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In This Issue...

President's Corner

To my surprise, many of you read my President's column in the last issue more than once and made verbal comments about it at Dayton and more recently during the HamCom convention in Arlington, Texas. I am glad that the time I spent writing my thoughts on the Spread Spectrum issue made many of you think about where digital communications and amateur radio as a hobby are heading and one type of technology we might have in the future. In this *PSR* issue, I'll hit on another area which has seen a lot of debate in the past several months — that of the Internet and its impact upon amateur radio.

The question I hear can be boiled down to: "Is Internet Good or Bad for amateur radio?" My answer is yes and no. This might sound like I am sitting on the fence on the issue — but I am not. Like anything, the Internet can either be seen as a threat or as an opportunity. Depends on your perspective.

I'll start with a quote "Times - they are a changing." Easy to use and affordable telecommunication is here to stay. Better face it. Amateur radio is never going to compete with the Internet and all the future forms of communications that allow people to communicate on both wire-based and wireless systems. The number of people getting involved with these new

Look for TAPR at these Upcoming Events

Sept. 20-22, 1996	ARRL and TAPR Digital Communications Conference in Seattle, WA
Oct. 11-13, 1996	ARRL Southwest Division Convention in Mesa, AZ

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President's Corner, continued...

forms of telecommunication systems indicates that it has a draw that amateur radio never has or will have.

Are amateurs moving permanently away from amateur radio to the Internet? Yes. There have been other areas in the past that have drawn amateurs away — it is just that the Internet is very noticeable. Price versus performance is one issue. Services versus time invested is another. People making this switch are finding these new services interesting/exciting — probably for the same reasons they got involved with amateur radio. How many of us have changed hobbies or even aspects of the hobby within amateur radio at one time or another? While we might lose 'hams' permanently, I bet some will rediscover the hobby again later.

Another possible reason for this change could be how amateur radio has been marketed over the last ten to twenty years. What do you remember as items that amateur radio was marketed as good for and why people should get their ticket? Are not many of those items better done someplace else, especially with the low cost of the Internet and other services (phone, paging, fax, Internet, etc). Many of these items were pressed forward by the commercial manufacturers — in order to expand the amateur commercial market. We are now seeing a percentage of people finding out that what they really wanted all along was commercially available communications, which is now very affordable and only getting cheaper and faster. Is yet another possible reason for losing 'hams' to the Internet is that they now have to communicate a great deal more using the Internet or similar networks in the workplace — that by electronically communicating all day long, people want to escape even more communications (amateur radio) when they return home?

Amateur radio is not going to compete with this commercial trend in information technology. Therefore, the digital aspect of amateur radio as a hobby must move to new niches in this changing time or the numbers of people attending hamfests and actively participating will continue to drop. Why do I say 'continue?' Several events I have attended this year have had lower numbers of hams attending than in previous years, which were lower than the year before. Coincidence or something else? As I talk to regional digital groups, the resounding response is that their membership numbers are headed down and the prospects don't look good unless something changes (i.e., new and exciting projects).

Why? 1200 baud and even 9600 baud operations are not perceived as being fast enough anymore. Most amateur operating methods have outgrown what was easily delivered in 1982. 28.8Kbps or 14.4Kbps, although they operate at near 1200 baud, are perceived as being more fun, easier to use, and delivering more of what

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Article submission deadlines for upcoming issues:

Fall 1996	September 15, 1996
Winter 1997	December 15, 1996
Spring 1997	March 15, 1997
Summer 1996	June 15, 1997

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.

many would term 'cool' services. While Internet connectivity has reduced membership in many regional digital groups, has it not also given an understanding of the value of what a truly useful network costs? Amateur radio can and should take advantage of this new understanding. However, to do this within amateur radio requires an increase in performance of our current network technology to something that we currently don't have readily available. Like many of us have been saying for years — radios are the key.

Based on this perceived value of commercial services vs. the amateur radio hobby, we could easily find ourselves — if not already — in a shrinking market. Meaning, the numbers of hams participating in amateur radio could decline in the future. I read a report last year outlying these same facts. At the time I was skeptical, but I am beginning to see what was forecast in those figures.

That is the down side of things. While the down side can be pretty depressing, I see the Internet providing valuable services to amateur radio as well. Many of us have been on 'what is now called the Internet' since the late 70's, early 80's. Electronic-mail, listservs, and news groups are nothing new. It is interesting to note that many of the amateurs that I know who were on the early Internet are still very active in amateur radio now, while still using the Internet. Maybe this proves that as the Internet experience becomes less new and exciting to amateur operators who have switched, we will indeed see licensed 'hams' returning. Another benefit is that the Internet is yet another way for amateurs to stay in contact with what they like to do — amateur radio. Internet has provided a way to communicate and work on group projects that once required meeting in person several times a year at conferences and ham gatherings. Now the in-person meetings at shows and conferences can be used in even better ways.

Many amateurs will accuse me of making a pact with the 'dark side of the force.' when I suggest that as amateurs we should be using and expanding the use of the Internet for linking regional digital networks, in order to tie these dispersed regions together. Many did this in the past and found that by having additional connectivity to other regions, it drew more people to what they were doing — before speed became the main issue. We should be using wire based communications when appropriate — when RF is just not going to happen due to money and other constraints. There is no doubt that amateur radio could design and build the much discussed 'national digital network,' but is that the correct question? The question might be better asked, do we want to? This is not saying that we should do away with backbones — NO — backbones and other types of RF networking should continue for all the reasons amateurs do things with the hobby — it is either fun, someone is learning something, or amateur radio operators are providing a public service. However, at some point, the initial newness of learning or doing something new wears off (months or even years after the project starts) — then what? Having reliable and useful RF long-haul connectivity is something where areas that require such communications in time of emergency must work hard to develop and maintain. It is easy to depend on having the wire connection there all the time, but what if it does go out. It is also easy to say that we will use nothing but radios for networking and then not be able to support or provide connections to distant locations. There has to be some middle ground between wire and wireless communications as part of our hobby. We must all keep reminding ourselves during the debate of wire vs. wireless networking, that we are all members of the same 'hobby.'

Another area that amateurs seem to be missing is that these 'non-hams' operating on the Internet are a new market to go after to get their tickets. Just like amateur radio worked with 11 meter operators in the past to get their tickets, why not begin to look at ways to make amateur radio the next exciting avenue for these new communicators using the Internet? I am sure some well-paid marketing firm could think of a snappy way :-) Tie this into some of the future projects regarding higher-speed communications and we have some interesting ties with a new segment from which to recruit hams. If we don't work on getting people interested in operating under Part 97 — then Part 15 will be where people will operate. Is this something we want to happen, because we were not willing to give some on how we perceive the world? Don't forget that Part 15 networking devices are secondary on our bands. With the growth in sales of Part 15 devices, it could be foreseeable that they could be made primary — due to the number of devices being used on those bands? Probably not — but what if it does?

Amateur radio operators in the 20s and 30s were experimenters. In the 40s, 50s, and 60s, we evolved into less experimenters and more technicians of the hobby. Since the 70s, amateur radio evolved again into what many would call a largely consumer/communicator group. Look at the recent announcement by Kenwood regarding distribution of their products. [They have expanded distribution in both wholesale and retail outlets.] There are other indications as well. Does it surprise us that we might be moving away from the consumer era of amateur radio into a new era? It is up to us — active amateur radio operators — to set that direction. A few might lead with a vision, but the entire amateur radio population will ultimately decide where we go. Do we become experimenters again or find a happy medium between the experimenters and communicators within the hobby? I would hope we can find a more

balanced point between all the participants in the hobby. One of the strongest things amateur radio has going is its ability to include others. We are a hobby of inclusion at the same time as differences. Those differences which make up the whole make us stronger in the end — while the vast majority as a whole allows us certain access to frequencies and brings manufacturers to us. As a hobby, we have to be aware of possible trends in amateur radio so that we can include other areas in the future and continue to be strong.

Internet can be seen as a negative or a positive. The perspective is one of choice. I believe that the worldwide explosion in communications and information technology offers amateur radio with a unique opportunity. We have to identify ways to take advantage of it as a hobby and move forward — or in the long term we will be left behind.

Organization issues

TAPR would like to congratulate Bob Hansen and his wife on the birth of their baby boy, Jeffrey Zane Hansen. Bob had to miss Dayton, because the birth was scheduled during the Dayton time frame. Jeffrey was born the Tuesday following the Dayton Hamvention. Mother and son are doing fine. I talked to Bob the other day and he reports that he will be attending the DCC in Seattle come September. See you there, Bob.

The Spring TAPR Board Meeting was held Thursday night before Dayton with a number of items being accomplished. The secretary's report for both the fall 1995 and spring 1996 meetings will be printed in this issue. The board tried something new this time by posting reports before the meeting to our mail group. This allowed more time to discuss important issues while the board was gathered in person. We plan on making that a normal procedure in the future. The board elections were reported in the last *PSR*. The officer elections were held at the Dayton Board meeting. Last year's officers were reelected to their positions: Greg Jones, President, John Ackermann, Vice President, Jim Neely, Treasurer, and Gary Hague, Secretary. I would like to thank each officer for remaining in their positions, because each does a lot of work that goes unnoticed in the day-to-day operations of the organization. The board, after reviewing the relevant information, voted to increase the dues. Read the article later in the *PSR* about this issue. Basically, printing costs have tripled in the last three years and add to this the rise in postal rates and we are only left with a choice to raise dues as an option. This is the first time since 1982, which isn't bad and we hope that the current rates will be seen as modest, but will allow TAPR to cover the *PSR* costs while retaining a small fraction for other membership services.

Picture 1: 3.25 wide and 2.5 high

Jim Neely, WA5LHS, presents a plaque to Dave Wolf, WO5H, during the June HamCom convention, for his effort in forming the TAPR BBS SIG. Dave is currently the President of the Texas Packet Radio Society.

It has become obvious during the last few months and during the Spread Spectrum STA process that TAPR needed a club callsign. Working with Paul Newland, AD7I, and Bob Nielsen, W6SWE, we have begun the process to acquire a club callsign. TAPR will let the membership know the status of this request in the coming months. By having a club callsign and then requesting additional callsigns for STAs and experimental licenses, as allowed under the current rules, we will be better able to represent TAPR as an organization as we do more active things with rules, experimenting, and radios in the future. We have thoughts about trying to have a station operational at the DCC in September with the club call!

Picture 2: 4 inch wide and 3 inch high

Tom McDermott, N5EG, Kent Britain, WA5VJB, and Frank Perkins, WB5IPM, chatting on Friday afternoon during the exhibitor setup for the HamCom (Arlington, Texas). Tom is author of the new TAPR Wireless Digital Communications: Design and Theory book. Frank has been one of the key software developers on the TAPR/AMSAT DSP-93 project. Kent is active in various amateur microwave activities.

Don't forget that papers for the ARRL and TAPR DCC are due by July 23rd!

Dayton was the best ever. If you didn't attend, you really should plan on attending next year. Many thanks to John Ackermann, AG9V, for arranging the new site for the Friday PacketBASH and TAPR Banquet. The NCR facility, I believe, will never be topped. Just ask those who attended the dinner. A real treat! I hope we will be able to have our dinner there for some years to come. Also, a lot of members stopped by and helped work the booth. Thanks to all who worked the booth.

Two plaques were awarded at the Dayton Hamvention Friday night banquet. Paul Newland, AD7I, received a plaque for his "outstanding service since 1983 as a designer, tester and dedicated volunteer on this 10th anniversary of the TAPR TNC-2." Sorry we were a year late, Paul. Paul was one of the original designers on the TNC-2 and TAPR owes a lot to Paul for his selfless activity within the organization all these years. A second plaque was awarded to John Ackermann, AG9V, for "outstanding service to TAPR as founder of the TAPR NETWORK Special Interest Group in 1994 and dedicated volunteer." Many don't know this, but Mel Whitten, K0PFX, and I approached John about 15 minutes before the scheduled first meeting of the NET-SIG at the Tucson Spring meeting in 1993 and asked him if he would be chair. He said yes he would give it a go and now look — he is VP! Thanks for the effort, John. During the Dallas/Ft. Worth HamCom convention Jim Neely, WA5LHS, presented Dave Wolf, WO5H, with a plaque for "outstanding service to TAPR as founder of the TAPR BBS Special Interest Group in 1994 and dedicated volunteer." Dave, like John, was asked to take on the job and start one of the first two SIGs within TAPR. A lot of effort went into forming the structure that all the SIGs are now based on. Thanks, Dave and John.

Spread Spectrum — happenings?

We have been busy campers in the weeks following Dayton. With luck, we will have several major announcements to make about potential Spread Spectrum projects that TAPR will be involved with in the coming months. If they come about as I see them now - we will have been very successful in our work. If they come out about 50%, we will still have a lot of fun! The TAPR board is also working up a Spread Spectrum policy statement, which should set the stage for the eventual direction the organization will take regarding Spread Spectrum communications. More next issue.

Cheers - Greg Jones, WD5IVD

TAPR Dayton '96

Greg Jones, WD5IVD

Dayton 1996 was a lot of fun! After last year's Dayton, we set improvement goals for a number of areas. These included the digital forum and the Friday banquet. The TAPR digital forum saw improvements in the content quality and pacing, the result was that the room was filled for most of the sessions. I would like to thank everyone who presented and for the high-level of presentations during the forum. Something that people have asked for next year is some type of futures panel discussion. We will look at doing one next year. If you have additional thoughts on what talks should be presented, please let TAPR know (ag9v@tapr.org) and we will make notes for next year. All sessions were recorded and the audio is available on the TAPR web page under the Virtual meeting area. Overheads should be added shortly.

The 1996 "Packet BASH" and TAPR Banquet co-sponsored by TAPR and the Miami Valley FM Association, Dayton's packet radio club, held on Friday was beyond words. The location and facility at NCR, south of Dayton, was just about perfect. It is everyone's hope to have it there year after year after year now. John Ackermann, AG9V, who works for NCR, made the location an option and we all thank John for his effort on that front. If you missed the Friday dinner — then you should make plans to attend next year. Phil Karn's presentation on his usage of personal computers to do advanced digital communications was thought provoking and very well received. The presentation, in RealAudio format, is available via the TAPR web page (www.tapr.org) in the Virtual Meeting area. TAPR would like to thank Mark and Keith Sproul, Bill Reed, and Consolidated Electronics for making items available for the prize drawing.

The booth still needs more work next year to increase presentation space and material availability. Several of us are thinking about what that requires. Maybe what AMSAT does at their booth. The booth space we have is unique in having all sides available....so we hope to take more advantage of that next year. We would like to thank everyone who stopped by to say hello and to all those who spent time in the booth this year helping out. Working the booth is always a lot of fun!

Dayton '96 was held, as many know, three weeks later than in past years. This seemed to have good and bad effects. Attendance seemed to be down, but the weather was sunny and clear. Several folks at the booth commented on the attendance after Dayton, but Dayton has not been the only ham-related convention to have fewer participants this year.

Anyway, Dayton looks to continue to be an important event for TAPR and we will continue to work on making it better each year! Come join the digital experience at Dayton '97 (May 16-18, 1997).

DPBOX/TNT: a brief overview

Joachim Schurig, DL8HBS

What is dptnt?

dptnt is a packet radio AX.25 package running under LINUX with no special requirements to kernel or setup. It is NOT another tcp/ip package.

The archive contains the programs:

TNT	A hostmode terminal program for packet radio
DPBOX	A full featured BBS
TFKISS	A TNC-Firmware-Emulator with a KISS and AX/IP interface
BOXSTART	A 'watchdog' and program starter
DPBOXT	A standalone console for BBS operator (DPBOXTerminal)

In addition, HDPARM is included, because of receiver overruns on the serial line with the actual LINUX-kernels. More details can be found in the README of TNT.

Out of these programs you can create a configuration which fits your needs. You can set up a personal mail system, a powerful packet radio terminal for your own needs or a full featured public bbs.

Some features

terminal part:

- Virtual screens for every connection
- connect scripts
- shell, run and socket interfaces
- AutoBIN protocol for file transfer
- forcing bbs to start forward if own call found in a mail beacon (to gather your own private mails)

bbs part:

- F6FBB-, WORLI-, TheBox- style forward protocols implemented
- 8-bit transparency of messages using AutoBIN protocol (no 7plus needed)
- BBS-data online compressed to save space on disk, forward and download
- BBS can be filled by monitoring the frequency (useful for private usage)
- PACSAT style bulletin broadcast transmitter and receiver
- up to 200 simultaneous users

both:

- fast, reliable, economic

Connectivity

With the current package, you are free to connect an unlimited number of the following devices to the system:

- TNC2 / TNC3 in wa8ded-hostmode
- any KISS device, this includes:
  - almost every TNC of any vendor
  - rmnc digipeaters
  - PC/Flexnet digipeaters
  - wampes tcp systems (SMACK KISS)
  - any redirectable KISS port on your Unix machine
- AX/IP to connect via any IP connection

Status

The development is ongoing, the archive is a snapshot of the current status. The documentation now is complete.

With this release we want to give easy access for everyone interested in the software. TNT and DPBOX is currently running in 8 BBSs of the german BBS network, and we received a lot of requests for a general release.

TNT and DPBOXT are under the GNU public license, TFKISS under ALAS, which is a German license for HAM RADIO software. For these programs, the source is included.

DPBOX can be freely distributed for HAM RADIO use, but the source is not available, commercial or citizen band usage is prohibited.

Archive files

boxstart.tgz	boxstart binary, source and documentation
dpbox417.tgz	dpbox binary, configuration and documentation
dpboxtsrc.tgz	dpboxt source
hdparm	hdparm binary
hdparm-2.2.tar.gz	hdparm source and documentation
tfkiss_960406.tgz	tfkiss source, configuration and documentation
tntbins_070496.tgz	binaries of tnt, tfkiss and dpboxt
tntsrc09l.tgz	tnt source, documentation and configuration

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wahlm@zelator.berlinet.de

Availability

The dptnt_140496.tgz archive currently is available on the following ftp servers:

ftp://ftp.funet.fi/pub/ham/unix/packet/dptnt/
ftp://ftp.tapr.org/pub/tapr/software_lib/Linux/
ftp://ftp.ucsd.edu/hamradio/packet/tcpip/incoming/

In the given directory you find the files dptnt_140496.tgz and dptnt_140496.txt (this text).

These are the developers' home pages. Newest versions are available here and documentation can be read online.

http://www.snafu.de/~wahlm/	(homepage dl4ybg)
http://hppool0.rz.hu-berlin.de/~h0187akk/	(homepage dl8hbs)

IC-275/IC-475 Modification For Satellite Packet Operation

Roy Welch, W0SL

Here is the way I cabled out the IC-475 & IC-275 rigs for 1200 bps and 9600 bps. All I have to do is turn off the unwanted TNC. You can't leave both of them on or you will transmit both audios at the same time. The AQS and ACC are the sockets on the rear of the sets. BE CAREFUL OF AQS PIN 13 AND ACC(1) PIN 7. They carry 13.8 volts and can damage things if accidentally shorted to other pins! I cut them off on the solder side of my cable plugs.

By the way it will be necessary to disable the beep tone that occurs when you depress a key on the IC-475. The beep tone is sent through the speaker system and will interfere with the 1200 bps data signal otherwise. The beep tone is disabled by rotating R348 (Beep Sound Level Adjustment) counter clockwise. See Section 9, p. 42 of the user's instruction manual for a photo. In my IC-475, I have also changed out the FL4 (Murata CFW455-E) for a wider filter. The CFW455-E is a +/- 7.5kHz (15kHZ) filter. I first tried using a CFW455-D, a +/- 10.0kHZ (20kHz) filter with a definitely noticable, but not terrific improvement. I then changed out this filter for a SFH455-D Gaussian shape filter designed for data reception. There seems to be a further small improvement with this filter but not such that I can place numbers on it. In addition, the S-Meter must be recalibrated if you want it to read correctly with this last filter. It reads low. I think the CFW455-D is the way to go and still have the S-Meter still behave.

