TAPR #99 SPRING 2006

PACKET STATUS REGISTER

TAPR at Dayton Hamvention

As in the past, TAPR will be making a major appearance at the 2006 edition of the Dayton Hamvention, May 19-21, 2006.

TAPR Digital Forum

On Friday, May 19, 2006, you can attend the TAPR Digital Forum in Hara Arena Room 2, 10:15 AM to 12:15 PM. TAPR President, David Toth, VE3GYQ, will moderate the Forum, which includes the following topics:

- "Introduction and TAPR Update" by David Toth, VE3GYQ and Steve Bible, N7HPR
- "GnuRadio/Software Defined Radio" by Matt Ettus, N2MJI
- "WinDRM Software Digital Voice And Data" by Mel Whitten, K0PFX

Digital Bash

The TAPR Digital BASH moves this year to what we believe is a more convenient location for most of the attendees. It will continue to be held on Friday evening (May 19).

For those who have been attending over the years, you may have noticed that as the years went by, the BASH kept getting further and further away from Hara Arena. This certainly wasn't by plan, but just the way things worked out each time we were forced to find a new venue.

"OK, don't keep me in suspense, where is it this year?"

It's going to be at the Dayton Airport Hotel. This is considerably closer and much easier to find than the old location. Just get on I-75 North and follow the signs to the Dayton airport. From I-75 you will take exit 61B to I-70 West. Go 1.9 miles West on I-70 to exit 32 for the Dayton International Airport Access Rd, which becomes Terminal Drive. The Dayton Airport Hotel is on the right just after passing Boeing Drive.

"OK, so why should I attend?"

The TAPR Digital BASH is a Hamvention tradition. Each year, digitally inclined hams get together for an evening of good food, good discussion, and good fellowship.

To be more specific, the BASH features a buffet dinner, followed by a keynote speech, door prizes, and an opportunity for "birds of a feather" to gather and talk over the latest bits and bytes.

This year's speakers are Lyle Johnson, KK7P, and Steve Bible, N7HPR, who will kick off TAPR's 25th anniversary celebration by taking a walk down memory lane.

The doors open at 7 PM and dinner will be served at 7:30 PM. The after-dinner festivities begin at about 8:15.

For more information, send email to **tapr@tapr.org** or stop by the TAPR booth at Dayton for schedule and map.

The cost is $28.00 per person, tax and tip included. There will be only 100 tickets available for dinner, so *order early*.

TAPR Booth

See us at Booths 607, 608, and 615 in the East Hall of the Hara Arena, where we will have our digital goodies on display so that you can kick the tires before you purchase your next digital project.

###

Call for Nominations: TAPR Board of Directors

Nominations are now open for TAPR Board of Director seats expiring this year, i.e., the seats held by John Koster, W9DDD, Brad Noblet, WA8WDQ, and Steve Stroh, N8GNJ.

Board members serve three-year terms and their responsibilities include:

1) Attendance at both board meetings each year. (One is held at the Dayton Hamvention in May, the other at the Digital Communications Conference in September.)

2) Regular participation in the continuous board session, which is conducted over the Internet.

3) Active engagement in TAPR's management.

To place a person in nomination, please remember that he or she must be a member of TAPR. Also, confirm that the individual is willing to have his or her name placed in nomination. Send that person's name (or your own if you wish to nominate yourself), call sign, mailing address, e-mail address, phone number(s), and a biographical sketch (100 words maximum) via e-mail to **tapr@tapr.org** or to the TAPR office (P. O. Box 852754, Richardson, TX 75085-2754) by August 10, 2006. If you submit a nomination via e-mail, we strongly encourage you to follow up by regular mail.

###

TADD-3 Pulse Distribution Amplifier

By John Ackermann, N8UR, jra@febo.com

TAPR is pleased to announce that the TADD-3 PPS distribution amplifier kit is now available.

The TADD-3's primary use is to distribute 1 pulse-per-second signals such as those obtained from GPS timing receivers, but it can work with pulse signals up to at least 10MHz.

The TADD-3 provides six low-impedance outputs that deliver greater than

3.5 volts into a 50-ohm load, with rise time at the output connector of less than 3ns. It also has two RS-232 level outputs that can be used to feed computer-timing applications. The polarity (normal or inverted) of each output can be independently set.

These outputs can be driven from one or two inputs (i.e., each input can drive half the outputs, or a single input can drive all outputs). The input circuit can accept either TTL/CMOS level signals, or signals at other levels through the use of high speed comparators with adjustable trigger points. The inputs can be terminated in 50 ohms, 4.7 kilohms, or 1 Megohm.

