



PACKET

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President's Corner

What will amateur radio networks look like in the future? Will amateur radio digital networks look any different in two years then they did 10 years ago?

The Past

Let us look back at how we began in the early 1980s with this thing called packet radio. We (amateur radio) began by building units capable of talking to each other in a local environment. It was a thrill to be able to talk to someone across town or within the county. Not until later in the process did we have any kind of long-distance networking. Networks like NetRom, ROSB, KaNodes, TexNet, etc. came on the scene to provide linking to get us from point A to point B over RF over several miles or hundreds of miles. These systems did not appear until after 1984, over 5 years after the first TNCs were available. This entire trend of networking was driven by the interest within the community to build such networks and the growth of the user base who owned TNCs. As we had more people owning a common data communications interface, we had just enough critical mass to make networks happen and to keep them going and growing. Some of these networks have been operating over 10 years, which is a real accomplishment considering the volunteer nature of a few people behind the process for each

Look for TAPR at these Upcoming Events

May 16-18, 1997	Dayton Hamvention
Oct. 10-12, 1997	ARRL & TAPR Digital Communications Conference - Baltimore / Washington International Airport

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President's Corner, continued...

network. Much of this interest and growth was because it was a new and exciting technology for amateur radio operators to be involved in.

Interest and excitement — that is what this is all about!

As technology has remained the same (for the most part), have we not seen a general lowering of interest within the packet user community as a whole? There are exceptions to the interest and excitement indicators — look at APRS, or continued experimental development. Resources (money/equipment) are still hung at speeds that were available in 1985, while personal interest has moved in favor of a much different type of access which is focused on speed, bandwidth, and information access and availability. Let's face it — technology has passed us by if we say 1200 baud AFSK or 9600 baud FSK communications are the best we can do as amateur radio hobbyists. It is time to make the jump to a new technology base.

I have recently been accused of being a 'moron' or the 'evil end of amateur radio as a whole' for stressing the importance of taking a step forward with new technology, but taking a step backwards at the same time because of the need to focus on local access issues.

This is where we need to move back to now. The emphasis has to be back on creating new technology to serve the general community for local access. The reason long distance networks were created was to connect these dispersed local areas together, but this process took time — years in fact — and new technology was created to make it happen. However, this new technology was a result of the user interface as it was designed. There is the problem. No new user interface was really ever brought forward past the TNC-2 that was so widely adopted. There are several reasons for this, but I believe the main one was price. TAPR did too good a job on the TNC-2. The cost was so low after the first 4 years, that most amateurs just didn't want to pay any more money to do better. There was also no incentive for doing it, since if you made the technology jump, there was typically no one else to talk to and getting a group to do something together was difficult, if not impossible.

We are now looking at developing new communication systems with physical limitation different from the past era of technology that will act as a current nodal point in communications. The systems that are being developed are a jump ahead in access and usage. Why hamper them with the requirements to work with systems that were based on 1970s technology? We shouldn't.

We have to start from the beginning. Build new local access infrastructures and then begin to explore ways of intercommunications based on the tradition of amateur

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The Tucson Amateur Packet Radio Corporation is a non-profit scientific research and development corporation [Section 501(c)(3) of the U.S. tax code]. Contributions are deductible to the extent allowed by U.S. tax laws. TAPR is chartered in the State of Arizona for the purpose of designing and developing new systems for digital radio communication in the Amateur Radio Service, and for disseminating information required during, and obtained from, such research.

Article submission deadlines for upcoming issues:

Summer 1997	June 15, 1997
Fall 1997	September 15, 1997
Winter 1998	December 15, 1997
Spring 1998	March 15, 1998

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.



President's Corner, continued...

radio ingenuity and availability. We cannot expect much of the technology currently installed to support the speeds of access for enabling long distance communications that these new technology implementations represent. The only thing that does remain viable in many of the networks today are the sites, the sites, and the sites. Sites are one of the most valuable resources we have today and they get used with any new technology that comes along.

For the many who 'rant and rave' concerning what I am saying in this column (the possible abandonment of long distance 1200 and 9600 baud systems), they have missed a major point -- these systems have already collapsed in many parts of the US. While some are still functioning, this is because of a few dedicated volunteers maintaining them. However, without a new technology influx to stir activity once again and keep the interest of current and future participants -- total collapse and stagnation is very apparent in the future of our aspect of the hobby and possibly the hobby as a whole.

We seem to have basic choices to make. Do we remain the same, using and supporting current technology with limited people to do this or use our talent and resources to push forward into the future and develop new systems and operating benefits. There is some overlap in both, but trying to do both will limit our resources for accomplishing our goals and later implementing them in any wide scale solution that really move the hobby forward.

Now on to little lighter subjects.

Elections

The last issue of the PSR had the election ballot for Board of Directors. First, I would like to thank all those who took the time to ballot by mail or over the Internet. The web based ballot system received over 90 percent of the ballots cast. From the response we received, I will ask the board to keep this system in place for next year. If you have comments on the balloting process, please let me know so we can look at ways to improve it in the future. Now to the election results.

The results of the election are as follows:

Greg Jones, WD5IVD, wd5ivd@tapr.org, 89.10%
Mel Whitten, K0PFX, k0fpx@tapr.org, 71.08%
John Koster, W9DDD, w9ddd@tapr.org, 68.67%
Steve Stroh, N8GNJ, n8gnj@tapr.org, 66.26%

I would like to welcome back to the board John Koster, W9DDD and Mel Whitten, K0PFX. This was a very close election, with one write-in vote for Ron Parsons, W5RKN. Steve Stroh, N8GNJ, will be continuing in his secretary position. Steve has brought a lot of new energy as an officer to TAPR. Thanks to all the members who voted.

Dayton 1997

Dayton Hamvention will be here before we know it. This year looks really good in the way of presenters for the TAPR Digital Forum on Friday, items being introduced and available at the booth, and the PacketBASH banquet on Friday night, which really looks better than last ever.

There are plans to transmit audio live from the TAPR Digital Forum on Friday on TAPR.ORG. There will be a special link on the home page as of Dayton to allow you to get this audio page. In addition, we will be providing audio on Saturday for another forum event with Len Winkler; keep an eye out for that one as well. If you don't get to listen to either of these events from Hamvention live, they will be on the site afterwards. It is also our hope to show off a Spread Spectrum connection between the TAPR Digital Forum and the TAPR booth on Friday to allow presenters to use the Internet or present their overheads off the server in the booth or even from their home sites! If this works out okay, there are some additional plans to use the same radios to provide Cu-SecMc video from the TAPR booth and from the surrounding Hamvention areas onto the Internet using Spread Spectrum communications. That should really be a good show of how Spread Spectrum works even in the RF environment of the Dayton Hamvention -- or maybe that it doesn't work there :-). We will just have to wait and see as the event unfolds. Be sure to drop by any of the events and say hello!

If you haven't been to Dayton before, you should think about coming this year. The dates for this year are May 16th - 18th. Check out the web page <http://www.tapr.org/tapr/html/dayton.html> for any last minute changes in the schedule. The schedule of events will appear later in the PSR, but things do sometime change at the last minute.

ARRL/TAPR DCC 1997

The date has been set for the 1997 ARRL and TAPR Digital Communications Conference. It will be held on October 10-12, 1997 in Baltimore, Maryland, just a few miles from the BWI airport. I flew up the first of March and met with the AMRAD folks to select the final hotel and sign the contracts. The airport seems to have decent prices to various parts of the US and the hotel has excellent service. The full details on the conference appears later in the PSR and there are going to be some great seminars and symposiums this year to attend, along with the conference. In addition, there will be a TAPR membership meeting during the conference. That was something that was brought up last year and it has been added.

Spread Spectrum Issues

Lots is happening on the Spread Spectrum front. While many members were disappointed by the collapse

President's Corner, continued...

of the Freewave deal (including me), we are continuing along the road of system development and rules change. The FCC released Docket 97-12 on March 3rd, 1997. Check <http://www.tapr.org/ss> for the text of the docket. First comment date is May 5th, 1997. The TAPR Regulatory Affairs Committee, chaired by Dwayne Hendicks, WA8DZP, is working on the TAPR comment to the rule making. TAPR will continue to attempt to make as much of the information about Spread Spectrum rule-making available on the Internet as possible, so everyone can follow what is being written. Concerning system development, there are two groups working on proposals for TAPR to review in the next few months. Both groups have asked for their identity to be kept confidential for the time being so they can focus on their work. Either design could be something that TAPR could take and develop in the coming 12-18 months into very interesting outcomes.

Until next quarter and lots more fun!
Cheers - Greg, WD5IVD

Rockets for Schools - Super Loki High Altitude Rocket Launch

Greg Heinen
heineng@orbitec.com

An Opportunity for Dayton Hamfest Goers

KB9OBV, WB8WKN, and KH9NHL request Dayton HamVention goers to view our ATV and Packets from space while at Dayton.

Rockets for Schools and High-Gain APRS/ATVers

Amateur Television will once again be part of the Aerospace States Association Rockets for Schools program. Two ATV payloads are scheduled for Super Loki sub-orbital launches as part of this year's MI/WI Rockets for Schools project. The joint Wisconsin and Michigan event will be held the weekend of May 16 and 17, 1997 in Sheboygan, WI. The Loki launches are currently scheduled for 1:15 pm and 3:15 pm on Saturday, May 17, with weather back-up windows on both Friday and Sunday. The ATV payloads have been developed by the local Rockets for Schools project, with help from the Aerospace States Association (ASA). This is a continuation of last year's project which included ATV carried by a Super Loki from Sheboygan on May 4, 1996 to an altitude of well over 30 miles. See Feb. *QST* or the Web site (<http://www.phy.mtu.edu/rocket>) for any details on last year's payload and this year's schedule.

The Rockets for Schools project is intended to increase student interest in science, math and aerospace sciences. This year students will not only participate in the

sub-orbital rocket launches but will also help to launch student-constructed, Tripoli approved, high-power amateur rockets as well. Students from each congressional district in Wisconsin and Michigan were given an opportunity build their own high-power rocket, with their own payload, to be launched from the Sheboygan Spaceport during the weekend event.

The center piece for the weekend will be the launching of two sub-orbital Super Loki rockets to an altitude of over 30 miles. The Super Loki rockets were donated to the project by the Aerospace States Association and will be launched by a professional crew from the Florida Space Port Authority. Based on the success of the Amateur Radio Television payload last year, Amateur Radio equipment for this year's payload is also being constructed.

Super Loki Payload I (1:15 pm) will have B&W ATV on 434.25 MHz and Morse ID and telemetry on the audio subcarrier. The ATV transmitter is an ATVM-70 from PC Electronics, boosted to 1W using an SAU35AH UHF power module. Payload I will include an experiment to investigate the influence of different optical filters on the image quality. This payload is packed with battery power and should provide images for as long as two hours as it descends into Michigan.

Super Loki Payload II (3:15 pm) will have ATV (439.25MHz), and carry a Jupiter Zodiac GPS receiver. A microcontroller will form APRS compatible AX.25 output, and be sent on audio. The race is on to interpret the binary output of the Jupiter board to supply data above 57,000 feet. Even if that is not possible, APRS data should be available below 57,000 ft. The current plan also calls for the development of an on-board frame-grabber. The frame grabber will allow a smaller number of individual video frames to be sent many times allowing for improved images after video averaging, post processing, etc. A Wisconsin Space Grant has been applied for to help with the post-processing and production of educational materials from the launch. Please keep your video and audio tapes.

A high-altitude balloon launch is anticipated, however a time has not been set, but is expected to be at 9:00 Central time. A schedule for the balloon launch will be available from <http://www.carthlab.com/rockets>. If you have questions or would like to help with this event, please do not hesitate to contact me (heineng@orbitec.com). Help is needed to organize, launch, and track (fox hunt) a balloon, possibly with ATV or APRS. Dayton Hamfest goers should even be able to track our north-lying payloads if they have sufficient horizon clearance. Even a simple (cheap) VHF beacon or ID'er would be a fun balloon payload.

TAPR Dayton Activities '97

TAPR again will be very active at this year's Hamvention. If you are attending Dayton, please take a look at the following schedule. We have tried to improve upon last year and we believe we have. Come join us at the Digital Forum on Friday and then come have Dinner and a good time that evening at the PacketBASH.

Our booth will be in its usual place and activity around the booth is expected to be high, with Spread Spectrum operating and Tom McDermott, N5EG, at the booth signing his new book! It is expected that the new TAPR MIC-E kit will be available as well!

TAPR Schedule

Friday

12noon — Exhibit Area Opens

1:00pm — TAPR Digital Forum Begins

7:00pm — PacketBASH (Dinner, Prizes, SIG meetings, Tom Clark, W3IWI, Banquet Speaker!)

Saturday

8am — Exhibit Area Opens

6pm — Exhibit Area Closes

Sunday

8am — Exhibit Area Opens

2pm — Exhibit Area Closes

1997 TAPR Digital Forum (Friday)

The TAPR digital forum should be a great forum this year. If you have time at Dayton — be sure to attend!

1:00-1:45pm - Introduction to Spread Spectrum Communications. Steve Bible, N7HPR

1:45 - 2:00pm - Update on TAPR. Greg Jones, WD5IVD

2:00pm - 2:40pm - Building TCP/IP Networks in the Amateur Radio Community. John Ackermann, AG9V, and Allen Finne, KB5SQK

2:40pm - 3:00pm - Review of current Spread Spectrum Developments. Barry McLarnon, VE3JF, and Dewayne Hendricks, WA8DZP

3:00 - 3:20pm - Topic to be announced. Tom McDermott, N5EG

3:20 - 3:40pm - Topic to be announced. Phil Karn, KA9Q

3:40 - 4:00pm - TAC-2 (Totally Accurate Clock) GPS Project. Tom Clark, W3IWI

4:00 - 4:20pm - RUDAK-U Update. Lyle Johnson, WA7GXD

4:20 - 5:00pm+ - APRS Update and TAPR APRS SIG Meeting. Bob Bruninga, WB4APR and Keith Sproul, WU2Z.