Cable Pinouts

TNC-2 to IC-475 & IC-275 for 9600 BPS Operation

FUNCTION	TNC RADIO PORT	IC-475 AQS	IC-275 AQS
TX AUDIO	1	-	2 (note 1)
GROUND	2	9	-
	2	-	1
PTT	3	-	7
RX AUDIO	4	5 (note 2)	
RF DCD	5	-	-

Note 1: Existing shielded lead to AQS socket pin 5 is re-terminated inside IC-475 to IC6 pin 9 through 5 to 10 mfd non-polarized capacitor. This lead is labeled AQAO on plug P13 on IC-475 schematic and can be removed easily from plug housing by CAREFULLY, slightly lifting plastic retaining tab on the side of P13. IC6 pin 9 is available on a bare wire between P13 and IC6 (they are about 1 1/2 inch apart). It comes out on the component side of the board, goes about 1/2 inch and goes back in the board. It is easier to solder the capacitor to this bare wire than the IC itself and much more desirable I think. The other capacitor lead is slipped into the female P13 sleeve just removed from P13. Nothing is cut! The bottom of the rig is removed to get access to P13 and IC6.

Note 2: Transmit audio can be input on AQS socket pin 2 without mods. It goes to P12 on lead AQTN and drives Q33 through trim pot R152. Q33 provides plenty of gain to modulate the rig and doesn't seem to distort the transmit audio. You can adjust the transmit gain either in the modem or by using R152. I use R152 because I use the modem to drive both the IC-275 on UO14 and the IC-475 on local 9600bps packet. That way I can independently set the transmit audio level for both rigs and switch it between them.

Cable Pinouts

TAPR PSK Modem to IC-475 & IC-275 for 1200 BPS Operation with AO16 and LO19

FUNCTION	PSK MODEM PORT	IC-475 ACC(1)	IC-275 ACC(1)
UP/DOWN	UHF 5	1 (Note 3)	-
GROUND	UHF 2 & 1	2	-
	VHF 2	-	2
PTT	VHF 3	-	3
TX AUDIO	VHF 1	-	4
RCV AUDIO	UHF 4	5	-
	VHF 4	-	5

Note 3: Wired added from mic connector pin 3 to ACC(1) pin 1 in IC-475. The mic connector pin 3 is available on a small circuit board immediately behind the mic socket. The socket is wired to this board via a small ribbon cable. ACC(1) pin 1 is not connected to anything, so the new wire must be soldered directly to pin 1 on the back of ACC(1). Fortunately it is on the side of the socket nearest the side of the rig and accessible with a bit of care. This wire is necessary only if you don't want to access it through the mic socket. I like all my cables on the rear of the set. Also, this wire is needed only if you are using the PSK modem UP/DOWN pulsing capability to keep your rig tuned into the downlink signals.

Silent Key: K0ROL

Lt. Colonel Oakley "Oak" Stockton, USAF, retired, died March 16, 1996 after a long illness. He served throughout WW II and the Korean wars, and was awarded the Bronze Star Medal, the Air Force and Army Commendation Medals, the Singhman Rhee Presidential Unit Citation, and others. Stockton served 24 years in the USAF and 6 years with the Defense Communications Agency, Western Hemisphere, as a Communications Specialist. He was licensed as an Amateur Radio operator for 60 years. Oak was an active member and past president of the Pikes Peak Chapter of the Society for the Preservation and Encouragement of Barber Shop Quartet Singing in America for 38 years, and held many offices within the Society.

He is survived by a brother, Paul M. Stockton of Winterhaven, Ca., four children, Chip G. Stockton of Poway, Ca., Scott L. Stockton of Castle Rock, Co., Lorrie D. Stockton of Los Angeles, Ca., and Rand K. Stockton of Colorado Springs, six grandchildren, and his loving companion Ora Marie Rose of Colorado Springs. Cremains will be distributed at the family mountain cabin in Park County, Colorado.

Memorial gifts may be sent to the Mayo Clinic or to the Penrose Hospital Cancer Unit.

DSP-93 on PACTOR and AMTOR

Jim Shepherd, K6OYY

Thought some of you might be interested in some brief comments related to my recent usage of my DSP-93 on HF Pactor and AMTOR (receive only) with Johan Forrer's PC-based PCTOR and PC-PACTOR programs. Having spent a good deal of time on packet and satellite activity using connected protocols, I was curious to see what was possible on HF. I had never decoded AMTOR or Pactor previously. I initially was not able to load an early version of Frank Perkin's HF modem with my DSP-93 and V2.15 eproms, although it did load and run on Johan's Beta DSP-93 with V2.14 eproms. Frank very kindly provided a copy of his latest HF modem (currently receive only) and it loaded immediately without problems. After editing the configuration file in Johan's PCTOR and PC-PACTOR, both programs became operational in AMTOR and Pactor modes. PCTOR will also operate in RTTY baudot and ascii modes, but to do so requires a simple serial cable switch modification to tie the TD and DCD lines together (it is likely that this will not be needed in the final version of Frank's DSP-93 modem). A "standard" serial cable is all that is needed for Pactor or AMTOR use.

Operationally, my greatest problem was distinguishing what was what among the bird-like chirping on the HF bands. It turns out that chirp chirp chirp is AMTOR ARQ, chirrrrrrp chirrrrrrp chirrrrrrp is Pactor, and chirrrrrrrrrrrrrrrrrrrrrrrrp is something I have yet to identify, likely GTOR, Clover, or perhaps Pactor II. Once I had some idea what to listen for, switching to the appropriate mode produced immediate results. AMTOR FEC sounds like RTTY but at a bit faster rate.

Johan's PACTOR program may be run either separately, or from within the shell provided by PCTOR, which was my choice. I have used it successfully to decode Pactor at 100 and 200 baud with both ASCII and HUFFMANN coding. Huffmann transmissions have produced consistently better copy than ascii in my admittedly short week or so of testing. Switching between baud rates and coding type is automatic and identification status is displayed on the monitor.

I used the PCTOR program to try listening to AMTOR/Sitor in ARQ and FEC modes. W1AW bulletins are a convenient source of AMTOR FEC transmissions and I had no trouble copying on 75, 40 and 20 meters. AMTOR ARQ was very slow by comparison, as one might expect. Since I was not transmitting in ARQ mode, my operation was not in a "connected status." I was a third-party listener and my reception under noisy conditions was frequently less than perfect copy, again as might be expected.

This configuration has nicely accomplished what I had intended, that is to gain some listening experience with these HF modes using my DSP-93. I have also used Dave Mill's "hot modem" with good success on AMTOR FEC and RTTY. Dave's modem currently will not provide operation on Pactor or Amtor ARQ, but it was very interesting to quickly switch between Frank's and Dave's modems while operating in the AMTOR FEC or RTTY modes, for purposes of comparison. I plan to make further comparisons when Frank's modem is available in a 'final release.' While the two modems differ substantially in design, both will produce very useful copy under a variety of conditions; it is great to be able to use the common DSP-93 platform and quickly load different modems for comparison!

I just wanted to offer some operational comments to those who might have similar interests. I would like to again thank Johan and Frank for their patient and helpful assistance while I worked out the usual problems involved with getting up and running in a new mode.

Important FCC NPRMs

The FCC has two current proceedings of a high degree of interest to many people, the Spread Spectrum Notice of Proposed Rulemaking (NPRM) and the NII/SUPERNet 5 GHz band. Comments for both are due soon.

In the Spread Spectrum NPRM (Docket 96-8), the FCC proposes to amend its rules regarding spread spectrum transmitters in the three ISM bands: 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz. The issues include reducing the limit on directional gain antennas in the 5 GHz band (the FCC has also requested comment on its initial decision to not also lift that restriction in the 2.4 GHz band), and reducing the number of frequency hops required in the 900 MHz band. Initial comments are due June 19, Replies on July 19. The text of the NPRM can be found at:
http://www.fcc.gov/Bureaus/Engineering_Technology/Notices/fcc96036.txt

In the NII/SUPERNet 5 GHz NPRM (Docket 96-102), the Commission proposes to make available 350 MHz of spectrum at 5.15-5.35 GHz and 5.725-5.875 GHz to use a new category of unlicensed devices. The purpose of this allocation would be to provide short-range, high-speed wireless digital information transfer and facilitate access to the National Information Infrastructure (NII) without the expense of wiring. Initial comments are due July 15, Replies August 14. The text of the NPRM is available on the Web at:
http://www.fcc.gov/Bureaus/Engineering_Technology/Notices/fcc96193.txt

The WordPerfect version is:
http://www.fcc.gov/Bureaus/Mass_Media/Public_Notices/pnmm6004.wp

Regulatory Issues and New Technology

We often think of Amateur Radio as simply a technical hobby: basement technologists playing with, developing, inventing, and fine tuning practical solutions to communication problems. But a lone adopter of new technology, or even a small group of enthusiasts, will not result in wholesale acceptance of the new technology. In addition to the technical barriers, there are legal, political, and cultural barriers to overcome. This special section highlights some of the non-technical issues facing Amateur Radio at this exciting point in history.

We start off the section with the latest in what seems like a never ending series of threats to the Amateur bands: the inclusion of the 2-meter and 70-cm Amateur bands on a list of candidate frequencies for use by commercial low-earth orbit satellites.

This is followed by a speech by FCC Commissioner Susan Ness in which she explains her eight principles of spectrum management. These clearly thought out principles show that the FCC has a good grasp of the delicate balance between public and commercial interests in regards to the radio spectrum. This indicates that the FCC is truly an ally with Amateur Radio, but there is a warning in this message: in order to accomodate the exploding demands for "new" spectrum space, we must all "make more efficient use of existing spectrum."

This challenge by the FCC provides an exciting opportunity for those who wish to push the limits of communications technology forward. In the final part of this special section, the ARRL and TAPR attempt to meet this challenge by promoting the development and growth of spread spectrum technology.

Amateurs Mobilize Against Threat to 2 Meters, 70 cm

ARRL Headquarters Newington, Connecticut May 29, 1996

The American Radio Relay League is asking radio amateurs across the United States to help defeat a threat to the two most heavily used amateur VHF and UHF bands.

An industry working group (known as IWG-2A) that is preparing draft U.S. proposals for the 1997 World Radiocommunication Conference has before it a list of "candidate bands" for low-earth orbit mobile satellites ("little LEOs") that includes, among a number of others suggested for consideration, the 144 and 420 MHz bands. Little LEOs are intended mainly to offer commercial paging and other low-data-rate messaging services. The list of candidate bands was submitted by little LEO industry representatives at a meeting of IWG-2A on May 7. ARRL Technical Relations Manager Paul Rinaldo, W4RI, was present and objected strongly to the inclusion of these two bands. He was told that objections should be submitted in written comments, and the ARRL did so on May 15. At the same time the ARRL advised the industry participants in IWG-2A along with its chairman, Warren Richards of the Department of State, that if we did not receive assurance that the bands would be dropped from the list of candidate bands we would have no choice but to advise members in the July *QST* that the bands were under threat. No such assurances were forthcoming. Instead, we were told that as long as little LEO allocation requirements remained unsatisfied, everything had to remain on the table.

This response was not acceptable. Accordingly, when the July *QST* went to the printer on Tuesday, May 28, it included the following editorial. The editorial speaks for itself, but it is worth emphasizing that **there is no reason for panic**. What we are dealing with is an ill-considered industry effort that is in its early stages; there is no reason to believe there is any government support for any move against these two amateur bands. Our mission is to quash the idea before it goes any further. An outpouring of thoughtful comment by amateurs, explaining why the public interest would not be served by the introduction of commercial services into these bands, will go a long way toward ensuring the desired outcome.

It Seems to Us, July 1996 *QST*

David Sumner, K1ZZ

[Reprinted with permission from July 1996 QST.]

Write Now!

Get out a pen and paper, or boot up your computer. There's work to be done! Your help is needed to defend two meters and 70 cm. Yes, that's right — the two most popular and crowded amateur VHF/UHF bands! But don't panic, and don't "go ballistic."

Here's what's happening, and what you can do about it.

The United States is preparing for the 1997 ITU World Radiocommunication Conference, WRC-97. In the past, the public has been able to participate in the preparations for such conferences by responding to FCC Notices of Inquiry. In March, the FCC announced a streamlining of its International Bureau's preparatory processes for WRCs. Under the new scheme, the NOIs have been eliminated in favor of increased emphasis on WRC Advisory Committees.

For WRC-97, a series of Informal Working Groups (IWGs) of the Advisory Committee has been created to address specific agenda items. The output of each IWG will go directly to a joint FCC-NTIA-Department of State Steering Committee of the Advisory Committee. There, draft proposals as received from the IWGs will be reviewed and forwarded to the FCC for possible release as preliminary U.S. proposals for public comment.

In announcing the streamlined WRC preparatory process, the FCC tried to reassure those who might be concerned about reduced opportunities for public participation: "Interested parties should note that input to the Advisory Committee may be sent at any time directly to the Chair of the WRC-97 Advisory Committee; the Chairs of the Advisory Committee's Informal Working Groups; Cecily C. Holiday, the FCC's federal officer of the WRC-97 Advisory Committee, or to Damon C. Ladson, the alternate federal officer."

Hold that thought while we shift gears to the substance of the issue.

One of the WRC-97 agenda items includes consideration of possible additional frequency allocations for the mobile-satellite service. So-called "little LEOs," low-earth orbit satellites below 1 GHz, already have allocations. Their proponents claim these are inadequate and are trying for more. The needs of little LEOs are being addressed in IWG-2A, chaired by Warren Richards of the Department of State. The ARRL technical relations staff participates in IWG-2A to represent Amateur Radio interests.

At the May 7 IWG-2A meeting, an industry representative proposed a list of "candidate bands" for little LEOs. The list includes a number of bands that would negatively impact existing services, and does not include others that would be technically more feasible but to which strong objection from incumbents could be expected — the point being that some political, rather than purely technical, judgment already has influenced the list.

Incredibly, 144-148 and 420-450 MHz were included on the list! This is the first time in memory that another service has been proposed for the two-meter amateur band. We must make sure it is also the last time.

We do not need to explain to ARRL members the extensive use that is made of these bands by amateurs. The two bands provide the backbone of our local public service communications effort. Voice and data, mobile and fixed, even television — the list of present amateur uses is a long one, and of future uses is even longer. Both are already used for satellite services and for moonbounce and extended-range terrestrial operations requiring extremely sensitive receivers and high levels of effective radiated power.

Apparently we did need to explain all this to the little LEO industry representatives, so we did just that — both at the meeting and in a followup letter on May 15. We also explained that we had to regard the matter as extremely serious. No one with the slightest background in radiocommunication could possibly believe that a mobile-satellite service could be introduced into either band without disrupting existing and future amateur operations. Therefore, we said, if we did not receive assurance that they would be taken off the list of candidate bands by the deadline for this issue of *QST*, we would have no choice but to bring the matter to the attention of the entire membership.

The response we received was unsatisfactory. In effect, we were told the little LEO industry would consider our views but that until their spectrum needs are satisfied, all bands must remain under consideration.

So, this is a call to action. We must get across to the industry and government participants in IWG-2A that the 144-148 MHz and 420-450 MHz bands cannot be considered as candidates for mobile-satellite services. We need to drive the point home so forcefully, with so many grassroots responses, that no one is ever tempted to try this again.

Which brings us back to that invitation for "interested parties" to send input "at any time." There's no time like the present! Here are the key addresses, including those of the mobile-satellite industry folks who seem to have started the ruckus:

Cecily C. Holiday, International Bureau, FCC, Washington, DC 20554; choliday@fcc.gov; FAX (202) 418-0748.

Warren G. Richards, Chair, IWG-2A, Department of State, CIP 2529, Washington, DC 20520; richardswg@ms6820wpoa.us-state.gov; FAX (202) 647-7407.

Tracey Weisler, FCC Rep., IWG-2A, International Bureau, FCC, Washington, DC 20554; tweisler@fcc.gov; FAX (202) 418-2824.

Mary Kay Williams, Final Analysis, Inc., 7500 Greenway Center, Ste. 1240, Greenbelt, MD 20770; FAX (301) 474-3228.

Leslie Taylor, President, LTA, 6800 Carlynn Court, Bethesda, MD 20817; ltaylor@lta.com; FAX (301) 229-3148.

Do comment. But be civil. Don't abuse people who are simply doing their jobs. We have to get across that casting covetous eyes on amateur bands is counterproductive, and contrary to the public interest. To accomplish this we need a lot of comments, including yours. But remember that the objective is to educate and persuade, not to intimidate. We don't need to. The facts are on our side.

To monitor the FCC's ongoing WRC-97 preparations, visit its WRC-97 home page at:

http://www.fcc.gov/ib/wrc97/

Write now. Right now!

Letter from FCC regarding LEO issue

Fred Maia, W5YI fmaia@internetmci.com

The following letter was received from the FCC. I am releasing it to the amateur community since I believe it to be of general interest. It concerns the recent publicity about consideration being given by a WRC-97 Industry Advisory Committee to future use of the 144-148 and 420-450 MHz bands for commercial low-earth orbiting (LEO) satellites.

Dear Mr. Maia:

In recent days, over 1,000 members of the Amateur Radio community have contacted me regarding the upcoming 1997 World Radiocommunication Conference in Geneva and expressed strong concern that U.S. proposals will impact adversely on spectrum allocated for Amateur bands. My purpose in writing to you is to respond to these concerns and to provide you with additional information regarding the WRC-97 prepatory process and its relation to existing services.

Many of the comments I received have focused on a list of "candidate" frequency bands discussed at the May 7 meeting of the WRC-97 preparatory Industry Advisory Working Committee Informal Working Group 2A (IWG-2A). The comments suggest that the Amateur Radio Service bands, specifically the 144-148 and 420-450 MHz bands, have been targeted as a source of spectrum for future Mobile Satellite Service (MSS) operations.

First, I want to assure the amateur radio community that no amateur bands have been selected for reallocation. The list of bands generated on May 7th represent only the IWG-2A's initial efforts to study spectrum use below 1 GHz in order to assess the feasibility of proposing world-wide MSS allocations in that range. Before recommending preliminary proposals for consideration by the Commission, IWG-2A participants must first conduct sharing studies among a range of services using frequencies below 1 GHz. These studies are necessary in order to determine the feasibility of sharing between services, and whether recommending any specific frequency band will be fruitful.

Second, the bands listed reflect only the initial component of a long-term effort to conduct sharing studies before submitting the Committee's proposals to the Commission for review. We intend to conduct sharing studies in bands currently occupied by government and non-government users. In any case, I want to emphasize that the survey on spectrum use is an international matter which involves all frequencies below 1 GHz.

Finally, the current WRC-97 preparatory process, as in years past, operates under a Congressional statute designed to encourage maximum participation by all interested parties. Therefore, all written and electronic comments received at the Commission to date by Amateur Radio operators have been included as part of the public record on WRC-97 proceedings. However, in the interest of efficiency, we have created a designated FCC office and e-mail site to channel future WRC-97 comments directly to the WRC-97 Committee Chairs. I have included our latest Public Notice outlining these changes and urge you to share it with your members.

I appreciate the many valuable contributions the amateur radio community has made to the progress of radio technology and to ensuring the safety of the American public. I look forward to working with you so that we can continue to advance the use of exciting telecommunications technology both in the U.S. and abroad.

