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President's Corner

Dayton is upon us and as in years past TAPR is always in a rush to get things done or reported by convention time. No matter how early you start in the year to get ready, it always seems like there is never enough time to get things finished. This Dayton should be another fun one. The TAPR forum has a number of very good talks covering a wide range of topics. Don't forget that the forum begins on Friday morning again this year. For the dinner Friday, we have been able to get Dave Pedersen, N7BHC to talk. Dave has been a long time TAPR member and has travelled to a number of far-off places where he has been able to deploy radio technology to help others. The talk should be a very good one and as usual dinner should be excellent!

This PSR also has the latest information on the 1999 ARRL and TAPR Digital Communications Conference. Start planning to attend the conference to be held September 24-26th, 1999 in Phoenix, AZ. It will be good to have TAPR back in Arizona for a national meeting. I hope to see all the old faces at this conference! If you are an author, the deadline for papers will again be at the end of July.

As everyone is well aware, a discussion (sometimes heated) concerning issues related to the future of APRS was occurring on

Look for TAPR at these Upcoming Events

May 14-16, 1999 Dayton HamVenton
Sept. 24-26, 1999 ARRL & TAPR Digital Communication Conference
Phoenix, Arizona

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President's Corner, continued...

APRS-SIG during the month of April. In order to be more productive, TAPR was able to bring together the main players and help facilitate a constructive dialog on the issues and arrange an in-person meeting the first of May. By the time this *PSR* is in print, the in person meeting will have been held. I am sure I will be writing more in-depth about this process and what agreements came about in the next *PSR*. If you are very interested in the outcome before the next *PSR* goes to print, then keep an eye on the APRS NEWS or APRS SIG lists. The group has agreed to publish the outcome of the process, so that everyone can find out what happened. An announcement is expected on what progress is being made to occur before Dayton Hamvention.

The Spread Spectrum Radio project continues forward. A full report on the current developments will be in the next *PSR*. The team has been focusing on the RF section and a second turn of the board will be required in the next two months to help further progress on the design.

Finally, I would like to thank all those members who took the time to cast ballots in the Board elections. I was a little disappointed that less than 6% of the membership participated in the balloting process. If you have a suggestion on how we might get more members to cast ballots in the yearly elections (other than sending money upon voting :-), please drop me an e-mail and share your thoughts. The four candidates we had running this year embody some of the best aspects of our hobby. I hope that we continue to have such a pool of talented and visionary members running each year.

Until next quarter.

Greg Jones, WD5IVD

TAC32 Version 2.1.0 is available

Richard M. Hambly
CNS Systems, Inc.
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www.cnssys.com

To all registered users: Tac32 Version 2.1.0 is now available. It has some new features and corrections.

You can see the release notes and install Tac32 at www.cnssys.com/tac32/.

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Article submission deadlines for upcoming issues:

Summer 1999	June 15, 1999
Fall 1999	September 15, 1999
Winter 2000	December 15, 1999
Spring 2000	March 15, 2000

Submission Guidelines:

TAPR is always interested in receiving information and articles for publication. If you have an idea for an article you would like to see, or you, or someone you know, is doing something that would interest digital communicators, please contact the editor so that your work can be shared with the Amateur community.

The preferred format for articles is plain ASCII text; the preferred graphic formats are HPGL or PCX. However, we can accept many popular word processor and graphic formats. All submissions on diskette should be formatted for MS-DOS.

Packet Radio for Less than \$10

John Hansen, WA0PTV

I thought it was about time to publish a construction article, so get your soldering irons warmed up. There are enough off-the-shelf pieces of technology now available for free that it is possible to cobble together truly marvelous systems that do new and wonderful things without paying a lot of money. Furthermore, you don't have to be either a hardware genius or a software developer to take advantage of this technology.

This month I'm going to show you how to put a packet radio station on the air for less than \$10. Now I'm sure you're saying, what's the catch? And, of course, there is one. In order to work this miracle you must have a computer with a 486 or better processor that has a sound card in it. If you have the computer, lack of a sound card should be no barrier. I've seen sound cards offered new for less than \$25. The basic thrust of this project is to use your sound card as a cheap analog-to-digital converter and using the processing power of the CPU to code/decode the data stream.

The first phase of this project is to get the software installed and monitor packet activity. You will need four zipped files (<ftp://ftp.tapr.org/pub/wa0ptv/>):

PCF.ZIP
FLEX95.ZIP
SM.ZIP
BCT.ZIP

PCF contains Flexnet, which is a packet networking system developed in Germany. It is described in detail in the June, 1997 issue of *CQ-VHF* magazine. For this project you really aren't going to be using this software for its originally-intended purpose and virtually none of the description in *CQ-VHF* sheds any light on the application described here. But if you want to know how it is being used for networking in Germany, *CQ-VHF* contains an excellent description. This software runs both under DOS and under Windows95. The file FLEX95.ZIP contains the additional files you need to run the software under Win95. While the software will run under either DOS or Win95, it will not run well under Win 3.x.

SM contains the sound card drivers that allow you to use your sound card for sending and receiving packet radio signals. The only real problem with this system is that it does not use the standard Win95 sound card drivers. The documentation that comes with the new driver explains that this is because of timing problems with the Win95 drivers that cannot be overcome. What this means is that if you run this system under Win95, you will have to reboot your computer before you can use your sound card for other applications. This is an annoying

drawback, which in theory could be overcome by installing a second sound card dedicated to packet only.

BCT is a special version of the "baycom" packet radio software that has been written to work with Flexnet. It runs under DOS or in a DOS box in Win95. As yet there are no native Win95 terminal programs that run with Flexnet, though some are reported under development.

What follows is a step by step procedure for completing the project. I suggest you check off each step as you complete it. If you are old enough to remember, think of this as a Heathkit construction manual.

Step 1: Obtain the software. You will need four zip files. I have gathered all of these together on my FTP site that is sponsored by TAPR. The address is:
<ftp://ftp.tapr.org/pub/wa0ptv>

Step 1A: Create a subdirectory on your hard disk, put the four files in it, and unzip all of them.

Step 2: Make sure your sound card is installed correctly under DOS.

If you installed your sound card under Win95, you may not have installed any of the DOS drivers, since you didn't need them. You will need them in order to run the Flexnet system, however. The easiest way to determine whether they were installed or not is to boot up in DOS (not windows) and run some software that requires a sound card. If you hear something, your sound card DOS drivers have been installed. There is generally a program that comes with sound cards that will play .WAV files that you can use for testing.

If you do not have sound card drivers installed under DOS, haul out the disks that came with your sound card and install the drivers. Usually this process is automated and pretty easy to accomplish. When you are done you should have a statement in your AUTO-EXEC.BAT file that looks something like this:

```
SET BLASTER=A220 I5 D1 H5 P330 T6
```

The parameters may be different, but the statement should start with SET BLASTER.