1997 Packet Bash!

The 1997 "Packet BASH" co-sponsored by TAPR and the Miami Valley FM Association, Dayton's packet radio club, will be held on Friday of the Dayton Hamvention. The event will be held at the NCR "Sugarcamp" Conference Center and will be catered. The dining room holds about 300 people! So the more the merrier! Dinner space will be limited, so make your reservation early for dinner, so that the correct number of dinners can be ordered in advance.

An event for the digitally-inclined ham, featuring:

- Buffet dinner
- Nationally-known speaker Tom Clark, W3IWI
- TAPR special interest group meetings
- "Birds of a Feather" gatherings

We hope that this will provide an opportunity for packet and digital radio enthusiasts to have a great night out while at Hamvention.

The schedule of events for the PacketBASH is still tentative, but will look something like this:

1900 — Doors Open (7pm)

1930 — Dinner (7:30pm)

2030 — Speaker, raffle, and SIG meetings after dinner

Talk-in will be on 146.415 simplex. Directions:

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

For more information, send email to "packbash@ag9v.ampr.org" or stop by the TAPR booth at Dayton for schedule and map. The maps are currently available on <http://www.tapr.org>

The dinner cost is \$20.00 per person, tax and tip included. Banquet tickets can be ordered from the TAPR office. Reservations made before May 1st will have their tickets mailed to them. After May 1st, tickets purchased will be available for pickup at the TAPR booth. Walk-up to the event will be accommodated as best as possible. There is limited space (in the way of food ordered) for dinner. Amateurs who wish to hear the speaker and discussion are asked to arrive around 20:30 (8:30pm). All amateurs are welcome to attend, enjoy the speaker, and participate in the meetings, although only those purchasing a dinner can eat.

To register, contact the TAPR office.

Selective Availability: What is it?

Tom Clark, W3IW1

[From the APRS-SIG]

In the context of the I.S. discussions, the words Selective Availability (SA) have come up several times. Let me give a little tutorial on SA.

In general SA, as defined by the Department of Defense (DoD), is a way for the U.S. Government to control the accuracy of the GPS system for different classes of users. For this discussion, let us realize what the essence of the GPS system is:

- a) Multiple satellites, each carrying an atomic clock that broadcasts precise timing signals.
- b) A message structure that tells where the satellite is located.
- c) Additional message information that convert the PRECISE timing signals into ACCURATE timing signals.

The GPS timing signals have a precision (smoothness) at the nanosecond (nsec) level. The typical GPS "consumer" (I'll call him the PDU — Poor Dumb User) uses the 1.023 MB/s C/A code timing signals. The PDU's receiver therefore has a ruler with rulings spaced by the wavelength of the ~1 MHz signal, i.e. about 300 meters. His receiver can "split" the 1 MB/s signal and interpolate to a few percent of 300 meters — typically achieving a relative timing measurement equivalent to the 10-30 meter level.

The PDU's receiver gets similar information from several other satellites. The minimum number is 4 if a 3-D position is to be determined, since the receiver's clock must also be set (3 satellites is enough for a 2-D position). These timing measurements are historically called "pseudoranges" — "pseudo" since they are relative to the receiver's internal clock.

To compute a location, the PDU (more precisely, his receiver) must know how far the satellites are from him. Here, we make use of the fact that embedded in the digital data coming down from the satellite is a digital message; the actual message sent by each satellite is 1500 bits long, sent at a rate of 50 bits/sec, and repeated every 30 seconds. In this message is included accurate Keplerian elements for the satellite which are updated several times per day by the DoD controllers. Since we know the current time (from the GPS timing data) we can calculate the position of the satellite. Also embedded in the message are some simple polynomial coefficients that allow the calibration of small (typically less than 1 usec) errors in the atomic clocks.

From the pseudoranges to several satellites, from the Keplerian elements, and from the reported clock errors we now have enough information to do the requisite trigonometry and compute our position. Our accuracy is limited by the basic pseudorange measurement accuracy and by our (in)ability to calculate the geometry. Under "good" conditions, the PDU's receiver achieves a positional accuracy in the 25 meter range, limited by

- (a) errors in the raw pseudorange measurements
- (b) errors in the computed satellite positions
- (c) errors in the correction of the timing data.

The first, (a), is a function of the PDU's receiver. The latter are determined by the accuracy of the DoD's message information. It is (b) and (c) that the DoD can "diddle" to limit the user's accuracy, and they constitute the essence of Selective Availability.

For various reasons (mostly due to the laws of physics), the DoD can't do much about (b), so all users have comparable accuracy knowledge of the satellite's position. What the DoD can (and does) do falls under (c), creating clock timing errors.

On the GPS spacecraft, all signals are derived from one clock (Cesium, with Rubidium backup) which produces a 10.23 MHz signal. In the output of the frequency standard, let's put a variable line stretcher (actually a programmable phase shifter) about 100 meters long and then let's train a mouse to stretch the line according to a pattern that is known only to a few folks (but not the PDU). If you know what the mouse is doing, you can correct for it. If not, then your measurement accuracy is reduced.

So here's all SA is: a smart (digital) mouse with a (digitally programmable) line stretcher! The DoD has made agreements that it will restrict the length of the line stretcher and that it will restrict the speed at which the line is stretched so as to impose controlled chaos on the civilian community (and not allow boats to crash). For example, the rate is controlled so that speed determinations won't be in error by more than ~1 MPH (about 1 Hz frequency offset at L-band). Since the line stretcher is finite in size, the long-term average effects are ZERO.

I've done measurements of the power spectrum of SA and have found that most of the energy is in the time range from a few seconds to ~1/2 hour. I later found out that SA is implemented as a series of coefficients at periodicities [1,2,4...1024,2048] seconds (and 2048 seconds jibes with my ~1/2 hour measurements). The DoD encrypted users know the coefficients while the PDU does not. The PDU puts up with positional errors of up to ~100 meters which

would have been at the ~25 meter level if SA were not imposed.

How to beat SA: Two ways come to mind. The first, already mentioned, is that the long-term average of SA is zero. If you have a day, then you simply average out SA's errors.

The second involves differential measurements. Two receivers tens of km apart will see the same SA modulation. If one of these is used as a reference station and its position is assumed to be known perfectly, then it can transmit the current error it sees in the pseudorange for each of the GPS satellites. A remote PDU receives the correction signals and subtracts the "dither" from his pseudorange measurements. In doing this we correct some other errors too:

- (1.) The SA clock "dither" already discussed, as well as errors in clock models broadcast by GPS
- (2.) Errors in the ephemeris data sent by GPS are common to both ends, so the errors cancel.
- (3.) The signals from GPS have to propagate thru the earth's atmosphere and ionosphere and are subject to uncalibrated delays. The atmosphere is similar over distances of tens of km, so these errors tend to cancel out.

So with Differential GPS (DGPS) corrections, the "nasty" effects of SA are removed AND other errors are corrected also. Depending on the rate at which correction signals are sent out (typically 1/sec to 1/30sec), the quality of the receivers on both ends, and the distance between the two ends, DGPS results are often in the 1-10M range (several-fold better than the ~25 meters if SA were turned off!). Some special DGPS techniques (involving carrier phase in addition to the use of the coded signals) push real-time DGPS results into the cm-level.

In the Baltimore/Washington/North VA. area, DGPS corrections (at a 1/20 sec rate) are available on 145.79 MHz from W3IWI-13. Around the USA, DGPS signals broadcast by the Coast Guard are available on ~300 kHz. Two commercial suppliers (DCI-Differential Corrections Inc and Acqupoint) provide DGPS signals to subscribers using subcarriers on FM broadcast transmitters.

FCC Demos Electronic Filing System

The Federal Communications Commission (FCC) demonstrated its electronic filing system at CTIA's Wireless 97 Convention in San Francisco, CA from March 3-5, 1997. Electronic filing is available for approximately 75% of the services licensed by the FCC's Wireless Telecommunications Bureau (WTB). These services include: Personal Communications Services, Land Mobile Radio Services, General Mobile Radio Service, Land Mobile Broadcast Auxiliary Service, **Amateur Radio Service** and Interactive Video Data Service license applications. Through the use of electronic filing, applicants have several options: (1) Electronic Data Interchange (EDI), or the exchange of business information electronically between organizations without human intervention; (2) Electronic Transfer (E/T), or the exchange of business information electronically in a designated record layout provided to an organization by the FCC; and (3) Interactive point-to-point filing over the FCC Wide Area Network (Interactive), or an exchange of business information by accessing the FCC on-line computer and interactively entering data. Additionally, the WTB will be unveiling a World Wide Web-based application that will permit applicants to file comments to ongoing proceedings before the Commission, and it will also demonstrate a prototype geographic information system for querying the WTB's cellular licensing database.

Since the inception of electronic filing, the WTB has developed several methods to permit electronic filing of applications for auctionable services and for participation in the auction process. Through public notices and other press releases, the WTB has attempted to convey to the public the importance and ease of using the electronic filing software. This demonstration allowed the public to have an opportunity to test and ask questions about the service. The FCC would like to inform the public of the existence of this capability and also to make the public more comfortable using electronic filing.

Area Code Change

The TAPR office phones will undergo an area code change in May.

Like many others in the U.S., the TAPR office is about to be affected by an area code change. In May, the new area code will be changed to 940. There has been some delay on the issue, because the phone company was trying to split Denton county into four area codes and there was a lot of movement to try to cut this down. Now it is only three area codes.

Starting in May, the TAPR phone numbers will be:

940-383-0000 Office Voice
940-566-2544 Office Fax

**1997 ARRL and TAPR Digital
Communications Conference
October 10-12, 1997
Baltimore, Maryland (minutes from BWI
airport)**

Web: <http://www.tapr.org/dcc>

It's that time again! Time to start making your travel plans and thinking about what to publish for the upcoming 16th Annual ARRL and TAPR Digital Communications Conference. 1997 marks the second year in which the ARRL Digital Communications Conference and TAPR Annual General Meeting have joined into one conference!

The ARRL and TAPR Digital Communications Conference is an international forum for radio amateurs in digital communications, networking, and related technologies to meet, publish their work, and present new ideas and techniques for discussion. Presenters and attendees will have the opportunity to exchange ideas and learn about recent hardware and software advances, theories, experimental results, and practical applications. The Digital Communications Conference is not just for the digital expert, but for digitally-oriented amateurs of all levels of experience.

The 1997 ARRL and TAPR Digital Communications Conference will be held October 10-12, 1997 in Baltimore, Maryland. This year's conference location is just minutes away from the BWI (Baltimore/Washington International) Airport.

Not only is the Digital Communications Conference technically stimulating, it is a weekend of fun for all who have more than a casual interest in any of the ham digital communications modes. This includes BBS operators, networkers, DX-Cluster Sysops, software writers, modem designers, and digital satellite communications enthusiasts. The ARRL and TAPR Digital Communications Conference is for all levels of digital operators — a must conference to attend to get active on a national level. Now, more than ever, amateur radio needs this great meeting of the minds, since it is important that we demonstrate a continued need for the frequency allocations we now have by pushing forward and documenting our achievements. The ARRL and TAPR Digital Communications Conference is one of the few ways to record our accomplishments and challenge each other to do more.

A Conference for the Beginner as well

The conference is not just for the expert. This year's conference will again provide an entire session strand with beginning, intermediate, and advanced presentations on selected topics in digital communications. Some of the topics will include: APRS, Satellite Communications, TCP/IP, Digital Radio, Spread Spectrum and other introductory topics. Come to the conference and hear these topics presented by the

experts! Don't miss this opportunity to listen and talk to others in this area.

Symposiums and Seminars

In addition to the presentation of papers on Saturday, three symposiums/seminars will be held before and after the conference. These sessions are provided to allow those with additional time and interest to make the most of the Digital Communications Conference. For those that might have interest in just a symposium or seminar, registration for the conference is not necessary to register and attend one or more of the symposiums and seminars. This allows maximum flexibility for those that might want to participate during the Digital Communications Conference, but do not have an entire weekend to devote to the event.

A full day symposium on Friday covering APRS will be conducted by Bob Bruninga, WB4APR (father of APRS), Keith Sproul, WU2Z, Mark Sproul, KB2ICI (developers of Mac and Windows APRS), Steve Dimsc, K4HG (developer of javAPRS), and other nationally known APRS developers. Join this group for the afternoon and evening for in-depth discussions and presentations on the current and future status of APRS. This is a unique opportunity to gain insight into this fast growing digital aspect of amateur operations that combines computers, packet radio, and GPS (Global Positioning System).

Starting late Friday afternoon a half-day seminar entitled "RF Basics for Computer Weenies: Helping the RF-challenged get the most out of the new high-speed wireless toys." The seminar will focus on such topics as basic antenna types and their characteristics, comparison of feedlines and connector types, propagation basics (calculation of path loss, multipath effects, Fresnel zones, etc.), weatherproofing, lightning protection, filters, basic RF measurements, and other issues related to maintaining radio equipment on the UHF/VHF bands. This seminar will be starting late enough in the afternoon on Friday to allow those flying in on that day to attend the seminar.

