts play a considerable part) must be designed and made easily reproducible. Software must be developed. A national effort must be mounted to spearhead orderly growth of packet; this includes building the high-speed backbone system as well as enhancing the services a true network should provide.

After the San Francisco conference later this month, packetdom should have a better idea of the direction that networking protocol will initially proceed. After Dayton, TAPR should be in a strong position to devote considerable energy into the hardware and software necessary to implement that network.

Did I mention Dayton? By all means, plan on being there! While it is not expected that there will be any awards to TAPR this year, there are certainly signs that packet will be represented at Dayton in some exciting and perhaps unexpected ways. There will be more manufacturers in the packet fray, and more TNC designs as well.

TAPR will have a booth again this year, and the Packet Forum will be held on Friday afternoon.

Come on along...



For DAYTON DATA  
see  
Page 1 and page 8



# PACGrams

By Jay Nugent, WB8TKL

Now that Packet Radio has a foothold in the amateur community with some 1500 plus TAPR TNC's scattered around the country it is time for something more than RTTY-like ragchewing, an occasional program transfer, or leaving messages for one another on the local Packet Bulletin Board System.

What I am proposing is an application for Packet that makes effective use of its capabilities. It also offers an improvement over any existing systems, not merely a duplication. The application that comes to mind, where rapid error free transmission is the goal, is traffic handling. A very effective protocol is already in widespread use for this task, the Radiogram.

A Radiogram is an addressed and numbered message format with handling instructions and simple error checksum. In order to merge this existing structure with a new transmission method, yet continue to use the message content in the existing worldwide networks, we must have an accepted standard for coding, recognizing and returning the radiogram back to its original form. So we don't limit the number of stations able to use this method of sending traffic a human readable form would be desired. To this end I propose PACGRAM.

PacGram is an application software package used on the host computer that is connected to a TNC. The software is responsible for prompting the operator for the proper Radiogram information one field at a time and forming a PacGram message. It is then sent to the TNC for transmission into the network.

At the receiver, PacGram watches the data stream for its starting character. When this character is detected the software knows to convert the message back into the standard Radiogram format for display. Other special characters are used to separate the fields within the message and to signal the end of a PacGram.

## PacGram Definition

Selection of special characters used in PacGram was based on the fact that they should not appear in the heading or body of a normal message. For those stations not possessing PacGram software, such special characters should allow a PacGram message to be read and easily returned to standard Radiogram form by hand.

The START of a PacGram shall be a pound sign.

"#"

The purpose of this character is to differentiate a PacGram from any other data sent from the TNC to the host computer. This start character also helps facilitate locating a PacGram in RAM for later retrieval.

The DELINIATION character shall be an asterisk.

"\*\*"

This character is present in the PacGram to delineate the fields of a standard Radiogram from one another. The absence of data in a field will cause two consecutive asterisks to appear within the PacGram. The asterisks may later be converted into tabs by the PacGram software to facilitate printing to a formatted screen or printer.

The END of a PacGram shall be the ampre sign.

"&"

The purpose of this character is to signal the end of the PacGram. This is used to identify the end of the PacGram in RAM for later retrieval.

The FIELD ORDER of a PacGram is as follows.

Number /Precedence /Handling instructions /Station of origin /Check /City & state of origin /Time filed /Date filed

Name to /Number & street /City & state /Zip /Phone number

Text of the message

Signature /Title of signee

FIELD LENGTHS and TYPES within the PacGram.

The fields may be of any length. Types may be either alphabetic or numeric. This is in line with a standard Radiogram which is handwritten or typed allowing very flexible use and applications.

Just as a Radiogram has well defined fields in a specific order, so does a PacGram. By design the PacGram will have an identical layout to a Radiogram. Here is a sample Radiogram with an equivalent data stream in PacGram form.

Number: 126 Routine WB8TKL Check: 5 Ann Arbor MI 1430Z May 21  
TO: Mike Nugent  
123 Hollywood Ave  
Hollywood, Cal 54321  
(818) 555-1234  
TEXT: How is the weather X  
Signed: Jay

The equivalent PacGram would be:

```
#126*R**WB8TKL*Ann Arbor MI*1430Z*0521*Mike  
Nugent*123 Hollywood Ave*Hollywood Cal*54321  
*(818)555-1234*How is the weather X*Jay**&
```

The length is well within the maximum AX.25 PACLEN. A single full length packet could contain a very large text field, one that many traffic handlers would groan at. Yet it could be sent in a fraction over a second, an enormous improvement over existing amateur traffic systems.