Sincerely,

s/ Cecily C. Holiday

Director, WRC-97 Preparatory Team

Procedures for Submitting Comments to the WRC-97 Advisory Committee

On March 14, 1996, the Committee released Public Notice (No. 61997) (Streamlining Notice), that announced its new streamlined World Radiocommunications Conference (WRC) preparatory process. Under this new process, formal Notice of Inquiry (NOI) proceedings are eliminated in favor of developing WRC proposals in the Commission's WRC-97 Advisory Commmittee. This removes the redundancy that was inherent in our previous "NOI-WRC Advisory Committee" process and enables the United States to respond more effectively to the rapidly evolving international environment and to the ITU's new two-year WRC schedule.

The Streamlining Notice included general guidelines for submission of public comments to the Advisory Committee. The Notice states that procedures would be developed to ensure that members of the public continue to have full opportunity to participate in the development of WRC proposals under the new streamlined process, including those parties who do not attend meetings of the Advisory Committee and IWGs.

Since the release of the Streamlining Notice, we have gained experience with our new process. We now provide these procedures for submitting comments to the Advisory Committee.

- Comments on Ongoing Advisory Committee Matters: Parties who wish to comment on the ongoing deliberations of the Advisory Committee and its IWGs may do so at any time.
- Comments on Preliminary Proposals: As announced in the Streamlining Notice, preliminary WRC proposals developed by the Advisory Committee will be released by the Commission in periodic Public Notices. These Public Notices will allow an opportunity for public comment and will provide the appropriate procedures, such as filing deadlines, to be followed.

In either case, parties wishing their comments to be considered directly by the appropriate Advisory Commmittee group and to become part of the Advisory Committee's public record should submit their comments in writing to Office of the Secretary, Federal Communications Commission, Washington, DC 20554, or by e-mail at "wrc97@fcc.gov." Commenters are requested to file an original plus one copy.

The comment should reference the Advisiory Committee public record file number "Reference No. ISP-96-005" and the appropriate Advisory Committee Informal Working Group, if known, in which their submission should be considered. The FCC staff will ensure that comments filed are considered in the appropriate groups.

For the most expeditious and efficient consideration of their comments, parties should refrain from filing comments directly with the Chair of the WRC-97 Advisory committee, with the Chairs and Vice Chairs of the Informal Working Groups, with individual FCC staff members, or private sector participants in the Advisory Committee process.

For additional information, contact Cecily C. Holiday, Federal officer of the WRC-97 Advisory Committee, or Damon C. Ladson, Alternate Federal Officer at (202) 418-0749, or consult the WRC-97 Homepage on the Internet
http://www.fcc.gov/ib/wrc97/

More On the 2m/70cm Band Challenge

Brad Wyatt, K6WR
Director, Pacific Division, ARRL
Packet: K6WR@N0ARY.#NOCAL.CA
Internet: K6WR@arrl.org
WWW Pacific Division Home Page — http://www.pdarrl.org/

The challenge to the 2 meter and 70 cm bands by LEO interests has received a great deal of publicity in recent weeks. The bare-bones facts are contained in the *QST* editorial for July 1996. Little has been available so far, however, on the WHO, WHAT, and WHEN of the matter. This update will attempt to fill this gap, with details that were not available when the news first broke. All this information has been obtained from public sources.

WHO are the "little LEO" folks?

In 1993, the FCC allocated several bands to the Non-Voice Non-Geostationary (NVNG), low-Earth orbit ("Little LEO") Mobile Satellite Service, which uses small satellites at 650-1300 miles altitude to provide data communication services.

The NVNG service is based on small satellite technology pioneered by the Amateur Satellite Service. Approximately 13 million commercial NVNG user terminals are expected to be in service by the year 2000.

Orbcomm (Orbital Communications Corp.) is a joint venture between Orbital Sciences Corporation of Dulles, VA and Teleglobe Canada. They have two satellites in orbit (launched April 3, 1995) with plans to launch the remaining constellation, for a total of 36 satellites, beginning around the end of this year. Satellites are being built by Orbital Sciences in Germantown, MD (former Fairchild facility) and launched on Pegasus XL launchers. Uplinks are 2400 bps FSK in the 148- 149.9 MHz band, user downlinks are 4800 bps FSK in the 137-138 MHz band, with beaconing in the 400-401 MHz band. Their two satellites are the only little LEOs actually in orbit. Orbcomm has an informative Web site at: http://www.orbcomm.net.

Starsys (Starsys Global Positioning, Inc.) of Lanham, MD, is now owned (80%) by GE American Communications. They were previously owned by NACLS (the US subsidiary of a French company that operates System Argos). They will most likely begin launching their constellation in early 1998. The satellites are being built by Alcatel (Toulouse, France). Launch services have not been announced, but likely candidates are Cosmos or Roket (Russia), Pegasus, LLV (Lockheed Martin) or Delta. They plan to use the same frequencies as Orbcomm, using spread-spectrum technology.

VITA is a non-profit development organization based in Arlington, VA. They were teamed with CTA Incorporated, but suffered a launch failure in August 1995 (the first LLV-1 launch). The VITA-CTA agreement ended and VITA is now partnered with Final Analysis, Inc. of Greenbelt, MD for the ownership of a single transponder on the FAISAT-2v satellite. This satellite is a hybrid US-Russian effort, and should be launched in the September time frame on a Cosmos from Plesetsk, Russia. VITA's uplinks are the same as Orbcomm and Starsys, with the downlinks in the 400-401 MHz band. VITA's uplinks are not from mobile terminals but rather are from a few fixed gateway stations. VITA has an informative Web site at: http://vita.org/. Final Analysis has an experimental license for the remainder of the satellite that allows for a limited number of user terminals to uplink at data rates from 1200 - 19200 bps GMSK in the 455-456 and 459-460 MHz band. Downlinks are in the 400-401 MHz band, ranging from 1200-38400 bps GMSK. Final Analysis has a Web site at:

http://www.uscom.ch/companies/it/facs/facs.html.

Those are the only little LEO companies that presently hold licenses.

The remaining companies that have applied for licenses are GE Astro Space, Princeton, NJ; Final Analysis Inc. (FAI), Greenbelt, MD; E-Sat Corp., Denver, CO, a subsidiary of Echostar Corp.; LEO One USA, a subsidiary of LEO One Panamerica of Mexico City; and CTA Corp., Rockville, MD. CTA has a Web site at: http://fester.cta.com/.

There are other websites which provide useful information:

Additional information on the ORBCOMM system:
http://leonardo.jpl.nasa.gov/msl/QuickLooks/orbcommQL.html

Fortune magazine article:
http://pathfinder.com/@@xmgeWQUA59yF*JLJ/fortune/magazine/1996/960527/cover.html

"Ethersphere," by George Gilder:
http://homepage.seas.upenn.edu/~gaj1/ethergg.html

Article on LEOs in "Network Computing:"
http://techweb.cmp.com/techweb/nc/615/615frezza.html

WHO

WHO are the consultants who introduced the "candidate bands" at the May 7, 1996, meeting of the Informal Working Group 2A (IWG-2A)?

Mary Kay Williams, Final Analysis, Inc., 7500 Greenway Center, Ste. 1240, Greenbelt, MD 20770.

Leslie Taylor, President, LTA, 6800 Carlynn Court, Bethesda, MD 20817.

WHAT are the "candidate bands" introduced at the May 7 meeting?

The "candidate bands" proposed by these consultants to IWG-2A on May 7, 1996, are the following (listed in MHz):

138-144, 144-148, 216-218, 380-400, 401-406, 406.1-410, 410-420, 420-450, 450-460, 460-470, 790-862, 890-902, 1427-1432.

Obviously, there are "incumbents" (such as ourselves) using these bands.

Bands that would be technically suitable but were not included are the VHF TV bands (notably 174-216 MHz) that the broadcasters eventually will be relinquishing when digital TV has been fully implemented in the UHF band.

Research in the *Spectrum Guide: Radio Frequency Allocations in the United States 20 MHz-300 GHz* by Bennett Z. Kobb, ISBN 0-9641546 indicates that the "little LEO" folks currently have the following allocations: 137-138, 148-150.05, 312-315, 387-390, 399.9-400.05, 400.15-401 MHz.

We are actively learning more about these consultants and their roles.

WHAT is the future planned meeting schedule for IWG-2A?

It appears that publicly scheduled meetings of IWG-2A will be held about every three weeks. The last such meeting was June 18, 1996. To keep up with the scheduled public meetings and locations, visit the FCC WRC-97 home page at: http://www.fcc.gov/ib/wrc97/.

HOW does this all get resolved?

This part of the problem is very unclear as Warren G. Richards, Chair, IWG-2A, Department of State, CIP 2529, Washington, DC 20520, has stated that he does not have the authority to change any of the candidate bands listed at the May 7, 1996, meeting. So far there seems to be no known procedure for modification, change or resolution to end this conflict between the incumbents (the current users of the spectrum) and the "little LEO" folks and their consultants.

WHEN does it get resolved?

This problem is likely to be with us until at least November 1996 before resolution. The various Informal Working Groups have a target date of November to complete their preliminary work and to have their data and positions ready for the Advisory Committee.

So WHAT do we do now?

There are a series of important actions for all interested hams to take:

1. Monitor the progress of this unfolding drama!

For the latest news on this volatile issue, read *QST*, ARRL Letter, Pacific Division Updates in hard copy. Read ARRL Letter and Pacific Division Updates on e-mail. Visit the ARRL Home page at http://www.arrl.org/ and click on "Band Threat News." Visit also the WWW Pacific Division Home Page — http://www.pdarrl.org/. To monitor the FCC's view of the ongoing WRC-97 preparations, visit its WRC-97 home page at:

http://www.fcc.gov/ib/wrc97/.

2. Join ARRL!

The ARRL is the only effective national organization fighting for YOUR 2 meter and 70 cm. hand held operating privileges. It is easy to join and help us win this battle to preserve our privileges.

3. Then write. Right now — and continue through Summer and Fall!

As it appears there will be no early resolution to this conflict, it is important that every interested ham write:

Comments by e-mail should be sent to:

wrc97@fcc.gov.

Hard copy written comments, with an original plus one copy, should be sent to:

Office of the Secretary, Federal Communications Commission, Washington, DC 20554.

Each comment should include at the top, "Reference No. ISP-96-005" and "Advisory Committee Informal Working Group 2A."

We must keep up this activity consistently throughout the Summer and Fall until November. Other strategic and tactical activities are in process and being developed and will be implemented as time progresses.

Spectrum Management Principles for the Twenty-First Century

Remarks of Commissioner Susan Ness
Federal Communications Commission at the FCBA/Warren Publishing Wireless Communications Summit, Washington, D.C.
June 10, 1996

It is a pleasure to be with you this morning.

It's hard to believe that two years have passed since I joined the Commission. As some of you may recall, during my first few weeks, I spent 140% of my time on the final orders which launched 140 MHz of spectrum for personal communications services. We are now two years and $20 billion into my five year term of office.

Here we are together again at the "Wireless Communications Summit." That is a rather lofty title for a Monday morning. It conjures up images of world leaders coming together to resolve issues of war and peace...and to play golf.

Wireless Summit also evokes images of standing atop a mountain peak. Seeing the world from a splendid vantage point. Overlooking everything. And there in front of this magnificent view — glistening in the sun — a wireless tower.

I.

I'd like to spend our time together exploring a different topic — the subject of the following riddle: It cannot be seen by the human eye, but always surrounds us. It is constantly used, but never consumed. It is our most valuable and renewable resource. What is it?

The radio spectrum, of course.

Spectrum is the common denominator of all wireless services. It brings us a world of news, information and entertainment; enables us to communicate with folks on earth while flying 32,000 feet above the ground, and with satellites perched 23,000 miles in outerspace. It opens garage doors, monitors our infants, provides rapid dispatch of fire and police vehicles, and allows us to stay in touch with our offices and our homes by phone and page. It permits efficient monitoring along thousands of miles of pipelines and railroad tracks. It connects computers with each other and with the Internet.

Today, as in the past, the demand for useable spectrum greatly exceeds the supply.

The FCC is the steward for commercial use of the radio spectrum. We must conduct spectrum policy in a manner that maximizes flexibility, efficiency, and the public interest. It is possible to have flexibility without efficiency; efficiency without flexibility; and both without serving the public interest.

By our action or our inaction, we can further or frustrate rapid development and deployment of innovative technologies and services. Thus, spectrum management is perhaps the most important of the Commission's many responsibilities.

In the past, few understood the inherent value of the radio spectrum. That is not so today. Six auctions and $20 billion later, our elected officials at both ends of Pennsylvania Avenue have added the proceeds of spectrum auctions to their budget calculations.

During the past year, both the Senate and the House have held multiple days of hearings on spectrum policy. Following those sessions, Chairman Pressler circulated draft legislation on spectrum reform.

Last March, the Commission met en banc, in a day-long "spectrum summit." We heard testimony from a broad array of witnesses on the FCC's spectrum management policies. The session was focused not on individual proceedings, but on spectrum principles appropriate for a rapidly changing technological world.

II.

I would like now to share with you some of my preliminary thoughts on spectrum management. They are embodied in eight principles.

Principle Number One: The spectrum belongs to the public.

The FCC licenses the use of the spectrum for a renewable term of years, but the spectrum remains a national asset. Some argue that existing and future licensees should be awarded spectrum in fee simple. That would be fee simplistic. Spectrum is one of our most valuable and scarce resources. It must not be allowed to be warehoused or wasted.

Also, as I will discuss in a moment, the public interest is best served if government has the power to review usage and to reallocate spectrum, if necessary, to increase efficiency or introduce new, innovative services. One cannot leave that task entirely to the marketplace.

Finally, spectrum is our prime communications link. It should not be controlled by a few — a bottleneck that can silence other voices.

Because spectrum is a national resource, the public must be compensated for its use. Auctions are one source of payment. Meaningful public interest obligations and user fees are two other ways of paying for use of this public good.

Principle Number Two: We must review and reallocate spectrum expeditiously.

Remember the old television sets — the ones that went from channel 2 all the way through channel 83? Now, sets only tune up to channel 69. That is because in the 1960s, the Commission reviewed spectrum use and decided to reallocate television channels 70 through 83 from television broadcasting to mobile services.

This is how the cellular, SMR, and passenger airplane telephone industries obtained their original mobile spectrum, as did police, fire, and other public safety officials.

As an aside, that is why some people reported hearing telephone conversations on their TV sets. They weren't crazy — some analog calls are perfectly audible on older TV sets, especially if located near a cell site.

As the popularity of cellular telephony grew, providers asked for more spectrum to accommodate new customers. But most of the spectrum in the adjacent band had been allocated, so the Commission suggested that companies increase capacity through digital technology.

Demand for mobile services continued to grow. In 1990 the FCC again conducted a study of spectrum usage and needs, and as most of you know, this time we reallocated for PCS 140 megahertz occupied by fixed microwave operators.

Had the Commission not been authorized to review and reallocate spectrum, it might have been difficult to get PCS and cellular off the ground. This was important — not just to provide for common equipment and widespread deployment — but also to create significant worldwide export opportunities for our cellular and paging industries.

However, the Commission has not always responded as rapidly as we should to accommodate advances in technology. We must move expeditiously if we are to stay in the forefront in the development of new technologies and services.

Principle Number Three: We must promote efficient use of both licensed and unlicensed spectrum.

Spectrum is finite, but its capacity may be infinite.

There are two ways to increase capacity: (1) allocate new spectrum or (2) make more efficient use of existing spectrum. The trade-off is between using additional spectrum that could support other services and the cost of developing and deploying the new, more efficient technology. Both options must be weighed.

When no more cellular spectrum was available, the industry developed a more efficient analog transmission system, and even more efficient digital technologies. Today, I am told that a fully digital CDMA system has ten times the capacity of the original AMPS system. This is pretty dramatic, given that many of the original cellular systems were completing initial construction just a decade ago.

At our spectrum en banc, licensees operating in the 220 MHz band demonstrated products that transmitted voice and data in extraordinarily efficient 5 KHz channels. That is five times more efficient than typical FM systems. When efficiency was emphasized, licensees were able to develop a commercially viable technology to fill the need.

The Commission must also promote spectrum efficiency in the unlicensed bands. There, parties must share spectrum with a wide assortment of other unlicensed services, frequently adapting their technologies to avoid interference. But the cost/efficiency tradeoff becomes more problematic with low cost, high volume unlicensed consumer products. Addressing this issue, unlicensed PCS providers voluntarily developed an etiquette that avoids interference and improves spectrum efficiency. The FCC then adopted those rules.

Principle Number Four: We must give licensees greater flexibility to respond to marketplace needs.

The mantra for licensing spectrum today is flexibility. In some respects the distinction between allocation and service rules has become blurred.

At the Commission's spectrum hearing, the issue was raised whether the FCC's traditional spectrum allocation process remains appropriate given the accelerating pace of technological change and innovation. Some witnesses proposed auctioning off chunks of spectrum in fee simple and letting private parties determine its best future use, subject to basic interference rights and consistent with international treaties.

Other participants supported flexibility in permitted uses of spectrum. They recognized a need for the Commission to specifically allocate spectrum for broad categories of services. Many praised the Commission's service rules governing PCS as an example of heightened flexibility.

I believe that we should provide greater service flexibility, particularly for emerging technologies. Generally, licensees should not need Commission approval to adjust their services to meet market demand where there is no interference. The PCS rules represent a good model.

Allowing greater flexibility will enable the licensee to respond rapidly to market conditions. But where the value of the service depends on a critical mass of providers using the same equipment, unbridled flexibility could lead to inefficient spectrum use and a reduction in the public good.

John Stupka of SBC Communications offered an intriguing "national investment — free market extension paradigm" to determine the appropriate degree of service rule flexibility. He argued that where there is a major new service worthy of national investment, more stringent rules should apply to help launch the offering. In contrast, where the service is merely a free-market extension of the original service (such as from cellular mobile telephone to PCS) then let the "free marketplace work its magic."

He warns that failure to apply the model of investment vs. extension may freeze both the introduction of new services and the extension of existing ones.

Principle Number Five: We must generally avoid mandating standards.

Let's apply the Stupka paradigm to standard setting. The free market will work better if the FCC avoids setting standards where the technology is an extension of an established service. (Cellular and PCS). The Commission's adoption of the AMPS standard spearheaded its worldwide acceptance. Since PCS is a market-based extension of mobile phone service, the FCC should resist the call to mandate a specific digital PCS standard. The marketplace should resolve the debate between competing technologies.

This is the right decision; but the FCC may wish to adopt several non-exclusive standards to promote sales of technology abroad.

For emerging technologies we have chosen to propose only the minimal technical standards necessary to avoid interference to other users, and a minimal spectrum-sharing etiquette to promote spectrum efficiency. Our recent SuperNet/GII Notice of Proposed Rulemaking illustrates this proposition.

Unlike cellular and other subscriber-based services, free over-the-air broadcast services require a transmission standard if equipment is to be widely available at low prices. The standard also ensures that all Americans can have access to a full array of over-the-air broadcast programming. Consumers need to know that a TV set bought in Richmond will also work in Rochester and in Redwood City.

Once the digital television standard has had an opportunity to succeed, the FCC should consider relaxing its rules to permit other transmission systems which do not cause interference.

I do not advocate adopting a single standard for other over-the-air video distribution services, such as DBS, wireless cable, and LMDS. The broadcast service is unique in its reach and provides a platform for free video distribution to all Americans.

Principle Number Six: Licenses must be issued expeditiously.

