

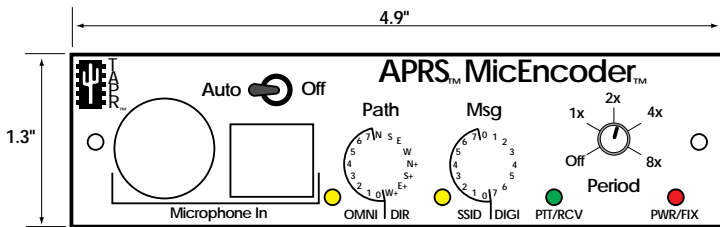
Product Overview

Spring 1998

Tucson Amateur Packet Radio • 8987-309 E Tanque Verde Rd #337 • Tucson, Az • 85732
Office (940) 383-0000 • Fax (940) 566-2544 • Internet tapr@tapr.org www.tapr.org
TAPR is a Non-Profit Research and Development Corporation

TAPR APRS™ MIC-E™

As mobile GPS/APRS continues to grow in scope, we can eliminate the need for every mobile user to have a TNC, digital radio, and second antenna by simply integrating the position report into a tone burst at the end of a voice transmission over any ordinary two-way radio. The MIC-E™ (Mic Encoder) is this solution, since no additional hardware is required in the vehicle, other than a GPS unit.



Simply install the MIC-E™ between your radio microphone and radio and your GPS unit will be transmitting APRS AX.25 frames at designated intervals without needing a TNC! Very useful in many settings. The MIC-E™ even allows for the installation of Garmin, Motorola, and Trimble OEM GPS units internally. Besides reporting position and vehicle type, one of 7 canned messages and 4 analog telemetry values can be transmitted.

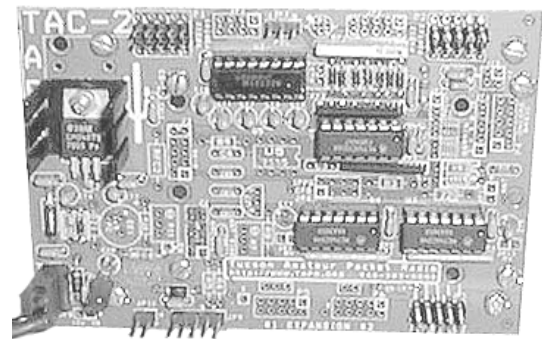
The MIC-E™ has been designed so that it will interface to any unmodified radio via the microphone using either an RJ-45 or 8-pin mic connector on the MIC-E™, uses standard AX.25, compresses the position report into 0.3 seconds of transmit, operates at a low enough power to be powered from the MIC jack (if supported by the radio), accepts the readily available NMEA output from GPS receivers, and supports 4 analog channels for telemetry. The result is a 1200 baud position report compressed to 32 bytes including beginning and ending FLAGS. This equates to about 320ms of transmission, including CALLSIGN, DIGIPEATER PATHS, and a minimum message capability. Plus, the packets are still receivable on ANY AX.25 TNC.

The heart of the MIC-E™ is a PIC chip processor. The unit is a semi-kit, which means that the board is assembled, but still requires some assembly and soldering to configure and setup for operations. See: <http://www.tapr.org/tapr/html/mic-e.html>