Step 3: Configure Win95 to allow you to access the sound card (skip this step if you are not running Win95. If you are running Win95, you need to do this step even if you are planning to run the program by booting to a command prompt).

Boot into Win95. Go to your control panel and double click on "system." Pick the "Hardware Profiles" tab. It will probably just say "Original Configuration." Push the "Copy" button to create a new configuration. You will be asked to specify a name for the new configuration; call it anything you want. I called mine

"SoundBlaster Packet." Click OK and then go to the "Device Manager Tab" Select your sound card from the list and pick the "Remove" button. You will then be presented with a dialog box that will ask you if you want to remove it from all configurations or just one. Pick "just one." Then remove the sound card from the new configuration. You may have to remove the parallel port from this configuration as well. While you are in the device manager, double click on the parallel port you will use to key your transmitter. Then pick the resources tab and make a note of the first number in the Input/Output range. It is likely to be either 0378 or 0278. You'll need this later. Then reboot your computer.

Step 4: Make sure your path statement includes the directory that has the Flexnet files in them. You will need to edit your AUTOEXEC.BAT file to make this change.

Step 5: Add the following statements to your AUTOEXEC.BAT file (these go at the bottom of the file, but before any command you may have in there to start Windows).

```
CD \flexnet          (see Note 1)
LN FLEXNET
LN SMSBC /t1:0x378  (see Note 2)
FLEX
LN SMDPSK12
FSET MODE 0 1200
FSET TXDELAY 0 30
SMMIXER /s:line /o:-24 (see Note 3)
```

Note 1: Assuming you've called your flexnet subdirectory "flexnet." Use whatever directory name you called this location.

Note 2: Where 0378 is the Input/Output range number you noted above in step 3.

Note 3: This will work if you have a Sound Blaster card, for other cards, see step 12.

Step 6: Reboot, looking for error messages. If you see any errors, check your work to see what you may have done wrong.

Step 7: Get your radio audio into your PC. You'll need a patch cable for this. Run the audio from the speaker output of your radio to the line input on your sound card.

Step 8: Turn up the audio from your radio to a moderate level, tune to a channel that has some packet activity. Then from the DOS command line in your Flexnet directory, type SMDIAG.

You will see an oscilloscope type display of the incoming signal. You want to adjust the volume so the signal fills about two thirds of the screen.

Step 9: If all has gone well so far, you are now ready to receive packet. At the command line, type:

BCT /yourcallsign
where yourcallsign is really your own callsign

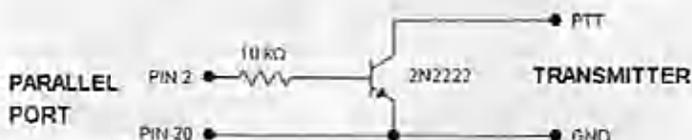
BCT is essentially a Baycom program that has been tailored to Flexnet, so if you are familiar with that program, this will now be a piece cake. If you are not familiar with Baycom, you may wish to obtain documentation on it, or you may just want to play with it until you get the hang of it. User input is taken in the top window of the screen. Commands are preceded with a colon. So to turn on monitoring, type:

:MON on

You should begin to see packets in the bottom window.

Step 10: Hook it up to transmit. Now you must hook up an audio line from your sound card to the microphone input on your radio.

This will allow you to transmit using this system. This is somewhat less trivial than simply hooking up a patch cord because you have to develop a way to key the transmitter. If you have a radio that supports VOX, you might think that you can simply use the VOX to key the transmitter. In my experience, this simply does not work. You need a keying mechanism. The guy that developed this system provided three ways to key the transmitter: use a serial port, use a parallel port, or use the game port. I suspect these all work, but the only one that I've actually tried myself is using the printer port. To do this you will need to make the following circuit (is your soldering iron hot yet)?



All of the parts to build this are available at Radio Shack.

Here's a parts list from Radio Shack:

Part #	Description	Price
276-1547	25 Pin Male D-Sub Plug	1.49
276-1549	Hood for above	1.19
271-1335	10K Resistors (pack of 5)	.49
276-2009	MPS2222A Transistor	.59
274-284	Pair of 1/8" stereo plugs	2.49
278-514	20 feet 2 cond. Audio cable	3.89

You'll also need a suitable microphone plug for your radio. This could drive the cost above \$10 if you have to buy everything new at Radio Shack.

Proceed as follows:

Step 10.1: Cut off a hunk of the audio cable long enough to run between your computer and your radio. Solder one end of the audio cable to the proper pins on your microphone plug. Connect one wire to the microphone audio pin, the shield to ground, and the other wire to the push-to-talk (PTT) pin.

Step 10.2: On the other end of the audio cable split the shield into two strands. One strand of the shield and the wire from the mic pin should be extended with another short piece of the audio cable with the mic wire connected to the tip of a 1/8" stereo plug and the shield connected to the shield of the plug. Leave the center ring unconnected. This plug will go to the speaker jack on your sound card.

Step 10.3: Solder the other stand of the ground line to the emitter of the transistor (look at back of the transistor package to see which is the emitter).

Step 10.4: Solder the line from the transmitter push to talk line to the collector of the transistor.

Step 10.5: Now take another short piece of the audio cable. Solder the shield to the junction of the ground from the transmitter and the transistor emitter (there will now be three wires connected here). The other end of this shield should be soldered to pin 20 on the D-Sub plug. If you look very closely you can see the pin numbers on the D-Sub connector itself. Make sure you don't solder to the wrong pin! This could damage your computer.

Step 10.6: Solder one end of the resistor to the base of the transistor (generally this will be the middle lead; consult the documentation). The other end of the resistor goes to the center conductor of the short piece of cable that goes to the D-Sub plug. The other end of this wire is hooked to pin 2 of the D-Sub plug. Make sure you don't solder to the wrong pin! This could damage your computer.

Step 11: Test the circuit you have built with a meter. Plug the D-sub connector into the parallel port on your computer. Take a resistance meter (any multimeter will do) set it for resistance and hook it to the ground and PTT pins of your radio connector (don't hook it up to the radio at this point). Run the Baycom software program. Try transmitting with it. When the program is receiving, you should see a high resistance across this connection. When you are transmitting you should see a low resistance. Don't expect to see an infinite resistance when you are receiving and a zero resistance when transmitting.

If you prefer to key your transmitter with a serial port or a game port, check out the circuit diagrams on:

<http://dl0td.afihd.th-darmstadt.de/~flexnet/soundmodem.html>

You're almost done. All you have to do now is make sure your audio is adjusted properly.

