# Automatic Packet Reporting System (APRS)

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## Introduction

The Automatic Packet Reporting System (APRS) is a multi-purpose program for the PC which makes use of data from the amateur packet network to provide a number of interesting and valuable functions.

APRS embodies WB4APR's experience over the last 13 years using packet radio for real-time communications in public service events. It also incorporates the capability for operating over non-local distances without use of the existing packet network.

APRS accomplishes the real-time display of operational traffic via packet broadcasts and map displays.

Historically, almost every aspect of HAM radio communications has as its root, the interest in the location of other stations. Look at DX maps, countries worked, counties worked, grid squares, mobile chatter; everyone is quite interested in where other stations are.

Secondly, APRS avoids the complexity and limitations of trying to maintain a connected network. It permits any number of stations to participate and exchanges data just like voice users would on a single voice net. Any station that has information to contribute simply transmits it, and all stations receive it and log it.

Packet radio has great communication potential but so far has been best used for passing large volumes of message traffic from point to point or into the national distribution system. It has been difficult to apply packet to real time events where information has a very short life time. Typically, several steps are involved in preparing and passing message traffic including decisions about routing and connectivity.

APRS recognizes that one of the greatest real-time needs at any special event or emergency is the tracking of key assets.

-Where is the Event Leader?
-Where are the emergency vehicles?
– Where's the fire?
– Whats the Weather at various points in the County?
-Where are the power lines down?
– Where is the flood?
-Where is the head of the parade?
-Where are the VIP's?
– Where is the mobile ATV camera?
-Where are the mobiles?
– Where is the hurricane'?

With the advent of affordable Global Positioning System (GPS) receivers, the powerful capabilities of APRS are greatly enhanced for the public service community (especially the Civil Air Patrol and disaster management", boaters, hikers, etc.

The latest versions also provide specialized support for DX cluster system users, and the direction finding capabilities are a boon to 'fox hunters.'

APRS should not be considered just a 'mapping program.' While it has a powerful capability to use vector maps (including USGS 15° grid and CAP 7.5°grid maps, and gridsquares) to display the position of objects, the program uniquely and powerfully handles databases such as country callsign prefixes, National Weather Service sites, airport locations, etc. NWS information may be automatically via a landline dialer function. Headings to any object may be calculated and displayed.

## Display Screens

There are three major display subsystems and a number of other minor displays.

### Latest Beacons

This display maintains a list of the latest UI frame received from each station. In effect, this is a multi-station one-line broadcast message system. Since the lines contain the LATEST time of receipt, this display shows if a station is still on line within the last few minutes.

### Positions

This display maintains a separate list of the positions of each station. Each position report can also contain a brief comment. These lines show the latest time of receiving a given position report and give an indication of the latency in the network over unreliable paths such as HF.

They also contain Beam Heading for Direction Finding, and Weather conditions for weather reporting stations.

### Maps

Maps to any scale from 0.125 miles up to 20,000 miles can be displayed. Stations are instantly displayed when they transmit a properly formatted position beacon. Stations with a reported course and speed are automatically dead-reckoned to their present position. A complete database of all the National Weather Service stations is built in. You can

center the map anywhere in the world.

## Traffic

In addition to the BEACON text which is used to broadcast information to all other stations on the net, there is an operator-to-operator message capability. Any station can send one line messages to any other station. On receipt, the messages are acknowledged and displayed on the bottom of the receiving stations screen until the operator hits the K key to kill them. These messages are ideal for station-to-station communication while remaining within the APRS environment. However, they are not as efficient as the connected protocol, and should not be used routinely for Rag-Chewing on a busy APRS net. To rapidly exchange text, got to Talk mode and connect to the guy.

## Read Mail

This screen shows the last 23 lines of messages exchanged by any stations on the net. Is useful for "READING THE MAIL".

## All Traffic Log

This display is a time sequenced log of every new beacon or one line message sent. Beacons are logged the first time they are received. This is in contrast to the LATEST display which shows the most recent time of receipt of a beacon text.

## Heard Log

This display maintains a count of the total number of transmissions from each station per hour. These statistics are ideal for displaying the connectivity of the network over varying paths, such as HF, or to see when stations enter and leave the net.

## Digipeater List

This Display shows the full raw packet header so that APRS users can see what digipeater paths are being used by other stations.

The proper use of digipeaters is important in an APRS network.