On Sunday morning, Dwayne Hendricks, WA8DZP, Phil Kam, KA9Q, and Tom McDermott, N513G, will conduct a seminar focusing on "Spread Spectrum system design and theory." All three presenters are well known for their work in various areas of amateur digital communications and this 5 hour seminar should be an excellent opportunity to learn about the design and theory of spread spectrum systems. This seminar is a follow up to the past two seminars of PCS technology by Dwayne with a new focus on system design.

2nd Annual ARRL and TAPR DCC Student Papers Award

ARRL and TAPR especially welcome papers from full-time students to compete for the second annual student papers award. Two \$500 travel awards may be given, one in each of the following categories: a) best

technical/theory-oriented paper by a student, and b) best educational or community-oriented application paper by a student. The paper should relate directly to a wireless digital communication topic (see guidelines for more information). Papers coauthored by educators or telecommunications professionals are also eligible for this award, as long as a student is the first author. Deadline for receipt of finished student paper manuscript: is June 20th, 1997. Please note that this deadline is different than the general conference submission date. For full details and paper guidelines contact TAPR or check <http://www.tapr.org/dcc>.

Call for Conference Proceeding Papers

Anyone interested in digital communications is invited to submit a paper for publication in the Conference Proceedings. Presentation at the Conference is not required for publication. If you know of someone who is doing great things with digital communications, be sure to personally tell them about this! Papers are due by August 20th, 1997, and should be submitted to Maty Weinberg, ARRL, 225 Main Street, Newington, CT 06111 or via the Internet to lweinberg@arrl.org. Information on paper submission guidelines are available on-line (<http://www.tapr.org/dcc>).

Local Co-Host

The 1997 ARRL and TAPR Digital Communications Conference will be co-hosted by AMRAD (Amateur Radio Research and Development Corporation).

The Amateur Radio Research and Development Corporation (AMRAD) is a worldwide club of amateur radio and computer experimenters whose purpose is to develop skills and knowledge in radio and electronic technology, advocate design of experimental equipment and techniques, promote basic and applied research, organize technical forums and symposiums, collect and disseminate technical information, and provide experimental repeaters. <http://www.amrad.org>

What can you expect during the 1997 ARRL and TAPR Digital Communications Conference?

- A full day of papers, breakout sessions, and selected topics on Saturday for the beginner to the advanced amateur digital enthusiast.
- Three seminars/symposiums:
 - Friday (1pm) - APRS
 - Friday (3pm) - RF Basics for Computer Wccnies
 - Sunday (8:30am) - Spread Spectrum System Design and Theory,
- The second annual Student paper awards.
- TAPR Membership Meeting
- A banquet with Special Guest Speaker (TBA)
- SIGs (Special Interest Groups) on Saturday following the banquet.
- Informal get-togethers throughout the weekend.
- A meeting facility that is perfect for this type of meeting.

- Informal engineering discussions/demonstration areas.
- An event at which the most important new developments in amateur digital communications are announced.
- Digital 'movers and shakers' from all over the world in attendance.

Conclusion

If you have attended a Digital Communications Conference in the past, just remember back to how much fun it was discussing the latest developments into the wee hours! If you have never been, then make your plans now to attend and find out how much fun the Digital Communications Conference can be.

There are few activities where the importance of your participation can be so much fun and important! What a great way to share and renew your enthusiasm for digital amateur radio! Getting together with colleagues from all over the world and bringing each other up to date on your latest work. All this, and more, for an unforgettable weekend of ham radio and digital communications. Make your travel and lodging arrangements now. We hope to see you at the ARRL and TAPR Digital Communications Conference October 10-12!

Full information on the conference and hotel information can be obtained by contacting Tucson Amateur Packet Radio, 8987-309 E. Tanque Verde Road #337, Tucson, AZ 85749-9399. Phone: (817) 383-0000. Fax: (817) 566-2544.

Internet: tapr@tapr.org

Web: www.tapr.org/dcc

Steve Ford, WB8IMY, ARRL Conference Co-Chair

Greg Jones, WD5IVD, TAPR Conference Co-Chair

Paul Rinaldo, W4RI, Local Host Liaison

Steve Stroh, N8GNJ, Asst Conference Manager

Note: If you need handouts or flyers for meetings, contact TAPR about getting what you need!

Hotel Information

Conference presentations, meetings, and seminars will be held at the Holiday Inn BWI Airport. DCC special rooms rate is \$89 per night. When making reservations with the hotel, be sure to indicate you are attending the ARRL and TAPR DCC conference to get the discount. It is highly recommended that you book your room prior to arriving - a block of 75 rooms is reserved until September 9th, 1997. After the 75 rooms are booked, rooms will only be available in nearby hotels. Be sure to book your rooms early! The hotel provides transportation to and from BWI Airport, nearby Amtrak/MARC rail station, and the local Baltimore Light Rail. Please contact the hotel to arrange specific transportation needs.

Holiday Inn BWI Airport (conference hotel)
890 Elkridge Landing Rd, Linthicum, MD, 21090
(410) 859-8400, Fax (410) 684-6778

Contact TAPR to register for the DCC.

*** Connect Request

[From the APRS-SIG]

From: "Doug Wetzel, K7IP" dwetzel@earthlink.net
To: aprssig@tapr.org
Subject: GPS-20

Having just completed my GPS-20 based tracker and now recovering from the horrible experience of building the subminiature connector from hell, I'm wondering if anyone on the sig with a GPS-20 has experienced consistent very long acquisition and lock-up times.

The tracker works great when locked, but even after a sky search, the GPS-20 still takes as long as 20 minutes to finally acquire enough satellites to work with. Occasionally it locks in three or four minutes, but I've never seen the 15 seconds or so the docs mention. I'm also using the Trimble amplified antenna, and seeing good S/N ratios on the birds when locked.

Weak lithium battery, maybe??

From: T Kealey (Terrance Kealey) KI0BF, tkealey@mdc.com
To: aprssig@tapr.org
Subject: Re: GPS-20

Sounds like you are either losing memory at power down (battery) or you do not have a good view of the sky (antenna). I normally get a good position fix within 2 minutes of powering up the GPS-20. The 15 second time that Garmin specs is for a "hot" start which is when the unit has been tracking satellites and is turned off for a short period (15 to 30 minutes). The unit will have current time, position, almanac, and ephemeris data and can provide a quick position fix without having to look for satellites and collect ephemeris.

If you have a battery problem, then I would look at the GPS time output at power up. It should be the current UTC time give or take a few seconds.

It appears that your antenna itself is not the problem since you have good satellite signals. The C/N values should be in the 40s since you have amplified antenna. I originally had tracking problems with the QST patch antenna I made and had C/N in the 30s and rarely tracked more than 4 satellites. The receiver will lose lock on a satellite around 33. Some antennas do better with a ground plane, others do not care, and I have even heard a few that got worse performance with a ground plane — so if your signals are low, you might want to experiment a little.

Make sure you are tracking 3 or 4 satellites or you will not get a position fix. Unfortunately the GPS-20 quits outputting position data if it is not tracking enough satellites or their geometry is not good

enough (high DOP). Normally you should see at least 5 satellites at all times and many times I see it tracking 7 or 8 satellites. If you are normally tracking less than 5 satellites, make sure your antenna has an unobstructed view of the sky or if you are using the antenna in a window, the south side of the building is preferred (in the northern hemisphere). If you have placed your antenna in a window, do not expect the receiver to track all the time - you will have numerous outages.

One other problem I have noticed with the GPS-20 is when it is left on for a long period without tracking satellites (i.e. antenna not hooked up or antenna shaded in garage), the receiver will take longer to acquire. Many receivers have a dead reckoning mode where they use the last known velocity to update the navigation solution when the receiver has lost satellites. The receiver will take small velocities last stored in the receiver and move the position hundreds of miles overnight. I would suggest turning the receiver off if it will not be tracking satellites for a long period.

GPS receivers also acquire satellites quicker after a power cycle. If the receiver has not output a position fix for 5 minutes, turn the receiver off for a few seconds. Wait at least 20 to 30 minutes the first time the receiver is powered up before trying a power cycle. The receiver is probably doing a search the sky acquisition and will need about 13 minutes after it finds the first satellite to download almanac.

Most GPS receivers take longer to get an initial position fix when they are moving. If possible wait a couple of minutes after the receiver has been powered up before speeding off down the road.

Sorry for the long winded explanation, but I tried to give a complete list of things to try, based on your description of the problem.

N7HPR is Guest on Ham Radio & More

TAPR's very own Steve Bible, N7HPR, was a guest on Len Winkler's Ham Radio & More Show Sunday, March 30th. The topic was the new spread spectrum plan.

If you were not able to hear the show, it is now available on-line. To listen to the show you can visit either:

<http://www.tapr.org/ss>

or

<http://www.tapr.org/hrm>

Proposed Amateur Spread Spectrum Rules Changes

[The following is an edited version of FCC Docket 97-12, the NPRM regarding Spread Spectrum communications. The unedited version is available in Text, word, and pdf format on: http://www.tapr.org/ss/rule_changes.html]

In the Matter of WT Docket No. 97-12: Amendment of the Amateur Service Rules to Provide For Greater Use of Spread Spectrum Communication Technologies - RM-8738

Notice Of Proposed Rule Making

Adopted: January 9, 1997

Released: March 3, 1997

Comment date: May 5, 1997

Reply comment date: June 5, 1997

I. Introduction And Executive Summary

1. On December 12, 1995, the American Radio Relay League, Inc. (ARRL) filed a petition for rule making ("Petition") requesting amendment of the rules to allow amateur stations to transmit spread spectrum ("SS") type emission technologies employing additional spreading sequences. It also requests that each SS transmitter be required to incorporate a device to automatically limit its power to that actually necessary to carry out the communications. The ARRL believes that these rule changes would facilitate the ability of the amateur service to contribute to the development of SS communications.

2. This Notice of Proposed Rule Making ("Notice") proposes to amend the Commission's rules for the Amateur Radio Services to authorize amateur stations to make greater use of SS type emission technologies. We believe that our proposed rule changes will allow amateur operators to develop innovations and improvements to communications products, and develop new communications technologies. We believe these proposed rule changes also would allow amateur operators more flexibility to use current and future communications technologies, encourage the amateur service community to expand its experimental activities with SS, and allow amateur stations to transmit SS type emissions that presently are transmitted by other communications devices. These proposed changes also are consistent with our general policy of allowing licensees flexibility to develop more effective and efficient uses of the radio spectrum.

II. Background

3. Spread spectrum is a technique whereby the energy of the transmitted signal is distributed over a wide segment of spectrum. The signal power density can be very low and the duration of a transmission on any

frequency in the segment of the spectrum can be but a fraction of a second. SS systems, therefore, can evenly share all of the spectrum in the available frequency segment, despite a number of stations transmitting simultaneously. They can often share the same spectrum unobtrusively with non-SS systems because the transmissions may not be noticeable to a casual listener.

4. Special Temporary Authority to experiment with SS transmissions was granted to 25 amateur stations affiliated with the Amateur Radio Research and Development Corporation 16 years ago. These experiments involved on-air evaluation of different spreading rates, frequency ranges, and interference to stations transmitting other emission types. On the basis of these tests, two types of spreading techniques — frequency hopping and direct sequence — were authorized by our rules. Under our current rules, SS transmissions may be made on authorized amateur service frequencies above 420 MHz with transmitter powers up to 100 watts. Since introduction of SS in the amateur radio service, numerous commercial applications of SS have also evolved, including personal communications services, remote meter reading and position locating.

III. Discussion

5. Comments. The Petition was placed on Public Notice January 26, 1996. In response to the Public Notice requesting statements opposing or supporting the Petition, we received 32 comments and reply comments. The majority of commenters support additional SS communications because of the benefits that may come from experimentation, but suggest that SS be limited to specific spectrum segments of the amateur service frequency bands to protect stations engaged in other types of communication. Some commenters oppose SS due to concerns that greater use of SS will result in interference to amateur stations engaging in satellite communications, weak signal terrestrial and Earth-Moon-Earth communications, and repeaters. In reply, the ARRL argues that the interference potential would not significantly increase because the rules already authorize SS on these amateur service bands. Also, the ARRL points out that concern regarding interference to repeaters is unfounded because most repeater usage occurs on the amateur bands below 420 MHz.

6. Two commercial Part 15 interests, Metricom and Symbol Technologies, request that new types of amateur SS transmissions in the 902-928 and 2400-2450 MHz amateur frequency bands be prohibited or alternatively, that radiated power limits for new SS types be limited to those governing the unlicensed Part 15 devices with which these bands are shared. Metricom, a service provider using unlicensed devices, acknowledges that spread spectrum experimentation accomplished in the amateur radio service enabled it to develop what it

describes as its own technologically leading edge SS systems. However, Metricom also argues that increasing the flexibility for amateur operators to experiment with new types of spread spectrum designs in these two bands would disturb the balance in sharing these bands among different users. Metricom expresses particular concern regarding the 902-928 MHz band, citing our recent Report and Order establishing rules for Automatic Vehicle Monitoring Systems. In an Ex Parte filing, Metricom also expresses concern that amateurs operators will obtain commercial Part 15 SS devices and modify them for use under our Part 97 rules. Symbol, a manufacturer of unlicensed devices that operate in these two bands, argues that the disparity between authorized power for amateur stations (100 watts with unlimited antenna gain) and authorized power for unlicensed devices (1 watt with 6 dBi antenna gain) will affect the operation of unlicensed devices in the vicinity of amateur stations.