The TADD-3 has the same form factor as the TADD-1 RF Distribution Amplifier. It has an

onboard LM7805 regulator and operates from 7-15 VDC. Current drain at 13.8 volts ranges from 70 to 250ma depending on load and duty cycle.

The TADD-3 kit is priced at $69, with a discounted price for TAPR members of $62.

TAPR is taking orders for the TADD-3 now. Details (and a link to the assembly manual) are available at **www.tapr.org/kits_tadd-3.html**. Orders will be shipped from the TAPR office starting shortly after May 21. Kits will also be available at the TAPR booth at the Dayton Hamvention.

I'm also pleased to announce that TAPR will offer an enclosure that will hold any of the TADD projects. Price and availability date are TBA, but we hope to have these spiffy boxes available by early July. We'll post an announcement as soon as the details with our vendor are finalized.

###

It's a Homecoming Celebration! 25th Anniversary of TAPR and the DCC

By Steve Bible, N7HPR, n7hpr@tapr.org

September 15-17, 2006 -- Tucson, Arizona: Mark your calendar and start making plans to attend the premier technical conference of the year, the 25th Annual ARRL and TAPR Digital Communications Conference to be held September 15-17, 2006, in Tucson, Arizona. The conference location is the Clarion Hotel Tucson Airport - Tucson, Arizona

The ARRL and TAPR Digital Communications Conference is an international forum for radio amateurs to meet, publish their work, and present new ideas and techniques. Presenters and attendees will have the opportunity to exchange ideas and learn about recent hardware and software advances, theories, experimental results, and practical applications.

Topics include, but are not limited to: Software defined radio (SDR), digital voice, digital satellite communications, Global Position System (GPS), precision timing, Automatic Position Reporting System® (APRS), short messaging (a mode of APRS), Digital Signal Processing (DSP), HF digital modes, Internet interoperability with amateur radio networks, spread spectrum, IEEE 802.11 and other Part 15 license-exempt systems adaptable for Amateur Radio, using TCPIP networking over amateur radio, mesh and peer to peer wireless networking, emergency and Homeland Defense backup digital communications, using Linux in amateur radio, updates on AX.25 and other wireless networking protocols.

Register for Conference

You can register online or download the DCC 2006 Registration Form (PDF) and mail or fax to the TAPR Office

Tucson Amateur Packet Radio

Phone: (972) 671-TAPR (8277)

Fax: (972) 671-8716

Email: TAPR Office

General Information

Three-Day Conference (Friday, Saturday, Sunday)

- Technical and introductory sessions will be presented all day Friday and Saturday.
- The DCC will also host the Tenth Annual APRS National Symposium with expanded coverage both days. APRS enthusiasts are highly encouraged to submit their presentations to be printed in the annual DCC proceedings.
- Friday Evening Social. Join others at the conference for a Friday evening social get together.
- Saturday Evening Banquet with an invited speaker that concludes with award presentations and prize drawing.
- The ever-popular Sunday Seminar that focuses on a topic and provides an in-depth four-hour presentation by an expert in the field.

Technical Sessions

This is a must attend conference for technically inclined amateurs. Now, more than ever, amateur radio needs this great meeting of the minds to demonstrate a continued need for our current frequency allocations by pushing forward and documenting our achievements. The ARRL and TAPR Digital Communications Conference is the best way to record our accomplishments and challenge each other to do more.

Introductory Sessions

The ARRL and TAPR Digital Communications Conference is for all levels of technical experience, not just for the expert. Not only is the conference technically stimulating, it is a weekend of fun for all who have more than a casual interest in any aspect of amateur digital electronics and communications.

Introductory sessions are scheduled throughout the conference to introduce new technical topics for beginners and experts alike. Here are some of the introductory seminars scheduled:

Banquet Speaker

Each year the conference invites top amateurs in the field to speak. Past speakers have included Geoff Baehr, N6LXA, Chief Network Officer of Sun Microsystems, Dale Hatfield, W0IFO, Chief of the FCC's Office of Engineering and Technology, Yutaka Sakurai,

JF1LZQ, Vice President of Japan's Packet Radio User's Group, Ken Kaplan, N0GZ, who wrote the OS/9 operating system, and Bruce Perens, K6BP, Linux and Open Source advocate.

This year's banquet speaker are The TAPR Founders. Listen and learn about TAPR in the early days from those that started it all. What were the challenges then? What challenges face the technical side of Amateur Radio today?