## Station Tracking

Although APRS automatically tracks mobile packet stations interfaced to GPS or LORAN navigation, the graphic capability of the maps works perfectly well with manual tracking or with gridsquares. Any station on HF or VHF that includes his gridsquarein brackets as the first text in his beacon text will be plotted by APRS. Additionally, any station can place an object on his map including himself and within seconds that object appears on all other station displays. In the example of a parade, as each checkpoint with packet comes on line, its position is instantly displayed to all in the net.

Whenever a station moves, he just updates his position on his map and that movement is transmitted to all other stations.

To track other event assets, only one packet operator needs to monitor voice traffic to hear where things are. As he maintains the positions and movements of all assets on his screen, all other displays running APRS software display the same displays. The Tracking command on the P display will cause APRS to keep the map display always centered on a selected object.

## Grid Squares

APRS now also plots stations by gridsquares. Since four-digit grid squares only locate a station to the nearest 60 miles or so, and six-digit gridsquares only specify stations to the nearest 3 miles or so, APRS will not display stations reported via gridsquares on map ranges less than 128 and 8 miles respectively. Stations reported by grid squares will each be assigned an exact LAT/LON which is offset from the center of the grid according to an algorithm based on the letters of their callsigns. This prevents all stations in the same grid square from all being displayed on one spot in the center and spreads them out in the grid The resulting POSIT in the POSITION list is annotated to indicate that the position is approximate.

Another advantage of GridSquare reporting in APRS is that it allows cautious people to participate in APRS without revealing their exact location. It is also very brief. Six characters vice seventeen. This is an advantage when reporting via MIR or SAREX.

## Space Applications

APRS could be a solution to the effective use of orbiting terrestrial style packet radio digipeaters in space such as on the Shuttle, MIR, AO-21 and ARSENE.

The problem with space digipeaters is the saturation on the uplink channel which makes the use of a normal CONNECTED protocol impractical. For a CONNECTED contact, a total of five successive and successful packet transmissions are required

Not only does APRS reduce this to one packet, but it also capitalizes on the most fascinating aspect of the amateur radio hobby, and that is the display on a map of the location of those stations.

If all stations were encouraged to simply insert their LAT/LONG or Grid Square as the first characters of their beacon text, or even better, a compressed form of their location in the 'TO' field of the Unproto command, everyone within the satellite footprint would see the location of every successful uplink.

Since the shuttle is a rapidly moving object, the locations of successful uplink stations will move progressively along the ground track.

All it would take to implement this capability is a single AMSAT news bulletin to ask all stations to insert their POSITS in their beacon text or

Unproto string. No changes onboard the shuttle or MIR would be required.

(Ed comment: One additional change is perhaps some attitude adjustment on the part of the user community to be more accepting of digipeated UI frames. This too is a valid form of communication deserving of access to the spaceborne systems.)

## Fox Hunting or Direction Finding

APRS is an excellent tool for plotting the location of a hidden transmitter, balloon, or interfering signal. APRS will display the intersection of bearing lines from a number of reporting stations. To use APRS in this manner, each station having a bearing report on the direction of the target simply enters that bearing using the OPS-BeamHeading command His station will then not only report his location, but also a line of bearing. All stations running APRS can simply hit the X key to display the intersection of these bearing lines. Further, if a DF vehicle has a GPS or LORAN device on board, he can be tracked and directed right to the location of the target. There is an optional Doppler DF registration for direct connection of a Roanoke or Doppler Systems DF unit for automatically plotting andtransmitting instantaneous DF bearings. Please note that APRS uses 360 degrees for North and 000 to indicate that no direction information is available.

## Weather Station Reporting

APRS position reports can also include the wind speed and direction, as well as other important weather conditions. APRS supports a serial interface option to the ULTIMETER-II home weather station. With this interface, your station includes WX conditions in your position report for display at all other stations in the network All weather stations show up as a bright blue circle, with a line indicating wind speed and direction. Remember that APRS uses 360 degrees for North and uses 000 to indicate that no wind direction is available. Each of these stations can be highlighted in turn with a single key stroke, so that all WX reports across the state can be had at a glance.

APRS also has a database of the locations of all the NWS sites in the USA for instant display. APRS can also crunch a file of NWS hourly WX conditions and update all NWS stations on the map.

## Using Dumb Terminals In An APRS Network

The simplicity and usefulness of this geographic capability cannot be over stressed. Stations running APRS simply move the cursor to where they think they are on the screen and their LAT/LONG coordinates are automatically transmitted to all other stations.