Also notice that since the fields for Handling Instructions and Title were left blank PacGram simply put no data between the two asterisks. This is necessary to maintain the field count for decoding the PacGram at the receiving end.

This formatting of Radiograms into PacGrams was tested using very crude software during the Simulated Emergency Test in Michigan a year ago and proved to work efficiently. Since that time I have been seeking improvements and suggestions and would welcome any that you may have. The work I have done so far has been in assembler for an 8080 under CP/M.

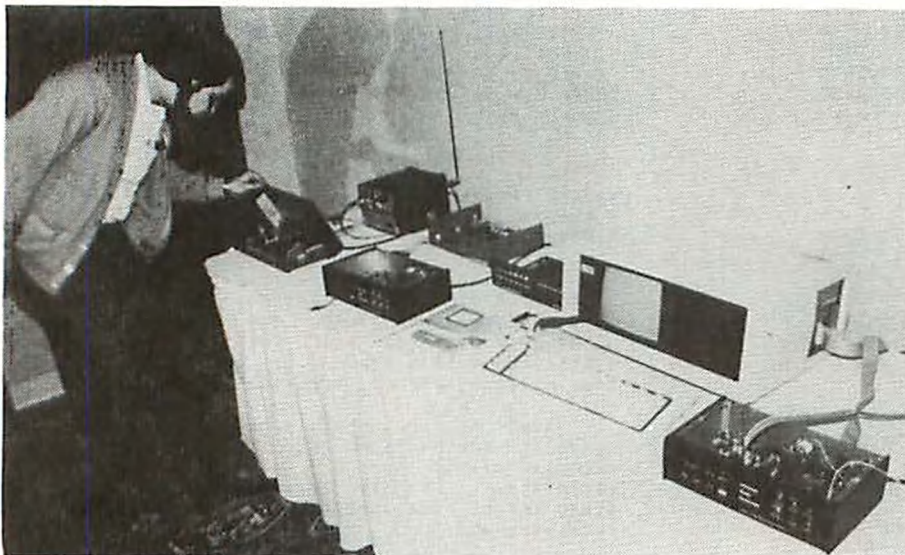
I am sure there are many of you better qualified and more knowledgeable in writing software, so I will make the software available to those that want to take a stab at it. Please return the favor by sending me a copy of what you have done to improve my code.

★★★★★

# TAPR 1985 Annual Meeting



The multitude at TAPR's 1985 annual meeting



A concentration of TNCs; AEA, Heath and TAPR models



Lyle Johnson, WA7GXD, president of TAPR

Chuck Green, N0ADI, holds up TNC number 2001



Steve Goode, N9NG, with his 9600 baud modem and RF gear



Jeff Ward, KBKA, editor of ARRL's Gateway



Harold Price, NK6K, speaks about level III



Tom Clark, W3IWI, points out EASTNet links to onlookers

# The DC TNC



Linc Haymaker, K0ZCO, demonstrating a DC TNC

By Bob Gobrck, WA6ERB

The following notes are based on my conversion of the TAPR TNC to 12v using the RMPRA project notes. Help was obtained from the three inventors:

Tim - KROU, Linc - K0ZCO and Don - NOBRZ

## Addendums:

There are a couple of errors and changes that have been made since the RMPRA notes were issued:

-There is a wiring error in the notes when connecting the +/- 12 volts to D9 and D12 (the schematic is correct). Check it out or you will lose TR-4 on the RS board and maybe damage the TAPR unit (I NEVER made such a mistake - Hi).

-Fusing: Change the 1.5 amp fuse to the "+" lead (red) going into the supply board. That way it works on both the battery and xfmr.

## New Changes:

I have my TAPR TNC now running off of the 117 VAC with a 12 volt deep discharge type car battery as a hot standby (charged each night by a 15 amp battery charger and light timer). For those interested in adding this 12 volt DC capability to your TNC here are some additional things that I have done:

1. I replaced the TNC power transformer with a Radio Shack 12.6 V, 1.2 amp one (RS # 273-1352). It uses the same mounting holes and fits perfectly. I am now assured that when I have both the 117 VAC and the battery hooked up, that the 117 VAC is the prime source for power (ie. higher voltage level output than the battery).