7. In reply, the ARRL argues that the potential for interference in these bands would not increase significantly because SS has been authorized at the proposed power levels for more than a decade. The ARRL goes on to note, however, that in its petition it proposed to control power by proposing to require automatic transmitter power control to limit radiated power to that level necessary to maintain communications. The ARRL acknowledges the underlying concern that amateur operators might purchase and modify commercial SS products. In response to this concern, ARRL contends that even if this were to occur, interference would be unlikely because such products likely will be designed to use different spreading codes and sequences so that they will not interact with each other when used as unlicensed devices. ARRL further contends that this design feature will minimize interference whether used as unlicensed devices or as amateur stations. Finally, the ARRL notes that the amateur radio service is a licensed service entitled to protection from interference, whereas unlicensed Part 15 devices have no interference protection rights under our rules and no domestic or international allocation status.

8. We believe that the amendments requested would increase spectrum efficiency and allow amateur operators to contribute to technological advances in communications systems and equipment. Experiments conducted by amateur operators have shown that stations transmitting SS emissions can co-exist with other amateur stations, and in many cases these spread spectrum emissions are undetectable by other amateur stations. SS publications in the amateur service community, and the comments of the ARRL, show that the effect of restricting amateur stations to using two spreading techniques has been to prevent amateur service licensees from incorporating into their operations technical advances

that have been developed in other services. We agree that the current rule prohibits amateur stations from using SS emission types that are routinely used in other communication services, and that such a prohibition is inconsistent with the experimental purpose of the amateur service. As requested by the ARRL and Part 15 equipment providers, we propose to require that automatic power control circuitry which reduces the radiated power of an amateur station transmitting an SS emission to the minimum level necessary to conduct communications, be included in SS equipment. Additionally, we solicit comments, regarding other methods that are available to minimize any potential interference between amateur station operations and Part 15 devices. Accordingly, we tentatively conclude that these amendments are appropriate and consistent with the underlying purposes of the amateur service. We propose, therefore, to facilitate the desire of amateur operators to experiment with, develop, improve, and test practical SS systems.

9. In view of the foregoing, we propose to amend the amateur service rules to allow amateur stations greater flexibility in transmitting SS communications. Specifically, we propose to eliminate the rules that restrict amateur stations to transmitting only frequency hopping and direct sequencing spreading techniques. These proposed rule changes are consistent with our policy of encouraging greater spectrum flexibility by enabling licensees to introduce innovative technologies and to respond quickly to demands for new and different services and applications, without administrative delays.

Comment Dates

Pursuant to applicable procedures set forth in Sections 1.415 and 1.419 of the Commission's Rules, 47 C.F.R. 1.415 and 1.419, interested parties may file comments on or before May 5, 1997, and reply comments on or before June 5, 1997. To file formally in this proceeding, you must file an original and four copies of all comments and reply comments. If you want each Commissioner to receive a personal copy of your comments, you must file an original plus nine copies. You should send comments and reply comments to Office of the Secretary, Federal Communications Commission, Washington, DC 20554. Comments and reply comments will be available for public inspection during regular business hours in the FCC Reference Center of the Federal Communications Commission (Room 239), 1919 M Street, N. W., Washington, DC 20554.

Contact Person

For further information concerning this proceeding, contact William T. Cross, Wireless Telecommunications Bureau, (202) 418-0680.

Appendix A

Comments

Mid-America Coordination Council, Inc.
SouthEastern Repeater Association, Inc.
Wisconsin Association of Repeaters
Southern California Repeater and Remote Base Association
The San Bernadino Microwave Society
The Indiana Repeater Council
The Central States VHF Society
Mike Cheponis
John Mock
George R. Isely
Henry B. Ruh
National Communications System
Tucson Amateur Packet Radio Corporation
Robert A. Buas
Charles M. Albert, Jr.

Reply Comments

American Radio Relay League, Inc.
Naval Postgraduate School
Radio Amateur Satellite Corporation
Manager, National Communications System
Metricom, Inc.
Tucson Amateur Packet Radio Corporation
Robert S. Larkin
James E. Mitzlaff
Robert Brown
Paul H. Trotter
Ronald Klimas
Mike Cheponis
Philip R. Karn
Robert A. Buas
Robert J. Carpenter
Steven R. Bible
William A. Tynan

Appendix B

Part 97 of Chapter I of Title 47 of the Code of Federal Regulations is proposed to be amended as follows:

Part 97 - Amateur Radio Service

1. The authority citation for Part 97 continues to read as follows:

Authority citation: 48 Stat. 1066, 1082, as amended; 47 U.S.C. 154, 303. Interpret or apply 48 Stat. 1064-1068, 1081-1105, as amended; 47 U.S.C. 151-155, 301-609, unless otherwise noted.

2. In Section 97.3, paragraph (c)(8) is revised to read as follows:

§97.3(c)(8) Definitions.

(a) ***

(c) ***

(8) SS. Spread-spectrum emissions using bandwidth-expansion modulation emissions having designators with A, C, D, F, G, H, J or R as the first symbol; X as the second symbol; X as the third symbol.

3. Section 97.305(b) is revised to read as follows:

§97.305 Authorized emission types.

(b) A station may transmit a test emission on any frequency authorized to the control operator for brief periods for experimental purposes, except that no pulse or SS modulation emission may be transmitted on any frequency where pulse or SS emissions are not specifically authorized.

4. Section 97.311 is revised by revising paragraphs (a) and (b) and redesignating paragraphs (c) and (d) as "Reserved" to read as follows:

§97.311 SS emission types.

(a) SS emission transmissions by an amateur station are authorized only for communications between points within areas where the amateur service is regulated by the FCC and between an area where the amateur service is regulated by the FCC and an amateur station in another country that permits such communications. SS emission transmissions must not be used for the purpose of obscuring the meaning of any communication.

(b) A station transmitting SS emissions must not cause harmful interference to stations employing other authorized emissions, and must accept all interference caused by stations employing other authorized emissions.

(c) Reserved.

(d) Reserved.

(e) *****

(f) *****

(g) The transmitter power must not exceed 100 W under any circumstances. If more than 1 W is used, automatic transmitter control shall limit output power to that which is required for the communication. This shall be determined by the use of the ratio, measured at the receiver, of the received energy per user data bit (E_b) to the sum of the received power spectral densities of noise (N_0) and co-channel interference (I_0). Average transmitter power over 1 W shall be automatically adjusted to maintain an $E_b/(N_0 + I_0)$ ratio of no more than 23 dB at the intended receiver.

APRS Tracks

Stan Horzepa, WA1LOU
One Glen Avenue
Wolcott, CT 06716-1442
email stanzepa@ct2.nai.net
URL www.tapr.org/~wallou

javAPRS

I run *MacAPRS* on my computer most of the day. It happily runs in the background, while I do work in the foreground. Whenever I need an APRS fix, I click on the *MacAPRS* icon and see what is going on in APRS-land.

I always have three maps loaded in *MacAPRS*: a map of Connecticut, the Northeastern U.S., and the Continental U.S. The Connecticut map lets me check out the local APRS activity and the Northeastern U.S. map lets me do the same on a regional level. The Continental U.S. map shows me what the local HF gateways are seeing on the HF APRS channels.

The Continental U.S. map also indicates when 2-meters is open. If I start seeing stations beyond the 300-mile range that I don't usually see on the Continental map, it is a good indication that either a new HF gateway is in operation or the band is open (and it is time for me to switch over to SSB and QRZ down to 144.2 MHz).

Those three maps cover a lot of ground, but something is missing. Wouldn't it be nice to view local APRS activity beyond the local area? It would be particularly interesting to view local APRS activity during events that APRS is covering like the Podunk Marathon or the Dayton Hamvention ("There's WB4APR standing in front of the TAPR booth!") Well, now you can, that is, if you are able to surf the Web pages of the Internet.

Thanks to Steve Dimse, K4HG, there are a number of Web sites using Steve's *Java* applet (called *javAPRS*) that permit you to view remote APRS activity from the comfort of your computer monitor. Many of these sites offer a selection of maps (local, regional, and national) that you can choose to view. Once the map is displayed, you can zoom up or down for respectively a wider or narrower view.

Other *javAPRS* commands allow you to list all the stations received, weather station reports received, beacons received, identification reports received, or the last 25 messages received. You can center the map, scroll the map in all four compass directions, and obtain information about a particular station displayed on the map.

Here is a list of *javAPRS* sites where you can view what is going on locally. Many of these sites have links to other *javAPRS* sites, so you will be able to find additional

javAPRS sites that come on-line between the time I write this and the time this is published.

California [San Francisco, Live Internet Data Service (LIDS)] at
<http://sboyle.slip.netcom.com/LIDSAPRS.html>
Georgia (Atlanta, Dale Heatherington, WA4DSY) at
<http://www.wa4dsy.radio.org/aprs/socast.html>
Georgia (Snellville, Alan Adamson, NE111) at
<http://www.ne1h.radio.org/aprs/>
Illinois (northern, John B. Leonard, N9VJQ) at
<http://tbcnet.com/~jleonard/noiltest.html>
Maryland (Baltimore-Washington, DC, Bob Bruninga, WB4APR)
<http://web.usna.navy.mil/~bruninga/radio.html>
New York (Long Island, Bob Evans, W2/G3ZFJ) at
<http://www.asb.com/usr/w2g3zlj/g3zlj1.htm>
Ontario, Canada (John, VE3SVE) at
<http://www.pcel.com/javAPRS.html>
Virginia (Vienna, Jack Anderson) at
<http://www.crosslink.net/~jra/aprs/>

For more information about *javAPRS*, go to the source and check out Steve Dimse's Web page at <http://www.bridge.net/~sdimse/javAPRS.html>

By the way, your Web browser must support *Java* in order to view the *javAPRS* Web pages.

APRS Elmers

Do you need help with APRS and don't know where to find it? Well, the Kansas City APRS Working Group has the answer. Jim Duncan, KU0G, has created an APRS Elmers page for the Kansas City APRS Working Group at <http://www.kcaprs.org/elmers.htm>. The page lists folks who have volunteered to assist other folks with APRS questions, problems, needs, etc.

A map of the U.S. displayed on the Web page makes finding an APRS Elmer easy. Just click on your QTH on the map and the page displays the Elmer closest to you.

Current APRS Software

As I write this, the current versions of APRS are *APRSDos* 7.8.7, *MacAPRS* 2.8.0, and *WinAPRS* 1.3.0. By the time you read this, those version numbers are likely to be higher. In either case, you can flip copies of the current versions of APRS from ftp.tapr.org by following the path of `/tapr/SIG/aprssiG/files`.

My Book and My Page

Getting On Track with APRS is the name of my latest ARRL book and it is selling like hot cakes (thanks to you all). "The Stan Horzepa - WA1LOU - Page," which is subtitled "Just the FAQs, Ma'am" is my Web page at <http://www.tapr.org/~wallou>. It was fun to do both the book and the page. I hope you enjoy them.

APRS: Using it, or: Now that I've got it set up, how do I make it work for me?

Artie Hooten N2ZRC

In previous articles I've described what The Automatic Position Reporting System is and how to get it set up on your computer and radio. So you're now probably telling yourself "OK, great. I've got these stations appearing on my screen. Now what do I do?"

One of the features in APRS is the ability to send what we call one-liners; that is, one-line messages from station to station either direct or by using digipeaters. From the main APRS screen press S(end), and type the stations call and cr. Then type your message and another cr. You'll know when they got it when you receive an ACK which replaces the first five characters of your message. These one-liners are the only situation when APRS uses anything other than UI packets.

When you send a message in this manner it will be sent via the same digipeater path as your position and ID packets. If your intended recipient is someplace else you can STILL send it there by specifying any of a dozen alternate digipeater paths which the program can store for you. If you press O(perations)-D(igipath)-S(ave), you'll be prompted to enter a two letter code for that path via whatever path you choose, such as:

NJ VIA N2SF,WA2JNF-4,W2HOB

to get to Southern New Jersey from Westchester. To see the paths you've stored, press O(perations)-D(igipath)-L(ist). The prime purpose of these alternate paths is to keep the QRM to a minimum and to use the most direct and, sometimes, the only feasible path.

The weather systems feature of APRS allows you to see various weather information in real-time which is transmitted by stations with a Pect Bros. or Davis Weather Station. Depending on which version of APRS you're using (as of now, late December, it's 7.7c) and the options the weather station has, you can get different kinds of information including temperature, rainfall amounts (to the 1/100th inch) in the past hour and 24 hour periods, wind speed, direction and gusts and barometric pressure. By pressing W(eather), you'll see a list of options to choose from. These have changed (for the better) in the last few versions, so I can't be specific.

If at any time you wish to cease transmitting without actually shutting down the program, simply touch C(ommands) X(mit). This will disable the timer within APRS. You will still send out whatever the TNC itself is set to transmit at the predetermined periods. Press them again when you want to resume transmissions. When you want to send a specific packet (most often your position),

you can do so by pressing X(mit) P(osition) [or B(acon), M(essage), S(tatus), O(bject) or A(ll), as the case may be.]

In order to find a station on the screen, you can always use the O(perations)-F(ind) (what else!) command. If you'd like to see something really neat, try O(perations)-R(eplay) with a mobile station. You'll see the station's track being replayed. To access your TNC you'd use O(perations)-C(omms)-T(NC) which leads you to a very basic terminal screen. To get stations to appear on your screen faster (within two or three minutes) you'd use O(perations)-Q(uey), followed by a radius in miles from you.