Step 12: Hook up the radio and run the software. Transmit some packets while monitoring them on another radio (such as an HT). If it sounds like packet to you it will probably work fine. If not, you can increase or decrease the transmitted audio level as needed using the following command:

```
SMMIXER /o:-24
```

You can change the transmit level by adjusting the value at the end of the command line. Note that it is a negative number so making its absolute value larger will lower the level while making the absolute values smaller will raise the level. With sound cards other than Sound Blasters, SMMIXER may not work. I have one computer with a Sound Blaster and one with a Pro Audio Spectrum card. The SMMIXER program does not work with the Pro Audio card. However, the card came with a DOS-based mixer program (called PAS) which can be used to turn up or down the gain on the sound card. It works fine. Consult your sound card manual for further directions.

You now have a working packet system under DOS. You should also be able to run the system under Windows95 as well. When you boot your system into Windows, a splash screen will appear that shows you that the Flex drivers have been loaded. You can then run BCT in a DOS Window.

But there's more! Baycom is not the only program you can run using this setup. There is an emulator for The Firmware that also runs under this system. This allows you to use a range of other programs that are designed to run in this operating environment including SP, THS, and so forth. From what I've heard additional applications are being created all the time.

The AFSK12 program allows you to run 1200 baud packet. There is another program included with the package called SMFSK96 which is supposed to do 9600 baud packet using the same set up. Of course you have to have a radio that is capable of 9600 baud. I've tried this package and, as yet, have had only limited success. I can connect at the higher rate, but I'm having trouble pushing data through. But it should work.

FlexNet is the work of Gunter Jost, DK7WJ. The sound card drivers for Flexnet were written by Thomas Sailer, HB9JNX.

FCC Announces Formation Of The Technological Advisory Council

[Please note that Dewayne Hendricks, WA8DZP, Regulatory Affairs Chairman for TAPR, is a member of this new committee.]

The FCC today announced the formation of the Technological Advisory Council. The Council, comprised of a diverse array of recognized technical experts, will help provide the technical expertise the Commission needs to stay abreast of innovations and new developments in the communications industry.

In announcing the members of the Council, Chairman Kennard stated: "I am thrilled that so many extraordinarily talented and respected individuals have been willing to share their time and expertise with the Commission. The work of this Council will continue to increase in importance as the Commission strives, during a period of exceptionally rapid technological change, to fulfill its responsibilities to the public."

Dr. Robert Lucky, Corporate Vice President, Telecordia (formerly Bellcore) will serve as Chair of the Council and Dr. Jules Bellisio, Chief Scientist, Telecordia, will serve as Executive Director. Dr. Stagg Newman, Chief Technologist for the Commission, will serve as the Designated Federal Officer.

Dale Hatfield, Chief of the Office of Engineering and Technology, who will serve as Alternate Designated Federal Officer for the Council, said "We are eager for the council to analyze the difficult technical issues facing the Commission in such areas as spectrum management, convergence, and the Internet. Sound technical advice is essential to our developing the best policies to serve the public."

The first meeting of the Council will be April 30, 1999, from 10:00 am to 3:00 pm in the Commission Meeting Room, 445 12th Street, S.W., Washington, D.C. The Council will discuss organizational matters, be briefed on key technical issues facing the Commission, and will work to define the issues that the Council will address. The public is invited to attend.

The Chair and members of the Council are as follows:

Chair

Dr. Bob Lucky - Vice President & Officer in Charge of Applied Research, Telecordia Technologies, formerly Bellcore (Bell Communications Research).

Members of the Technological Advisory Council

- Mr. Bruce Allen - Vice President and General Manager, Harris Corporation,
- Mr. Jose M. Alvarez Caban - Assistive Technology Specialist, Puerto Rico Assistive Technology Project, University of Puerto Rico.
- Dr. Vincent Cerf - Senior Vice President, Internet Architecture and Technology, MCI Worldcom.
- Ms. Susan Estrada - President and CEO, Aldea Communication.
- Mr. Bran Ferren - Executive Vice President for Creative Technology and Research Development, Disney/ABC.
- Dr. Richard Green - President and CEO, CableLabs,
- Ms. Christine Hemrick - Vice President, Technology Communications, Office of the CTO, Cisco Systems, Inc.
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- Dr. Charles E. Jackson - Independent consultant.
- Dr. William Lee - Chief Scientist, AirTouch/Vodaphone.
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- Mr. Dennis Roberson - Vice President & CTO, Motorola.
- Dr. Marvin Sirbu - Professor of Engineering and Public Policy, Professor of Electrical & Computer Engineering, Professor - Graduate School of Industrial Administration, and Chairman of the Information Networking Institute, Carnegie Mellon University.
- Dr. Greg Vanderheiden - Professor - Human factors Group, Dept. of Industrial Engineering, University of

Wisconsin, and Director of Trace Research and Development Center.

Mr. Jack Waters - VP of Network Engineering, Level 3 Communications.

Dr. Pat White - Director, Telecommunications Practice, AD Little. Robert Zitter - Senior Vice President, Technology Operations, Home Box Office.

Executive Director

Dr. Jules A. Bellisio, Chief Scientist/Executive Director, Telecordia Technologies, formerly Bellcore (Bell Communications Research).

Designated Federal Officer

Dr. Stagg Newman, Chief Technologist, Federal Communications Commission.

Alternate Designated Federal Officer

Dale Hatfield, Chief, Office of Engineering and Technology, Federal Communications Commission.

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Amateur Spread Spectrum Radio in Japan

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[Reprinted from the ARRL/TAPR DCC Proceedings September, 1998]

Introduction

In 1997, some Japanese amateur radio stations were licensed for Spread Spectrum (SS) by the MPT, which wasn't allowed before. We, the PRUG96 members applied for SS licenses all using the same SS method and performed field tests three times. Most other SS stations were not able to communicate with each other, since each of them used different SS methods. In this paper, the author would like to explain the results of our experiments, and to mention the state of alpha/beta tests now in progress.

The first experiment between Kitakyushu and Shimonoseki (Nov 2, 1997)

On November 21 1997 -- just after Mack, JJ1CEI and the author, 7K1NCP received SS licenses --- we attended Partech'97 in

Kitakyushu City, and demonstrated a SS QSO for the first time.

Figure 1 shows the system we used in the first experiment. The Protocol Server (PS)[1] converts an IP packet into a radio packet, and the IP Shield Machine (IPSM) [2] hands it to the 2.4GHz SS data transceiver (Table 1). The antennas we used were 27 elements Yagi-beam, front gain of 21dbi.

Table 1. The features of an SS transceiver.