Sunday Seminar

Each year the conference holds an in-depth four-hour seminar on Sunday. Past seminars have included such topics as Software Defined Radios, Spread Spectrum Design and Theory, RD Design and Deployment, PICmicro MCU design and development, Packet Radio Networks with Millions or Billions of Stations, and others. Seminars are given by experts in their field.

This year's Sunday seminar will be "Beginning FPGA Development" by Austin Lesea, AB6VU

Demonstration Room

Each year at the DCC a separate (and lockable) room is provided for people to bring and show off their latest projects. Tables and power will be provided. Bring your equipment and display for all to see, learn, and ask questions about. Be sure to bring a small sign and/or flyer naming and describing your

project.

Hotel - Clarion Hotel Tucson Airport - Tucson, AZ

Conference presentations, meetings, and seminars will be held at the Clarion Hotel Tucson Airport - Tucson Arizona.

It is highly recommended that you book your room prior to arriving.

A block of rooms at the special DCC room rate of $69.00 single/double - and includes a complimentary hot breakfast and two cocktails each evening This special rate is good until August 31, 2006, or until the block of rooms are all sold out. Be sure to book your rooms early!

Clarion Hotel Tucson Airport

6801 S. Tucson Blvd.

Tucson, AZ 85706

Tel: (520) 746-3932

Fax: (520) 889-9934

Internet: **www.choicehotels.com/hotel/AZ034**

Transportation

The nearest airport is the Tucson International Airport. The Clarion Hotel Tucson Airport provides a free 24-hour airport shuttle. Check with hotel front desk hotel for availability and scheduling.

Registration Fees

Student pricing (17 yrs and younger) is 50% off regular registration price (meals excluded)

Pre-registration* (before September 1, 2006)

- Two-Day Conference - $70.00
- Friday Only Conference - $40.00
- Saturday Only Conference - $40.00

Late Registration* (after September 1, 2006)

- Two-Day Late Registration after Sept 1st or at door - $80.00
- Friday Only Late Registration after Sept 1st or at door - $50.00
- Saturday Only Late Registration after Sept 1st or at door - $50.00

* - Conference registration includes conference proceedings, sessions, meetings.

Lunches

- Friday Lunch - $15.00
- Saturday Lunch - $15.00

Saturday Evening Banquet

- Dinner with guest speaker, awards ceremony, prize drawing - $35.00

Sunday Seminar

- Sunday 8:00 AM-12:00 PM - $25.00

###

Call for Papers: Digital Communications Conference

By Steve Bible, N7HPR, n7hpr@tapr.org

Technical papers are solicited for presentation at the 25th Annual ARRL and TAPR Digital Communications Conference to be held September 15-17, 2006 in Tucson, Arizona, and publication in the Conference Proceedings. Annual conference proceedings are published by the ARRL. Presentation at the conference is not required for publication. Submission of papers are due by July 31th, 2006 and should be submitted to

Maty Weinberg, ARRL

225 Main Street

Newington, CT 06111

or via the Internet to **maty@arrl.org**

Details on Call for Papers

Technical papers are solicited for presentation at the ARRL and TAPR Digital Communications Conference for publication in the Conference Proceedings.

Annual conference proceedings are published by the ARRL. Presentation at the conference is not required for publication.

The ARRL and TAPR Digital Communications Conference is an international forum for radio amateurs to meet, publish their work, and present new ideas and techniques. Presenters and attendees will have the opportunity to exchange ideas and learn about recent hardware and software advances, theories, experimental results, and practical applications. Topics include, but are not limited to:

- Software defined radio (SDR)
- Digital voice
- Digital satellite communications
- Global position system
- Precise Timing
- Automatic Position Reporting System (APRS)
- Short messaging (a mode of APRS)
- Digital Signal Processing (DSP)
- HF digital modes
- Internet interoperability with Amateur Radio networks
- Spread spectrum
- IEEE 802.11 and other Part 15 license-exempt systems adaptable for Amateur Radio
- Using TCP/IP networking over Amateur Radio
- Mesh and peer-to-peer wireless networking
- Emergency and Homeland Defense backup digital communications in Amateur Radio
- Updates on AX.25 and other wireless networking protocols
- Topics that advanced the amateur radio art

Submission Guide Lines

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!

See above for deadlines and where and when to submit your paper.

Some Quick Guidelines:

- Papers should be on 8-1/2 X 11 inch paper

with the following margins: left and right, 0.75 inch; top, 0.8 inch; and bottom, 1 inch (very important).

• Structure of paper should be (see single column example below, two column should follow a similar format):

- Title
- Author(s) with affiliation
- Abstract (200 words or less)
- Key words (3-5)
- Body
- Reference List

• Papers can be in one- or two-column format.