Now that you've been on the air with APRS for a few hours, you don't necessarily want to wait for all those stations to reappear if, for some reason, you have to exit the program. No problem. Next time you fire it up, press F(iles)-I(oad), then type BACKUP.BK, or whatever you'd like to call it. Every time you shut APRS down it'll save a BACKUP.BK file, replacing the previous copy. Be aware, though, that all of those packets are timed, and any station in this backup that was heard more than two hours ago will "gray-out" (APRS considers them to be inactive and makes room for more stations that way.)

One thing to remember when playing APRS is that the best way to learn, as with anything else, is by doing. You can play with the commands as much as you want. You're not going to BREAK anything! About the worst thing that can happen is a lockup, and this is a rare thing. Usually the three-fingered-salute (Ctrl-Alt-Del) will get you out of it and you'll have to start over. So play with the thing. I mean, how do you think I learned about APRS, by reading about it?

Speaking of reading about it, yes I did. It's right there in the APRS distribution zip file. You can always read those files by pressing F1-F(iles) and typing in the name of the file you want to see.

There are dozens of these readme files in the "README" folder. You can also see them (at your leisure and there for the printing) by using any old text editor. Many of the answers to your questions can be found there, sometimes buried deep and not quite as visible as you'd like.

I hope you enjoyed this series on APRS and hope to see you on the map in the near future. Whenever I see a new station on the screen I try to send them a one-liner welcoming them to APRS and offering live assistance and advice. Feel free to take advantage of this, or ask questions of any station on the air at that time. We're all very excited about this program and think that "the more, the merrier" is the way to go. We've gotten a lot of "converts" in the last few years and this situation can only improve, so come and join us on 145.790!

Packet Radio in Education: Amateur Radio in the Classroom

Charles R. (Dick) Greene

This is the seventh of several articles appearing 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, WDSIVD

Reprinted from:

Jones, Greg (ed). *Infusing Radio-Based Communications Tools into the Curriculum*. Texas Center for Educational Technology. 1995. 136 pages. <http://www.tcet.uni.edu>

Abstract

This paper discusses the use of amateur radio technology in the classroom. Amateur radio can provide the teacher with an effective tool to enhance the teaching of curricula.

Introduction

Educators are constantly seeking ways to motivate students to become actively involved in the education process. Amateur radio can provide students with an exciting way to reach out of the traditional classroom into the world around them. It is another teaching tool, but it is one that requires the student to become an active participant. It is a "hands on" activity in which students communicate with others outside of their classroom. The subject of the communication may be related to any traditional course content.

Modes of Operation

A common misconception is that a teacher must have an amateur license before using amateur radio in the classroom. This is not true in all cases. There are at least three modes available for using amateur radio in the classroom, and the first requires no license. Even without a license, the teacher and students may monitor any amateur radio transmissions. The second mode would be if only the teacher has a license. The teacher would be considered the control operator of the station. As long as the teacher is present, the students may operate the radio. The third mode would be if the

teacher and students were both licensed. In this case, both the teacher and students would be free to operate the radio. [1]

Current Usage in the Classroom

Currently, the use of amateur radio in the classroom is not widespread. Typically, the use of amateur radio in the classroom has been implemented by teachers who already have their amateur license. It is from this "grass-roots" base that other teachers and even administrators have seen the benefits to be derived from the educational use of amateur radio. There is an ever increasing interest in using amateur radio technology in education. More and more individual schools and even whole districts are in the process of putting amateur radio to use in the classroom. A number of universities and colleges are becoming involved in research on the subject. These are all an indication of the growing interest in amateur radio as a teaching tool.

Using in the Curricula

Amateur radio can be used across the curricula from the elementary level through the secondary level. A number of different strategies can be used to incorporate amateur radio into the curricula. Some of these are:

Language Arts - Writing skills can be improved by the students exchanging poems, stories, or even their own biography with someone at another school in their city, state, country, or even across the world. Listening skills will improve. Students are highly motivated to try to understand what someone is saying when it is a part of a radio transmission. The need for clear, concise oral expression will become evident to the students, and they will have the opportunity to practice this skill while communicating over the radio.

Mathematics - The Metric System is the basis for radio frequency calculation. All exercises in determining and reading frequencies will require the students to work with the Metric System. Telemetry information received from satellites can be used as a database for the students to work with. An analysis of this information will allow students to determine the status of a number of different elements of the satellite. The database provides an excellent source for chart and graph work.

Social Studies/Geography - After a radio contact, students will want to know exactly where the person they were talking to was located. They will need to identify cities, states, countries, and continents. This leads them to using maps and globes to find various locations. They will learn to use latitude and longitude to find a specific place. They will become familiar

with using compass headings to express the location of a contacted station in relation to their own station. Time zones become important. They will need to be able to determine when a station in another zone may be on the air. Students will be exposed to other cultures which will promote a better understanding of the diversity of these cultures.

Science - The emphasis in science education must be to equip the students to identify and solve problems. In order to effectively do this, students must be given the opportunity to question and share ideas with others. Amateur radio allows the science student to collaborate with others on problem solving. Cooperative projects can be worked on between students of different schools. Weather information is readily available from satellites, or from various database services, for use in the classroom. Telemetry information from satellites provide for the study of space technology. The radio equipment itself can be used as a basis for subject matter in the study of Physics.

Foreign Language - Amateur radio can give students a chance to speak, read, and write the language being studied. This can be accomplished by making contact with other students studying the language, or with a station operator who is fluent in the language.

Computer Skills - Computers are a natural for hook-up to a radio. The use of a computer with the radio allows information to be entered into the computer for later 'packet' transmission by radio. In this configuration, the students will become involved in the practical applications of computer technology and data communications.

As a teacher becomes more familiar with using amateur radio, he/she will constantly find even more exciting and fun activities for the students to participate in.

Student Motivation

Across the curricula, the students are involved in communicating. If they are using "packet" transmission, they are reading information received or writing information to be transmitted. In the voice mode, they are listening or preparing an oral response. The important point is that the student is an active participant. The world outside the classroom is open to them each and every time they use the radio. Each and every contact is an adventure. The purpose may be to once again contact an old radio friend, or the purpose may be to contact a new station. For those students with special needs, activities using amateur radio can be adapted to challenge the student at their level of need. With teacher approval, gifted

students can be given the opportunity to explore subjects in more depth than others in a class. Students with learning and/or emotional disabilities are drawn into interacting with others. There is a certain anonymity to communicating over a radio. Students are able to operate in their personal "comfort" zone. The radio acts as a screen between the student and the other person. This gives the students full control over how much they choose to reveal about themselves.

Getting Started

As most teachers do not have a great deal of knowledge about the use of amateur radio, they will need help and guidance in exploring this technology. One of the first places to contact is the American Radio Relay League (ARRL). Most of the active radio amateurs in the United States are members of the ARRL. As a body, this group is interested in the growth of amateur radio usage. They have dedicated a great deal of time and effort investigating and developing ways to use amateur radio to enhance classroom activities. They can provide various training materials and other services. They may be able to identify a school in the area that is already using amateur radio. Visiting a school already using this technology and having the opportunity to talk to another teacher would be extremely helpful. The ARRL can provide the names of any local clubs or operators in the area. In most cases, these amateurs are eager to talk about their hobby, and they are glad to help new people get started. Check with the closest university or college, they may be involved in activities related to the usage of amateur radio communications.

Conclusion

Amateur radio offers the teacher a tool to enhance any traditional course content. It is a "hands on" activity that requires the students to become an active participant in the education process. The walls of the traditional classroom become invisible, and the students are exposed to new experiences in the global world outside of the classroom. Teachers owe it to themselves and their students to explore the usage of amateur radio in their classrooms.

References:

[1] Jones, Greg (WD5IVD) and Knezek, Gerald (KB5I:WV). The Importance of Teacher Training for Increasing the Use of Amateur Radio in the Classroom. In Proceedings of The ARRL National Educational Workshop, 1989, p. 50.

Kits/Publications Update

APRS™ TAPR MIC-E™ Project

As of this writing (first of April) the rev-2 (production) version of the MIC-E is about to be tested before production begins. This redesign is based on input from the Beta testing and should provide a solid first production model for all those out there that are looking forward to getting a MIC-E. Keep an eye on TAPR-BB and the MIC-E web page (<http://www.tapr.org/tapr/html/mic-e.html>) for latest information on price and configurations before Dayton. It is our goal to have units available for people to walk away from Dayton with them in their hands and hooked to their radios!

If you are not familiar with the MIC-E project, it began several years ago with the creation of a PIC chip processor that is now sold commercially by Clements Eng (<http://home.navisoft.com/agrelo/clement.htm>). In 1996, Gwyn Reedy, WA1BEL, President of PacComm approached TAPR about handling the amateur version in a semi-kit solution.

The MIC-E (Mic Encoder) installs between your radio mic and radio and allows your GPS unit to transmit APRS AX.25 frames at designated intervals without needing a TNC! Very useful in many settings. You can listen to a discussion of the MIC-E by Bob Bruninga, WB4APR, while Bob uses one or read over the text about the APRS

MicEncoder (<http://www.tapr.org/tapr/html/virtual.html>).

The units are planned to be a semi-kit. This means that the board has already been assembled, but interface wires, box, and other items will still need to be configured and assembled for proper use.

N2IRZ GPS-20 Power Supply and Interface Board

The N2IRZ GPS-20 Power Supply and Interface Board is a compact 5 volt power supply and RS-232 interface board for the Garmin GPS-20 Global Positioning System engine. The power supply portion provides a filtered, short-protected 5 volt DC output to operate the GPS-20. The interface portion provides a simple and convenient method of providing the required 5 volt power to the GPS-20, as well as a 9-pin female sub-D connector for supplying the RS-232 data to a computer or TNC. Also provided on the DE-9 is the one pulse-per-second output.

The power supply is designed around the National Semiconductor LM2940T-5.0 low-dropout regulator. This rugged regulator, designed for the rigors of automotive use, supplies a well-regulated 5 volt output with a wide input range of 5.4 to 25 volts. This exceptionally low input voltage allows battery operation from 5 NiCds or 4 alkaline cells. To further improve

portable operations, the power supply uses wide-temperature range components, from -40C to +85C, more than enough for most applications.

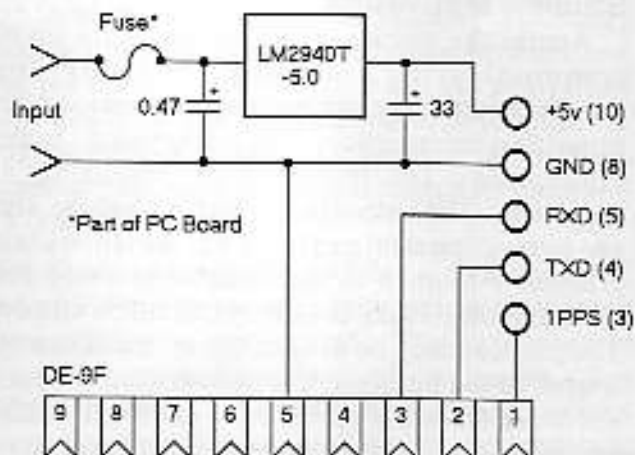
The easy-to-assemble single-sided PC Board, which is the same size and form as the GPS-20, is silkscreened and solder masked for convenience. A small prototyping area, for modifications or additional circuitry, is provided. The power input jack is a standard 5.5 x 2.1 mm coaxial jack, the same as found on most TNCs. The regulator is self-protected against overvoltage transients to 60 volts, short circuits, over temperature, over current, and reverse polarity input.

Although anyone could make their own power supply, this new TAPR kit offers an excellent price/value ratio. Add the convenience of a feature-packed under-an-hour kit, and the deal is irresistible!

TAPR intends to offer the GPS-20 Power board as part of an accessories kit for the GPS-20. This kit will include the interface board with parts, standoffs with screws, RF MCX to BNC bulkhead connector with coax, and will have a JST preassembled cable that fits the GPS-20 connector. No cost has been determined for this accessory kit yet, but the kit should be useful for those building future TAC-2 or MIC-E kits as well as wanting to use your GPS-20 as a standalone unit. Keep an eye on the TAPR Web page and the next PSR for full details.



Bob Bruninga, WB4APR, and Mark Humphrey, KE3XY, talking about the MIC-E and APRS issues during Greg's, WD5IVD, recent visit.



Schematic of GPS-20 Power Supply and Interface Board.

TAC-2 Project Update

The TAC-2 project is moving to conclusion. The Rev B board has checked out. The documentation has been written and is being tested against the kit build. We should have kits available at Dayton. Check the TAPR web page <http://www.tapr.org/tapr/html/tac2.html> for details on the kit, cost, and availability. Articles in PSR #64 p.5 and PSR #63 p. 29-35 detail all the technical information. The bottom line is that we will have a kit that provides nearly the same types of timing accuracy as \$5000 - \$10,000 units!

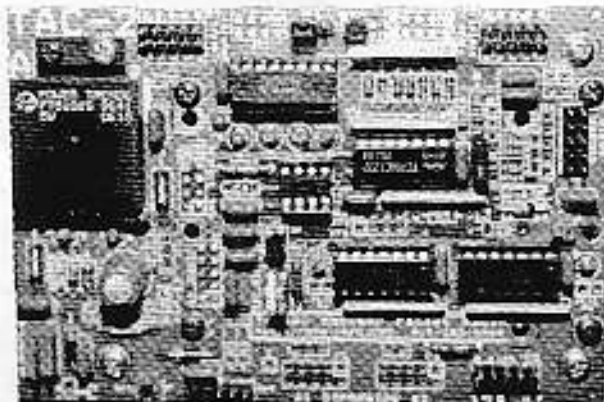
In case anyone is interested in the commercial market for precise timing, Tom Clark, W3IWI has just pointed out the following article by Hewlett-Packard in the December 96 HP Journal. It has some very good introductory materials regarding GPS and timing related to using GPS. Well written with some good figures to show the issues at hand.