Center Frequency	2446MHz
Output Power	30mW
Spreading Method	Direct Sequence
Spread Length & Code	11 bits Baker, 63 bits m
Chipping Rate	4.444Mchips/sec
Occupied Band Width	8MHz
Modulation	DQPSK
Data Transfer Rate	808kbps

The first ever SS QSO in Japan was performed by JJ1CEI/4 and 7K1NCP/6, between Kyushu-Island and Honshu-Island, across the Kanmon Strait, where the distance between the two stations was about 2km. Not only had we accomplished a 2-way SS QSO for the first time, but also this QSO has a special meaning because we used TCP/IP protocol over amateur SS packet radio.

We measured the ping statistics, round trip time, and throughput, using 'ping command' and 'web browser'. The results were 99%, 110ms, and 80kbps, respectively. Figure 2 shows one of the pictures used in the experiment. The reason why we used this picture is that we wanted to share Dr. Takayanagi's success in 1926 -- the first experiment of TV transmittance in Japan.

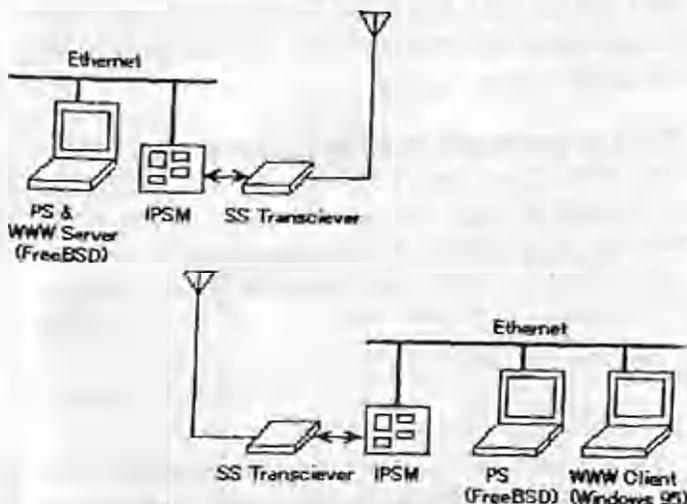


Figure 1. System configuration

The second experiment in Kofu (Dec. 14, 1997)

In the first experiment, we confirmed that our system, employing TCP/IP over amateur SS packet radio, worked well with practical speed. However, the distance between two stations was only 2km, which could be achieved even with ISM band transceivers, very low EIRP (Equivalent Isotropic Radiated Power). Therefore, we decided to perform one more experiment, aiming to make a long distance QSO. Furthermore, multimedia such as voice communication was also a goal of the experiment.

On December 14, 1997, the second experiment was done in Kofu-Valley, where we performed the 15km distance 2-way QSO. The system we used in this experiment was almost the same as what we used in the first experiment. The slight difference was that we added some client PCs to each site (station).

In this experiment, we divided ourselves into two groups. One group set up the base station on the top of a hill and another moved around Kofu-Valley and operated from three different points: 5, 15 and 30km from the base station. At the 5 and 15km points, the ping statistic was 100% and we tried not only web browsing but also voice communication using 'cool talk'. We could hear the voice from the other station clearly on both sides, as if they were connected to the same Ethernet.

However, at the 30km point, the condition was very bad and unstable. The ping statistic showed nearly 20% at its peak and the BER (Bit Error Rate) was almost $1E-2$. We changed the position slightly, but it didn't make the situation better.

The third experiment in Kofu (May. 9-10, 1998)

During wintertime, there had been much improvement in our system, though we didn't perform any field experiments. Mack tuned the SS transceivers to make their sensitivities better. Satoshi, 7M3LCG rewrote IPSM's firmware to improve its stability. Shin, JNUZD implemented routing protocol into the PS. In addition, some of our other members (neither Mack nor the author) obtained SS licenses.

On May 9 and 10, 1998, we performed the third experiment in Kofu-Valley (picture 1). In this experiment, we made the 30km distance QSO as our main goal. Radio-Network operation (something like a round-table

QSO), videoconferencing using CU-SeeMe, and mobile communications were to be tested also.

In this experiment, we achieved all of our goals. We performed the 30km 2-way QSO and videoconferenced three points simultaneously. Furthermore, we confirmed the following two matters: The routing table changed dynamically as we moved the direction of the antenna or as the new site appeared/disappeared. We could communicate between



Figure 2.
The first letter of Japanese old alphabet.



Picture 1.

moving cars as long as they were in sight of each other.

Alpha/Beta tests

Since April 1998, the alpha test using our PRUG96 system has been proceeding near Meguro-Ward, Tokyo, under the support by JA1YAD/JL1ZCF, Tokyo Institute of Technology Amateur Radio Club [3]. The goals of the alpha test are to estimate its stability, to find out its weak points and so on. We will soon start the beta tests in many regions in Japan, such as Aichi, Fukushima, Kanagawa, Tokyo, Miyagi and Nagano. You can expect to learn some outcomes of these tests at the next Partech/DCC. [Also, see the article on the next page.]

References

- [1] S. Kanno, not published
- [2] S. Funada, IP-Shield Machine (IPSM): An Ethernet interface for High Speed Packet Radio, 1998 DCC.
- [3] S. Watanabe, S. Funada, Alpha-test report of PRUG96 High speed radio link, 1998 DCC.

MPT: Ministry of Posts and Telecommunications Japan
PRUG96 project: the group consists of people interested in high-speed packet links and networks
Partech: Packet Radio Technical Conference; annual meeting of amateur packet radio in Japan
Kitakyushu: a city in Fukuoka Prefecture, Kyushu-Island, Japan
Shimonoseki: a city in Yamaguchi Prefecture, Honshu-Island, Japan
Kofu: a city in Yamanashi Prefecture, central part of Japan

Japanese Spread Spectrum Recent Activity Report

Masaaki Yonezawa, JE1WAZ
yonezawa@mcc.yokogawa.co.jp

1. Beta testers

Over thirty sets of 2.4GHz amateur SS radio and IPSP control units were delivered to beta testers after the DCC'98 meeting. These beta tester groups are located in nine separate areas and the systems are placed in different environments. Some groups are in mountainous area, countryside, and others are located in towns. Their activity reports will be available at the next DCC meeting.

2. 2.4GHz Survey

The alpha testers found interesting effects of daily transition on accessibility. The cause of the effect is assumed to be leaking energy from microwave ovens or other industrial heating equipment.

A 2.4GHz spectrum survey is taking place east of Tokyo to find the background energy level in an urban area. This system is equipped with an Advantest R3621 spectrum analyzer controlled by an NEC PC9801 computer and dedicated software made to run 24 hours a day. The spectrum analyzer is running on HOLD mode to capture transient energy. The PC9801 collects captured data using the HP-IB bus every minute. Mr. Amano (JQ1VIE) is planning to add 3D graphic capability to this software to make it easier to analyze the daily transitions on interference signal strength.