The Commission is streamlining its licensing processes. First, we have used auctions as a means of assigning licenses to those who value them the most. Auctions have hastened the pace of selecting licensees and commencing service.

To further speed up our licensing, the Wireless Bureau has instituted electronic filing. This can take weeks off license and renewal response times. License modifications can also be made "on line."

Our licensing databases also are being placed on the Internet, so that the public can examine them and judge for itself whether there may be room for another licensee in a particular area.

And we have relied upon the private sector whenever possible to perform many ministerial tasks.

For FM and TV broadcast licensing — where we do not have auction authority and the bands are already crowded — I wonder whether sequential proceedings for allotments and assignments truly serve the public interest. Instead, it might make sense to combine the procedures and cut in half the time it takes between the request for a channel and commencement of service.

Principle Number Seven: Not all spectrum or services were created equal. (Corollary: some spectrum and services are more equal than others).

In this chaotic world, it is tempting to believe that all spectrum is created equal. But not even a Wireless Summit can by edict eliminate the laws of physics. The higher the frequency, the shorter the wavelength and the shorter the distance the signal is carried. Mobility is best achieved in bands 2 GHz and below.

It stands to reason that there is greater efficiency — and more service to the public — if spectrum use bears some relationship to the propagation characteristics of the spectrum. Also, some bands are pretty crowded already. Sharing and overlays are possible in some bands and unlikely in others.

I am an avid proponent of spectrum auctions. Auctions should be our primary method for selecting licensees. However, there are times when I believe the public is better served by not auctioning licenses.

For example, the Commission has set aside bandwidth for unlicensed services. These are bands where entrepreneurs battle it out, tinkering with their systems to accommodate sharing with other users. Services such as cordless telephones, remote home and auto security devices, and wireless access to the Internet are just a few examples of unlicensed spectrum uses.

Is There a Spectrum Shortage?

On March 5, the FCC hosted a series of four *en banc* hearings. Four of the five Commissioners (Commissioner Quello was unable to attend) spent the day listening to and quizzing panelists assembled to address four topics in turn: future spectrum demand, technology trends, spectrum allocation (for specific services), and spectrum assignment (for specific users). An overflow crowd of FCC and congressional staffers, press, communications attorneys, and other representatives of telecommunication interests gathered to hear the presentations and the give and take between Commissioners and panelists, looking for clues to help them chart the uncertain waters of the telecommunications revolution.

The first panel described where the greatest future demand for access to the spectrum would likely originate: wireless local loop, and services (including satellite services) that support mobility (the term "mobile services" being conceptually too confining). Predictably, no one suggested that demand would shrink appreciably in any existing service, nor could anyone quantify the likely demand beyond the next two or three years. Thus, the classic spectrum management dilemma: how do you add new uses to fully allocated spectrum without making difficult choices between competing possibilities? Auctioning the spectrum is one way to structure the decision-making process that has the side benefit of generating some revenue, but what about the uses of spectrum that are for public rather than private benefit? Is it best to set aside some spectrum space for the fire department to use to dispatch its trucks, to tell the fire chief to bid against AT&T for spectrum if he needs it, or to encourage competition between service providers in the expectation that this will force up the reliability of service and force down the price, to the point where buying the service will be cheaper for the fire department than the purchase and maintenance of its own radios?

One of the day's highlights came during the second panel, an impressive battery of technologists including Paul Baran, who is sometimes called "Grandfather of the Internet," and Dr. Donald H. Steinbrecher, formerly of the Massachusetts Institute of Technology and now an entrepreneur in wireless telecommunications technology. There were other, equally engaging panelists; the reason for focusing on these two is that in their written testimony and in the course of discussion, both of them stated and supported the heretical premise that *there is adequate radio spectrum to satisfy the anticipated demand*—if we use it intelligently.

Baran's written testimony described the need to move away from the communications model of "dumb transmitters talking to dumb receivers" and toward networking with "smart" equipment having greater tolerance for impurity (ie, interference), maximum reuse of the spectrum through shorter range transmitters, and incentives to maximize shared use of spectrum and to minimize spectrum "warehousing." He described most of the spectrum as now being vacant in terms that were strikingly similar to the arguments advanced on this page back in January 1991.

Steinbrecher went a step further, suggesting that the spectrum should be viewed as generic, much like a computer platform, with traffic managed by "spectrumware" in much the same way that the wired network is managed today. He used the Internet to illustrate his point. There, information flow is controlled by the end user. You create your Web page, but it doesn't occupy space on the network until someone requests it. How many Web pages could the Internet accommodate if everyone were constantly "broadcasting" their page?

Also on this panel was John Battin, senior vice president and general manager of Motorola's multimedia group, who happens also to be K9DX. While he agreed with Baran that a "snapshot" of spectrum occupancy would show little activity and, therefore, great opportunities for more intensive spectrum use, Motorola's written testimony was cautious, acknowledging that the movement from analog to digital created much greater capacity and improved efficiency, but predicting that demand would grow at an even faster rate. Battin also cited the limits imposed by dynamic range considerations on the extent to which differing uses of spectrum can be mixed, a healthy reminder that spectrum policy should not be made solely by economists.

Who's right: those of conventional wisdom who feel there will always be a shortage of spectrum, or the heretics? Billions of dollars, literally, are riding on the answer. Spectrum auctions are premised on the notion that spectrum is scarce. If there is no spectrum shortage, or if the shortage is only the artificial result of past inefficiencies, how can the enormous amounts being bid in spectrum auctions be justified—and how will the winning bidders ever recoup their investment?

What does all this mean for Amateur Radio? First, the rules of the game are changing. As incumbent users of the spectrum, we must realize that the yardstick by which our use is measured is getting longer. Second, digital technology gives us powerful new tools to enhance our own service—tools that we have barely begun to think about using.

At the *en banc* hearings, even the most enthusiastic free-market voices conceded that if spectrum auctions were the general rule there would have to be exceptions. Amateur Radio was specifically mentioned as such an exception. Amateurs should not have to pay for spectrum access; the value to the public of what we do cannot be measured by the size of our collective checkbook. But there is no room for complacency. To let the telecommunications revolution start without us would be as shortsighted as failing to convert from spark to CW, or from AM to SSB.—*David Sumner, K1ZZ*

Public safety and amateur radio are two other areas where auctioning may not serve the public interest.

Finally, although we have focused on auctioning commercial services, there are important private uses for spectrum, such as parcel delivery tracking systems. But, as I stated in Principle Number One, the public should be compensated for the use of this spectrum — perhaps by assessing an annual fee on private licensees.

Principle Number Eight:
We must coordinate internally to lead externally.

My last principle. The United States has a strong international leadership role to play. But it can succeed only if it has sufficient lead time and only if its international advocacy is consistent with domestic policy. We must not fight for allocations abroad which cannot be honored at home. We are taking steps to improve our internal coordination and to accelerate decision-making on U.S. proposals. Billions of dollars for U.S. industry hangs in the balance.

III.

As I noted in my eight principles for management of the radio spectrum, the goal of the FCC should be to maximize flexibility, efficiency, and the public interest. Spectrum belongs to the public. We must review, reallocate, and license spectrum expeditiously. Licensees need flexibility to respond to market needs. We generally should avoid mandating standards. Not all spectrum or services are created equal. There is a need for unlicensed uses and other public services. And finally, we must improve internal coordination and accelerate decision making to provide global spectrum leadership.

At this Wireless Summit, we have discussed how our Nation can best manage its radio spectrum. Over time, we will learn whether we at the FCC have climbed the right mountain to reach that Summit.

Thank you.

Sumner Editorial: Is There a Spectrum Shortage?

League Responds To Comments In Spread Spectrum Petition

The ARRL says its petition to relax spread spectrum rules seeks to address a lack of SS experimentation by hams, not too much spread spectrum. Responding to comments filed in response to its December rule making petition, RM-8737, the League emphasized that Amateur Radio — as an experimental service — requires flexible rules and "some trust of the licensees carrying out experiments."

Noting that some commenters called for tighter rules on SS, the League sought to dispel fears that relaxing the rules on spread spectrum would lead to an increase in the noise floor in bands used by narrowband modes. The League said most opposing commenters "ignore the fact that some amateur bands already are occupied by Part 15 spread spectrum devices," many near ham stations. Additional constraints would hinder hams from keeping up with spread spectrum developments and prevent maximizing spectrum efficiency, the League's filing asserted. The ARRL said its petition "suggests only a modest deregulatory effort."

The League's Petition for Rule Making seeks relaxed restrictions on spreading sequences and greater flexibility in spreading modulation. The spread spectrum technique, which distributes information among several synchronized frequencies within a band at the transmitter and reassembles the information at the receiver, was first approved for Amateur Radio in 1985 for bands above 225 MHz, and there has been some experimental amateur operation since then.

The petition proposes that the FCC permit brief spread spectrum test transmissions and allow international spread spectrum communication between amateurs in the U.S. and those in countries that permit hams to use spread spectrum techniques. The current rules allow only domestic communication. The petition also asks for automatic power control provisions to insure use of minimum necessary power to conduct spread spectrum communication and limit the potential for interference to narrowband modes. The petition does not ask for any changes in frequency restrictions on SS emissions, the 100-W power limit, or logging and identification requirements. The League calls the proposals "the minimum necessary changes in order to foster SS experimentation in the Amateur Service."

Those filing comments supportive of spread spectrum included TAPR; Robert A. Buaas, K6KGS, and John Mock, KD6PAG. Commenting in opposition were the Indiana Repeater Council; Henry B. Ruh, KB9FO; the Wisconsin Association of Repeaters; the Mid-America Coordination Council Inc; the Southern California Repeater and Remote Base Association; the San Bernardino Microwave Society and the Southeastern Repeater Association Inc.

TAPR files for STA (Special Temporary Authority) on Spread Spectrum Issues

April 10, 1996
Mr. William Caton
Acting Secretary
Federal Communications Commission
1919 M Street, N.W.
Washington, D.C. 20554

Re: Tucson Amateur Packet Radio Corporation
Request for Special Temporary Authority
Dear Mr. Secretary:

The Tucson Amateur Packet Radio Corporation ("TAPR"), by its attorneys, hereby requests Special Temporary Authority ("STA") for TAPR to conduct an experimental program to test Code Division Multiple Access ("CDMA") spread spectrum emissions over amateur radio facilities, as described in greater detail below. The STA is requested beginning as soon as possible and continuing for a period of one year. Except for the addition of one frequency band, as noted below, TAPR is requesting identical authority to that granted to Mr. Robert A. Buaas (K6KGS) on April 17, 1992.

TAPR was founded in 1982 as a international organization with interests in the areas of packet and digital communications. Today, TAPR continues as a membership supported non-profit amateur research and development organization, and currently has more than 2,000 members worldwide. TAPR continues to develop kits for the amateur community and is working actively on publications and communications standards.

TAPR's members have participated in a number of experimental programs designed to investigate the value of spread spectrum emissions for the packet radio community, including experiments that later provided the basis for authorizing spread spectrum modulation in the amateur service. TAPR plans to continue its leading role in developing standards for spread spectrum communications for the amateur community through discussion groups, cooperative efforts and experimental programs such as would be permitted by the requested STA. In particular, because of the rapid development of communications hardware and software, TAPR believes that the use of hybrid spread spectrum emissions, as well as spreading codes not envisioned by Section 97.311(d) of the Rules can be employed without causing harmful interference to other amateur operators.

TAPR proposes to implement an m-sequence as specified in Section 97.311(d)(1) of the Rules as a "generating function." Spreading codes will be selected from continuous segments of bits produced in the output of the generating function based on their suitability to

provide uniformly distributed spectral density, code orthogonality and maximum coding gain. Each spreading code will represent one symbol in the data to be transmitted. Only the selected spreading codes will be transmitted, and each will be transmitted in its entirety.

Direct-sequence spread spectrum generators using inexpensive surface acoustic wave matched filters with fixed spreading codes not related to the m-sequences specific in Section 97.31(d)(1) will also be used.

Frequency hopping may be evaluated as a means for further distributing the transmitted energy. Additionally, frequency synthesized homodyne and single hetrodyne transceivers will be evaluated on each of the frequency bands proposed, time and resources permitting.

TAPR is requesting STA to fully evaluate the transmission, reception and processing techniques of CDMA spread spectrum emissions. Specifically, TAPR will:

- Assess the strengths and weaknesses of the proposed systems;
- Evaluate the potential of spread spectrum overlay on conventional FM systems;
- Study the interference potential of CDMA spread spectrum emissions, if any, to existing users of the specified frequency bands;
- Evaluate the resistance of spread spectrum emissions to multipath interference;
- Evaluate the ability of spread spectrum emissions to improve spectrum efficiency;
- Evaluate the performance improvements potentially offered by CDMA technology;
- Gain operational experience with CDMA spread spectrum techniques; and
- Evaluate the proposals contained in the RM-8737 (Amendment of Part 97 of the Commission's Rules Governing the Amateur Radio Service to Facilitate Spread Spectrum Communications).

The participants in this experiment will initially be various members of TAPR who are amateur radio licensees. TAPR requests authority to add participants, including licensed amateurs who are not members of TAPR, during the course of the experimental program upon notification to the Commission of such additions. The experiments will be carried out from the fixed stations listed on the station licenses of the participants, plus any portable operations as are permitted under Part 97 of the Commission's Rules. All participants hold a minimum of a Technical Class license.

TAPR requests authority to operate on the following frequencies: 50-54 MHz, 144-148 MHz, 219-220 MHz, 222-225 MHz, 420-450 MHz, 902-928 MHz, 1240-1300 MHz and 2390-2450 MHz. (1)

The maximum transmitter output power will not exceed 100 watts, and CDMA spread spectrum emissions will be used.

TAPR expects that the antennas used for this experimental program will include dipoles, as well as collinear and Yagi arrays with gains of 0 to 12 dBi, at heights up to 30 meters AGL. Only existing, licensed antennas will be used for this experiment; no new stations will be constructed.

In order to conduct the tests discussed in this letter, TAPR requests the following Rule waivers:

(1) Waiver of Section 97.305(c) of the Rules is requested to permit emission type SS in the bands 6m, 2m, and 1.25m;

(2) Waiver of Section 97.311(c) of the Rules is requested to provide for transmission of hybrid spread spectrum emissions;

(3) Waiver of Section 97.311(d) of the Rules is requested to permit the use of other spreading codes.

Accordingly, for the reasons stated herein, TAPR respectfully requests Special Temporary Authority to conduct an experimental program to test CDMA spread spectrum emissions over amateur radio facilities, as described in the instant STA request.

Questions with respect to this matter should be directed to the undersigned.

Respectfully submitted,

Henry Goldberg
Attorney for
Tucson Amateur Packet Radio Corporation

cc: Mr. Robert H. McNamara

Note 1: The operational frequencies requested herein are identical to those granted to Mr. Buaas, except for the 219-220 MHz band, which was not allocated to the Amateur Radio Service at the time Mr. Buaas filed his STA request. To the extent that the addition of the 219-220 MHz band will significantly delay Commission grant of the instant STA request, TAPR requests that the STA be granted as soon as possible for all frequency bands other than 219-220 MHz, and that the 219-220 MHz request be processed separately.

ARRL letter to the FCC regarding TAPR's STA

May 15, 1996

Robert H. McNamara, Esquire
Chief, Private Wireless Division
Federal Communications Commission
2025 M Street, N.W., 8th Floor
Washington, D.C. 20554

Re: Pending Request for Special Temporary Authority, Tucson Amateur Packet Radio Corporation; CDMA Spread Spectrum Tests

Dear Mr. McNamara:

The American Radio Relay League, Inc. has been made aware of a request for special temporary authority received in your office on April 10, 1996, submitted by Goldberg, Godles, Wiener & Wright on behalf of the Tucson Amateur Packet Radio Corporation (TAPR).

We understand that the request is defective in that it was not submitted on behalf of a Commission licensee and that you will require that a list of licensed participants, with their callsigns, be submitted. With that amendment, the League would endorse and support most of the requested rule waivers.

Specifically, waiver of Section 97.311(c) and 97.311(d) is consistent with the request the League has made in its petition, RM-8737, that these paragraphs be deleted from the rules.

With regard to waiver of Section 97.305(c) to the extent necessary to permit spread spectrum (SS) emission in the bands 6m, 2m, and 1.25m, the League enthusiastically endorses the requested authority to use the band 219-220 MHz. Amateur stations using this frequency band, which is limited to amateur stations participating as forwarding stations in point-to-point fixed digital message forwarding systems, are subject to severe geographic limitations designed to protect the primary Automated Maritime Telecommunications Systems (AMTS) from interference. The use of SS emissions would reduce the potential for interference, and might well permit amateurs to engineer-in a system in closer proximity to an AMTS licensee than would otherwise be possible. The resulting increase in efficiency of spectrum occupancy would benefit all parties. The League notes that the limitations and requirements of Section 97.303(e) would still apply to stations operating under the requested STA.

However, the League has serious concerns with regard to the proposed use of other frequencies in the 6m, 2m, and 1.25m bands. The use of these additional frequencies would not appear to be required by the objectives stated in the STA request. Among these stated objectives is: "Evaluate the proposals contained in the RM-8737." RM-8737 is the petition by the ARRL referenced earlier. RM-8737 makes no proposal for changes in the frequencies authorized for spread spectrum emission. In its development of the proposals contained in RM-8737, the League was persuaded that spread spectrum emissions pose a significant interference potential to existing amateur operations in these bands. Unlike the situation with regard to 219-220 MHz, there is no geographic separation requirement that would protect narrowband users from interference from a nearby spread spectrum transmitter. While the League is very supportive of spread spectrum emissions in the Amateur Service and particularly of continuing experimentation to determine how these emissions can be used with the least possibility of harmful interference to other spectrum occupants, with the singular exception of 219-220 MHz there is nothing in the request to suggest there would be any added value in conducting these experiments outside the bands where spread spectrum emissions are already authorized.

Accordingly, the League supports granting of the STA request, if amended to show a list of participating stations; and to limit the waiver of Section 97.305(c) to the band 219-220 MHz.

Yours very truly,

Christopher D. Imlay
General Counsel

TAPR's Response to ARRL's letter regarding TAPR's STA

May 24, 1996

Mr. Robert H. McNamara
Chief, Private Wireless Division
Wireless Bureau
Federal Communications Commission
2025 M Street, N.W.
Washington, D.C. 20554

Re: Request of Mr. Greg Jones (WD5IVD) and Mr. Dewayne Hendricks (WA8DZP), Tucson Amateur Packet Radio Corporation ("TAPR"), for Special Temporary Authority

Dear Mr. McNamara:

This letter responds to the letter submitted to you on May 15, 1996 by the American Radio Relay League, Inc. ("ARRL") regarding the above-referenced request for special temporary authority ("STA").

In its letter, the ARRL generally supported the requested STA and, in particular, 'enthusiastically endorsed' the requested authority to use the 219-220 MHz band.

The STA applicants and TAPR appreciate ARRL's support and its willingness to accommodate STA

operations in the 219-220 MHz band, in order to promote the organizations' shared interest in the further development of spread spectrum technologies.

ARRL, however, expressed concerns about the applicants' proposed use of other frequencies in the 6m, 2m, and 1.25m bands. While TAPR and each of the licensee-applicants shares ARRL's commitment to preventing interference to existing amateur service operations in these bands, these parties urge the Commission to grant the STA as requested, permitting operation in each of the bands originally identified.

Perhaps most importantly, operation in each of these bands already is permitted pursuant to the spread spectrum STA originally granted to Mr. Robert A. Buaas in 1992. Under this STA, any amateur station joining the Buaas project may conduct experiments involving CDMA spread spectrum transmissions in each of these bands, provided only that notice of their participation is provided to the Commission.