• Use 12-point Times Roman for the main body of text; do not number pages.

• Photos and drawings should have good contrast. Note: a photocopy gives a good indication of print quality.

• Electronic submissions can be made in any of the following formats:

- Adobe Acrobat PDF
- Microsoft Word

• Reference citations and other topics not explicitly discussed in this list should follow a recognized standard format (APA, IEEE, etc).

• A biographical page is to be included with the manuscript. It should contain Name, Address, Phone, and E-mail for each author as well as a short descriptive paragraph about the first author. The bio page will be used to contact authors concerning the conference and presentation schedule.

Release Form

A formal release form is not required, but indicate that the paper is being sent for use in the Proceedings of the ARRL and TAPR Digital Communications Conference. You are only giving permission for your paper to be printed in the Proceedings.

###

Stereo Microscope for Surface Mount Soldering

By Steve Bible, N7HPR, n7hpr@tapr.org

Often the question is asked about what one should look for in purchasing a microscope for surface mount soldering. Recently heard on the Net...

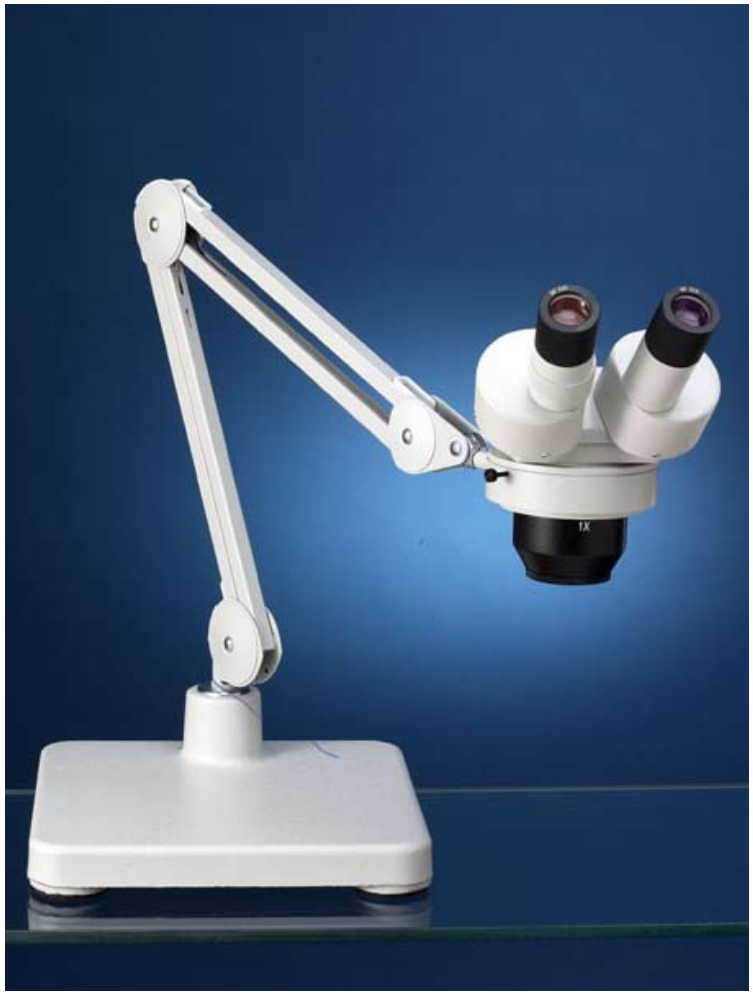
Chuck Green, N0ADI:

You *need* a stereo zoom microscope.

Magnification 10X. Most of the time I use 7X to get a wider field of view. Higher magnifications are sometimes useful for looking as suspect items, but this is rare. I never use greater than 40X and even this is extremity unusual.

Distance to focal point as long as possible. Remember you need to work in this space. Mine is about 3" and that is often limiting.

Get a really good light. It might be a significant portion of your total outlay. It's worth it! I have a 360 deg. (goes completely around the objective lens) florescent light. It was pricey but I'm glad I got it. Its only drawback is that it is a bit large and exacerbates the workspace under the microscope problem. Since I bought this, some LED lights have become available which *might* be better. I have no experience with these.



Don't get a microscope mounted on a stage. Get it mounted on a boom. The stage just gets in the way. You really want your work to only be on your anti-static mat so the microscope needs to be able to swing out over this space. My boom is about 22" long and is just about right. The length that is best for you will depend on your workspace. Mine is a standard desk (5' x 30"). You want to be able to swing the microscope in and out as needed. This needs to be easy to do as you will do it a lot. It's also nice to be able to swing the microscope completely off the surface of your workspace so you can get large objects under it.