Even the simplest of portable packet stations with dumb terminals can report their positions if a pre-printed map is made available to all net participants which has a LAT/LONG grid reference. The portable station just looks at the map and enters his LAT/LONG into his beacon text. Using the same map, he can plot with pins the location of all other stations as he sees their position reports go by. APRS also plots station positions based on Grid Squares. Eventually, we hope that all stations, no matter how they are using their TNC, will include their LAT/LONG or Grid Square in their Beacon Text so that their location is immediately available.

## DX Cluster System Monitoring

APRS will grab all DX SPOTS and put them on the ALL list and maintain a list of all DX cluster users on the local node in the LATEST list. And finally, APRS will plot the DX spot by callsign prefix or Gridsquare if given as the first four letters of the comment field!

## Chessboard

To demonstrate the flexibility of APRS in reporting the movement of objects on screens in a net, I have drawn a chessboard map in the center of the Gulf of Mexico. Any two stations can play chess easily using APRS by placing pieces on the map using the INPUT-ADD command and updating their positions using the cursor and INSert keys!

Monitoring stations that have also zoomed into the chessboard will see the game progress too! You should consider going to an unused frequency so as not to clutter an active APRS net.

## Protocol Techniques

Since the objective of APRS is the rapid dissemination of real-time information using packet UI frames, a fundamental precept is that old information is less important than new information. All beacons, position reports, messages and display graphics are redundantly transmitted but at a longer and longer repetition rate. Each new beacon is transmitted immediately, then 20 seconds later. After every transmission, the period is doubled. After ten minutes only six packets have been transmitted. After an hour this results in only 3 more beacons; and only 3 more for the rest of the day!

APRS version 5.06 implements a decay mechanism which adapts to channel usage.

## APRS Digipeaters

To satisfy the objective of instantaneous response, APRS stations are designed to begin operating without any prior knowledge of the network. For this reason, all APRS stations are initialized with the alias of RELAY and to send all UI frames via the path of RELAY. With this form of generic alias callsign (RELAY) and wildcard digipeating (RELAY), a mobile, or new station

on the air does not have to know anything about the network in advance, but to simply turn on his computer to be seen by adjacent nodes.

Although digipeaters work poorly for AX.25 level 2 connections, they are ideal for APRS operation using UI frames only.

The minimizing of wildcard addressing and multiple repeats when not needed is the key to an efficient APRS network.

In the Washington DC area and Chesapeake Bay area, we are establishing a network of WIDE area digipeaters on the simplex packet frequency of 145.79. This frequency is for Keyboard QSO's and all UI frame applications. Even leaving personal mail boxes on the frequency is welcome, since mail is posted at keyboard rates and is read off-the-air by the mailbox owner without QRM. The normal CONNECTED operation of BBS's, mail forwarding, file transfers, TCP-IP and DX clusters is discouraged!

## Wildcard Digipeating

To make these WIDE area digipeaters respond to mobiles and new stations, all wide area digipeaters have the same alias of WIDE in addition to their normal FCC callsign. This second generic alias of WIDE adds tremendous flexibility to APRS networks by significantly extending the ranges for wildcard digipeating using well situated permanent digipeaters.

These wide area digipeaters are spaced several tens of miles apart so that they are not too close, but that they can hit their adjacent other WIDE digipeaters.

Assuming WIDE area digipeaters are about 30 to 50 miles apart it is very easy to select an UNPROTO path prior to a road trip which will assure that your location packets will always get back to your home area. The following example shows a string of digipeaters along the east coast. The HAM calls of SOUTH and NORTH are used for clarity.

CALL: NORTH-3 NORTH-2 NORTH-l HOME-O SOUTH-l SOUTH-2 SOUTH-3

ALIAS: WIDE WIDE WIDE RELAY WIDE WIDE WIDE

If the mobile is going south for the day, and will be operating in the vicinity of SOUTH-3 digipeater, the operator can preset his UNPROTO path to be via WIDE,SOUTH-2,WIDE.

Notice that not only will his packets make it back to home from the area of SOUTH-3, but also from the area of SOUTH-l since SOUTH-l will also respond to the first WIDE in the list. Similarly, stations in the vicinity of SOUTH-3 are alerted to his movements as he leaves home, since the WIDE,SOUTH-2,WIDE specification is symmetrical. If he set the UNPROTO path to SOUTH-3, SOUTH-2, SOUTH-l in the usual manner, he would not be tracked at his homeuntil he actually arrived at his destination.