Mr. Jones and Mr. Hendricks' interest in seeking an STA separate from the Buaas STA is to permit them, and through them, to permit TAPR, to conduct coordinated research evaluating the transmission, reception, and processing techniques of CDMA spread spectrum emissions. Through the efforts of its member licensees, TAPR intends to continue its leading role in developing standards for spread spectrum communications for the amateur community. This can be done most efficiently and effectively, however, only if TAPR through its licensee members is itself in a position to coordinate participation in the testing and to oversee the program, rather than having to work through the Buaas STA.

Granting the STA requested by Mr. Jones and Mr. Hendricks, therefore, will enhance the development of spread spectrum standards without substantively altering the number of amateur licensees who may transmit CDMA spread spectrum emissions in the bands questioned by ARRL. As a result, a grant would not subject existing users of these bands to increased interference risks.

The ARRL's letter also understates the potential benefits of granting the requested authority to operate in the 6m, 2m, and 1.25m bands. Contrary to the ARRL's suggestion, evaluating the proposals contained in RM-8737 is but one of TAPR and the licensee's objectives. As a result, the fact that RM-8737 does not propose to permit spread spectrum operation in each of the bands covered by the STA request does not undermine the need to conduct testing in these bands. Moreover, the fact that ARRL concluded that a general authorization for spread spectrum transmissions in these bands could result in unacceptable interference to existing users of the band, and therefore decided not to request an amendment to the Part 97 rules authorizing spread spectrum transmissions in these bands, does not mean that limited spread spectrum testing, within the constraints imposed by an STA, cannot be accommodated.

More fundamentally, a great deal can be gained by permitting operation in these bands. Among other things, TAPR plans to study the strengths and weaknesses of proposed systems, a variety of potential interference issues, and the ability of spread spectrum emissions to improve spectrum efficiency. Through these efforts, TAPR and its licensee members will be able to improve the factual record for determining whether and, if so, under what conditions, spread spectrum operations could be more generally authorized under Part 97 of the Commission's rules. Due to the unique characteristics of operation in different bands, the type of broad-based study and analysis TAPR and its members contemplate can be achieved only if operation is permitted in a variety of different bands, characterized by different operating frequencies and sharing scenarios.

For the reasons stated herein and in the original STA request, as amended, the STA applicants and TAPR respectfully request that the Commission grant the STA request, including authority to operate in the 6m, 2m, and 1.25m bands.

Respectfully submitted,

Henry Goldberg
Attorney for Tucson Amateur Packet Radio Corporation

Note 1: ARRL conditioned its support on the substitution of Commission Amateur radio licensees as the applicants and a requirement that licensed participants, with their callsigns, be submitted. Both of these conditions have been satisfied. See Letter from Greg Jones and Dewayne Hendricks to Mr. William Caton, dated May 9, 1996.

Note 2: See Letter from Ralph A. Haller to Mr. Robert A. Buaas, dated April 17, 1992 (attached) (authorizing operation in the 6m (50-54 MHz), 2m (144-148 MHz), and 1.25m (222-225 MHz) bands). This STA has been subsequently renewed by the Commission since granted in 1992.

Note 3: Id.

Note 4: See STA Request at 2-3.

Packet Radio in Education: Radio and Satellite Telecommunications Technology: Kindergarten Through Sixth Grade; Math, Science, and Geography

Charles L. Baker

This is the fifth of several articles that will appear in the PSR concerning Amateur/packet radio and its potential in K-12 educational applications. These papers were assembled over several summers of teaching a graduate level course at the University of North Texas. Many thanks to the Texas Center for Educational Technology for allowing TAPR to reprint this information.

As part of TAPR's goal in education, we hope that these articles will be disseminated to a larger group that can take the concepts and ideas to a next step or final application/implementation. If you have a teacher or educator as a friend, please pass these articles along.
— Greg Jones, WD5IVD

Reprinted from:
Jones, Greg (ed). Infusing Radio-Based Communications Tools into the Curriculum. Texas Center for Educational Technology. 1995. 136 pages.

Introduction

This paper is written as a proposal to illustrate how radio and satellite technology can be utilized in classroom instruction. An attempt is made to show how students can learn science, mathematics, and geography concepts, in grades kindergarten through sixth, using this technology. It should be stated that this technology can be utilized with students at any grade level. This proposal will present the aspects for developing this curriculum for students in the area of grades kindergarten through sixth. This proposal will discuss the importance of featuring such programming for this level student, discuss how the cost of adding this instruction to the curriculum can be minimized, and how instructional assistance can also be made available to school classes developing a radio and satellite technology instructional program.

Program Development And Motivational Aspects

This technological instructional design will function best (Perry, 1989) when the program is developed in cooperation with local amateur (Ham) radio operators clubs for both training and instruction. Further, these clubs can help with obtaining equipment. The teacher would design the course of instruction and utilize ham radio club members as a resource for course content and as guest instructors for certain aspects of the course curriculum. The participation by club members will also be helpful in motivating student learning as they share their personal experiences in the use of Ham radio and satellite technology for entertainment, learning about the world, and examples of humanitarian uses, such as aiding the Red Cross or Civil Defense, in helping individuals in emergency situations or in time of national or international disaster. Also, input from other school programs in the area may be beneficial, especially if you have a Ham radio club member that has worked with children and/or in a school setting.

There are many ways to utilize the Ham radio and satellite technology to motivate student learning. The use of this type learning and instruction could and should become a regular part of classroom instruction (Learner and Barr,1989), and not just as an occasional frill or disjointed project or a mirror handful of select students, but rather should enhance the mainstream of student's basic education.

This type of learning environment allows for differences in learning styles and is especially good for those students in need of a "hands on" approach to learning and for intellectual manipulating of the knowledge gained, to develop further understanding and knowledge, long advocated by John Dewy and others (Marler, 1975, pp. 152-153). In addition the use of Ham radio and telecommunications satellite instruction can fit well into a whole area of technology curriculum that involves computer science, video disc technology, and even the use of robotics (Anderson and Sullivan, 1988, pp. 3-373). Developing an early elementary school base of instruction, in this type of technology, can even open doors for more specialized curricular offerings, in the secondary schools, where student interest could carry over into vocational and avocational interests, for possible life-long student benefit.

The National Space Society (NSS) and the Radio Amateur Satellite Corporation (AMSAT) are responsible for setting up a space network known as the Space Education Network (SEN) (Jones and Knezek, 1990). The SEN network consists of amateur radio stations, both on the Earth and in outer space. This network can provide a direct link between the understanding of the amateur radio and other scientific studies, by allowing students to have direct access to satellite and spacecraft transmissions. This direct interaction with science and technology can both be a learning experience and, equally as important, provide motivation for future learning. Once students are motivated, there is no limit to the amount of effort students will put forth, in attempting to learn about and from the use of radio and satellite technology.

Types Of Licenses

In providing instruction it is not necessary that the teacher be licensed as an amateur radio operator. According to Jones and Knezek (1990), there are at least three modes of radio available and the first of these does not require a license. In this first mode the teacher and students simply monitor radio activity and can discuss this broadcast data and content. Examples of information monitored might be weather reports and information, the monitoring of foreign radio communications, emergency calls, and even listening in on space flight communications.

The second mode is when the teacher has a license and the students can transmit by a demonstration method, where the student can transmit and receive on the radio, but the teacher must be present during the entire time. The students transmit using the teacher's call number.

The third mode is to have both teacher and students licensed. This allows students to exchange information across the airwaves without the teacher having to monitor the entire transmission. This gives students more freedom to exchange data on the radio, as part of their learning process.

There is another radio satellite called "PEACESAT" (Moore and Knezek, 1990). This license can be obtained through the Federal Communications Commission (FCC). This FCC license is obtained on an experimental basis with a hookup from schools in Hawaii, the Cook Islands, and Western and American Samoa. This satellite hookup is available for very little cost to the school. The University of North Texas, Denton, Texas has an experimental license and school districts such as Sanger Independent School District, Sanger, Texas, also have this type of license. This type of license can be obtained by a school district rather than each individual having to obtain a separate license.

Cost Of A New Program

Cost is a concern for most school districts and must be addressed, when you are starting a new radio satellite technology program. Perry (1989), suggests that you might be pleasantly surprised to know that the initial cost to the school district, in starting this type of programming, may be much less than you would anticipate. It is likely you can locate and purchase some used equipment (Jones and Maner, 1990). Often, for example, you may be able to purchase used transmitters when a Ham club is purchasing new equipment. These transmitters are a great deal less costly than new ones and are often in excellent condition. The estimated cost of starting a new program of this type, in a school district, is approximately $3,000.00. Hopefully a Ham radio club can be located, in the area, that can help with getting this new technology program started.

Educational Benefits

As stated previously, the use of satellite and radio technology will provide an opportunity for "hands on" student learning activities in the areas of science, mathematics, and geography. This proposal is to start this type of technological programming in the grades kindergarten through sixth, so that a foundation for future learning at the secondary level can be provided to these students early. While science, mathematics, and geography are the primary concerns, students may be given opportunities for using a whole language approach to both read about and write about radio and satellite technology and the knowledge gained through listening and interacting with various radio communications (Fairclough, 1989).

Attention now must be turned to consideration for the ways in which the use of radio and satellite technology can more specifically be applied to the teaching of concepts in science, mathematics, and geography. There are some specific examples that will illustrate the effectiveness of using this technology in the these academic pursuits.

Science may have several applications for which radio and satellite technology can be used to teach. Many concepts of basic electricity and electronics could be taught. Weather overlaps into both physics and geography by plotting of geographic locations for weather occurrences and for where certain transmissions are coming from. You can learn how to plot weather in different areas through the use of Packet Radio. Mathematics can be taught in conjunction with all other aspects as there is the need to use some mathematics with the electronic aspects, in understanding the speed with which certain weather fronts are pacing or moving, and many other aspects which are only limited by the creativity of the teacher and of the Ham radio clubs assisting. The younger children may begin by using Lumaphones.

Summary And Closing Remarks

It appears that the successful schools in the 1990s, in the areas of science and technology, are those that are able to develop a radio and satellite technology program, as they continue to develop in other areas of technology, such as computer science and the use of videodisk technology. There is little doubt that more and more schools will begin using radio and satellite technology in the near future.

To begin at the elementary level, is ideal as this proposal has sought to point out. We must have a

program that will be able to follow a child through the grades in school. To be a leader in schools that want to develop the ability of students to function in a technological society, the development of a radio and satellite technology program is critical.

This proposal is designed to point out that we are able to put the students at the forefront of a technological education through the use of developing a radio and satellite technology program.

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New South Georgia Packet Link

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The Southern Amateur Packet Society (SAPS) was reactivated after several years of not meeting, even though several members have continued their packet activity.

The installation of a new packet gateway on June 4, 1996 in Tifton, Georgia has rekindled the interest of many packet operators who had become frustrated with the lack of packet links and things to do in the local Area. The SAPS group will meet in September to get the organization back together with new officers.

The gateway came about after years of persuing every possible way to get an access port to LANs outside the local area. In recent months a local internet service provider for our rural community came online. I wasted no time getting acquainted with the Surf South staff.

After discussions with Surf South, explaining the community service a gateway would provide, bringing the severe weather bulletins immediately into our area for the skywarn group. The gateway would also get their company talked about all around the area, as Amateurs discussed the link's availability.

Surf South and its owners were agreeable right from the start to work with the SAPS group and Coastal Plains ARC. Everything went together very quickly, and with the help of KA4PKB - Bob and KL7Q - Tom from Alabama, we pulled the idea into reality.

The SAPS group hasn't installed this system to take the place of any RF link. The Group is actively persuing the construction of better RF links in South Georgia and links out of our area. There is an active HF port online, with plans for another HF port soon.

This gateway's purpose is to link users in our LAN to other LANs around the world. It will also bring the DX Cluster into our area for the first solid link for local operators.

The SAPS Group looks forward to working with area clubs in South Georgia, helping their members become involved with packet.

You may contact the Southern Amateur Packet Society, 2716 Denham Rd., Sycamore, Georgia 31790. Email: wharrell@surfsouth.com. Phone 912-567-2643.

APRS Tracks: Alias Envy

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My XYZ-brand TNC has served me well. It has been on the air for nearly ten years, virtually 24 hours per day and has never given me a problem. It even survived two run-ins with lightning. But, my TNC became a problem after I became active on APRS.

I am located at the top of the western rim of the Connecticut River Valley and, as a result, I have good 2-meter coverage of most of the eastern half of the state. When I started operating APRS, my station became a key part of the APRS network due to its location.

I had one problem though. The firmware in my TNC was old and only supported one alias (MYAlias). To be a useful part of the APRS network, a digipeater should have two alias: "relay" and "wide." This permits mobile APRS stations, whose Unproto paths are typically set to "relay,wide," to have their packets digipeated initially by any station whose alias is "relay." Then, by any station with an alias of "wide" that receives the packet digipeated by the "relay" station.

With my TNC supporting only one alias, I had to choose between "relay" or "wide." I experimented using "relay", but ended up using "wide" because there were not many mobile APRS stations to relay. But, as time marched on, more mobile APRS stations began showing up on my APRS map, so, I felt I had to do something to correct my alias envy.

GPS Compatibility?

Lo and behold, just as I was about to order a new TNC that supported multiple aliases, I noticed an advertisement in QST that indicated that the son of my XYZ-brand TNC was now "GPS compatible." My mind began to wonder. Did GPS compatibility mean multiple aliases? Could I upgrade my old XYZ-brand TNC with the GPS compatible firmware?

The advertisement did not answer my questions, so I telephoned XYZ to get the answers. My conversation with XYZ did not leave me with a warm, fuzzy feeling. The XYZ representative that I talked with was not sure what GPS compatibility encompassed, however, I could experience GPS compatibility myself because my old TNC could be upgraded with the new firmware. Bad news was that in order to use the new firmware, I had to add more RAM to my TNC, which more than doubled the price of the upgrade. I decided to sleep on it for awhile.

A while passed and I telephoned XYZ again. The XYZ representative I talked with the second time was different, but still was not sure what GPS compatibility encompassed. However, he did assure me that I did not need the RAM expansion in order to use the new firmware. That pushed me over the brink and I ordered the upgrade figuring that for twenty bucks, I could afford to explore the world of GPS compatibility myself.

Seven to ten working days later, the man in the big brown truck delivered the upgrade and before he had backed out of my driveway, I had popped the cover off my TNC and swapped the old EPROM for the new. After I wiped the sweat from my brow, I poured myself a tall cool drink, took off my shoes, and sat down in my easy chair to cuddle up with the documentation that accompanied the upgrade.

I soon started feeling uneasy in my easy chair as I scoured the documentation for a mention of GPS compatibility and found none. Not giving up so easy, I read the documentation cover-to-cover hoping to find something related to GPS, APRS, or, better still, multiple aliases, but three strikes and I was out!

As I walked slowly back to the shack, I concluded that the documentation must be in error because XYZ could not advertise GPS compatibility and not deliver. So, I decided to check out the new firmware by invoking the Display command.

Buried in the long Display list were commands that I had never seen before: NMeabcn, NMEAFLT1, and NMEAFLT2. I knew that NMEA was the organization responsible for defining the protocol used in GPS equipment, so I thought I had finally hit pay dirt. But, I had no idea what these commands did, so I began experimenting and discovered that NMEAFLT1 and NMEAFLT2 accepted strings that were six characters in length. Were these the long sought after multiple alias commands?

I decided not to experiment with these commands on the air because I feared that I might make a mess of the APRS network. So, I posted a message on the TAPR APRS-SIG asking if anyone had a clue. Howie Goldstein, N2WX, did and explained to me that the NMEA commands were implemented in the March 12, 1994 release of TNC-2 firmware (how did I miss that?). They permit a TNC to broadcast the sentences received from an attached NMEA device such as a GPS unit.

That's GPS compatibility!? It had nothing to do with multiple aliases, so I was back to square one. That's the square where I was about to order a new TNC.

Big Things in Small Packages

I like small gadgets, so I decided to order the smallest TNC I could find that supported multiple aliases and was GPS compatible. I called PacComm, ordered a PicoPacket, and seven to ten working days later, the man in the big brown truck delivered my new TNC.

When I opened the box, it took me a while to find the PicoPacket because it is small indeed. At 1 x 2.5 x 3 inches, six PicoPackets could fit inside my old XYZ-brand TNC with room to spare for a GPS 20 or two. Small in size, but packed with capability, the PicoPacket provided GPS compatibility in the guise of three GPS commands. And, voila, it also supported four aliases!

I connected the PicoPacket to my radio and computer as fast as my soldering iron would warm up and soon my station was back on the APRS network with aliases "relay" and "wide" like a proper APRS digipeater should.

I have been running the PicoPacket for two months, 24 hours per day without a hitch or a glitch. As soon as my GPS 20 arrives, I will mate it with the PicoPacket and a 2-meter radio and drive around downtown Wolcott just for fun.

If you are in southern New England, anywhere east of downtown Wolcott, you can find my APRS station (WA1LOU) on 145.79 running some flavor of APRS 24 hours per day. Send me a packet and say hello. Good-bye, until then.

Some Really Simple Basic Instructions On Getting APRS On The Air Now

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 APRS isn't exactly intuitive in it's installation and setup and any help we can get out to the newbie should be welcomed.

NOTE: I have used APRS 7.5 for this example. If the version you are using is something else, substitute that something else for 75 (ie: if you've got version 9.9z, use APRS99z.) Also, if you downloaded APRS (FTP, BBS, etc) or got it from a C-D, sub- stitute "A:" for the appropriate path.

If you don't use Windows, but have PKZIP204g, put the APRS disk into the floppy drive of your choice (I'll call it drive A) then expand the APRS files by using the following commands on the hard drive of choice. Note the use of the "-d" command to create the necessary subdirectories.

Make an appropriate directory	MD APRS
Change to this directory	CD \APRS
Switch to the A drive	A:
Run PKUNZIP with directories	PKUNZIP -d APRS75.zip C:

If you use WINZIP, change to drive A and double-click on APRS75.zip, click expand button, tell it where you want it and follow on screen directions. If the distribution you have is on more than one floppy disc, you'll have to have PKZIP properly installed and it's location known to WINZIP.

If you are using a Kantronics TNC, open the file "INITTAPR.TNC" (it's in the "SYSTEM" folder) and, using any text editor, change the line that says "PAR 0" to "PAR NONE" if it's a KPC-3, or the appropriate figure for your model. If you don't, your TNC won't understand anything the program will tell it!

Make sure your TNC is in Terminal or Command mode (what- ever it's called by the manufacturer.) Go to the DOS prompt (NOT in a "DOS window",) go to your chosen APRS folder and invoke "APRS75.exe". This brings you to the LOGO screen. Enter your callsign. Tell it what kind of TNC you're using. Answer the other various questions. When you're done, the main map screen will appear.

Now press M(aplist) then C(hange), and tell it you want the appropriate maplist for your area. This will probably be either EAS(t), SE(Southeast), CEN(tral), WES(t) or NW (Northwest.) Use the arrows or mouse to bring the cursor to your approximate location (keep your eye on the upper left part of the screen which shows latitude/longitude of the cursor.) Then press HOME to center the screen on it. Use the PgDN key to zoom in a few screens and tweak the cursor to your EXACT QTH. You may have to zoom in to a very small scale to get the necessary resolution. Once the cursor is at the right spot hit the HOME key again.