Assi Friedman, KK7KX/4X1KX

I agree with Chuck. We have a B&L stereo zoom 4. We got it off an industrial liquidator. You can often purchase them for around $400-$500. We have the rear

illuminator (it's the cylinder in the back), which isn't as good as a circular one. But since we tend to work on a board from the left and right sides, I rarely block the light. The boom is a must indeed as it allows you to work on a box or a bare board. It is also convenient when you want to get it out of the way. The only nicer microscope I have seen is the true stereo ones that give you a 3D image. While not a must, it is a nicer viewing experience.

Lyle Johnson, KK7P:

A couple more comments:

I bought an inexpensive stage-type binocular microscope a few years ago, with a rotating (not zoom) lens system. It was helpful, but not as useful as I had hoped.

Last year I bought a 7-45x binocular zoom microscope on a boom stand with a circular light system from a dealer on eBay "precision*world". They sell for $350 to $425 depending on, well, who knows?

This is a huge improvement and I use it all the time. I bought a 0.5x Barlow lens for it, and sometimes with I had bought a 0.25x or 0.3x instead, as the minimum magnification of 3.5x is sometimes a little too much. 7x as a minimum is definitely too much.

One problem with this microscope is that as you vary the zoom, the focal length changes. So, as you zoom, you need to raise or lower the head slightly. Not a big deal, well within the adjustment range of the knob :-)

With the Barlow lens, the focal length is about 5.5". This is a comfortable working distance.

To prevent solder fumes from plating on the lens, I put a small piece of Costco plastic kitchen wrap over the lens and hold it in place with a rubber band. Seems to not distort things optically, and means I don't have to touch the lens surface with anything to clean, just toss the plastic wrap. Of course, I use a solder fume extraction blower when I solder under the 'scope.

Downsides of this 'scope:

1) The lamp is a little weak, or maybe my eyes are just tired. I sometimes wish for a little more brightness.

2) The variable focal length with zoom.

3) I wish the boom were longer.

4) It would be nice if the boom were grooved or ??? so that if I wish to alter its extended length, the head wouldn't rotate about the boom's long axis. In practice, this is not a problem, as I rarely need to change the extension. I see the same dealer carries a "dual arm boom" system to mitigate this.

Would I buy one of these again?

Yes. I haven't found a better value for the money.

Steve Bible, N7HPR:

Take a look at **www.microscope-store.com/** (he also goes by "windypines" on eBay).

John Stephensen, KD6OZH:

The best that I've found is a Luxo microscope. These are about $800 at Contact East and have a 10" working distance with 5X magnification and will do 20X.

###

SW Ohio Digital Symposium: Looking For New Organizer

By Hank Greeb, N8XX, hgreeb@one.net

The Southwest Ohio Digital Symposium is looking for a volunteer to continue the 20-year tradition of this event.

Carl Morgan, K8CM, has been sponsor for all 20 years, and Hank Greeb, N8XX, has been co-sponsor for 19 years. This is the 2nd longest running digital "convention" in the United States, and has attracted between 50 and 150 digitally minded hams over the years. Carl and I both retired from full time work years ago, but we've been keeping the symposium going until I moved to Michigan, about 300 miles north of Middletown.

The task is fairly easy - we need one "in-house" person to arrange the venue, and at least one other person to arrange the program. Arranging the venue is a matter of filling out a form and submitting it to the property entity within Miami University, but you need to be a faculty or staff member to do so. There are several hams within the Miami University faculty and staff, one or more of whom we might prevail for physical arrangements. The program was "sorta self arranging" - I'd put out a "call for papers" two or three times a year, and keep my eyes to the ground and ears to the digital publications (or some such efforts), and about September or October I'd start sending out feelers to those in the area who have been doing new things with digital modes. I'd say it took between 15 and 25 hours over three or four months to get the program together.

If you're interested, please contact Hank Greeb, N8XX, **n8xx@arrl.org**, with a short bio and why you'd like to carry on. More than likely we'll draft you.

###

APRS Field Day 2006

By Bob Bruninga, WB4APR, bruninga@usna.edu

This year at Field Day, portable and fixed stations all across the USA are encouraged to demonstrate the true portability and ad-hoc responsiveness of the APRS system for come-as-you are needs.

To meet the spirit of the ARRL Field Day Rules, APRS operations will not use any of the existing infrastructures, but will attempt to relay from station-to-station and via portable temporary digipeaters using the generic long haul path of TEMPn-N (spoken as TEMP en dash en).