As you can see, having the flexibility to alternate the generic aliases of RELAY or WIDE with other known sites gives a good degree of flexibility without having to change the UNPROTO path while on the road. Using the three digipeater string, he can wander up to 150 miles in his planneddirectionandstillbetracked by the XYL. If he has no idea where he is going, he can always use the path of WIDE, WIDE or even WIDE, WIDE, WIDE and go anywhere, but with greater QRM on the channel. Yes there are multiple collisions, and repeats, but the packet does get out to the third tier!

## Pre-emptive Digipeating

The ultimate APRS digipeater configuration is to have modified digipeater code so that any digipeater hearing a UI frame with its callsign anywhere in the UNPROTO path will pause for a reasonable time andthen digipeat the packet as long as it was not previously digipeated by any stations earlier in the list,

This way, to always report your movements back home, you always place digipeaters in your UNPROTO command in the reverse order of your travels. Your packets will be digipeated back to your home area as you enter each new digipeater in your direction of travel. For example, if you live in the vicinity of DIGI-1 below and routinely travel in the direction out to and including DIGI-3.

DIGI-1 DIGI-2 DIGI-3 etc.

The mobile could specify the UNPROTO path of VIA DIGI-3, DIGI-2, DIGI-1 in order to be tracked anywhere all the way out to the area of DIGI-3.

If only DIGI-1 hears the packet, it will pre-emptively digipeat the packet and set its digipeat flag.

If DIGI-2 also hears the original packet, DIGI-2 will pause for P seconds to see if DIGI-1 repeats it. If so, it does nothing, since DIGI-1 follows it in the list. If not, after P seconds, it digipeats the packet for DIGI- 1 to subsequently further digipeat in the normal manner.

Similarly, DIGI-3 pauses for 2*P seconds to see if DIGI-2 digipeated the UI frame. If so, it does nothing. If not, after the 2*P seconds, it digipeats the packet.

Even if the packet pauses and comparisons are not performed, (to simplify the code) the worst case is that N duplicates will arrive at the destination for all N digipeaters that simultaneously heard the original UI frame. Since these are UI frames, any pauses in the network for the comparisons suggested are not sig-

nificant. The extra code to do the pauses and comparisons only protects against duplicates when two digipeaters hear the same original packet.

This algorithm works perfectly well in reverse. If a mobile desires to announce his progress forward in the direction of his travel he can specify the digipeaters in the forward direction. Then using this algorithm, all of his packets will be repeated in the forward direction, no matter where he is along his route, but not in the backward direction.

Until we get new UI forwarding algorithms, the general aliases of WIDE and RELAY will do nicely. If fixed, known digipeaters are available, even with the generic alias of WIDE, it is best for fixed APRS stations to use the digipeaters unique callsign instead of alias to avoid any ambiguity. Also avoiding the wildcard addresses except when necessary, significantly reduces QRM on the channel.

APRS now has a special command that sets ones own station to the ALIAS of WIDE vice RELAY. This is so that an APRS station that is well situated, can serve as a WIDE digipeater. This command should be used with caution and with the understanding of all stations on the net. Too many WIDE's and too close together causes too much QRM.

PacComm also added a new UI frame in their 3.2 ROM so that the POSITION information would be independent from the BText. This LText is just like the Beacon Text, except it is a separate entity with its own timing. This keeps the BText free for other applications. (particularly, for announcing WHAT your mobile is doing, and what symbol to use, etc....) This maintains the same distinction between BTEXT and POSITS that APRS already handles easily.

Similarly, the LText command allows you to manually enter your LAT/LONG or grid square in your TNC, even without a GPS, so that TNC's in networks will send their locations periodically. The LText permits a free text format so that it is compatible with any future specific formats (currently APRS parses GGA, RMC, VTG, APRS L/L, PACCOMM and grid squares and a future 8 character compressed L/L format) and there will probably be others too.

## Network Considerations

Since NODES are so much smarter than digipeating, the ultimate solution is to have the NODES do all UI frame routing. The APRS station simply sends his UI frame TO APRS VIA HOME; Any NODE hearing that transmission that has knowledge of the route to HOME, will send the single packet via the NODE network (internode, level 4) to the HOME node! When it arrives at the HOME node, it is transmitted once as a UI frame. With this arrangement, a mobile only has to specify his one intended destination, no matter where he travels!