Totally Accurate Clock

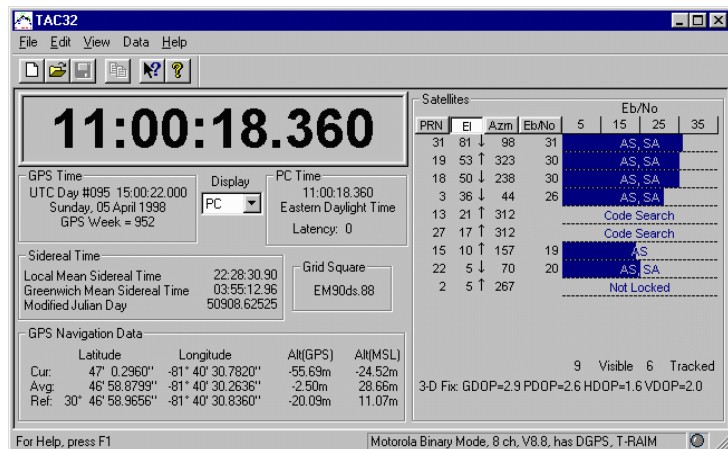
If you need an accurate clock, then the TAC-2 (Totally Accurate Clock), designed by Tom Clark, W3IWI, is for you. Depending on the selection of a GPS, RMS timing precision of 50nsec or less can be obtained. This is 3-4 orders of magnitude better than any of the WWVB or DCF77 systems -- like the "Most Accurate Clock" units provided by Heathkit in years past.

The TAC-2 kit can interface to several popular GPS units including the Motorola ONCORE, Garmin GPS-25 and Trimble SK-8 — which can all be mounted on the TAC-2 board. The TAC-2 adds a number of desirable features in this kit (see web page for all the details!)



The TAC-2 kit is intended to serve several purposes: It provides a "universal" electrical and mechanical interface for a number of common OEM board-level GPS receivers including specifically: Garmin GPS-25, Motorola Oncore, and Trimble SK8. It provides interfaces for the 1 pulse-per-second (1PPS) signal generated by the GPS. It supports Low-impedance, fast rise-time 1PPS signals for "laboratory" applications. Has RS232 level 1PPS signals for computer applications. Supports specialized 1PPS interfaces for an add-on PCB that will stabilize a low-cost crystal oscillator to an accuracy ~ 1 part-per-billion. It can be configured with several

different power supply options to make use of your GPS receiver easier. The kit has provision for an Uninterruptible Power Supply (UPS) to buffer the GPS receiver through brief power outages. The TAC-2 can provide Battery Backup so the GPS receiver can wake up "smart."



The SHOWTIME program (provided) displays the UTC time, date, day-of-week, day-of-year, local, Greenwich Mean Sidereal times, JD and MJD, and even the current GPS week. You can enable audible "WWV-like" time ticks to assist you in setting the formatter (or your wrist-watch). You can have the software automatically reset the PC's internal clock with about 25 msec accuracy. All the time display updates and audible ticks happen synchronously with the GPS 1 PPS signal because the PC reads the tick on its DCD line. SHOWTIME allows you to enter timing offsets, thus allowing easy corrections for time delays in cables and the instrument and it tells you (with 1 nsec resolution) the actual epoch of the 1PPS tick and it gives you an estimate of the accuracy of the tick. SHOWTIME gives you a nice display of which satellites you are using and which satellites are above the horizon and includes a bar-graph "S-meter" for each of the GPS satellites currently in lock. Full details on the software is available on the web page. (<http://www.tapr.org/tapr/html/kits.html>)

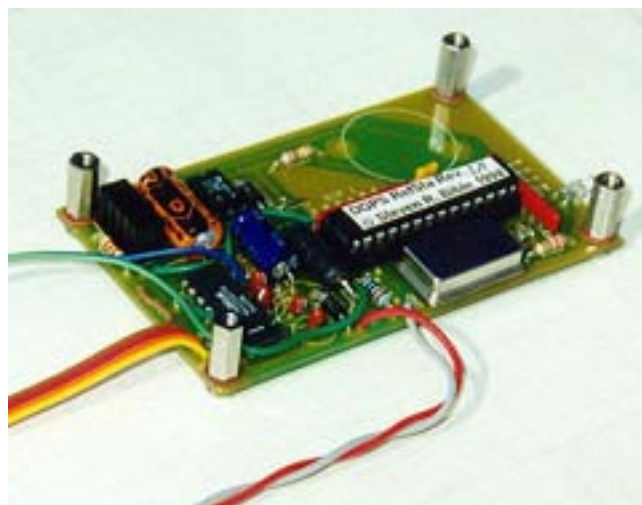
TAPR Mug

11oz white Porcelain Mug with TAPR logos



DGPS Ref Station

The Differential GPS (DGPS) Reference Station Interface Board connects to a Motorola Oncore VP OEM GPS receiver to create a low cost 8-channel DGPS Reference Station. The Reference Station provides pseudo-range differential GPS corrections that conform to the RTCM SC-104 Type 1 Version 2.1 message format. These can be transmitted via data link to remote users. Possible data links are radio modems, terminal node controllers (TNC), or telephone modems. Remote users receive the corrections and apply them to their DGPS ready receiver to calculate a DGPS solution.