Further, operations will be conducted off the national APRS frequency and on the general 2-meter digital channel, which is 145.01, if available, in most areas.

On the day of Field Day, all Amateur Radio operators with any fixed home or portable packet capability are encouraged to set up their stations as temporary digipeaters on that (or other agreed regional frequency) using the settings on the APRS Field Day 2006 Web page. You can find that page by Google search for "APRS Field Day 2006."

Particularly, all mobile TM-D700 radios can easily be configured to support TEMPn-N digipeating not only for Field Day, but also permanently so that these mobiles can re-constitute an APRS network at any time, anywhere. See the "how-to" instructions on the Web page.

Katrina and other disasters show the importance of being able to locate operators and stations using APRS and to do so using an ad-hoc packet network without reliance on the existing infrastructure.

If you have any APRS experience, bring it to Field Day this year, hone your skills and make contact!

###

Call for Papers: 2006 AMSAT Space Symposium

Speakers are invited to submit and present papers dealing with the science of Amateur Radio satellites and associated technologies for the AMSAT 2006 Space Symposium. The Symposium will be held on October 6-8, 2006 at the Crowne Plaza Hotel in Foster City, California approximately 10km south of San Francisco International Airport. This is an annual Symposium, however the 2005 Symposium was cancelled due to hurricane damage caused by hurricanes Katrina and Rita. Speakers originally scheduled for the 2005 Symposium are invited to re-submit papers for the 2006 Symposium.

Recommended topics include but are not limited to the following categories:

- AMSAT P3E
- AMSAT Eagle
- Microsatellite Projects
- Cubesat and Nanosatellite Projects
- ARISS
- Attitude Determination and Control
- Propulsion
- Communications
- Mechanical
- Antennas
- Ground stations
- Digital Modes
- Education and Outreach
- Launch Opportunities
- Status Reports

Applications to present papers must be submitted by July 15, 2006. Papers must be submitted no later than August 1, 2006.

The planning committee has created an online registration system where you can submit your abstract and track it. Using this system will allow you to submit your paper and any subsequent changes online. Visit the 2006 Symposium Paper Registration Web page for instructions: **www.amsat.org/amsat-new/symposium/2006PapersProcedure.php**

###

Tracker2: Advanced APRS Tracking in a Small Package

By Scott Miller, N1VG, scott@n1vg.net

When I started development of the OpenTracker back in 2003 (Introducing the OpenTracker, PSR #92), I had one purpose in mind: to develop a simple, inexpensive demonstration platform for the experimental OpenTRAC protocol (A New Tactical Reporting Protocol, PSR #87). It achieved that goal, and since then I've shifted my attention to making it as useful as possible for regular APRS. In that role it has become far more popular than I ever expected, but it's clear that with either protocol there is only so much that can be done with a transmit-only device. Many of the APRS features requested by users, and most of the really interesting things I'd like to try with OpenTRAC, would require receive capability.

Even if the current OpenTracker hardware could demodulate an AFSK signal, buffering a single AX.25 packet could require more than the total amount of RAM available in its microcontroller. A successor to the OpenTracker would need a much larger MCU, but to reduce development time and allow reuse of as much existing code as possible, it would need to be a device from the same family. I considered several possibilities, and finally settled on the Freescale MC908AP64. The 'AP64 has roughly eight times as much flash memory as the 'KX8 used in the OpenTracker, and more than ten times as much RAM.

The next step was to design the demodulator section. The ever-popular MX-614 chip was a possibility, but I didn't need the transmit side – in fact, using it would have eliminated the 300 baud and PSK-31 modes that the OpenTracker was already capable of. In the end, I settled on the venerable XR2211 and a small passive filter network, a proven configuration similar to many TNC-2 clones. It's also significantly less expensive than the MX-614 and more readily available. With the replacement of some passive components, it can be reconfigured for 300 baud AFSK, or even RTTY reception.

I tentatively named the new project the Tracker2 – not to imply less openness than the OpenTracker, but to avoid confusion with the OpenTRAC protocol and another open source software project. The source code for the new project will be released, most likely under the GNU GPL rather than the BSD license that covers the original OpenTracker code.

I had originally intended to produce the Tracker2 only in surface mount form, but when the time came to start beta testing, I decided to create a traditional through-hole board layout that could be easily assembled as a kit. This version – model OT2m – measures 3.9" by 2.7", and includes a modular jack for accessories (in particular the Dallas 1-Wire Weather Station), serial and radio connectors, a DC power jack, and has space for a 20-amp high side switch to control power to a radio or other device. A surface mount board that fits in the same case as the OpenTracker and TinyTrak3 is also in testing, but lacks the power control and 1-wire bus features.