3. Public Service

Shikoku area MPT division designed and performed a capability test of the Internet connection on the PRUG96 system using 2.4GHz commercial SS radios. The basic architecture was the same as that of the amateur system and this community link system had a gateway to the Internet. Improved public services in this district were tested with good results.

4. New Routing Method

A new routing and link layer protocol for wireless networks was proposed. This method is named ARVE based on a new capability for selectable error correcting operation. The goal of this method is to reduce data traffic for routing itself.

5. IPv6

Mr. Naoto Shimazaki (7K3FEP) is implementing a new PRUG96/PRUG99 system for IPv6 to get the benefits of a mobile IP connection. The system uses Linux kernel version 2.2 with IPv6 support enabled. This kernel is running on a small industrial PC without HDD. A new radio controller is directly connected to the PC using the

ISA bus to support bigger MTU for IPv6 and to reduce Ether-packet overhead. A developer's release will be available in a few months.

5. Internet Conference '98

Internet Conference '98 (Kyoto JAPAN) is an international conference of the internet technology. Mr. Shin-ichi KANNO (JN1JDZ) presented at IC98, about the PRUG96 wireless network system and its routing algorithm. PRUG demonstrated three nodes of PRUG96 system simultaneously, and received demonstration award of IC98.

6. New SS Radio

A new HF SS radio was proposed. This new radio uses a rotating disk for clock synchronization similar to the early days of SS systems used by the military.

The idea is to use a 40X speed CD-ROM drive and disk for synchronization with a high chip-rate signal. A dedicated CompactDisk with PN data bit pattern is used to detect and capture the spread spectrum signal on HF band.

The Creative Lab's iNFRA6000 CD-ROM drive was selected for its rotation stability and its high fidelity sound replay capability. Lead investigator Mr. Yonezawa says, "This system will be used to distribute high quality audio signal. It's the best to listen to fine music with tube amplifier."

pocketAPRS

Mike Musick, N0QBF
71301.3106@compuserve.com

pocketAPRS - Beta v0.25 Release

An "unplanned" release of a new version is now up on the server. There was nothing seriously wrong with the old one, but the new version was stable in testing, added some stuff, and fixed a couple of minor "gotchas." A quick synopsis:

- New station list display choice showing distance and bearing.
- Automatic beaconing ("Auto" on Transmit control screen) based on distance since last beacon.
- Self-tracking positions now come from GPS and not digi'ed packets.
- Self-tracking and centering based on distance traveled and map scale.
- Infrequent crash problem on map and station views found and fixed.
- PacComm Tiny-2 added to TNC choices.

The "Auto" beacon is the most compelling and interesting of the changes. With this enabled (on the "Transmit Control" screen), a posit beacon will be sent

after travelling one mile since the previous posit. This way, the timer can be set for a stationary rate (say, every fifteen minutes) and the distance-based beacon can handle the need for position update. Stop, and the stationary rate takes control. Plus, if the time stopped exceeds the stationary rate, as soon as movement is detected (1/10 mile), a fresh position is sent.

The Tiny-2 TNC selection is experimental and may not be definitive. I'll need feedback from Tiny-2 users whether this solved the initialization problem.

More Maps Uploaded

A bunch of new maps have been uploaded to the FTP server. Included are detail maps of Kansas City and Springfield, MO; Olympia, WA; and Las Vegas, NV.

The biggest group is coverage for Southern California. There is a new regional overview (not too good at high magnifications, though), plus detail maps for Bakersfield, Barstow, Antelope Valley, Victorville, Orange County, San Diego and San Bernardino.

I'm still cranking, and maps on the "soon" list are a bunch for the Pacific Northwest, plus Indianapolis, St. Paul/Minneapolis, Memphis, Amarillo and Houston. If your need hasn't been met yet or isn't on this list, let me know (or remind me) and we'll move it up the ladder.

MacDLG v2.02 Released

The Macintosh-based APRS map generator, MacDLG, has been lying fallow for over a year. It has been poked and prodded a lot in recent months to produce pocketAPRS maps, and seems to do a passable job at generating maps for US locations. The program is a self-extracting archive file, and contains documentation in PDF form. Download it from:

<http://aprs.org/aprssi/macstuff/macmisc/MacDLGv2.02.sca>

All the pocketAPRS maps on the FTP were generated with MacDLG. There is a big warning about a crash problem which sometimes strikes with a vengeance, yet at other times I can run two dozen or so without a glitch.

While it will run on 68K Macs with little trouble, there is "the need for speed" as well as RAM if you intend to generate maps comparable to those in the /palmmaps/ folder. I use a 300MHz G3 desktop and a 266MHz iMac, each with 96MB RAM, and a 40x40 mile detail view of a major metro area (200-250K points) will take about an hour to distill.

A favor to ask of those interested in doing pocketAPRS maps - for anything beyond local-area maps for personal use, let's coordinate production so effort isn't duplicated.

APRS Mic-Lite

Two news items about the MIM Module:

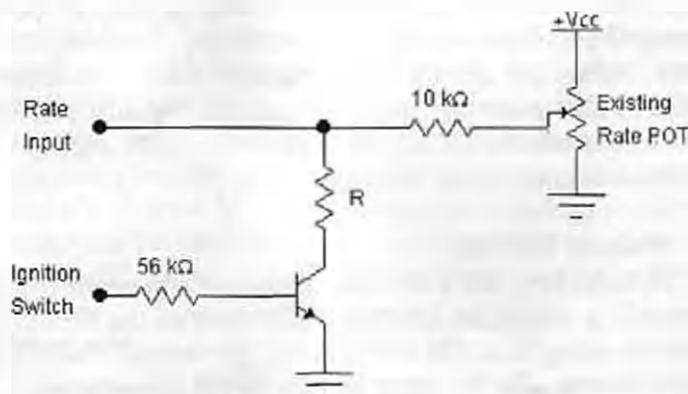
- 1) APRS Engineering LLC has taken over the production of the ubiquitous MIM module from Clement engineering and has lowered the price to \$79 plus \$4 S&H.
- 2) The MIM can be easily used as a miniature APRS Mic-Encoder with only the addition of two external diodes. You can add as many or as few of the front panel switches to suit your operating needs.

This is called the Mic-Lite(tm).

MIM Variable Rate Mobiles

One other thing about the MIM, Mic-E and Mic-Lite are that they make excellent stand alone trackers and can vary their rate according to the ignition being on or off. Their main advantage is front panel control for setting the DIGPEATER PATH, the MESSAGE, and the RATE. (Normal TNC trackers need a laptop to reconfigure them).

Although simply remembering to turn the RATE POT down when you leave the car and UP when you are driving, is one way, the automatic method uses one transistor as follows:



NOTE: you must insert a new 5k resistor in series with the existing RATE pot input so that the new circuit can share the input as shown.