2. I replaced C1 (2200uf 16v) with a 1000uf 35v capacitor (RS #272-1032). Even though it is not needed (there is enough filtering in the RS board), I always like my rectified AC to look good??? (You have to remove C1 if you do the above xfmr mod because of the 16v operating voltage).

3. For the DC battery connection I installed a red and black insulated binding post (RS# 274-661) on the rear of the TNC cabinet in the holes vacated by the 5 volt regulator. The holes are offset, so you ruin the symmetry of your Gucci cabinet, but you don't have to drill.

4. Drilling - yes I drilled two holes in the top cover to mount the board. All I need now are some more of those black screws to make it match (purist).

5. I wanted the front panel power switch to turn both the AC and the DC battery sources off, so I rewired the switch to turn on the RS board's power. The RS Power Supply board has a DPDT (SW1) which is modified for this use. First jumper the "negative" leg of this switch (the one going to the white DC input lead). and then parallel the front panel Gucci switch to the "positive" (red) leg. Your 117 volt AC will always exciting the xfmr, but this is no different than most of the inexpensive computer power supply designs that are on the market today

6. Finally, I added Radio Shack Molex type plugs for the input and output lines to the power supply (reuse the Gucci switch one). I now can remove the top cover and work on the unit a little easier.

★★★★★

By: Tim Groat, KROU

WA6ERB WAS RIGHT!

There is an error in the second paragraph of "TAPR INTERNAL POWER SUPPLY HOOKUP" in the DC power module write-up. The second reference to U22 should be to U23.

The correct paragraph is as follows:

1. Remove the +5, +12, and -12 regulators (U24, U22, and U23) from the TAPR board. U24 may have been mounted on your cabinet back-panel.

2. Remove D9 and D12 from the TAPR board.

3. Connect an insulated jumper wire (#24 AWG or larger) from the ANODE of D9 (not banded) to the output of U22 (pin 3).

4. Connect another insulated jumper wire from the cathode of D12 (banded) to the output of U23 (pin 3).

These jumpers bypass the 12V rectifiers and regulators, so the +/- 12 supply can be connected at J4.

Sorry about the confusion. Fortunately, the schematic IS correct as distributed. You will find the mistake when you try to put the second wire onto U22.

★★★★★

# Teaching Old Dogs....

By John Dewey, KA9CAR

I picked up a crystal controlled radio at a hamfest for \$30 to dedicate to packet. Getting it to run with a TAPR TNC took a little modification. Some of the changes may be of interest to other readers of PSR

## Equipment

The radio I bought is a Varitronics IC2F Deluxe. The Varitronics line was made by Inco Communications Company which is now known as ICOM. The radio uses Diode switching and puts out about 10 watts, and is phase modulated.

## T/R Switching

The diode switching requires a very low resistance on the PTT line. The TNC pulled it down to .4 volts, which was low enough to cut off the receiver but not key the transmitter. The current on the PTT line was over 100 MA. A check of the schematic and circuit description showed a red "transmit" light bulb in series with a 47 ohm resistor being used as a pull up on the PTT line. The rig keyed fine after I changed that to a 1000 ohm resistor in series with an LED.

## Receive Audio

The sound of packets on the speaker of this rig is strange. I didn't even try to use the speaker audio. On other radios I have used the audio at the audio gain (volume) control pot. I could have done that here except there was a better way. An accessory jack on the rear panel had a line direct from the discriminator. This line was intended to drive a centering meter, and was connected to their discriminator output with a circuit almost identical to the one to the audio pot. The TAPR TNC presents "a 10,000 ohm load bypassed by a .01 mfd capacitor." I figured that a total bypass capacitance of .016 or more was needed to put the proper de-emphasis on the discriminator audio. I removed the 22,000 ohm load resistor in the radio (a previous mod? It was not shown on the schematic), and replaced the existing .01 mfd bypass cap with a .022. Considering the capacitors for RF bypassing at the discriminator, the back panel, and the TNC that gave me about .042 mfd to ground. I connected this line to the TNC receive audio input. This audio is unaffected by squelch or volume control settings, so you can set the speaker audio control any way you like for monitoring the channel. It

is a low level signal which is adequate for the TNC and low enough not to cause the false carrier detections that I used to on an unsequelched speaker signal.