So what does it do? Here's a rundown of the features, either currently implemented or expected soon:

Waypoint Output – Like the Kenwood TM-D700 and TH-D7, the Tracker2 can output NMEA $GPWPL strings so that received stations show up as waypoints on your GPS receiver's map display. Unlike the Kenwoods – or any other existing APRS device – the T2 also supports the proprietary interface protocols for Garmin and Magellan receivers, and can set the symbol, comment text, and elevation for each waypoint. A symbol translation table finds the closest match to the requested APRS symbol in the available set, which depends on the particular model of GPS receiver being used. Modern Garmin units offer the best symbol set, and some models even include the ability to upload custom symbols. The T2 will optionally use

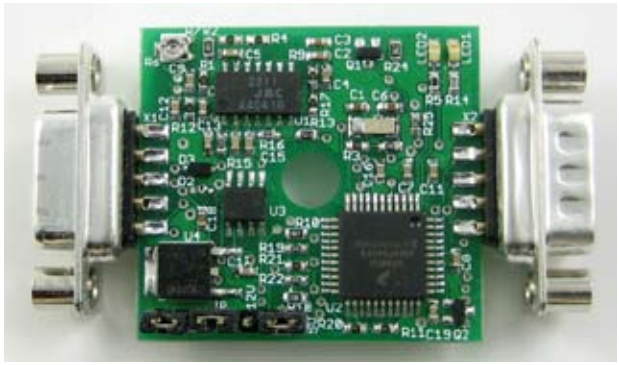
these custom symbols for roughly a dozen of the most popular APRS symbols that aren't found in the regular Garmin symbol set. Comment text from the incoming packet is stored with the waypoint, if the GPS receiver supports text comments. All position formats are supported, except for Maidenhead.

KISS Mode – While the T2's relatively small transmit buffer is likely to make it inefficient for applications like bulk file transfers, it's more than adequate for APRS and similar modes.

Digipeating – The T2 currently supports up to eight digipeater aliases. It can perform WIDEn-n and TRACEn-n style digipeating with optional preemption on a per-alias basis, hop count limiting, and configurable duplicate elimination. Digipeating can operate concurrently with KISS mode.

APRS Queries – The T2 responds to both general and directed position queries.

Remote Configuration – Configuration options can be changed using APRS text messages. While not all options are supported yet, eventually you'll be able to completely reconfigure the unit remotely, with changes saved permanently in flash memory. And since it uses APRS messages, the configuration can be done through I-gates – you can key in a configuration command on your D7 handheld and reconfigure a unit on the other side of the planet. Authentication is by call sign only for now, but it'll eventually support a strong authentication algorithm.



Software DCD – With this option enabled the T2 can be operated with the radio's squelch open, allowing faster acquisition of incoming packets. A mute output will also be available for Mic-E repeater operation.

Garmin Protocol – Native support for the Garmin binary interface protocol is provided. In this mode, estimated position error can be reported in the status text.

Console Mode – When not in Garmin mode, a command console similar to a traditional TNC is available. Configuration options can be changed here, incoming packets can be monitored, and APRS messages can be sent to other stations.

All OpenTracker Functions – Everything the original OpenTracker can do, the T2 can do too. That includes SmartBeaconing, time-slotting, temperature and voltage output, profile switching, APRS telemetry, Base91 compressed mode, low-voltage transmit inhibit, digital counter, and easy flash firmware updates.

The 20-amp switch on the OT2m can be controlled remotely, and a future version of the board might provide several more digital I/O lines and analog inputs on a terminal block for remote control and telemetry use.

The Tracker2 is currently in beta testing – you can follow the development at **http://groups.yahoo.com/group/tracker2**. Much programming work remains, but with any luck I'll have the first batch of kits available at Dayton. Stop by booths 213-214 and check out the demo, along with the latest gadgets from APRS World LLC and the HamHUD group.

###

Amateur Radio Missing the Digital Age

By Pete Loveall, AE5PL, pete@ae5pl.net

During the 20th century, a bunch of hobbyists known as Amateur Radio operators (hams) helped pioneer many types of radio communications. While some hams were at the forefront of technology, others had to be dragged along kicking and screaming. This was to be expected and did little long term harm to the hobby.