Now, software program your Mic-E to a peak rate of 1 minute so the the 16:1 front panel RATE pot gives you a range of 1 to 16 minutes. The added transistor and new value R are switched in when the ignition switch is on. Although the front panel RATE pot can still override to any setting, set it normally to your desired max value, say 16. Now you can choose R to give you:

PANEL POT will set the maximum period when the ignition is off.

R = 0 will always force the peak rate no matter where the pot is set.

R = 2k will force at least a MAX/8 rate.

R = 4k will force at least a MAX/4 rate.

R = 10k will force at least a MAX/2 rate.
(These values are approximate, your mileage will vary.
But they show how you can modify the circuit to your
preferences).

Again, you can use this circuit on any Mic-E, MIM or
Mic-Lite. The next batch of MIM's (Mic-Lites) will be
shipping by 15 April we hope. \$79 ea plus \$4 S&H.

APRS Engineering LLC (sorry, no credit cards yet)
115 Old Farm CT
Glen Burnie, MD 21060

TAPR Board of Director Elections

The last issue of the *PSR* had the election ballot for
Board of Directors. First, I would like to thank all those
who took the time to ballot by mail or over the Internet.
We had four excellent members running for the three
positions that were available. As one member messaged
me: "Greg, how am I to vote this year! The selection of
candidates are too difficult to select from." I think this
statement sums up the quality of the members we had
running for board positions this year.

The number of members who cast ballots was up this
year, but still disappointing that we had less than 6% of
the general membership voting.

The results of the election are as follows:

Steve Bible, N7HPR	91.35%
Steve Dimse, K4HG	78.85%
Bob Hansen, N2GDE	64.42%
Steve Stroh, N8GNJ	59.62%

I would like to welcome back to the board Steve Bible,
N7HPR, and Bob Hansen, N2GDE. Steve Dimse,
K4HG, will be joining the board as the newest member
at the next Board of Directors meeting which will be held
during the Dayton 1999 Hamvention weekend. Steve
Stroh, N8GNJ, has been our organizational secretary for
the last two years and we hope that he will remain in that
position for the coming year.

Thanks again to all those who made this process
possible.

Greg Jones, WD5IVD President

GPS-25 Price Drop

TAPR has been able to drop the price of the Garmin
GPS-25 OEM receiver by \$49. The price for the GPS-25
in single Qty is now:

Member Price: \$135 + s/h
Non-Member Price: \$150 + s/h

Check

www.tapr.org/tapr/html/fgps25.html
for further details.

TCP Header Compression According to Van Jacobson via AX.25

Gunter Jost, DK7WJ/K7WJ

Lichtenbergstrasse 77, D-64289 Darmstadt, Germany

Translated by: Don Rotolo, N21RZ

*[Reprinted from the 16th proceedings of the ARRL &
TAPR Digital Communications Conference and the
NEDA Report v5.3]*

Abstract

The Van Jacobsen scheme for TCP/IP header
compression is briefly introduced and an implementation
of this system under FlexNet is described and discussed.

TCP/IP requires a header of at least 40 bytes for each
packet. In connections over ethernet carrying packets
with little data, as in Telnet and similar mostly inactive
sessions, this header adds considerable overhead, making
slow connections highly undesirable. Often there is only
a little information carried within each packet, in the
extreme case a single key click. Above all the reaction
time becomes intermittently high. Once, when phone
modems mainly worked at 2400 baud, Van Jacobson had
taken up this problem and offered a technique in RFC
1144 [1].

With the Van Jacobson scheme, the header is
compressed to be only 3 to 8 bytes in length. Interesting,
and relevant to the implementation, is that the
compression requires a memory table for each TCP
connection. Only the differences from the last sent packet
are transmitted. Frequently occurring special cases are
handled in a specific manner which also improves the
compression ratio. For example, the transmission of a
TCP sequence number is mostly superfluous, because it
can be calculated from the number and length of the
packet.

TCP retries are generally carried uncompressed, so that
the distant end can resynchronize. This is also valid for
special, infrequent packet types (such as SYN and RST).

The necessity to store in memory the present status of
each TCP connection requires naturally some computing
capacity and memory space. The integration into the TCP
layer was impossible, since it is a black box, and routers
should also be able to handle compression. There is also
the question of how many simultaneous connections
should be realizable. For user stations 16 TCP
connections should be sufficient, for routers it should
possibly be more.

If there are more connections than slots available, the
slot that is unused for the longest time is reassigned. It can
also be a little tight with routers here. It is however not a

problem to assign slots to stations using other criteria, for example according to the frequency of your usage.

The entire RFC won't be repeated here, mostly since it is over 40 pages long. The Protocol contains further details, and it is very interesting and well thought out. As far as the author knows, it has not been translated into German.

Implementation

The RFC already contains a practical implementation suggestion in C, which is a good platform upon which to build. Following a suggestion from Thomas Sailer, HB9JNX, I implemented the algorithm in the FlexNet IP coupler. To eliminate the need to implement the "hacks" Jacobson suggested for the transportation over SLIP, two new AX.25 PIDs were found to be needed for proper identification. After a review of all the available information, PIDs 6 and 7 were found to be available. When we informed the ARRL of this selection, they seemed surprised that we assumed them responsible for PID coordination, as was written in the AX.25 protocol definition some 13 years ago. At present, we are awaiting a confirmation of this coordination [2].

PID 6 denotes a compressed TCP/IP packet, with PID 7 an uncompressed packet being transmitted with the Jacobson scheme. That isn't the same as a packet without compression: In an uncompressed packet the slot-information remains, that is used for the compressed packets that follow. Naturally PID 8 used, as is known, for segmented IP packets. These also contain the original PID, and combinations of PID 6 through 8 as well as CC can appear. A segmented packet can contain a compressed header, thus it has PID 8 as well as the PID 6 or 7 packed within.

It is important to understand that the compression runs continuously point to point. The tables are organized as in an AX.25 QSO, and this functions only in Virtual Circuit mode. If a connection is rerouted or reestablished, it must not be built on old status tables. One can not coordinate the compressibility of an IP destination, as this belongs always to an AX.25 station or partner.

A disadvantage of the Van Jacobson specification is stated within, that the "partner" cannot provide the slot quantity required, but this should also not be different, since packets can get lost when the receiver has fewer slots than the sender. With the FlexNet implementation this is resolved by allocating a fixed 16 slots to the sender and up to 255 slots dynamically to the receiver, the maximum allowed under the specification. According to the definition, a Link Reset (reconnect) forces both sides of the connection to delete the relevant tables. In this manner, memory can be conserved.