Press I(nput) M(y qth) and confirm your lat/long, choose a symbol for yourself (try S(ymbol) - for starters ... it's the little house), type in a brief comment, and verify it. Once you press that "Y" you're essentially ready to go on the air! In it's most basic form, you're configured! Tune the radio to 145.79, hook it up and see what you can see. It might take a few minutes for other stations to appear (assuming there are some) but if you get a little impatient, try pressing O(perations) Q(uery) and give it a radius such as 64 to force position reports from others.

Look for stations whose symbol is a star. These are the WIDE digipeaters! Is there one fairly close to you? If there is, press the D(igipath) key. If an asterisk (*)

appears next to a callsign (hopefully that nearby WIDE) then you're hearing it directly. Make a note of that nearby WIDE station's digipeater path.

Now you're going to set YOUR digipeater path. Press O(perations) D(igipeaters). If you heard that WIDE station directly, enter it's callsign and ssid, if any. Follow this with a comma, then type in "WIDE". For example: "WA2JNF-4,WIDE" would be how I'd enter it here in The Bronx, but the nearest WIDE to YOU is what YOU'RE looking for.

If you're not in range of a WIDE digipeater, look at the path used by the station closest to you, again using D(igipath). Can YOU hear this station? If so, you might try using that call as the first digipeater in your path, followed by whatever they have set for theirs. As a matter of courtesy, try to avoid this as a normal means of operation unless you have that station's permission. Few of us have rigs that can handle much more than a 40 to 50% duty cycle.

Next you want to set your Power-Height-Gain figures. Press I(nput) P(ower) and tell it how many watts you're using, your antenna's height above AVERAGE terrain (look at a topographical map of your area.) the gain in dBd and the antenna's directional pattern in degrees or 0 (zero) for an omnidirectional antenna.

Finally, set your Beacon Text by pressing Alt-B(eacon) and typing in a short comment different than the text you used for your Position Text earlier. At this point, you're about as far as you need to go for now.

APRS has extensive documentation included with every distribution. Most of these will be located in the "README" folder and can be viewed even when the program is running by pressing F1 - F(iles) and typing in the name of the file you want to see. I suggest you carefully read "HELP.TXT," "SCREEN.TXT" and "OPS.TXT" to give you an overview of the most pertinent information.

If you have access to E-mail, there is even a mail reflector you can subscribe to which will keep you up-to-date on the latest information on APRS and to which you can send your many questions. To subscribe, send a message to "listserv@tapr.org" with the subject of "subscribe". The body of the message should read "subscribe aprssig your_name" where your_name is... YOUR name!

I hope to see you all on my screen in the VERY near future. Look for me at cruise missile coordinates: 4052.69N/07354.06W.

APRS-FL List Server in Operation

Richard Garcia, N2CZF n2czf@magg.net

Anyone involved with APRS operations in Florida is encouraged to subscribe to our new mailing list. The reason this mailing list has been formed is that a few of us have found out that several APRS users (meaning a lot) have kept away from the aprs-sig or have unsubscribed due to the volume of mail and the ammount of mail that did not really pertain to them.

APRS-FL is geared to people wo use APRS in Florida or surrounding states and others that are interested in networking or different areas to the NWS and possibly some of the Caribian Islands. If you are one of thse people please sign up so we can start a more orginized group of users and administrators and keep abreast of everything that is happening in the state. A lot goes on that no one knows about due to the large area that we cover and much of that we can all use for ideas and as a learning tool.

If you know of anyone in the state that has unsubscribed from the aprs-sig or has never joined please let them know so they are aware of our existance. To sign up, do the same as you have done for the aprs-sig send a message to:

listproc@tapr.org

In the body of the message enter the following:

subscribe aprs-fl First_Name Last_Name

The above listserver does NOT MEAN that EVERYTHING should be posted to aprs-fl but ANYTHING pertaining particulary to our region. Use common sense in deciding if a message should go to aprssig@tapr.org or aprs-fl@tapr.org. The APRS Sig still has one of the largest and most knowledgeable group of people that I know of and should be seriously considered for general APRS questions and problems. Remember if aprs-fl get's crazy with mail that is not on topic, whoever we attract that had been on the aprs-sig but signed off for the same reason will probably do the same. We need to have everyone possible stay in touch somehow so we can get some semblance of organization together. Our numbers are growing every day now but most areas do not know what the other ones are doing!

Your Own APRS Mic-Encoder!

Bob Bruninga, WB4APR
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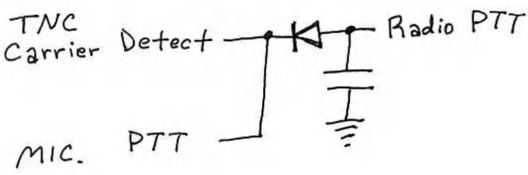
Clearly I have no business sense, because the following circuit will show you how to build an APRS mic-encoder for about 95 cents. It will put your GPS position report into a brief one second data burst on the tail end of a voice transmission on any radio circuit.

Obviously, the packets will not be as short as the MIC-E, and you will not get all the powerful routing and messaging capability, but you can be tracked! This kludge is a good way to get more people using APRS packets on voice repeaters without having to purchase the special mic- encoder hardware.

You Can Do This Now!

Using any TNC as a mic-encoder: In order to encourage initial testing with the mic-encoder concept on your voice frequency, you can use any GPS capable TNC to simulate the MIC-E. The big difference will be longer packets. This is a risk, since your initial confrontation with voice users will be worse than the final design. Here is how:

1) Use the $GPGLL sentence (it is shortest)
2) Set your POS rate to about once every 2 minutes (see below)
3) Turn BText off and configure TNC for GPS operations.
4) set UNPROTO to APRS (via nothing)
5) Connect a capacitor and diode to your MIC and TNC as follows:



Here's how it works. Your TNC just does its normal GPS thing. If your radio is NOT keyed, then the packet audio goes nowhere because nothing is keying the radio. If your radio is keyed by your MIC, then any posit packets will be held off until you release the PTT. The capacitor keeps the radio keyed long enough for the packet to get transmitted.

Notes

Lets call this mode the APRS-TNC-ENCODER.

Determine the value of C so your radio stays keyed for the full length of a posit. My Alinco takes 30 uF, my TS-711 takes 220 uF. Notice that the PTT from the TNC does NOT connect to the radio.

Connect the TNC xmt audio to your radio mic input through a HIGH value resistor so it does NOT load down the MIC audio. Try 50-100K.

If you talk longer than your POS rate, two or more packets will be buffered up and go out at the end. If your capacitor is the right value, then the additional packets should get cut off.

Unfortunately, the one-second hang time on your PTT will always be there, but it should hopefully not be too bad.

These packets will be longer than MIC-E packets. Set NO digis to keep the packets as short as possible. People monitoring the repeater with APRS can track you today!

If you monitor a voice repeater with APRS at home, Disconnect your transmitter! Transmitting APRS beacons on your repeater will be shooting yourself in the foot AND face!

Get someone to install a TNC with true DCD at your repeater site. It listens to the repeater audio input and transmits on the digital APRS frequency. Set its alias to VOX. Then voice users use the UNPROTO path of APRS VIA VOX,WIDE. (the advantage of the true DCD is so that you can use DCD to mute the repeater transmitter audio when the TNC hears the packet so other voice users don't hear it).

CAUTION: do not use the digi path of RELAY on a mic-encoder system! It could force all monitoring APRS stations on the repeater to key up!

Now this should finally get things moving. As APRS mic-encoder packets become more acceptible, and users discover its value, then you can purchase the APRS-MIC-ENCODER for the full power of APRS in voice systems.

PSR Deadlines

Check page two for upcoming *PSR* deadlines. If you have something for publication, please contact Bob Hansen, *PSR* editor at psr@tapr.org. TAPR is looking for technical and introductory articles on the following subjects: information on general digital communications, applications using digital communications, equipment hints or modifications, future directions and standards, tutorials, and any regional packet news or information.

Garmin GPS-20 Timing Performance

Tom Clark, W3IWI

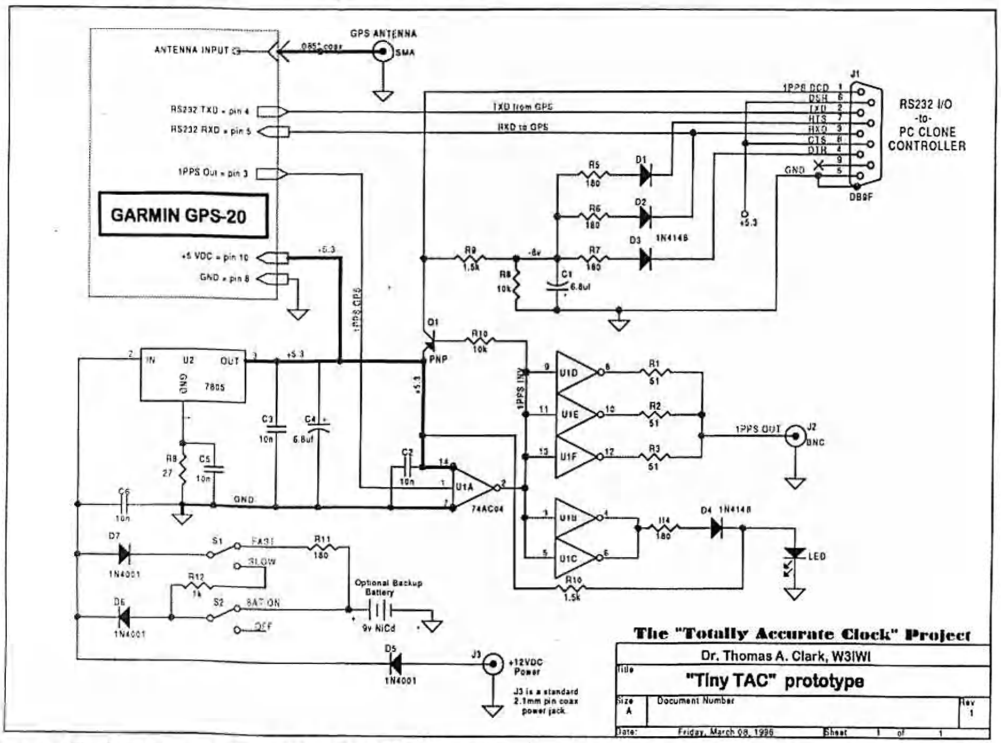
I have done some testing on the timing performance of the Garmin GPS-20 in my TAC-LITE box. The hardware in the TAC-LITE is described in the file
ftp://aleph.gsfc.nasa.gov/GPS/totally.accurate.clock/tac-lite.zip

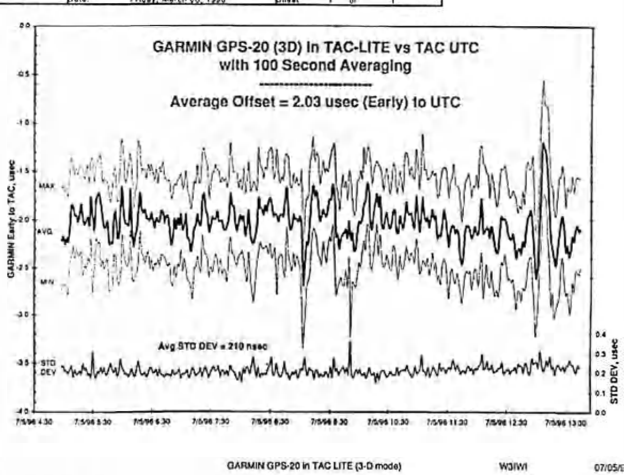
For these tests I used my original 6-channel "Totally Accurate Clock" (TAC, based on the Motorola ONCORE) operating in zero-D timing mode as the reference here at my home. All cable length offsets were zeroed out so that the relative performance could be judged. Because the Garmin's 1PPS output is found to be about -2 usec (Early compared to UTC USNO), the TAC was offset 10 usec early to insure unbiased positive counter readings and the TAC zero-D position was constrained to be the best long-term average value for the antenna on my roof. The TAC and TAC-LITE operated from the same antenna with a 3dB directional coupler used as a power splitter (the original TAC supplied the necessary +5VDC antenna preamp bias).

Time interval measurements were made with an HP 53131A counter operating in time-interval average mode, with data outputted to the PC thru the counter's RS-232 "printer" port. The time-interval averaging was set to 100 seconds. In this mode, the HP 53131A counter sends individual 1PPS measurements once/sec and every 100 seconds outputs the AVG, STD DEV, MAX and MIN values for the preceding 100 second period. The formatted data was cleaned up for import into an EXCEL spreadsheet but no data was deleted in this editing process.

The results are summarized in the plots (in both .GIF and .PS formats) in the file
ftp://aleph.gsfc.nasa.gov/GPS/totally.accurate.clock/garm-tac.zip

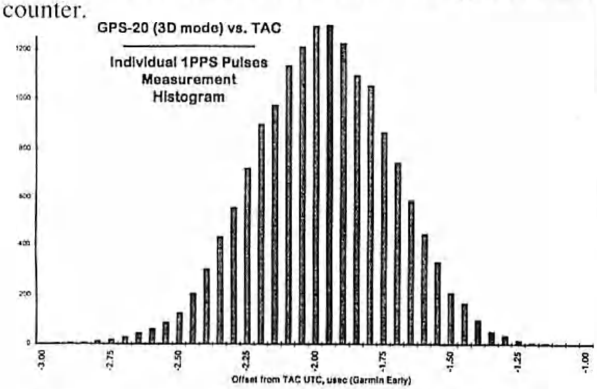
The GARM-3D files show the long-term trend of the 100 second statistical entries after subtracting the 10 usec intentional bias put into the TAC. Note that the MAX and MIN values are the extreme readings within each 100 second bin, typically defining a band of +/- 500 nsec around the AVG. The STD plot is the Standard Deviation





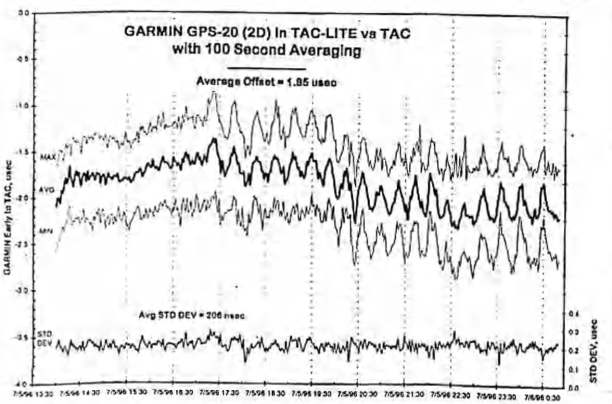
of the individual measurements in the 100 second windows. The measurements include contributions from any "noise" intrinsic to the ONCORE in the original TAC (including the +/- 52 nsec ONCORE 1PPS "sawtooth").

The HIST-3D plots show the histogram of the first 16384 individual pulses (16384 is an EXCEL limitation). The curve looks like a clean Gaussian with a width consistent with the STD DEV determined by the 53131 counter.



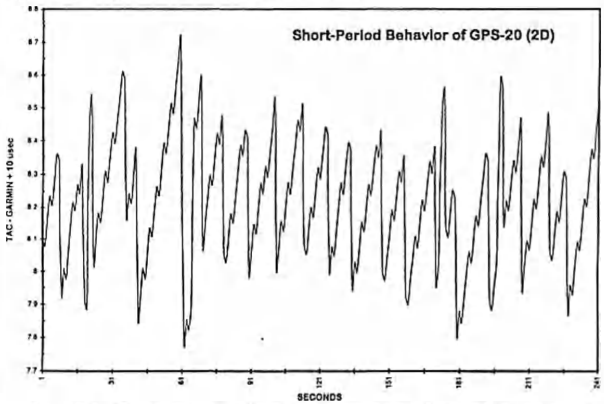
Based on all this data, for the Garmin GPS-20 in 3-D operation mode, the 1PPS pulse is determined to be about 2.0 usec early compared to UTC USNO (based on our previous calibration of the ONCORE in the TAC), and the GPS-20 can certainly be regarded as a 300-500 nsec RMS "clock".

Much of the performance of the original TAC is due to the ONCORE's ability to operate in "zero-D" mode with all the satellites being used to generate accurate timing. The GARMIN lacks such capability. The only settable parameter is 2-D vs. 3-D vs. Auto 2/3-D; in SHOWTIME I have included the ability to select 2-D vs. Auto, so I thought it was a good idea to test the GPS-20 performance in 2-D height-fixed operation. I ran the same test described above for about 11 hours and the results are shown in the GARM-2D plots. The 100 second averages in 2-D are somewhat smoother than for 3-D although the average STD DEV is nearly the same (206 vs. 210 nsec).



It was interesting (and perplexing) to note that about a third of the way thru the 2-D test (at about 17:00 UTC) the timing developed a ~300 nsec peak-to-peak sinusoidal character with a period of about a half-hour. Other systematic variations at a level of ~400 nsec and duration of a few hours are also seen; presumably these are due to the evolution of the visible satellite geometry. Also note that the 2-D average epoch offset from UTC USNO is about 150 nsec different from what was seen in the 3-D test.

To get a feeling for the short-period variability of the GPS-20, the SHORT-2D files show the second-to-second HP 53131A counter readings; Note that this data has a mean value of ~8 usec since the 10.0 usec intentional offset of the ONCORE has not been subtracted. The well-known 104 nsec peak-to-peak ONCORE "sawtooth" is easily seen (for example, notice the "ramp" between 45 and 60 seconds). Although much less predictable than the ONCORE, the GPS-20 shows a tendency for a 500-700 peak-to-peak sawtooth with ~15-30 second periodicity; but occasionally the pulse epoch jumps in an erratic manner.



In the documentation accompanying the recent SHOWTIME v3.31 I suggested that the Garmin timing model sigmas should be

MSIGMA 500 500

Based on the recent investigations, these values seem to be too pessimistic and that a more reasonable model for use in SHOWTIME is

MSIGMA 250 250

The Garmin GPS-20 is clearly not the same quality clock as the Motorola ONCORE used in the original TAC. However it does appear to perform at levels 500 nsec or better (assuming that the ~2 usec bias is accounted for). This is very encouraging for lower accuracy requirements (like amateur radio) especially in view of the $200 price for the Garmin GPS-20 engine. Based on the performance reported here, there seems to be little preference for 2-D vs. 3-D operation.

Totally Accurate Clock - Version 2 - Plans & Circuit Description

Tom Clark, W3IWI
w3iwi@amsat.org

12 May 1996

This note will describe the design plans for the "TAC-2" for review/comment by others. Please give me feedback soon, as I hope to get going on the detailed PCB layout shortly.