<http://hpcc998.external.hp.com:80/hpj/dec96/de96a9.pdf>
 along with the sidebar
<http://hpcc998.external.hp.com:80/hpj/dec96/de96a9a.pdf>

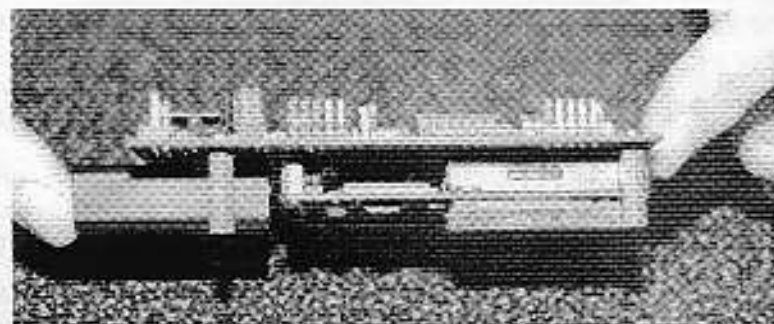
The generic HP Journal can be found at
<http://www.hp.com/hpj/journal.htm>

Tom mentioned that he had problems printing the .pdf files from the official Adobe Acrobat reader (v3.0), but GhostScript worked fine.

Finally, Tom points to the following link for those amateurs who ask "Why bother with accurate timing?". Applications of/needs for precise timing in communications systems is discussed in an HP press release dated last June. The page is entitled "Timing Solutions For Communications Networks: Crucial Issues Arise as Network Carriers Strive to Handle Increased Loads, Digital Technology." <http://www.hp.com:80/pressrel/jun96/17jun96d.htm>



TAC-2 populated board equipped with the Power Trends power module interface.



TAC-2 board shown on its side with a Motorola Oncore VP attached underneath (bottom).

TUC-52 and METCON-II personality board.

The TUC-52 is going to beta test. The METCON-II personality board has gone to layout. The goal is to try to have METCON-II kits available this summer. The METCON-II should be very versatile. Much more than the past version of it.

AN-93

The documentation is written and being tested against the current boards. With a little more work, kits will be shipped to everyone who have been waiting for several months now.

TAPR Badge

Size (3.5 x 2.5)

TAPR
WA7GXD
LYLE JOHNSON

Identify yourself
as a member
of TAPR! \$10⁰⁰

Call the TAPR office to order your badge.

TAPR Publications

Wireless Data Communications: Theory and Design, by Tom McDermott, N5EG, is shipping! Dorothy has already shipped over 300 books in the first 3 months. The book looks like it is going to be as good as we thought it would be. Have a look at the details on <http://www.tapr.org/tapr/html/publications.html>. We printed 1000 copies of the book and it looks like we might be doing a second printing before the end of the year.

The 9600 baud Land Mobile Modification Publication is still on hold awaiting several sections to be completed by various authors. More as we know about a completion date.

1997 CD-ROM

The TAPR 1997 CD-ROM is available at the office. The CD has been rebuilt from the ground up and a lot of html code has been put together to help navigate around the CD using any number of browsers. Using a web browser locally on your computer to access the information should make information easier and faster to find and review. If you don't have a computer which supports the necessary browser software, don't worry, you can still get all the data directly from the CD like before. The CD will again be an ISO-9660 standard format, which will allow it to be accessed on any number of platforms. The price will not change from last year \$20, + \$4 s/h. Keep an eye on TAPR-BB and the web page for information before the next PSR.

NADSD Update

Carl Estey, WA0COG
cestey@tapr.org

In it's first two months, the North American Digital Systems Directory (NADSD) has grown to 3,300 listings for over 40 States and a large

number of Provinces. The NADSD team's efforts are currently directed toward increasing the number of listings and improving uniformity and accuracy of the data presented. Greg Jones, WD5IVD, has written a special program to check newly uploaded data from the over 90 registered providers to assure proper formatting.

The NADSD is available at the TAPR site: <http://www.tapr.org/directory> For detailed information on how the NADSD works, visit the TAPR NADSD page at: <http://www.tapr.org/directory/how.html>

Errors in the data or additions should be reported to the data provider listed for the entry in question. An e-mail link is provided so that you can easily make contact with the data provider. A list of the data providers is available at: <http://www.tapr.org/directory/groups.html>

Forward questions and problems to Carl Estey at cestey@tapr.org.

Summary Financial Statements

Tucson Amateur Packet Radio Corporation
Statement of Assets, Liabilities & Fund Balance
December 31, 1996

Assets	
Total Cash Accounts	\$ 44,447.96
Total Inventory	29,070.89
Total Non-Current Assets	11,034.52
Total Assets	\$ 84,553.17
Liabilities & Fund Balance	
Total Current Liabilities	\$ 32,843.69
Total Fund Balance	51,709.48
Total	\$ 84,553.17

Tucson Amateur Packet Radio Corporation
Statement of Revenues and Expenses
Year Ended December 31, 1996

Revenue	
Total TAPR Revenue	\$ 158,714.90
DSP Revenue	13,045.88
Total Revenues	\$ 171,760.78
Expenses	
Total TAPR Expenses	\$ 154,586.54
DSP Cost of Sales	8,990.00
Total Expenses	\$ 163,576.54
Total Net Revenue	\$ 8,184.24

Call for Papers: AMSAT-NA Annual Meeting & Space Symposium

The 1997 AMSAT-NA annual meeting and space symposium will be held on Oct. 17-19, 1997 at the Airport Delta Hotel in Toronto, Ontario, Canada. This is the first call for papers to authors who wish to present papers at this event. Topics for all amateur satellite disciplines are sought from the AMSAT community. Authors and titles are requested by March 1st with abstracts by June 1st. Final versions are due by August 1st. We also encourage those not able to attend to consider a paper for publication in the Proceedings of the symposium. Submissions and enquiries should be made to:

Wayne Chandler, VE3WHC
By internet: ve3whc@amsat.org
By mail: W.H.Chandler
Box 6, Carlisle, Ont., L0R1H0,
Canada.

Accessing TAPR via the Internet

There are several ways TAPR can be reached via the Internet.
Information Server

The Automated Information Server that TAPR provides allows anyone to request information on TAPR, products, newsletters, and lots of other files. To find out more about this service, send an e-mail message to listserv@tapr.org with the subject line "Request" and one or more of the following text lines in the body of the message:

help (for a brief set of instructions)
index -all (for a list of all files by topic area)
list (for a list of TAPR Mail Groups)
get tapr taprinfo.txt (for info on TAPR)

Internet E-Mail

TAPR can be reached by sending mail addressed to tapr@tapr.org

World Wide Web

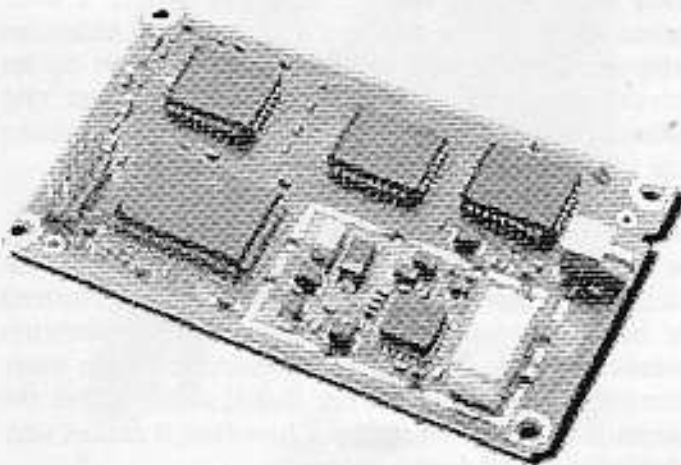
<http://www.tapr.org/tapr>

FTP

The TAPR Software Library is available at 'ftp.tapr.org' in the directory /tapr/software_lib. Login in as 'anonymous', with a password of 'your_account@internet_address'.

TAPR to offer Motorola ONCORE VP

TAPR has worked a deal to provide the popular Motorola ONCORE VP GPS engine at a savings for TAPR members. This now allows TAPR to provide a low-end and high-end GPS engine to our members. For full details and pictures of both GPS group purchases, check out <http://www.tapr.org/gps>



Motorola Oncore (without RF shielding hood)

The price is:

\$269.00 US for members of TAPR + s/h

or

\$290.00 US for non-members + s/h

and will include:

- Motorola ONCORE VP (B4121P115x) engine (2.00 x 3.25 x 0.64 in.)
- Documentation

TAPR will be taking orders for 10+ units, which is the minimum purchase at this time. Once at least 10 units have been purchased, TAPR will order the ONCORE VP units. TAPR will deposit money when the units are ordered and ship when the units arrive at the office.

Please note: This is not an enclosed/sealed unit. It is assumed that the purchasers will be installing the unit in another enclosure for normal and experimental operations like the TAC-2 (Totally Accurate Clock) kit designed by Tom Clark, W3IWI, or the APRS MIC-Encoder for APRS tracking. Both kits will be available at Dayton!

No 10% Discount for TAPR Members. Due to the nature of the purchase, the \$269 purchase price for TAPR members represents the membership discount.

Warranty. TAPR will provide replacement units for DOA units that are promptly reported by the purchaser within 90 days after TAPR ships.

Shipping and Handling

Shipping and Handling within the US will be \$7.00 US by UPS Ground unless otherwise requested by purchaser. International Shipping will need to contact the TAPR office and get a quote on the shipping to your country. TAPR uses International Express Mail, unless the purchaser requires something else.

Notice about all TAPR Group Purchases

TAPR coordinates group purchases as a service to help amateur radio operators obtain access to technology at prices better than those typically available in individual unit orders.

Those participating in group purchases must understand that these products are not part of TAPR's standard offering, that TAPR may not have an established relationship with the vendors involved, and that the terms of the purchase may be changed, or the purchase may be canceled, for any reason. If purchase terms (such as price or delivery schedule) significantly change during the order period, TAPR will notify participants and permit them a reasonable time in which to cancel their order; if they choose to cancel, TAPR will refund any money they have deposited for the purchase. Once TAPR has committed the group order with the vendor, no further cancellations are permitted. In no event will TAPR's liability to the participant exceed a refund of any money deposited for the purchase.

Although informal support for products may be available through TAPR's on-line mailing lists and other services, product warranties and entitlement to post-sale support are limited to what is offered by the manufacturer, and are not TAPR's responsibility.

Motorola Oncore VP Information

General Characteristics:

Receiver Architecture

- 8 channel
- L1 1575.42 MHz
- C/A code (1.023 MHz chip rate)
- Code plus carrier tracking (carrier aided tracking)

Tracking Capability

- 8 simultaneous satellite vehicles

Performance Characteristics:

Dynamics

- Velocity: 1000 knots(515 m/s) > 1000 knots at altitudes < 60,000ft.
- Acceleration: 4 g
- Jerk: 5 m/s³
- Vibration: 7.7G per Military Standard 810E

Acquisition Time (Time To First Fix, TTFF)

- 20 sec. typical TTFF hh
(with current almanac, position, time and ephemeris)
- 45 sec. typical TTFF
(with current almanac, position and time)
- 2.5 sec. typical reacquire

Positioning Accuracy

- Less than 25 meters, SLP (without SA) [DoD may invoke Selective Availability (SA), potentially degrading accuracy to 100 m (2dRMS)]
 - DGPS accuracy 1-5 meters typical
- #### Timing Accuracy (1 pulse Per Second, 1 PPS)
- 130 nanosec. observed (1 to) with SA on
 - In position hold mode, <50 nanosec. observed (1 to) with SA on

Datums

- 49 std. datums, 2 user defined, default WGS-84

Serial Communication

Output Messages

- Latitude, longitude, height, velocity, heading, time, satellite tracking status
- NMEA-0183 Version 2.00 (selected formats)
- Software selectable output rate (Continuous or Poll)
- Broad list of command/control messages
- TTL interface

Electrical Characteristics:

Power Requirements

- 5±0.25 Vdc 50 mVp-p ripple (max)

Power Consumption

- 1.1 W @ 5V

Physical Characteristics:

Dimensions

- Receiver 2.00 x 3.25 x 0.64 in. (50.8 x 82.6 x 16.3 mm)

Weight

- Receiver 1.8 oz. (51g)

Connectors

- Data/Power: 10 pin (2x5) unshrouded header on 0.100" centers
- RF: Right Angle **MCX** (subminiature snap-on)

Environmental Characteristics:

Operating Temperature

- Receiver Module -30°C to +85°C

Humidity

- 95% noncondensing +30°C to +60°C

Altitude

- 60,000 ft.(18km)(max)
- > 60,000 ft.(18 km) for velocities <1000 knots

Miscellaneous:

Optional features

- 1 PPS timing output
- Raw measurement data

- On board LNA option for use with passive antenna
- Differential GPS-standard software feature

DGPS

- RTCM-104 format (remote input)
- Motorola custom format (master output and remote input)

The Markey/Antheil Spread Spectrum Patent

[Beaumont, C. (1997). Secret Communications Device: The Markey-Antheil spread-spectrum patent [1 web page]. Available Web: <http://www.ncafe.com/chris/patent/index.html>]

Many years ago, on the eve of World War II, a well-known actress of the day and a avant-garde American composer, while at a dinner party, thought up an interesting scheme to control armed torpedoes over long distances without the enemy detecting them or jamming their transmissions.