Possible uses include:

- Search and Rescue
- Fire Fighting/Flood Area Boundaries
- Automatic Vehicle Tracking
- APRS Trackers
- Parades and Marathons
- Balloon Tracking
- Research and Development
- Anything that requires increased GPS accuracy

(<http://www.tapr.org/gps>)

AN-93

The AN-93 kit (designed by Johan Forrer, KC7WW) provides any PC user with the capability for operating RTTY, AMTOR, and PCTOR with this simple modem-only design. AN-93 is the equivalent of a BayCom, BayPac, or PMP setup, but for HF digital operations. This very simple kit should be for many that have wanted to play on HF, but didn't want to pay the money for an expensive multi-mode controller.

With the AN-93, only three components are required for HF digital communications: a PC-compatible computer, the AN-93 modem, and software that performs the encoding and decoding. The AN-93 comes with a tuning indicator to allow visual tuning and the unit also provides audio output for oscilloscope display.

The TAPR AN-93 allows for both FSK and AFSK output, allowing operations on all HF radios. Single board dimension is approximately 4"x3.5" and operates off 12volts DC. The kit allows for self-tuning and calibration. A Digital VOM and a working PC is needed in order to calibrate and test the modem. Connections to the RS-232 serial and parallel ports are made through DB-9 and DB-25 connectors. Interfacing to the radio is through a DB-9 connector. The kit is shipped with the A/D convertor providing full-memory ARQ capability for PCTOR. Shareware software is included along with Johan's code. If you decide to use the shareware software, TAPR requests that you do submit the necessary registration fee.

DAS

The DTMF Accessory Squelch (DAS) designed by Paul Newland, AD7I, is based on an article which appeared in QST (December 1995). The DAS acts like a switch connected in series between the speaker output of your VHF or UHF transceiver and an external speaker. DAS will monitor a radio channel for you, with the speaker switch open so the speaker remains silent, until someone sends one of the DTMF sequences you have selected. When DAS hears your selected Touch-Tone ID sequence it can then control any number of applications -- light a LED, sound a buzzer, close switch, etc. Application Notes cover issues regarding: Operating with Fewer Controls and Indicators, Selective Group Calling, How to use DAS with a scanning radio, and automated methods of Acknowledging SELCAL Messages.

TAPR is selling a "partial" kit of the DAS (DTMF Accessory Squelch) system described recently in QST (QST Dec 1995, pages 25-31). We say it's "partial" because not all components described in the QST article are provided with the kit. The partial DAS kit includes the PC board, almost all components that mount on that board, including TB1 and TB2, the screw terminal blocks, and all ICs. The microcomputer (U1) included with the kit is a OTP microcomputer pre-programmed with the DAS firmware. Sockets are included for all DIP ICs. You get one relay for K1.

TAPR TNC DCD Upgrades

Proper operation of Data Carrier Detect (DCD) is imperative for efficient sharing of a packet channel. Many TNCs don't provide optimum DCD operation. Over time, it has become apparent that most modems lack the proper DCD operation. Some work well, some are worse than others, some allow improper operator adjustment, and some have the "threshold" adjustment set incorrectly. If the DCD decision could be made on the basis of "information coherence" rather than "is there some sort of signal or noise present?", LAN operation would improve. The TAPR DCD kits were designed to make it a trivial matter to upgrade most TNCs to improved DCD operation with the addition of a simple board. These mods are extremely useful for both VHF and HF operation. **This upgrade will dramatically improve DCD operation**, allowing you to run your radio unscelched. This alone reduces other stations' TXDelay requirements, improving channel throughput.