[Note from TAPR: TAPR has been talking to Tom about this project and we hope to have the kit under-development, once Tom says it is ready for us to start work on. We would also like to get a feel for the interest level in this kit, so let us know what you think — contact John Ackermann, ag9v@tapr.org]

Plans

The idea is to make a new, more flexible version of the Totally Accurate Clock (TAC) GPS add-on which will be made available to the user community through TAPR. The file, tac2a.zip (available on ftp://aleph.gsfc.nasa.gov/GPS/totally.accurate.clock/) contains the following files:

tac1blok.ps = PostScript version of block diagram of the original TAC package
tac2a-1.ps thru tac2a-4.ps = four PostScript schematics for the Version 2 PCB
tac2a.bom = bill of materials (ASCII Text File)
tac2-pcb.doc = this file for MS WORD
tac2-pcb.txt = this file in half-ASCII format
tac2.txt = some thoughts I posted earlier
tac2a.dsn = ORCAD Capture for Windows files with these drawings
tac.olb = ORCAD library for special parts

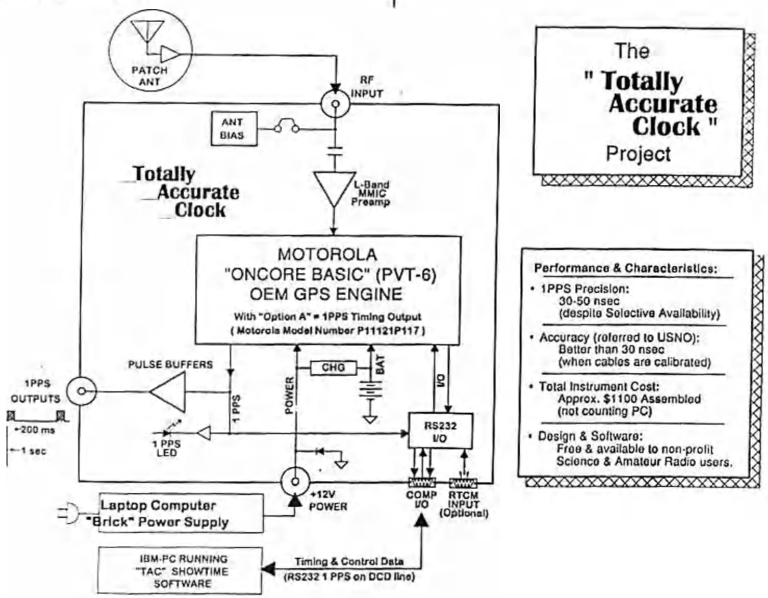
The new TAC-2 would preserve all functional features of the original TAC package (as shown in the tac1blok.ps drawing) except that the built-in RF preamplifier is not included. It would add the following capabilities:

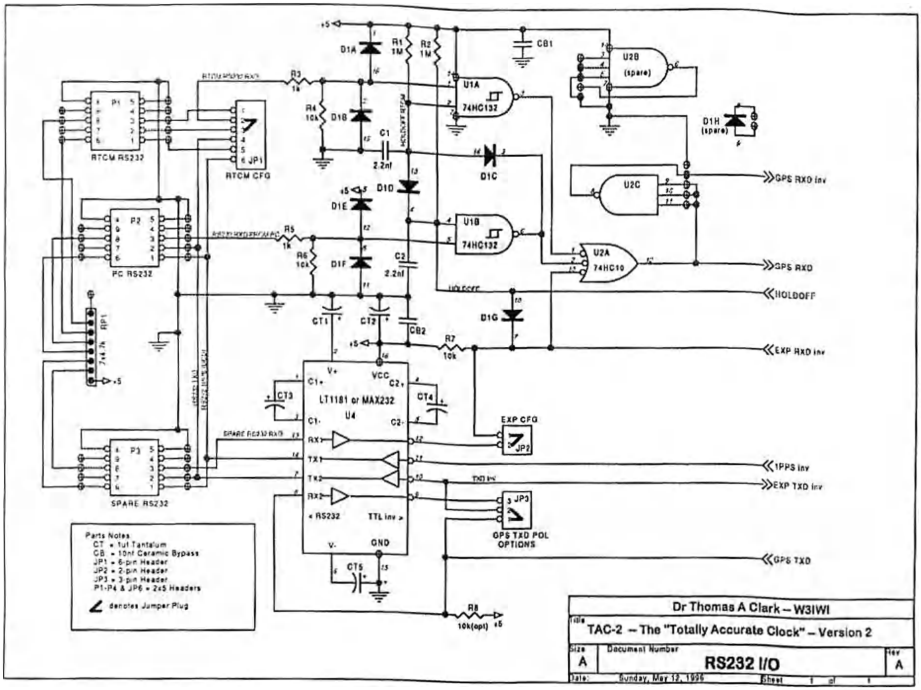
- Support for the Motorola ONCORE VP in addition to the ONCORE BASIC receiver
- Additional support for the Garmin GPS-20/25 receivers
- Options to allow for the use of other GPS receivers (like the Trimble SV-6)
- Addition of an optional precision Low-impedance 1PPS pulse buffer
- Addition of expansion support for an embedded microprocessor for real-time display, GPS-steered oscillator, "alarm clock" timing functions, etc.
- "Prioritized" multiple RS232 (or TTL) data inputs to the GPS receiver
- Addition of a high-efficiency switching power supply
- Extensive use of IDC connector headers to simplify cabinet wiring

The original TAC PCB was 70x100mm in size to match the ONCORE BASIC receiver; mounting holes on the PCB matched the BASIC's 60x90 mm footprint so that a 2-board "sandwich" mounting could be used. I hope to preserve this footprint, but I haven't yet laid out the TAC-2 PCB and don't know if everything will fit. I hope that the PCB will have added holes that match the ONCORE VP and GPS-20 footprints for "sandwich" mounting (the VP and -20 are smaller than the BASIC).

Circuit Description

Four pages of TAC-2 schematics are provided and will be discussed in order.





TAC2A-1.PS: This page shows the RS-232 I/O connections. There are several polarity options needed because the BASIC and GPS-20 receivers have non-inverted inputs (nominally RS-232 levels, but they work fine with 0/+5v "TTL" logic levels) while the VP requires inverted TTL levels.

RS-232 Inputs

In the old TAC-1 board, we made use of the fact that the BASIC was designed with RS-232 I/O. RS-232 input from either a PC or from an optional RTCM SC-104 DGPS correction receiver were multiplexed with a simple diode RS-232 OR-gate. This caused some problems because the RTCM signals could "step on" the higher priority (but infrequent) commands sent by the PC.

The TAC-2 implements a 3-level prioritized input with the RTCM port having the lowest priority. If U1A pin 2 is high, the RTCM signals pass through. Either D1C or D1D diodes can pull pin 2 low if higher priority activity is present, and C1 holds the input low for a time R1C1 (about 2 msec) after the other activity has stopped, this keeps the "holdoff" input low between bits and for about one 4800 bps character after activity has ceased. The R3/R4/D1A/D1B network allows RS-232 level signals to be safely handled by U1A.

U1B functions similarly for the "middle" priority signals from a PC and it can be turned off by activity on a third "spare" or "expansion" port via D1G or the HOLDOFF signal.

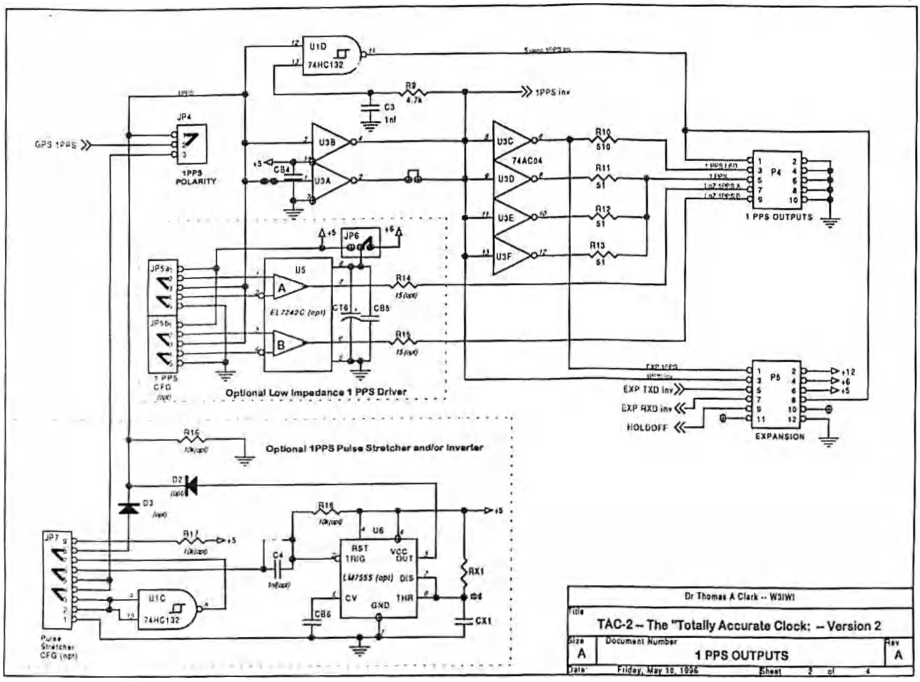
The highest priority serial input comes from either the "Spare RS-232" input (via U4Us RX1 line receiver) or the expansion input (via the EXP RXD inv signal, after removing an option jumper in JP2).

The three possible serial signals are all inverted at this point, and the inverted signals are OR-ed in U2A. For the BASIC/GPS-20, U2AUs output (GPS RXD) is the proper polarity. For the VP, the signal is re-inverted in U2C (GPS RXD inv). Note: if you don't use a VP, U2C can be used as a spare for other functions.

RS-232 Outputs

The TAC-1 used a kludge RS-232 line driver with an Op-Amp and a "homebrew" LM7555 oscillator as a negative voltage supply. These functions are replaced in the TAC-2 with a simpler circuit using a MAX232/LT1181 chip.

The TAC has two RS-232 outputs: the GPS receiver's TXD signal, and the precision 1PPS signal sent to the RS-232 DCD handshaking line and thence to the computer. Since the BASIC and GPS-20 receivers provide RS-232 outputs, one of U4's line receivers is used



TAC2A-2.PS: This schematic covers all the signal conditioning for the 1PPS signals.

to invert the TXD signal and convert to "TTL" levels. The choice of RS-232 vs. TTL levels is set by JP3.

RS-232 I/O headers

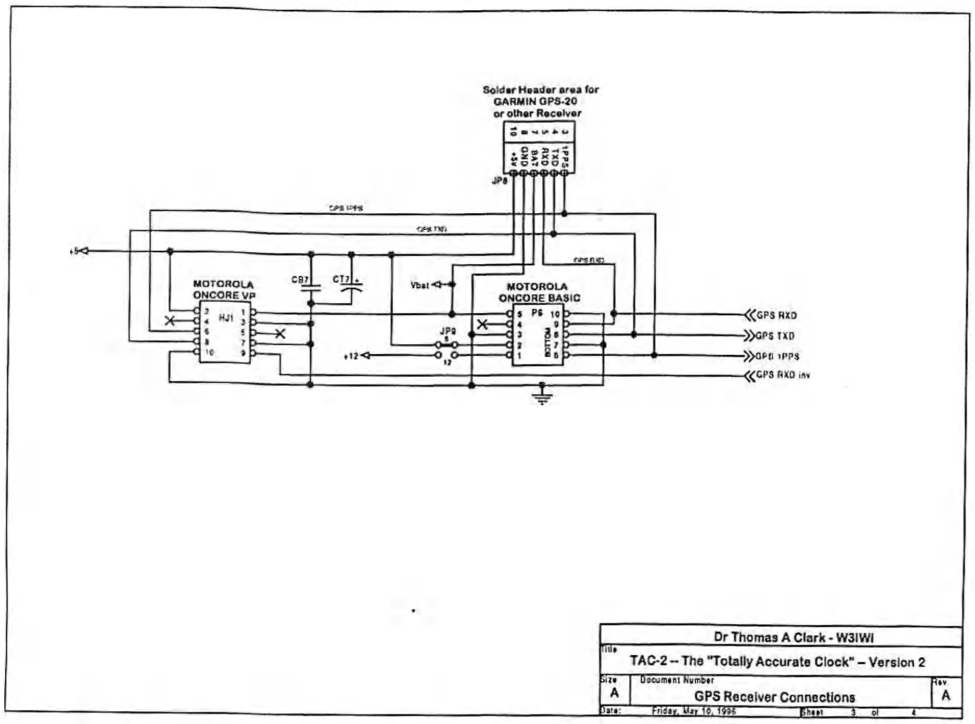
To make RS232 connections easier, all three RS-232 I/O signals are on 10-pin headers (P1, P2 and P3) which match standard DB-9 RS-232 connectors and allow for wiring with simple IDC ribbon cable connectors. On all the I/O connectors, the DSR and CTS lines are pulled high with resistors in RP1. The signals to/from P1 pass thru the JP1 header. This allows either pins 2 or 3 to be the signal source; in addition, jumpers on JP1 can be added to allow this port to be a full I/O port.

The standard GPS receivers produce wide (Mototola =200 msec, Garmin=100 msec) TTL level signals which rise at the nominal UTC second. The U3 inverter/driver chip is an "AC" series part to provide fast rise-time pulses with minimal delay. U3A and U3B invert to make the 1PPS INV signal (optionally U3A can be separated if you need a spare gate for some other function). U3C is used as a driver (via R10) for a front-panel 1PPS LED indicator. It also generates a 1PPS signal for use on the P5 expansion port. U3D/E/F are paralleled (via R11/12/13 51 ohm "snubbers") to provide a user 1PPS signal. U1D generates a ~5 usec negative-going pulse that is used on the expansion port by the (planned for) oscillator stabilizer circuit. U5 is an optional 2-channel fast 1PPS low-impedance 1PPS driver using an Elantec EL7242 driver. If used, the polarity of the output pulses on either port can selected on the JP5 jumper headers. U5's supply voltage can be selected to be either +5 or +6v at JP6. The +6v option provides for a +4v minimum pulse into a 50 ohm load (and +6v into an open circuit).

All the 1PPS outputs appear on the P5 header for wiring to the cabinet with ribbon IDC cable. The ribbon cable can be slit into 2-conductor pairs since alternate wires are at ground.

The P6 12-pin header is intended for connection to an internal expansion microcontroller. My current plans call for the use of a Parallax "Basic Stamp 2" for display, alarm clock and oscillator stabilizer functions. P6 has two uncommitted pins for expansion use.

JP4, U1C and U6 provide an optional 1PPS pulse stretcher and/or inverter function. The Trimble SV-6 has a 1 usec wide open-collector, negative-going pulse. For



TAC2A-3.PS: This drawing shows the signal connections for the 3 supported GPS receivers. Only one type of receiver would be used at a time, so the connectors P6 and HJ1 are Motorola-only options.

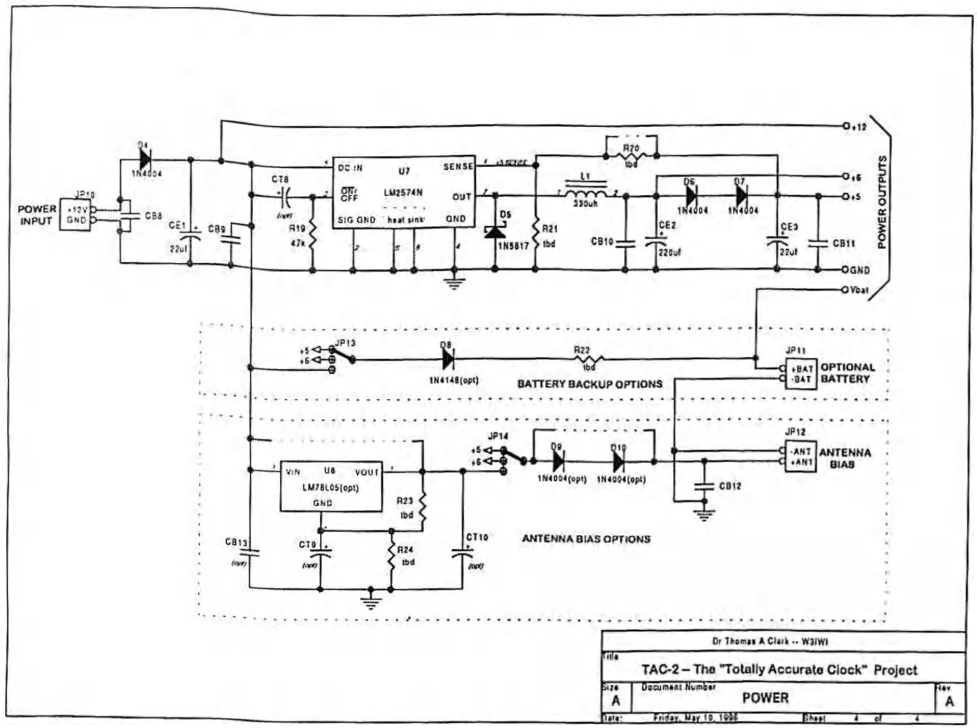
such a receiver, the LM7555 would act as a one-shot to generate a wide (100-200 msec, as determined by CX1/RX1) positive-going pulse with R18 acting as the pull-up resistor (C4 omitted). The LM7555 is not as fast as desired, so U1C also inverts the pulse and the two positive-going pulses are combined in the D2/D3/R16 OR-gate. For other receivers with different 1PPS outputs, the U6/U1C signals can be re-configured with jumpers on JP7 to handle almost any contingency.

ONCORE BASIC: Like on the TAC-1 board, a 10-pin header plug (P6) provides the connection to the receiver. A short (~1 inch) IDC cable provides the interconnection. Note that Motorola uses a non-standard pin numbering sequence on this connector; this drawing uses their pin numbers. This receiver has an on-board power converter and can run from either +5v or a higher voltage (like +12v). JP9 allows the user the option of selecting either type of power.

ONCORE VP: The VP receiver has a 10-pin plug and will plug directly into a 10-pin jack at HJ1.

Garmin GPS-20/25: The Garmin receivers have a 12-pin header that is not suitable for direct PCB interface. The TAPR "group buy" is supplying connectors with short wires attached. These wires will need to be soldered in the JP8 area. Other brands of receivers would use the same header area. If they need other than +5v power, they can pick it up at JP9. If they need inverted TTL RXD signals, they can pick it up on HJ1 pin 9.

The 12v supply is converted to the lower voltage required by the receiver with a switching power supply using the LM2574 "Simple Switcher" chip; the design is taken right from National Semi's notes with a few minor exceptions. The input diode D1 provides protection against inadvertent polarity reversal. The optional CT8 capacitor with R19 provides an optional start-up time delay. If the delay is not desired omit CT8 (and R19 can be shorted). Because heat-sinking of the chip is needed, the unused pins 6 & 8 are shown as grounded. Because I wanted a voltage around +6v, the diodes D6+D7 provide about 1.2v of drop between the "+6" and "+5" volt supplies. The LM2574Us remote sensing pin regulates the delivered +5v. The small series resistance of D6+D7 and CE3 provide additional filtering for the +5v output. The bypass capacitors CB10 and CB11 provide high-frequency "de-spike".



TAC2A-4.PS: This drawing covers the on-board power supplies. It is assumed that (like we did for the original TAC) the user will provide power in the +10 to +20v range (which is called +12v in this discussion).

R20 & R21 are shown as TBD optional parts. I have found that the Garmin GPS-20 receivers really want ~5.2-5.3v at their +5v input to work reliably. A small resistor in R20 allows the output voltage to be set. If a part other than a 5-volt LM2574 is used, then R20 & R21 can be used as the voltage divider needed to get the correct voltage. If +5.0v is wanted and an LM2574-5 is used, then R20 is shorted and R21 is omitted.

Some receivers come with a backup battery installed and some don't. The JP13+D8+R22+JP11 parts provide for an external battery. R22 sets the float charge current. The source voltage can be set with JP13. This duplicates a function we found necessary in the original TACs. The GPS-20's seem to all come with batteries installed so these parts can probably be omitted for the Garmin receivers.

Like with the original TAC, we found it desirable to allow for special antenna biasing and several optional components support this. The intention is that the connection from JP12 will go to a bias tee or preamplifier supplied by the user.

Personally, I found it desirable to make sure that any external voltages applied to the antenna bias connector would not re-enter the receiver. In a couple of cases, people connected TACs to antennas that already had been biased at +12v, and it resulted in frying some components. So I recommend the use of series diodes. Since the +6v supply rail is 2 diode drops above +5, D9+D10 allow for a +5v bias when JP14 is set to the +6v position. If desired, the internal +5v supply can be used by omitting the diodes.