While they had the foresight to patent their invention, the term of the patent lapsed without either of them realizing any money from their invention, which formed the basis of what was to become spread-spectrum communications. This invention becomes even more incredible when you consider that it came before the invention of digital electronics..however, it makes very substantial use of digital concepts.

Yes, indeed the term "ahead of its time" would apply here, because over 60 years later, as high-speed microprocessors become inexpensive, spread-spectrum communications, Hedy 'Lamarr' and my father, George Antheil's "secret communications technique" - adapted to use today's ultrafast microprocessors is coming into its own as an effective and inexpensive way to communicate over long distances, privately and efficiently.



George Antheil



Hedy Lamarr

In fact, the same characteristics that made their technique jam-proof, also, through a mathematical phenomenon which can easily be documented, creates an extraordinary efficiency of transmission such that extremely low-power transmitters can be used over extraordinary distances, and most significantly, many transmitters and receivers can occupy the same band of frequencies at the same time.

This extraordinary efficiency has the potential, indeed, it is already enabling inexpensive wireless access to high-bandwidth TCP-IP telecommunications, frequently radically altering the economics of setting up Internet-connected LANs for community organizations.

Hedy Lamarr and George Antheil's invention of spread-spectrum has recently received the EFF Pioneer award.

The complete patent is available at:
<http://www.ncafe.com/chris/patent/patent1.html>

Aug. 11, 1942.

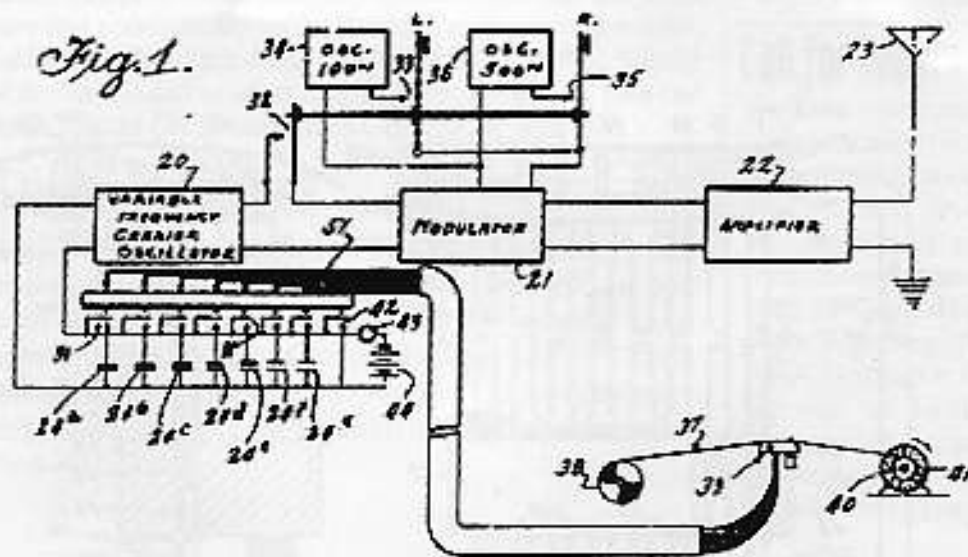
H. K. MARKEY ET AL

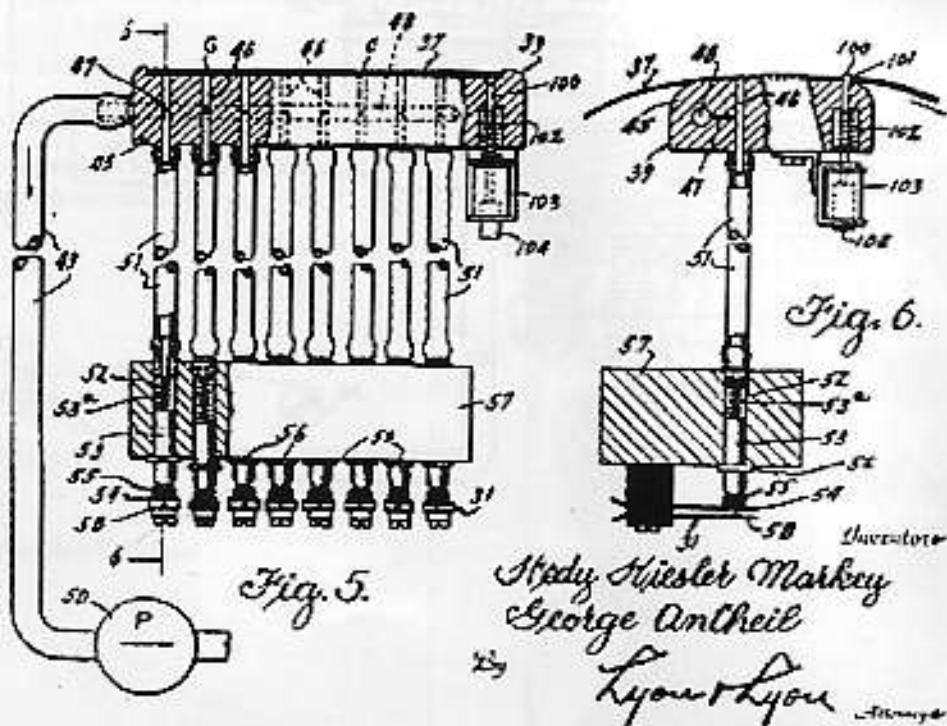
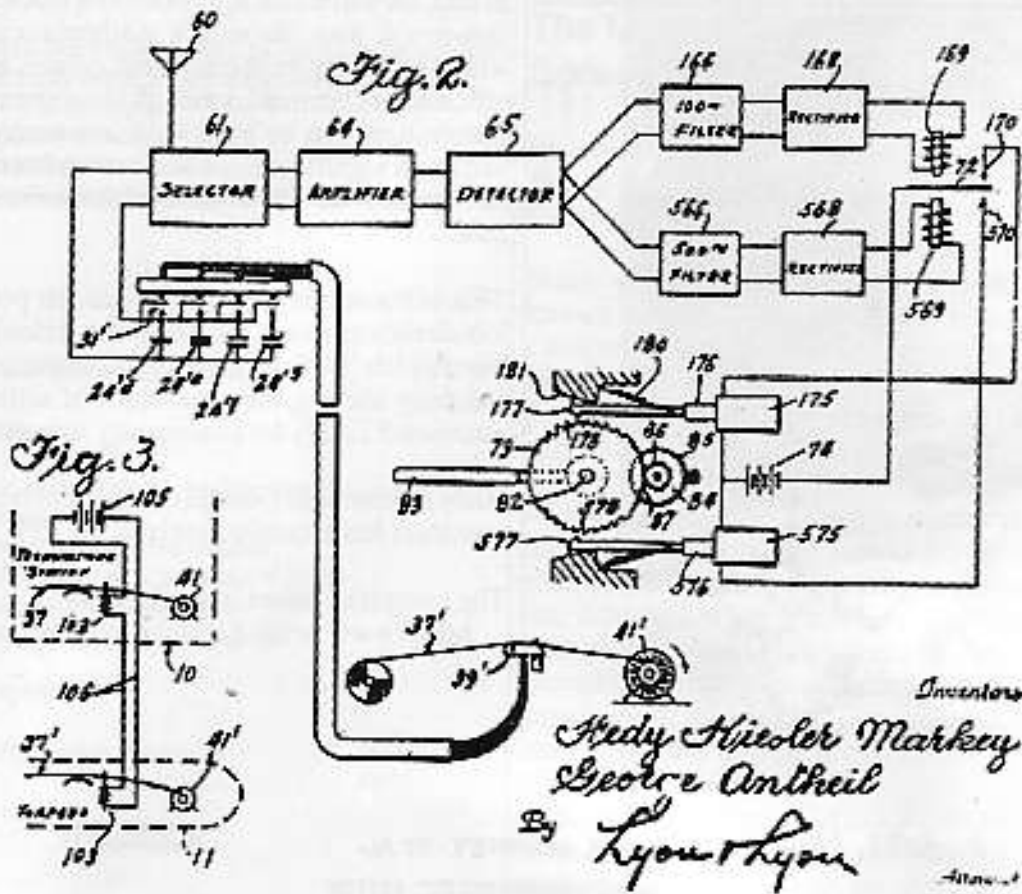
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SECRET COMMUNICATION SYSTEM

Filed June 10, 1941

2 Sheets-Sheet 1





ARRL and TAPR 16th Annual Digital Communications Conference

October 10 - 12, 1997 • Baltimore, Maryland



<http://www.tapr.org/doc>

Information

Don't forget that the 1997 DCC will be held **October 10-12, 1997 in Baltimore, Maryland.**

Not only is the Digital Communications Conference technically stimulating, it is a weekend of fun for all who have more than a casual interest in any of the ham digital communications modes. This includes APRS operators, networkers, DX-Cluster Sysops, software writers, modem designers, and digital satellite communications enthusiasts. The ARRL and TAPR Digital Communications Conference is for all levels of digital operators -- a must conference to attend to get active on a national level. Now, more than ever, amateur radio needs this great meeting of the minds, since it is important that we demonstrate a continued need for the frequency allocations we now have by pushing forward and documenting our achievements. The ARRL and TAPR Digital Communications Conference is one of the few ways to record our accomplishments and challenge each other to do more.

The Digital Communications Conference is a forum for radio amateurs and experts in communications, networking, and related technologies to meet, publish their work, and present new ideas and techniques for discussion. Presenters and attendees will have the opportunity to exchange ideas and learn about recent hardware and software advances, theories, experimental results, and practical applications. If you are doing HF, VHF/UHF, APRS, Spread Spectrum, Digital Voice and Video or other digital communications, then the 1997 ARRL and TAPR Digital Communications Conference is for you.

A Conference for the Beginner as well

The conference is not just for the digital expert. This year's conference will again provide an entire session strand with beginning, intermediate, and advanced presentations on selected topics in digital communications. Some of the topics will include: APRS, Satellite Communications, TCP/IP, Digital Radio, Spread Spectrum and other introductory topics. Come to the conference and hear these topics presented by the experts! Don't miss this opportunity to listen and talk to others in this area.

Workshops

In addition to the presentation of papers on Saturday, three symposiums/seminars will be held before and after the conference. For those that might have interest in just a symposium or seminar, registration for the conference is not necessary to register and attend one or more of the symposiums and seminars. This allows maximum flexibility for those that might want to participate during the Digital Communications Conference.

A full-day symposium on Friday covering APRS will be conducted by Bob Bruninga, WB4APR (father of APRS), Keith Sproul, WU2Z, Mark Sproul, KB2IC1 (developers of Mac and Windows APRS), Steve Dimse, K4HIG (developer of javAPRS), and other nationally known APRS developers. Join this group for the afternoon and evening for in depth discussions and presentations on the current and

Local Hosts

The 1997 ARRL and TAPR Digital Communications Conference will be co-hosted by AMRAD (Amateur Radio Research and Development Corporation).

The Amateur Radio Research and Development Corporation (AMRAD) is a worldwide club of amateur radio and computer experimenters whose purpose is to develop skills and knowledge in radio and electronic technology, advocate design of experimental equipment and techniques, promote basic and applied research, organize technical forums and symposiums, collect and disseminate technical information, and provide experimental repeaters. <http://www.amrad.org>

Call for Papers

Anyone interested in digital communications is invited to submit a paper for publication in the Conference Proceedings. Presentation at the Conference is not required for publication. **Papers are due by August 20th, 1997**, and should be submitted to Maty Weinberg, ARRL, 225 Main Street, Newington, CT 06111 or via the Internet to lweinberg@arrl.org. Information on paper submission guidelines are available on-line (<http://www.tapr.org/dcc>).

Call for Student Papers

ARRL and TAPR especially welcome papers from full time students to compete for the second annual student papers award. Two \$500 travel awards may be given. **Deadline for receipt of finished student paper manuscript: June 20th, 1997.** For full details and paper guidelines contact TAPR or check <http://www.tapr.org/dcc>.

future status of APRS. This is a unique opportunity to gain insight into this fast growing digital aspect of amateur operations that combines computers, packet radio, and GPS (Global Positioning System).

Starting late Friday afternoon a half-day seminar entitled "RF Basics for Computer Weenies: Helping the RF-challenged get the most out of the new high-speed wireless toys" will focus on such topics as basic antenna types and their characteristics, comparison of feedlines and connector types, propagation basics (calculation of path loss, multipath effects, fresnel zones, etc), weatherproofing, lightning protection, filters, basic RF measurements, and other issues related to maintaining radio equipment on the UHF/SHF bands.

On Sunday morning, Dewayne Hendricks, WA8DZP, Phil Kam, KA9Q, and Tom McDermott, N5EG, will conduct a seminar focusing on "Spread Spectrum system design and theory." All three presenters are well known for their work in various areas of amateur digital communications and this 5 hour seminar should be an excellent opportunity to learn about the design and theory of spread spectrum systems.

Hotel

Conference presentations, meetings, and seminars will be held at the Holiday Inn BWI Airport. DCC special rooms rate is \$89 per night. When making reservations with the hotel, be sure to indicate you are attending the ARRL and TAPR DCC conference to get the discount. It is highly recommended that you book your room prior to arriving - **a block of 75 rooms is reserved until September 9th, 1997.** After the 75 rooms are booked, rooms will only be available in nearby hotels. **Be sure to book your rooms early!** The hotel provides transportation to and from BWI Airport, nearby Amtrak/MARC rail station, and the local Baltimore Light Rail. Please contact the hotel to arrange specific transportation needs.