State Machine Upgrade

For TNCs with modems such as:

KPC-1	PacComm Tiny-2/Micro-2
KPC-4	DRSI PC*PA Type 1
KPC-2400	DRSI PC*PA Type 2
KAM	AIWA APX-25
AEA PK-87	AIWA APX-25M
AEA PK-88	TASCO TNC-20
AEA PK-232	TASCO TNC-20H
PacComm TNC-220	Heath HK-232
Heath Pocket Packet	

The upgrade adaptor for these TNCs adds an EPROM-based State Machine to derive DCD based on lockup of a digital phase-lock loop. It is a small PC board assembly that mounts easily inside the cabinet of most any TNC (**NOT** the Heath Pocket Packet/TASCO TNC- μ 21).

DCD Clock Option: For TNCs with "software HDLC," an optional clock generator may be included to provide the necessary clock signal (**KPC-1**, **KPC-2**, HF channel of **KAM**).

XR-2211 Upgrade

For TNCs using the XR-2211 demodulator such as:

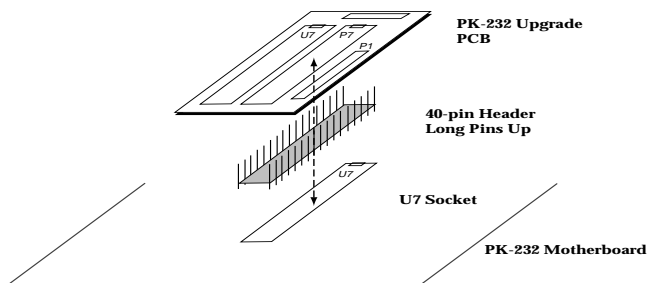
TAPR Beta Board	GLB PK-1
TNC-1	GLB TNC-2A
TNC-2	PacComm TNC-200
Heath HD-4040	MFJ 1270
AEA PKT-1	MFJ 1274
AEA PK-80	DRSI HF*MODEM

The PC board is tiny and shaped to fit into a TNC-1 or TNC-2. After construction (an hour or so), you simply unplug the XR-2211 chip from its socket, insert it into the socket on the upgrade board, then plug the upgrade board into the IC socket vacated by the XR-2211 chip on the TNC. If you are into HF operation, provisions are made to connect a "Threshold" control onto the demodulator. The result will be fast-attack, slow decay DCD with a hang time to compensate for temporary fades due to multipath. When all stations sharing a channel have proper DCD action, data flows more efficiently.

PK-232 Modem Disc

This kit is a simple PC board assembly once completed simply plugs into an IC socket inside the PK232 and provides you with a "Standard" TAPR modem disconnect header with no wires tacked solder onto your unit. This header provides a convenient place to connect the DCD State Machine upgrade kit, the TAPR 9600bps modem, DSP-93, or other items that need the TAPR 20pin modem header. The result is a no-holes enhancement of your PK-232 (or Heath HK-232).

Diagram of PK-232 Modem Disc with AEA PK-232 main board.



PK-232 MBX Install

This kit allows owners of a PK-232MBX with the "new" motherboard to install the TAPR 9600 bps modem with complete ease.

The kit consists of two pre-wired harnesses, metal spacers, and screws. The metal spacers and screws are used to mount the TAPR 9600bps modem to the PK-232MBX motherboard by picking up existing mounting studs inside the PK-232MBX. The first pre-wired harness is used to connect the TAPR 9600bps modem to the TAPR PK-232 Modem Disconnect Upgrade. The harness plugs into between the 9600bps modem and the modem disconnect header. This harness can be used with all styles of the PK-232. The second harness provides connections to all the other points required on the "new" PK-232MBX which does not have a daughterboard. The second harness is only suitable for the PK-232MBX units of the new style.

Installation becomes a simple "plug and play" operation, with no wiring harnesses to fabricate, no hardware to locate, and no holes to drill!