In the event that some other voltage is needed, the optional U8 78xx regulator can be used. R23/R24 allow a special voltage to be developed. Or U8 can be bypassed and the full "+12v" can be supplied (with or without the D9+D10 protective diodes).

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For more information contact:

Larry Brown, NW7N
nw7n@amsat.org
520-886-1957 (Evenings)
or
Heather Johnson, N7DZU
n7dzu@azstarnet.com
520-749-5106

Also look for the announcement on the opening of our new AMSAT Annual Meeting Web page.

AMSAT membership is not required to attend, so satellite new-comers are encouraged to come and learn about AMSAT and satellite operations. Registration forms will be sent to all AMSAT-NA members and can be downloaded from our new web page (when it becomes operational).

Registration for the Annual meeting is $20 prior to Sept 15th and $25 afterwards. Banquet tickets are $24 per person. We can also provide round-trip bus transport for the Kitt Peak tour for $10 per person. I should point out that Kitt Peak is at an elevation of 7000 feet and the temperatures will probably be about 15 to 20 degrees F cooler than in Tucson.

TAPR offers its first CD-ROM!

Considering that less than 50% of the TAPR membership is now on the Internet, we felt it was important to make the information from the TAPR Internet site and other information regarding TAPR available to all who wanted access. The result is our first CD-ROM. There are plenty of things to add next year, like a search engine and more *PSR* archives. This project will be a growing source of information now and in the future. The plan is to do a CD-ROM before each Dayton.

TAPR's 1996 CD-ROM
ISBN 0-9644707-3-X
Price: $20

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  - TMS320C26: C26_DSK
  - TMS320C50: C5X_DSK
  - DSP56000
  - DSP56001: DSPCARD3; DSPCARD4; DSP_12
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Your purchase helps support TAPR.

NET/Mac version 2.3.58

Adam van Gaalen, PA2AGA NET/Mac is the application that supports TCP/IP over packet-radio, which means, that ham radio operators can use NET/Mac for their wireless TCP/IP network.

In this version of NET/Mac the following mods/features were implemented:

- Some mods for ROSE (by Joe K5JB, I forgot these mods in 2.3.47)
- 1995 - 1996 in Copyright notice
- Mod for 'beacon set' command
- 'addmenu' mod to allow APRS beacon formats. See online HELP
- Implemented some temporary mods to keep track of sleeping sessions
- Mod by DK2HD: Allow ^[(escape), $d (date) and $t (time) in 'param' command

NET/Mac does NOT support the new Buckmaster CD-ROM HAMCALL database yet. I am trying to convince Buckmaster that I need the new data encryption method, but as of yet they are not ready to release a description of the encoding-algorithm. The old CD-ROMs remain fully supported.

This version obsoletes all versions of info-mac/comm/radio-net-mac in the Sumex-Aim.stanford.edu (and it's mirrors) archives.

The new NET/Mac has (hopefully) been uploaded to:

oak.oakland.edu	in the directory	/pub/hamradio/mac/digital
ftp.ucsd.edu	in the directory	/hamradio/packet/tcpip/incomin

If it's not there (anymore), then look at
/hamradio/packet/tcpip/mac.hamster.business.uwo.ca in /pub/amsoft

WA2ZKD mirrors UCSD's incoming on his Landline BBS. Hams without ftp can call 716-544-1863 or 716-544-2645.

NET/Mac will also be uploaded to PI1HVH.AMPR.ORG, in directory public/mac.

Adam, PA2AGA e-mail:
a.vangaalen@iag.tno.nl for mail to my office and BIG files
or: pa2aga@iag.tno.nl for letters only, NO BIG files here

Membership Dues to increase on August 1st, 1996

At the Spring 1996 TAPR Board of Directors meeting, held in Dayton Ohio the week of Dayton HamVention, the board reviewed the issue of a proposed dues increase. This issue had been discussed informally at the previous two board meetings, but at this meeting it was obvious that dues would have to be raised to cover the increases in postal rates and the cost of printing that have occurred over the last few years. At the past Board meetings, the issue was discussed and the Board felt that the price of printing might begin to fall, but this did not happen.

The board voted to increase membership dues to: $20 U.S., Canada and Mexico, $25 all other International members.

The increase of $5 a year to U.S. members, $2 for Canada and Mexico members was felt to be best at this time to offset the recent costs as indicated above. $25 for all other international members still pays for the postage and printing of their *PSR*.

The board understands the impact that a dues increase could have, but the yearly dues goes to pay the printing and mailing of the *PSR* as well as to cover a good percentage of membership services: office space, office phone/fax/e-mail, printing information materials, and the like.

Dues will increase starting August 1st. Please let other members know of the dues increase.

If you would like to comment on the issue, you can send e-mail to VP, John Ackermann, (ag9v@tapr.org) and he will forward comments to the TAPR board.

TAPR Metcon-1 Micro. Replacement

TAPR does not sell replacement microcomputers for the METCON-1 project. Those people that need to replace this part should purchase a part on their own and then send it to the METCON-1 designer for programming. One place to obtain the microcomputer is from Jameco, 415-592-8097. The part you need is an 87C51, and Jameco tells us that their part number is 52978. The cost is about $21. If you want a re-programmable part (as opposed to a One Time Programmable (OTP) part) be sure the part you are getting is a so-called "windowed" or "uV erasable" part).

The METCON-1 firmware must be programmed into the part for it to function correctly. That firmware is located on the TAPR WWW file server under software. If you don't have access to a 87C51 programmer, the METCON-1 designer, Paul Newland, ad7i, has offered to program parts for a limited time. There is no charge for this service. Contact Paul directly (ad7i@tapr.org, or POB 205, Holmdel, NJ 07733) to determine the current procedure. As of April 1996 the procedure is to send Paul an 87C51 along with a note saying that you want METCON-1 firmware programmed into the device. Be sure to include a Self-Addressed, Stamped Envelope (SASE) along with your request so that the device can be returned to you. Paul will then program the 87C51 and return it to you in your SASE with whatever packing materials you provided. Paul will assume no responsibility for parts lost or damaged in the mail or parts that his programmer is unable to program or otherwise may damage. People outside the U.S. (who probably can't easily get U.S.A. stamps) should contact Paul about alternatives to SASEs.

Welcome to new TAPR Software Librarian

TAPR would like to welcome Allen Finne, KB5SQK, as the new TAPR software librarian. Allen will be taking over for Bob Nielsen, W6SWE.

TAPR owes a great debt to Bob for his work on the software library over the last number of years. Bob had been software librarian for several years before he stepped down when Lou Nigero, KW6H began to do TAPR's first e-mail list system and the software library. When Lou had to leave the position, Bob stepped back up to bat at a time when the organization was short on available volunteers. Bob had just finished his term as President and really helped out by taking over this duty when we couldn't find anyone to do the job. Thus, Bob has definitely done his duty in this area. Bob helped TAPR get the software library made available on the TAPR.ORG system after the first initial steps were made and has done an outstanding job in keeping the library organized in both the disk and Internet version. During Bob's term we moved from 5.14" disks to 3.5" 720K disks. Now at the end of his tenure the process of moving to 1.44 HD disks has begun.

Allen brings a fresh approach at what the software library could be providing and has a lot of new plans he has been discussing. We look forward to Allen's tenure in this position and the great thing we think will be happening — being completed. Allen can now be reached at kb5sqk@tapr.org for anyone who has information regarding upgrades or comments on the software library area.

Welcome aboard Allen!

TAPR Group Purchase: PC-DSP and PC-SIM for Windows

For the past several months, the subject of digital signal processing has been discussed on the TAPR DSP-93 and HF-SIG e-mail lists. Software designed to facilitate the further learning and modeling of DSP entities has also been discussed (PC-DSP). Mention was made of a DSP course utilizing a text and a program called PC-DSP. The text is aptly named *Digital Signal Processing-A Laboratory Approach Using PC-DSP* by Oktay Alkin, PhD.

Jim Kauten, KO4RQ, checked with PC Solutions, the developer of the software, and it was discovered that a Windows version is available. There are versions available for Win 3.1x, Win NT, and Win 95.

After discussion with PC Solutions, they are willing to give a volume discount if there is enough interest. Jim announced the offer several weeks ago and approximately 30 people expressed an interest. Based on this interest TAPR will do a group purchase.

The cost of the PC-SIM and PC-DSP for Windows package (includes both programs) will be $220.00 US (*see note). Shipping and handling will be an additional $6 for U.S. deliveries. The standard non-discounted price for the package is $256.00, inclusive of s/h, from PC Solutions. The TAPR group purchase plan nets a savings of $30.00 for each person involved in the purchase of the software package.

21 orders must be placed with Dorothy at the TAPR office before the purchase will be made. These are orders (i.e. check, money order, or Visa/MC). This is not a call to generate a list that will be contacted at some future time. As with past group purchases, monies collected for the purchase will not be deposited until the order is placed. The purchase does not include the text mentioned above.

Overview

PC-DSP is an interactive, menu-driven software package used for: waveform synthesis using a variety of methods, basic signal operation, fast Fourier transforms, convolution and correlation, solution of difference equations, analysis and design of IIR and FIR filters, digital filter simulation and code generation, and power spectrum estimation using classical and modern techniques. Some key features of PC-DSP listed include: GNUPLOT support, code generation, macro compiler, dialog compiler, sound file support, data file formats, and compatibility with PC-SIM.

PC-SIM is described as a continuous- and discrete-time simulator that is used for time-domain simulation of systems described by block diagrams. It was designed to be a flexible and open-ended tool to allow simulation of a broad range of systems encountered in communications, signal processing, and control theory. Some of the key features mentioned include: pre-defined components, code generation, sound file support, and compatibility with PC-DSP.

Demo versions of both programs are available from the PC Solutions web site:
http://www.dspsolutions.com.

Information regarding the software should be directed to Jim Kauten, MD, KO4RQ (kauten@mindspring.com). Orders for software should be directed to the TAPR office. TAPR would like to thank Jim for his effort in organizing this purchase.

* Note: There will be no 10% membership discount on this purchase.

TAPR Group Purchase: Garmin-20 GPS units, Round 2.

As of 7/7/96 the TAPR office has received orders for 40 of the 75 units required for the second group purchase.

We need another 35 orders before we can place the order. This is your chance to get a GPS unit for under $200.

See the last issue of the *PSR* for more information, or check the web page at http://www.tapr.org/gps for pictures and information on the GPS-20.

TrakBox Kits Available

A small number (10 kits) of TrakBox Kits are available from TAPR. Once these are gone, there will be no more available. This popular satellite tracking and radio/antenna control kit costs $250 plus shipping. Contact the TAPR office to order your TrakBox kit.

Kit and Publications Update

AN-93 — PC Modem for HF

The AN-93, which seems to have taken forever to get closure, is approaching that point now. The TAPR volunteer working on the kit has completed the design and layout of the daughterboard to correct the layout problem. Once the design is delivered to the board house it will take a month to get the board back. We have about 40 of the 100 kits, which are sitting at the office, spoken for. We would like to thank everyone who has placed orders and been waiting patiently for the kits to be completed. The last two elements required to complete the kit is to double-check the documentation and build one. As the old phrases says, "Sometime you get the bear and sometime he gets you." In this case

the bear has won several times. More later!

For a full description of the AN-93 modem and its specifications, see the May, 1994 issue of *QEX* or issue #55 of the *PSR*.

TNC-95 — Plugin TNC for PCs

As reported in January, we are waiting on the volunteer firmware programmers to complete the port of the TAPR 1.1.9 code. The TNC-95 beta/final design is ready to go the board shop, once the firmware has been ported. Doing kits after that should be simple, due to the current design.

DAS

The DAS kit (DTMF Accessories Switch) is shipping. We have another 50 kits (half of the first batch) in stock and will evaluate doing more kits after these are sold. Thanks to Paul Newland, AD7I, for helping out with the OTP programming. We have added the audio presentation that Paul gave at this year's Dayton to the DAS Web page (http://www.tapr.org/das). The web page also has full details on the project and spread the word about this little kit.

9600 baud modem

The TAPR office now has plenty of 9600 baud modems available and ready to ship. The PAL issue regarding the 18CV8 availability has been corrected. Thanks to Brian Straup, NQ9Q, and Joe Borovetz, WA5VMS for their help regarding the PAL code porting and testing. There will be meetings in the coming months looking at ways to correct the current board layout tweaks required as well as doing some additional cost reduction.

TAPR/AMSAT DSP-93

Orders for DSP-93 continues. Shipment of last batch should be in everyone's hands before this printing. TAPR will continue to provide DSP-93 kits until all current inventories are depleted. This means about another 50-100 kits to be sold over the coming months/years. If you have a DSP-93 or thinking about getting one, be sure to check out the group purchase of PC-DSP software discussed in this issue.

TUC-52 (PCON, METCON)

Paul Newland, AD7I, has been able to get back to work on this project. The next step in the project is to layout the PCON daughterboard and test that with the alpha-TUC52 boards already completed. Once the development group is happy there are no problems, the next crank on the TUC-52 main board will be done as well as a run of the PCON units. Once the PCON units are kitted, the METCON-2 design will enter layout and beta-testing. More as this project continues.

The TUC-52 is a generic microprocessor board which is used with a personality board to implement a specific function. The PCON personality board provides the I/O needed to turn a stand-alone printer into a packet "rip and read" terminal. The METCON personality board can be used to provide remote control and sensing functions.

GPS-20 Group Purchase

As will be outlined in this issue, TAPR is doing another group purchase of GPS-20 units. TAPR provided some 130 units in the first buy. 75 units are required for this buy. Pictures of the GPS-20 unit can be found on the TAPR web page (http://www.tapr.org/gps). These are really small units and fit the needs of the experimenter and APRS user. If you are interested in the TAC kit, discussed below, then you will want to get a GPS-20 unit while the price is low and the group purchase is happening.

Future Kits

TAPR is talking to Tom Clark, W3IWI, about making his TAC (Totally Accurate Clock) into a kit that TAPR can produce. Details on the kit are provided in this issue. More information in the coming months about availability.

Wireless Digital Communications: Design and Theory

Tom McDermott's, N5EG, book on wireless digital communications is in final edits and should be going to the printers in August. Goal is to have it ready for everyone at the ARRL and TAPR Digital Communications Conference in Seattle in September. Interest is picking up — if you would like to reserve a copy now, contact Dorothy at the office.

TAPR's 9600 baud land mobile modifications book

The authors meet before and at Dayton regarding getting the book wrapped up. About 75% of the book has been layed out and reviewed. Just a few sections with pictures needs to be added to conclude the radio mods book. We are still looking for a good name — if you have one, send us some e-mail. An additional appendix regarding the examination of these same radios and their performance has been submitted for review and we are looking at including it in before printing later this year. We are planning on printing this as a three-hole punched book, so that additional chapters on radios can be added in the future. Not sure if it will come in a binder yet or not. Looking at costs.

CD-ROM

The big news at Dayton was the introduction of TAPR's first ever CD-ROM. The CD-ROM is packed with good information and lots of neat information. Check the blurb

later in the *PSR* about what is on the CD-ROM. Demand has been high since Dayton. We are already looking into ways to help increase the usefulness of the CD-ROM for next year's production (i.e. search engine for the SIGs mail lists, on-line web pages for helping organizing the information on the CD-ROM, etc). The plan is to generate a new CD-ROM each year for Dayton.

Networking Without Wires: Amateur Radio TCP/IP

The author has submitted the first half of the book for layout. The second half is due to arrive at the office by the end of July. No date has been set on when this book will be available . The book consists of 22 chapters and 11 appendices comprising more than 150 pages of information on the subject of amateur TCP/IP. This looks to be another good intermediate book to add to the ever growing TAPR publication library.

Board of Directors Meeting Minutes - Fall 1995

T.A.P.R. Board Meeting Arlington, Texas - 8 Sept. 1995 (Edited for Publication)

Meeting was called to order at 8:00 am by Greg Jones, the TAPR President.

Committee Reports

The Secretaries report from the previous meeting was read by Gary Hauge.

Motion to accept: Greg Jones
Seconded: John Ackerman
Passed

Treasurers report was presented by Jim Neely.

PSR report presented by Bob Hansen.

Greg Jones presented report on the Internet server.
5000 plus accesses per month.
5 - 10 TAPR orders per week.
We are currently on a 56 kb line.
At the end of October we will move to a 120 kb line.

The SIG group breakdown as follows:
BBS Sig - 198 members
Net Sig - 291 members
APRS Sig - 424 members
DSP-93 - 206 members
TAPR BB - 159 members
TAPR TNC - 309 members

In addition we have 5 BBS working groups and 17 list serv groups.

Greg Jones presented status of the proposed petition to the FCC on Spread Spectrum. Does TAPR propose or do we wait for the ARRL to do it. There are many misunderstandings in the Ham community about spread spectrum and how it works. TAPR may submit and wait for ARRL comments.

PCS System: Greg/Barry
Appears dead for the moment, will look at changing the focus to Spread Spectrum.

OEM Status Report by Greg Jones

Office report: Greg
Dorothy and Bill working hard keeping up with office activities.

Marketing/Advertising: Greg
QST
73
Radio Shows
Technical articles (need to write more)
World Radio
Book Distribution
RF Modem design book in work
Intro NOS book in work

Moderation of NET and BBS SIG: Steve/John A.
Moderation of the two SIGs is working with fewer fire fights.

A motion was made and passed to include in the minutes that there has been 100% attendance at board meetings for the past three years.
Motion made: Gary Hauge
Seconded: John Ackermann
Passed

Old Business:

Move and approved the joint TAPR and ARRL DCC meetings. Discussed in length.
Motion: Gary Hauge
Second: John Koster
Passed

23 cm German Radio Kit Status:
Dead due to lack of response. Monies collected will be returned.

Manufacturers Group
Only one manufacturer showed interest lack of response from other manufacturers has effectively killed the idea.

9600 Baud Modem
The Board discussed the future of the 9600 baud kit. Will look at ways to cut the cost of the kit.

New Business

Kitting - Discussion was presented to move the kitting to The Barefoot Trading Company in Florida due to the notice from PacKit. This company is owned by a TAPR board member and Board discussed possible conflicts of interest. After discussion, the Board felt there were none.
Motion: Jim Neely
Second: John Koster
Passed - Gary did not vote.

Elections
Discussion to improve the election process to allow more time to return ballots.

1996 DCC
Discussion over location and dates. Several locations are possible. The board selected members to sit on the conference committee to locate a place for the next meeting — once the MOU has been accepted.
Motion: Jim Neely
Second: John Koster
Passed

Dayton
Dinner needs better coordination for registration and facilities. NCR has facilities. John Ackermann will look into availability. We need a dinner room plus three meeting rooms.

Technical Projects

DSP-93 - Doing well and to be continued.

TUC-52 - Waiting on price quote on boards. Alpha test soon.

TNC-95 - John Koster presented the circuit board and showed how it fits into the DSP-93 box.

AN-93 - Waiting on documentation and add-on board

TAPR Trademark - John Ackermann lead the discussion on the TAPR logo. This could be expensive depending on how we approach the effort. We should be using the "TM" on TAPR products. A motion was made and approved to follow up on this research.
Motion: Jim Neely
Second: Barry McLarnon
Passed - 1 negative vote was cast.

Other Business

TAPR presence at the South West Digital Conference and other regional locations were discussed at length. The TAPR presence on the World Wide Web was also discussed at length.

Mel Whitten will attend the ARRL Frequency Coordinator conference in ST Louis.

Regional Groups - How can we get them involved in TAPR?

The meeting was adjourned at 12:30pm

- Gary Hauge, N4CHV
TAPR Secretary

DCC Advertisement
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DCC Advertisement Page 2

TAPR Price List / Order Form