Because of Amateur Radio was moving forward in communications and because the participation was distributed throughout the country and world, many organizations and governments began to look to Amateur Radio for supplemental and emergency communications. This is how the hobby was transformed into the Amateur Radio Service. Unfortunately, Amateur Radio started to slip from prominence in the 1990's as digital communications became commonplace while hams remained stuck in a communications environment devoid of the concept of networks. Some people have claimed that the widespread availability of the Internet killed AX.25. They are wrong. The refusal of the Amateur Radio community to adopt networking standards for their digital communications killed the AX.25 networks in the USA and made them extremely restrictive in other parts of the world.

Why are network standards and concepts so critical to the continued use of Amateur Radio as a service? Because our served agencies now expect and demand readily available and accurate information in visual form, either in text or images. Why doesn't Amateur Radio adopt network standards for its digital communications? Because there are many people who believe that no ham should be "at the mercy" of a sysop and that each ham should have the complete authority to dictate how and where their data goes. Unfortunately, these two concepts are not based on any historical, regulatory, or operational foundation other than how the AX.25 protocol has been misused for the past 25 years.

Historically and operationally, hams have always been "at the mercy" of sysops for years. Net Controls for traffic and other nets are in essence sysops. They control who gets to talk to whom, when they get to talk, and how they get to talk (on frequency, on a different band, etc.). Repeater Control Operators and trustees are sysops. They control who can us the repeater and how it can be used. They dictate what linking, if any, can be done.

From a regulatory standpoint, the FCC mandates that each operator is responsible for how his or her stations are used. Digipeaters (digital repeaters) are not exempt from this requirement. True, the FCC has allowed for certain exemptions for content of automated repeaters, but they have not exempted those repeaters from being operated in a fashion compatible with surrounding areas. If a repeater is set up that interferes with another repeater or station that is against the law. Setting up a digipeater that can be used to interfere with other digital operations on that frequency when there are controls that can be in place to prevent or minimize interference is also against the law. So why do people believe that it is "their right" to dictate to the digipeater trustee (sysop) how their digipeater will be used?

This all gets down to the central issue: when Amateur Radio entered the digital age, some very forward thinking individuals developed AX.25 as a layer 2 (data link) protocol. Then the rest of the Amateur community quickly adopted it

to keyboard-keyboard and keyboard-BBS type operations, wrote everything around the protocol (instead of on top of the protocol), and tried to make use of the digital repeater concept to create wide area networks using the repeaters as nodes, We got what we asked for: a limited, difficult to use hodge-podge of incompatible networks which were seldom viable for even the most local of areas.

It was not the widespread availability of the Internet that killed AX.25. It was Amateur Radio that killed AX.25. The Internet brought simple, easy-to-use digital applications to our homes. Configuration was continually refined to a plug-and-play level. Anyone with sufficient funds could use the Internet. Amateurs, on the other hand, did nothing to move out of the station-to-station communications mindset and refused to embrace the expansive world that a generic network infrastructure would enable. It was and is easier to talk to a person than to type on the keyboard so Amateurs went back to picking up the microphone or experimenting with other radio modulation techniques. Except for some isolated backbone networks and for APRS, AX.25 has slid into the background. APRS suffers from all of the same issues that previous AX.25 implementations had (written as part of, not on top of, AX.25, uses digipeaters as nodes, and incompatible with other AX.25 applications) and will, unfortunately, tend to peak and then decline (it already has begun this decline).

Do we want to turn Amateur Radio into an ISP? No! What some of us do want to do, however, is bring Amateur Radio into the digital age so we can continue to expand our communications universe, encourage non-hams to join our community, and to provide necessary services to served agencies. There is currently a drive underway to create an AX.25 v2.3 specification that will be accepted throughout the world. The SIG supporting this drive is the AX.25 Layer 2 SIG hosted by TAPR. Significant issues being addressed are things like standardized extended frame windows; extended frame lengths; well-defined layer 2/ layer 3 interfaces; mandating a maximum of 2 digipeaters; no callsign substitution except for the generic discovery callsign.

There are also hams working on bringing WiFi technologies, D-STAR technologies, and other generic digital technologies into common use. These are all significant if Amateur Radio is to be called upon in the future to provide communications for served agencies. Generic network architectures give developers the ability to create applications that don't care how the data is being transported. It gives developers the ability to develop common drivers with standardized interfaces (APIs). It gives users the ability to install and run software without having to know or understand the local network topology. It brings Amateur Radio into the 21st century.

If you want to see Amateur Radio become useful again, join up with one of these groups and help move Amateur Radio into the easy-to-use, easy-to-deploy digital age. Without your help, Amateur Radio will still be using the equivalent of spark-gap technology and will become less and less of a factor to provide services in the future.

Next quarter: OSI protocol model, why the Internet is so successful, and what it all means to Amateur Radio.

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