## Transmit Audio

Unshaped phase modulation appears the same as pre-emphasized FM. However in order to control the audio, the usual system is to pre-emphasize, amplify, clip, and de-emphasize the signal before applying it to the modulator. Running my audio into the same point as the microphone worked. But I made some changes anyway.

Since the two tones coming out of the TNC are at the same level at all times it is not necessary to limit them if they are properly adjusted. The amplifiers, shaping and clipping circuits might not be perfect, and could introduce distortion into the signal. I tried driving the wiper of the deviation pot with the TNC audio, but it didn't work. I was successful in applying audio directly to the base of the transistor (TR26) which drives the modulation transformer. Since there is no limiting on the this signal you must be sure to adjust the TNC audio output to a level that PRECLUDES OVERDEVIATION. First adjust the microphone audio deviation, then set the TNC HIGH tone deviation to between 4.5 and 5.5 KHz using the Cal 4 feature without moving the jumpers. I did this by monitoring with another radio with a "tight" bandpass, then checking with several other stations to be sure the audio had a crisp clean sound, indicating that their receivers were not clipping an overdeviated signal.

## Summary

If you have access to the proper equipment you could custom design the audio shaping to your radio. I don't have any test equipment beyond a VOM, so I can't tell you what the net shape of the received or transmitted audio is. I can tell you that this radio now gets through with no retries to both TAPR TNC's with MX-10 shaping of the received audio and to GLB units with no shaping. It also receives on the first try.

The sensitivity and selectivity of this 1970's era radio is not what a modern rig would have. But it is adequate for packet use in an urban area and works the digi-peater which is 40 miles away.

\*\*\*\*\*

## MEMBERSHIP APPLICATION

Tucson Amateur Packet Radio Corporation  
P. O. Box 22888, Tucson, Arizona 85734

Name: \_\_\_\_\_

Call Sign: \_\_\_\_\_ License Class: \_\_\_\_\_

Address: \_\_\_\_\_

City & State: \_\_\_\_\_ Zip Code: \_\_\_\_\_

Home Phone: \_\_\_\_\_ Work Phone: \_\_\_\_\_

If you wish not to have any of the above items published in a membership list, indicate here which they are:

I hereby apply for membership in TAPR. I enclose \$12.00 dues for one year.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Which Beta Test site (if any) is closest to you?

# Dayton Events

by Bob Neben, K9BL

These are suggested topics for the forum, there may be some changes made by the time of the Hamvention. Each Presentation last 30 minutes.

Friday April 26 in the big room (I think it's #2)

1430 Introduction Bob Neben (maybe 5 minutes)  
1500 Pete Eaton - Packet Primer 1985  
1530 Jeff Ward - ARRL and Packet Technology  
1600 Lyle Johnson - TAPR activities  
1630 Harold Price - PACSAT update  
1700 Terry Fox - Linking, BBS's and the 820

## The Packet Dinner

On Saturday evening beginning at 1900 there will be an informal Packet dinner at the Upper Crust, 1919 N Main St. This is a sandwich shop that we can get together informally and discuss Packet with one another until midnight. This is where we were two years ago and it looks like another good time. The only problem is there is only seating for 75; I hope all 2500+ packeteers don't show at one time.

For Hamvention Packet, the place to be is 145.01.

.....  
The Tucson Amateur Packet Radio Corporation is a nonprofit scientific research and development corporation. The Corporation is licensed 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 acquired during and obtained from such research.

The officers of the Tucson Amateur Packet Radio Corporation are:

Lyle Johnson ..... WA7GXD ... President  
Pete Eaton ..... WB9FLW ... Executive VP  
Pat Snyder ..... WA0TTW ... Secretary  
Dan Morrison ..... KV7B ..... Treasurer

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## TAPR Telephone contact:

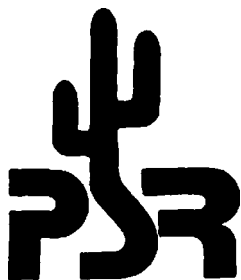
(602) 746-1166

## TAPR HF Net:

21.280 MHz      3.865 MHz  
1900Z Sundays   2100Z Sundays

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Tucson Amateur Packet Radio Corporation  
P.O. Box 22888  
Tucson, AZ. 85734



Check YOUR address label for  
membership EXPIRATION date !