9600bps modem

NOTE: This kit requires some prior hands-on experience with radio modifications.

The TAPR 9600bps modem (by Lyle Johnson, WA7GXD) is a full-duplex baseband modem compatible with K9NG and G3RUH standards. The TAPR 9600bps modem requires an interface to your radio other than via the microphone and speaker jacks. The modem fits internally into the case of many popular TNCs and supports a 20-pin modem

disconnect header which allows for a second external modem (such as the TAPR PSK modem) to optionally be connected. The modem selection logic correctly routes the PTT command from the TNC to prevent keying your 1200 baud radio when running 9600bps. The receive filter includes a compensation adjustment to tailor the modem to the radio receiver and AC-coupling to accommodate frequency drift on the channel. An improved state machine is used for clock recovery. The DCD circuit works on both signal quality and the presence of a signal.

9600bps Modem Clock Option

The clock **option** provides the necessary radio port clock for 9600bps operation. With the clock option installed, you can switch between 1200bps and 9600bps operation with a single switch. The clock option is necessary if you wish to use your modem as part of a stand-alone full-duplex 9600bps repeater, in conjunction with the bit regenerator option.

9600bps Modem Bit Regenerator Option

This **option** (works only when installed in a TAPR 9600 baud modem) is intended only for use as part of a full-duplex 9600bps repeater. It is not suitable for use at a home station. The bit regenerator keys the PTT line of the modem whenever it receives an incoming signal (DCD is true). It stores the first 8 bits in a buffer, then starts sending the bits out again, resynchronizing them with its own crystal-controller clock to remove jitter and noise from the received signal. Full-duplex bit-regenerating repeaters are beginning used in many locations.

TAPR Shirts!

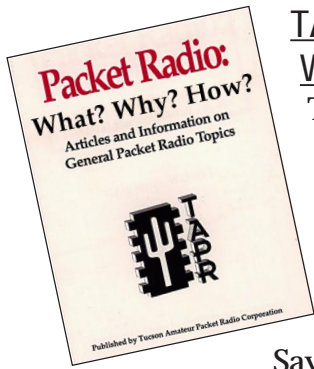
You too can wear a TAPR shirt!

TAPR's shirts Page is located at URL:

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

- TAPR is making available four types of shirts in all sorts of colors, prices, and sizes.
 1. 100% heavyweight preshrunk cotton t-shirt
 2. 50% polyester/50% cotton fashion knit collar and rib cuffs
 3. 100% ring spun combed cotton hvywt pique
 4. 100% combed cotton double mesh pique golf shirt with vertical stripes
- Each shirt has the TAPR logo (three color style choices) embroidered on the left chest.
- Members may add their name and call for a slight additional cost.
- Orders for shirts are placed at the first of each month and may take 1-2 weeks before they can be shipped from the office.

Publications



TAPR's - Packet Radio: What? Why? How?

The packet elmers will help you set up your digital shack! If you own a packet station or think you might buy one soon, this book is a must for your reference library. Why reinvent the wheel?

Save hours of time and endless frustration getting started, and find hundreds of tips and short cuts from ham radio's digital experts. Finally, a book with everything you need to know about packet radio, explained in easy-to-understand English, not overly-technical mumbo jumbo!

TAPR' s - BBS Sysop Guide

This book contains basic information for the amateur operator interested in getting involved in and operating a full-time, full-service BBS. Learn from the BBS sysops who have gone before. A guide worth having!

ARRL CNC and DCC Proceedings

Looking for past proceedings of the ARRL Digital conferences, then TAPR is your source. Our agreement with the ARRL, gives us the proceeding two years after the conference.

TAPR CD-ROM

Over 650 Megs of Data in ISO 9660 format. TAPR Software Library: 30 megs of software on BBSs, Satellites, Switches, TNCs, Terminals, TCP/IP, and more! 150Megs of APRS Software and Maps. RealAudio Files. Quicktime Movies. Mail Archives from TAPR's SIGs, and much, much more!