There are no problems with data reliability. Each TCP packet is protected by a checksum. Additionally, all of the measures of an AX.25 connection are used. As long as the L2 connection remains, it is guaranteed that all packets arrive in a defined order. With a Link Reset, all the compression tables are deleted. In this way the defined continuation of the TCP connection is guaranteed, and the inadvertent confusion of a compressed packet from another TCP connection with the same slot number is safely eliminated.

Matthias Welwarshy, DG2FEF, has tested this behavior in WAMPES under Linux, without the source code being exchanged between us. In this way, we have a high level of confidence that our implementations comply with Jacobson specification. In a multi-week test, run between four stations at different user ports, there were no unmotivated disconnections of the TCP connections. Last but not least, this shows that the behavior is very robust against sporadic reestablishments of the logical (AX.25) connection.

Conclusion

We can conclude that the Van Jacobson compression scheme provides a very good result with minimal difficulties. One must ask himself, why this concept has not (in the author's knowledge) been previously applied to Amateur Radio.

One disadvantage is that, at present, one of the two partners must switch the compression on manually. It must be assured that the other partner controls the system. In a further development, this facility should be handled automatically.

References

- [1] Jacobson, V., Network Working Group, Request for Comments 1144, February 1990.
- [2] Also awaited for quite some time is the coordination of PID CE for FlexNet. *[received in 1997]*

PIC-E

The PIC-E Evaluation has come to an end. The PIC-E development team has finalized the minor changes to the kit based on the evaluation phase input and we are scheduling the final version of the PIC-E to be shipping around the time of the Dayton HamVention (we plan to have units at Dayton as well). The TAPR Office is now taking orders on this final version of the PIC-E kit. Thanks to those that participated in the Evaluation process. Full details are on www.tapr.org/tapr/html/fpico.html

1999 Packet BASH at Dayton



Friday, May 14th, 1999, 7pm

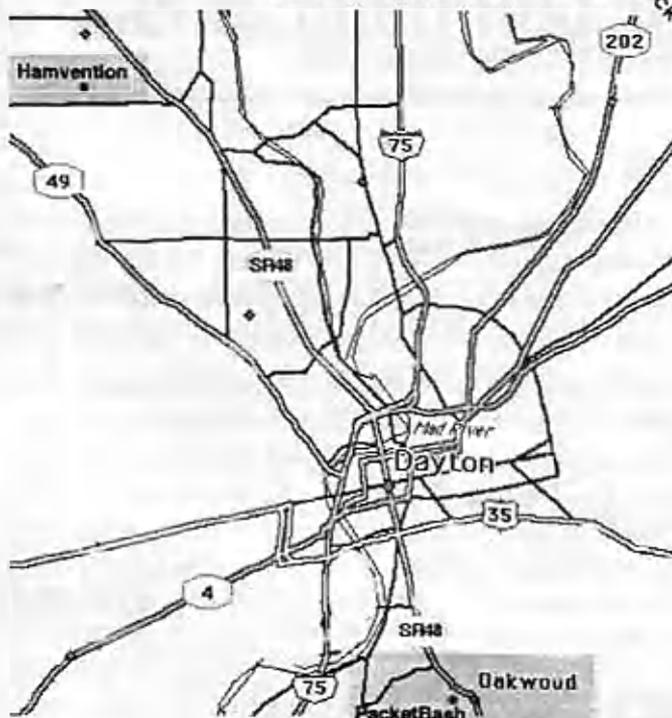
An event for the digitally-inclined ham, featuring:

- Buffet dinner
- **Dave Pedersen, N7BHC**, talking about "A Little Technology Goes a Long Way"
- TAPR special interest group meetings
- "Birds of a Feather" gatherings

Talk-in will be on 146.415 simplex.

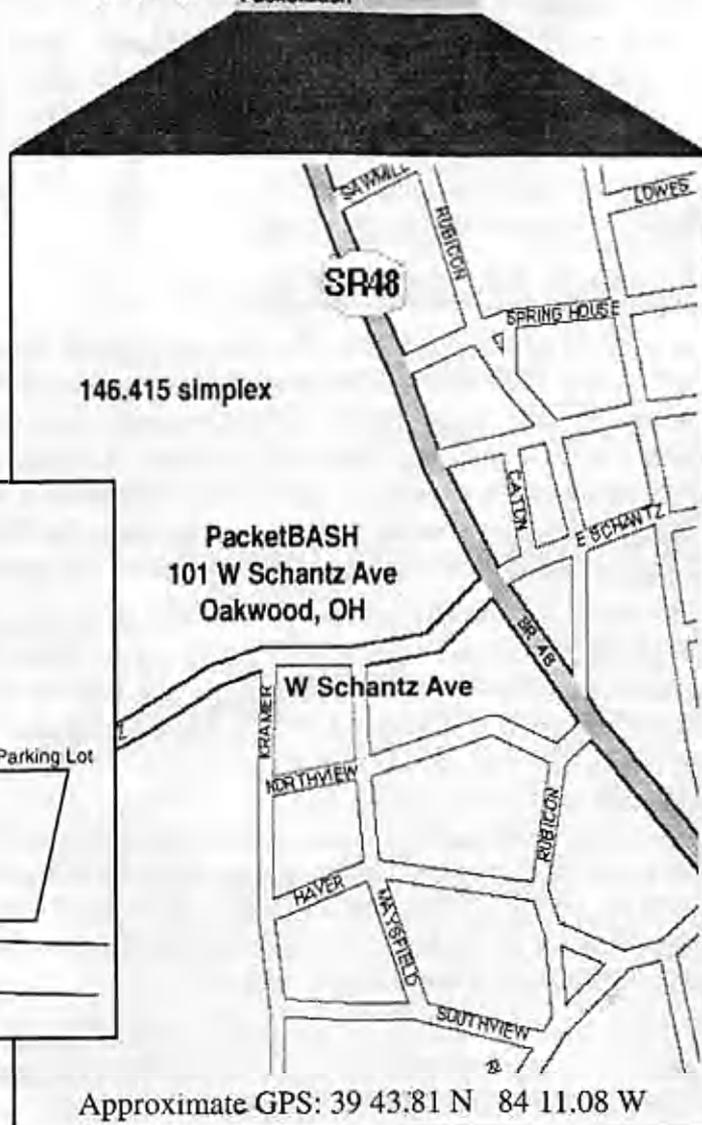
Directions:

- Head South on I-75 from Hamvention (North of Dayton)
- Take 35 to the East around the south part of Dayton
- Take SR48 (also known as S. Main) South
- Exit on West Schantz and head West
- Site complex is on the North side of Schantz about 2 blocks from SR48.
- NCR "Sugarcamp" Conference Center, 101 W. Schantz Ave.



The cost is \$20.00 per person, tax and tip included. Make reservations with the TAPR office.