Holiday Inn BWI Airport (conference hotel)
890 Elkridge Landing Rd, Linthicum, MD, 21090
(410) 859-8400, Fax (410) 684-6778

What can you expect in 1997!

- * A full day of papers and breakouts for the beginner to the advanced
- * Three seminars/symposiums
- * The second annual Student Paper session.
- * A banquet with Special Guest Speaker (TBA).
- * Informal get-togethers throughout the weekend.
- * TAPR Membership Meeting
- * An event at which the most important new developments in amateur digital communications are announced.
- * Digital 'movers and shakers' from all over the world in attendance.

Conclusion

There are few activities where your participation can be so much fun and important! What a great way to share and renew your enthusiasm for digital amateur radio! A get-together with colleagues and bringing each other up to date on your latest work -- all this, and more, for an unforgettable weekend of amateur radio and digital communications. We hope to see you at the ARRL and TAPR Digital Communications Conference on October 10-12!

Full information on the conference and hotel information can be obtained by contacting Tucson Amateur Packet Radio, Phone: (817) 383-0000, Fax: (817) 566-2544, Internet: tapr@tapr.org Web: www.tapr.org

Registration Form

Contact the TAPR office by Phone 817-383-0000, Fax 817-566-2544, or Internet: <http://www.tapr.org/dcc> and tapr@tapr.org to register or for additional information.

- Pre-Registration (before Sept 10th) \$42.00 _____
- Registration (after Sept 10th) or at door \$47.00 _____

Conference Registration includes:
Conference Proceedings, Sessions, Meetings,
and Lunch on Saturday.

- Saturday Evening Dinner \$20.00 _____
(Limited Space)
Dinner, Banquet Speaker (TBA), Prize Drawing

Seminars/Symposiums

- APRS, Friday, 1pm - 8pm. \$25.00 _____
Conducted by: Bob Brumby, WB4APR,
Keith Sproul, WUZZ, Mark Sproul, KB2ICL,
Steve Dimse, K4HG - Symposium Coordinator
- RF Basics for Computer Weenies \$20.00 _____
Friday, 3pm - 7pm.
Conducted by (TBA)
- Spread Spectrum System Design and Theory \$20.00 _____
Sunday, 12noon-3pm.
Conducted by: Dewayne Hendricks, WD8DZP,
Tom McDermott, N5EG, and Phil Kam, KA9Q

TOTAL _____

Name / Call: _____

Street Address: _____

City / State / Zip: _____

Country: _____ Phone Number: _____

Internet E-mail: _____

Charge my credit card (check one):

VISA MasterCard



Acct. # _____

Expiration Date: _____

Signature on card: _____

Mail completed registration form with
check to:

TAPR
8987-309 E Tanque Verde Rd #337
Tucson, Az 85749-9399

or check <http://www.tapr.org/dcc> for an
on-line registration form.

A registration packet will be mailed in September upon
receipt of registration form and payment.

1997 Packet BASH at Dayton

Friday, May 16th, 1997, 7pm

An event for the digitally-inclined ham, featuring:

- Buffet dinner
- Tom Clark, W3IWI, talking on "Amateur Radio 2000: A Retrospective View of the Future"
- TAPR special interest group meetings
- "Birds of a Feather" gatherings

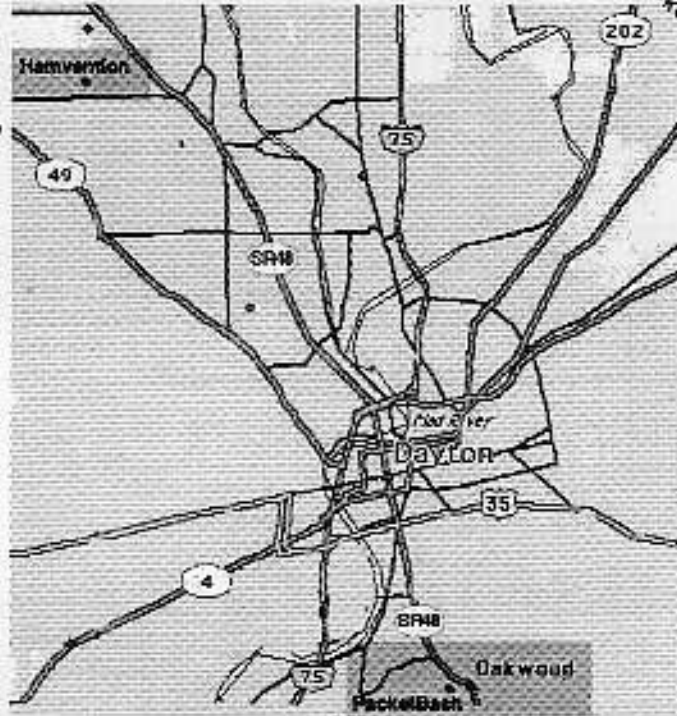
Talk-in will be on 146.415 simplex.

Directions:

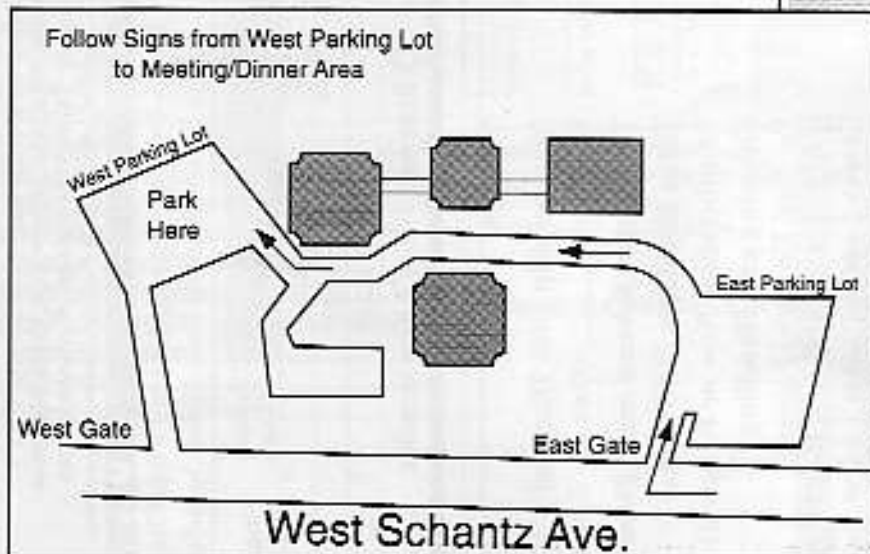
- Head South on I-75 from Hamvention (North of Dayton)
- Take 35 to the East around the south part of Dayton
- Take SR48 (also known as S. Main) South
- Exit on West Schantz and head West
- Site complex is on the North side of Schantz about 2 blocks from SR48.
- NCR "Sugarcamp" Conference Center, 101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

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

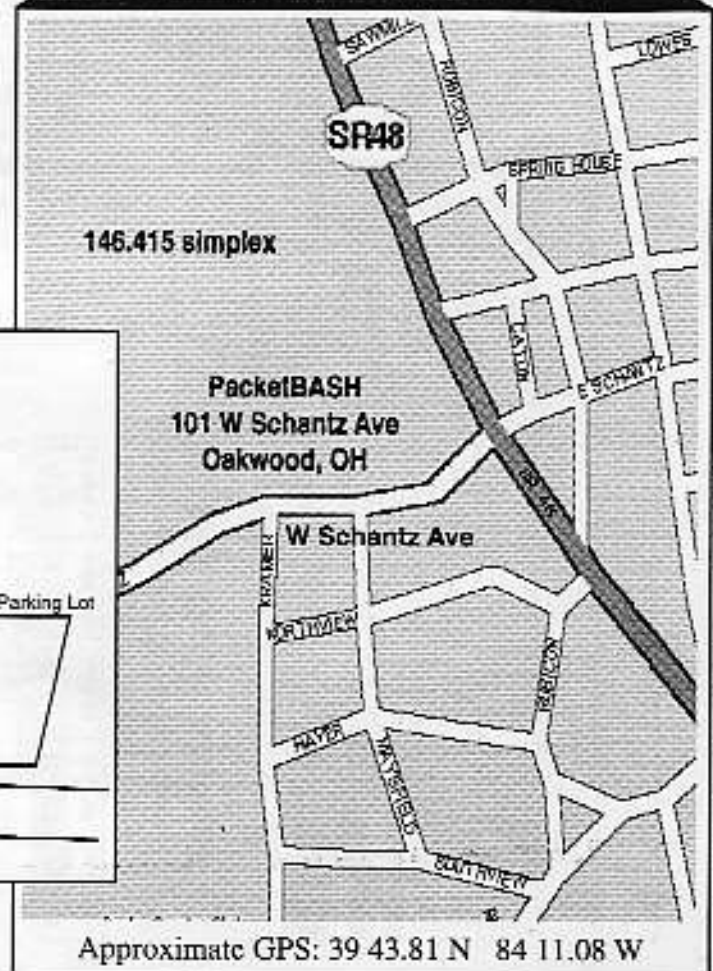
Walk-ups to the event will be accommodated as best as possible. There is limited space (in the way of food ordered) for dinner. Amateurs who wish to hear the speaker and discussion are asked to arrive around 2030 (8:30pm). All amateurs are welcome to attend, enjoy the speaker, and participate in the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



North



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



Kit	Price	Qty	Total	Kit Code	Information
DSP-93 w/ wall transformer (US)	\$430.00			16	check with office on ship date, no discount for international orders only, no discount limit on rebate. As seen in Dec 95 QST
DSP-93 w/o wall transformer	\$420.00			16	
DAS (DTMF Accessory Squelch)	\$68.00			3	
AN-93 HF Modem	\$90.00			3	limited kits available.
TAPR 9600 bps Modem	\$80.00			6	
Bit Regenerator	\$10.00			1	used for regenerative repeater operation
Clock Option	\$5.00			1	used for regenerative repeater operation
PK-232 Modem Disconnect	\$20.00			2	simplifies connection of external modems
PK-232MBX Installation Kit	\$20.00			2	for installation of 9600 modem in PK-232MBX
XK-2211 DCD Mod.	\$20.00			2	
Seize Machine DCD Mod.	\$20.00			2	
Seize Machine DCD w/air Clock	\$25.00			2	For KPC or other TNC with 16X or 32X or clock
METCON-1 Telemetry/Control	\$30.00			3	Metcon-1 kits no longer available.
Voltage-to-Frequency module	\$40.00			3	Plenty of the Option Kit!
Temperature-to-Freq module	\$45.00			3	
A-D Converter	\$45.00			3	
Elapsed Time Pulsar	\$35.00			3	
Fineware					
32K RAM w/ TNC2 update docs	\$20.00			2	
TNC-2 1.1.9 w/KISS EPROM	\$15.00			4	includes 1.1.9 Commands booklet (below)
1.1.9 Commands Booklet (only)	\$8.00			2	(all TNC-2 command set for 1.1.9)
TNC-2 WADED EPROM	\$12.00			2	8 correct version for ALICE/Data standard
TNC-1 WADED EPROM	\$12.00			2	
TNC-2 KISS EPROM	\$12.00			2	
TNC-1 KISS EPROM	\$12.00			2	
PK-87 WADED EPROM	\$12.00			2	
Publications					
1997 TAPR CD-ROM	\$20.00			4	ISO 9660, 650 Megs of info, w/hand nav pages
Wireless Digital Communications	\$39.99			8	300+ pages writch by: Tom McDermott, N5EG
Packet Radio: What? Why? How?	\$12.00			2	130 pages, TAPR's Packet Radio book
BBS Sysop Guide	\$9.00			2	60 pages by: Barry Burlew, WA0JHT
TAPR's 94 Annual Proceedings	\$7.00			2	Papers from the Annual Meeting (Tucson)
TAPR's 95 Annual Proceedings	\$7.00			2	Papers from the Annual Meeting (St Louis)
PSK Set Vol 1 (#1 - #17 82 - 85)	\$20.00			8	
PSR Set Vol 2 (#18 - #36 '86 - '89)	\$20.00			8	
PSR Set Vol 3 (#37 - #52 '90 - '93)	\$20.00			8	
NOSINtra, Intro to KA9Q NOS	\$23.00			8	for WA5KJ, G3RNV, TCPRP over Packet Radio
ARRL CNC Proceedings 1st - 15th	call			1	Individual Proceedings, call for prices
Endre Sec ARRL DCC 1st - 15th	\$110.00			144	10 Proceedings from 1981 to 1994
Other					
TAPR 11oz Coffee Mug logo	\$11.00			4	Logo in black and microwearable gold
TAPR Badge	\$10.00			0	includes Name and Call for badge
3 1/2" Disk from TAPR Library	\$3.00			0	\$1 per disk. See TAPR Software Library List
Garmin GPS-20 (Member Price)	\$169.00			28	No Discount. Check with office about next buy
Oncore VP GPS (Member Price)	\$269.00			28	No Discount. Check with office about next buy

Subtotal:

Added Total Kit Codes



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

May 1997

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

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

Renewal New Member

SubTotal

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

Except where noted

Total Sales (Subtotal minus discount)

Texas Residents (7.75% tax)

Membership (New or Renewal)

Shipping and Handling

For Total Kit Codes Between

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

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

TOTAL Order Amount

Charge my credit card (check one):
 VISA MasterCard

Acct # _____
 Expiration Date: _____

Signature on card: _____

Name / Call: _____

Street Address: _____

City / State / Zip: _____

Country: _____ Phone Number: _____

Internet Email: _____

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