Wireless Digital Communications:

Design and Theory

Finally a book covering a broad spectrum of wireless digital subjects in one place, written by Tom McDermott, N5EG. Topics include: DSP-based modem filters, forward-error-correcting codes, carrier transmission types, data codes, data slicers, clock recovery, matched filters, carrier recovery, propagation channel models, and much more! **Includes a disk!**



Spread Spectrum Update (1998)

The purpose of this publication is to provide a publication of current and past information and articles related to the area and research of spread spectrum in amateur radio. Articles cover: Intorduction to Spread Spectrum, Theory and Design papers, Regulatory, and more.

TAPR Membership

Are you interested in:

- HF Digital Communications ?
- Digital Video ?
 - Internet Radios ?
 - Spread Spectrum Communications ?
 - APRS w/ GPS ?
 - Wireless Communications ?
 - Packet Radio ?

TAPR is the largest group in the world devoted to the amateur digital modes. TAPR is a non-profit amateur radio organization that develops new communications technology, provides useful/affordable kits, and promotes the advancement of the amateur art through publications, meetings, and standards. TAPR began with the development of the now famous TNC-II (packet radio TNC).



Combine this work with the Packet Status Register, an authoritative source since 1982 for up-to-date user and technical information about digital communications, and you can't go wrong when you join TAPR!

Membership includes **10% off** on most kits and all publications and a subscription to the *TAPR Packet Status Register* quarterly journal. **Don't be left out!** TAPR is the place to get connected on a national and regional basis. Find out what others are doing and what **you** might do next in digital communications!

Membership

Annual membership US/Canada/Mexico \$20, outside North America \$25. US Funds. Visa/MC

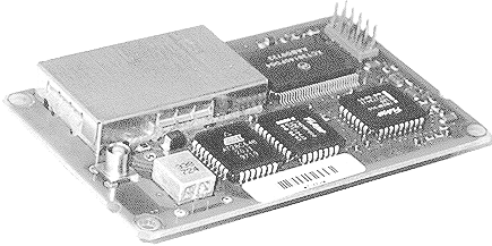


JOIN TAPR

MEMBERS GET 10% OFF ON
KITS AND PUBLICATIONS

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>



and includes:

- Motorola ONCORE VP (B4121P115x) engine
- Documentation

TAPR places orders for Oncore units the first of each month.

Garmin GPS-25

and includes:

- Garmin GPS-25 (8 channel sensor) engine (1.83" x 2.74" x .45")
The Garmin GPS-25 is similar to the GPS-45
- assembled power/data cable with connector shell
- Documentation

TAPR places orders for Garmin units the first of each month.

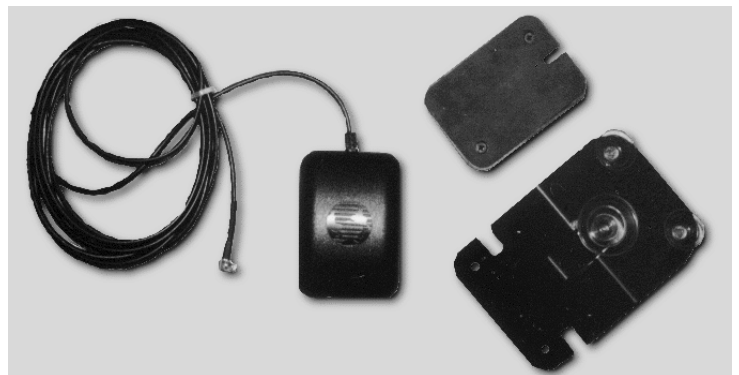
Motorola Antenna 97



and includes:

- Motorola Antenna 97
- mag mount
- BNC connector attached to coax

Garmin GA-27 Antenna



and includes:

- Garmin GA-27 Antenna
- mag mount and suction mount
- MCX connector attached to coax

No 10% Discount for TAPR Members on some products. Due to the nature of some purchases, the purchase price for TAPR members represents the membership discount. See order form for details.

See: <http://www.tapr.org/gps> for full details and information about GPS group purchases.

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.