Walk-ups to the event will be accommodated as best as possible. There is limited space (in the way of food ordered) for dinner. Amateurs who wish to hear the speaker and discussion are asked to arrive around 2030 (8:30pm). All amateurs are welcome to attend, enjoy the speaker, and participate in the meetings, although only those purchasing a dinner can eat.



If the West Gate is locked, use the East Gate.

Kits	Price	Qty	Total	Kit Code	Information
PIC-B(ncoder)	\$65.00			8	
CompactFlash Card Adapter	\$59.00			8	
Motorola EVM56002 Interface	\$150.00			16	A FlashCard is not included in the kit
TAPR APRS™ MIC-Encoder™	\$149.00			28	http://www.tapr.org/tapr/html/usp56002evm.html
TAC-2 (Totally Accurate Clock)	\$139.00			10	Requires a GPS to operate
Differential GPS (Member Price)	\$179.00			16	Requires a GPS to operate
DAS (D1MF Accessory Squelch)	\$68.00			3	As seen in Dec 95 QST
AN-93 HF Modem	\$90.00			4	limited kits available.
TAPR 9600 bps Modem	\$80.00			6	
Bit Regenerator	\$10.00			1	used for regenerative repeater operation
Clock Option	\$5.00			1	used for regenerative repeater operation
PK-232 Modem Disconnect	\$20.00			2	simplifies connection of external modems
PK232MBX Installation Kit	\$20.00			2	for installation of 9600 modem or PK-232MBX
KR2211 DCD Mod.	\$20.00			2	
State Machine DCD Mod.	\$20.00			2	
State Machine DCD w/Int Clock	\$25.00			2	For KPC2 or other TNC w/o 16X or 32X int clock
Firmware					
32K RAM w/ TNC2 update does	\$20.00			2	
TNC-2 1.1.9 w/KISS EPROM	\$15.00			4	includes 1.1.9 Commands Booklet (below)
1.1.9 Commands Booklet (only)	\$8.00			2	full TNC-2 command set for 1.1.9
TNC-2 WA8DED EPROM	\$13.00			2	R connect version for ARES/Data standard
TNC-1 WA8DED EPROM	\$12.00			2	
TNC-2 KISS EPROM	\$12.00			2	
TNC-1 KISS EPROM	\$12.00			2	
PK-87 WA8DED EPROM	\$12.00			2	
Publications					
TAPR Spread Spectrum Update	\$18.00			8	200+ pages on ARS Spread Spectrum Topics
1998 TAPR CD-ROM	\$20.00			4	ISO 9660, 650 Megs of info! w/ html nav pages
1997 TAPR CD-ROM	\$10.00			4	ISO 9660, 650 Megs of info! w/ html nav pages
Wireless Digital Communications	\$39.99			8	300+ pages w/disk by: Tom McDermott, N5EG
Packet Radio: What? Why? How?	\$12.00			5	130 pages. TAPR's Packet Radio book.
BBS Sysop Guide	\$9.00			4	60 pages. by: Barry Buelow, W4DRJT
NOSIntro, Intro to KA9Q NOS	\$23.00			8	fun Wade, G3NRW, TCMP over Packet Radio
TAPR's 94 Annual Proceedings	\$7.00			4	Papers from the Annual Meeting (Tucson)
TAPR's 95 Annual Proceedings	\$7.00			4	Papers from the Annual Meeting (St Louis)
PSR Set Vol 1 (#1 - #17 '82 - '85)	\$20.00			8	
PSR Set Vol 2 (#18 - #36 '86 - '89)	\$20.00			8	
PSR Set Vol 3 (#37 - #52 '90 - '93)	\$20.00			8	
PSR Set Vol 4 (#53 - #68 '94 - '97)	\$35.00			16	
ARRL/TAPR 1998 DCC	\$15.00			4	1998 DCC Proceedings Chicago, IL
ARRL/TAPR 1997 DCC	\$15.00			4	1997 DCC Proceedings Baltimore, MD
ARRL CNC Proceedings 1st - 16th	call			-	Individual Proceedings, call for prices
Entire Set ARRL DCC 1st - 16th	\$120.00			144	12 Proceedings from 1981 to 1997
Other					
TAPR 11oz Coffee Mug logo	\$11.00			4	Logo in black and microwavable gold
TAPR Badge	\$10.00			0	include Name and Call for badge
TAPR Shirt - 4 styles				0	http://www.tapr.org/tapr/html/shirts.html
3 1/2" Disk from TAPR Library	\$3.00			0	\$3 per disk. See TAPR Software Library List
GPS					
TAC-32 Software Registration	\$55.00			0	
Garmin GPS-25 (Member Price)	\$135.00			28	No Discount. (data cable included)
Garmin GPS-20/25 Interface/Power Kit	\$35.00			8	
Garmin GPS-20/GPS-25 Data Cable	\$15.00			2	No Discount.
Garmin GA-27 GPS Antenna	\$75.00			8	new connector, mag and junction mounts
Oncore VP GPS (Member Price)	\$269.00			28	No Discount.
Oncore VP Interface/Power Kit	\$40.00			8	
Oncore GT+ GPS (Member Price)	\$169.00			28	No Discount.
Motorola Antenna 97	\$65.00			8	new connector, mag mount
MCX Rt-Ang Connector w/coax pigtail	\$15.00			2	No Discount.

Subtotal:

Added Total Kit Codes

All prices subject to change without notice and are payable in U.S. funds. Members receive 10% off on Kits and Publications. Please allow six to eight weeks for your order to be shipped. For specific information on kits, see Product Description flyer.



Tucson Amateur Packet Radio
 8987-309 E. Tanque Verde Rd #337
 Tucson, Arizona • 85749-9399
 Office: (940) 383-0000 • Fax: (940) 566-2544
 Internet: TAPR@TAPR.ORG • www.tapr.org
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May 1999

www.tapr.org • ftp.tapr.org • tapr@tapr.org
 Office Hours: Tue-Fri 9am-12pm, 3pm-5pm CT

Membership	Price	Number of Years	Total
United States	\$20.00		
Canada/Mexico	\$20.00		
International	\$25.00		

Renewal New Member

SubTotal

Membership 10% Discount
 Member #: _____ (Place new if joining)

Except were noted Total Sales (Subtotal minus discount)

Texas Residents (7.75% tax)

Membership (New or Renewal)

Shipping and Handling

For Total Kit Codes Between

1-3	4-7	8-15	16-27	28-55
Add \$3	Add \$5	Add \$6	Add \$7	Add \$8

Kit Codes above 55 or International orders must contact TAPR for amount.

TOTAL Order Amount

Charge my credit card (check one):

VISA MasterCard

Acct. # _____

Expiration Date: _____

Signature on card: _____



Name / Call: _____

Street Address: _____

City / State / Zip: _____

Country: _____ Phone Number: _____

Internet E-mail: _____