DIGI/NODE COMPATIBILITY: Since the user should not have to change his digipeater path as he drives from one area to another, he should be able to specify a path that is compatible with both nodes and digipeaters. This is easily accomplished by assuming that the LAST field in an UNPROTO digipeater list is the HOME NODE and should be the ultimate destination for the UI frame through any level 4 network. Any and all preceding fields are assumed to be digipeaters only.

With this arrangement, the user could use an UNPROTO path of APRS VIA WIDE, HOME so that any generic WIDE digipeaters would repeat his position to their local area as would any WIDE NODES in the usual digipeater fashion. Only the node that hears the direct packet would also forward it through the network at level 4 to the HOME NODE. If only one field is included in the digipeater string, it would be interpreted as both a digipeater and a HOME destination without any difficulty. Digipeaters and NODEs would digipeat it, and nodes (hearing it direct) would forward it at level-4. It is important that NODES hearing digipeated UI frames from other digipeaters do NOT enter the packet into the network, to eliminate duplication. Only the ones hearing the direct signal should be responsible for doing the level 4 routing.

EXAMPLE: A typical mobile just wanting to keep his spouse informed of his whereabouts might want to just use the UNPROTO path of APRS VIA HOME. Then his UI frames will be digipeated by the local HOME node or digipeater and will also be routed back to HOME by all NET- NODES along his travels. If he also wants to be seen by most HAMS in the areas of his travels, then he sets his path to APRS VIA WIDE,HOME. If he travels through a region that has both digipeaters and NODES, he might choose APRS VIA WIDE,WIDE,HOME. This way any areas with digipeaters would digipeat via. WIDE,WIDE and if he gets to an area with nodes which are aware of the path to HOME, then they will forward his packet there.

Finally, since I hope to build a regional area Tracking network, the node should also permit the SYSOP to turn off other level 4 routing if he wants to make a dedicated network of APRS nodes just for tracking. Such a network would be swamped if all of the: BBS and other CONNECTED protocol users began to use it, and the original purpose of the network would be defeated.

Still, most of these APRS support ideas could be included in all NODES so that a minimum of APRS

tracking could be supported by ALL networks on all frequencies, especially where there is not yet a dedicated APRS TRACKING NETWORK I think there are other undeveloped applications for shipping UI frames through ALL networks which have not yet been explored. The capability should be there, in any case, so that experimentation can proceed.

## Using APRS for Space Communications

The Automatic Packet Reporting System could be a solution to the effective use of orbiting terrestrial style packet radio digipeaters in the amateur satellite program. To date there have been three AX.25 1200 baud FM transponders flown in space. The first was on the Space Shuttle STS-35, the second was on the space station MIR, and the third has been via the FM transponder mode of AO-21.

The problem with a space based digipeater is the total saturation on the uplink channel which makes the use of a normal CONNECTED protocol impractical. For the SAREX robot QSO mode, a total of five successive and successful packet transmissions were required to constitute a successful contact. Of an estimated thousands of uplink stations, only about 250 were successful.

Recognizing the stringent requirements for success using the CONNECTED protocol, provision was also made to recognize those stations which were successful in getting only one packet heard onboard the shuttle. Over 700 stations successfully completed single uplink packets.

APRS takes advantage of this unconnected, one packet mode to demonstrate successful uplinks to the shuttle. In addition, however, it capitalizes on the most fascinating aspect of the amateur radio hobby, and that is the display on a map of the location of those stations.

## RV And Mobile HF Net

We have begun a nation wide Boat, RV and APRS position reporting net on HF using 7.085 and 10.1515 MHz LSB. (Yes this is in the band! It is the same as saying 10.147.1 USB, but the convention on HF is to specify packet frequencies using the LSB convention.)

All boaters and Recreational Vehicles are welcome! To see the locations of all stations on the net, tune your TNC to the exact frequency and monitor for at least 15 minutes. When you first activate APRS, it will send out a query to all stations on the network for their positions.

## Packet Positions On All Frequencies

Encourage all BBS's, NODES, Servers, and stations in your area, to start placing their LAT/LONG in their beacon text using the format: BT!DDMM.xxN/DDDMM.xxW/... .comments. (In order to accept this data in TheNet ID beacons, APRS will accept this position format anywhere in the ID text. APRS will also plot the positions of stations reporting by Grid Square surrounded by brackets [FM19xy]. If all packet stations get in that habit, then APRS will automatically plot a map of packet activity on any frequency!

## Objects

As noted previously, anyone may place an object on the map and all other stations will see it. In their systems, on their P-list, the object's position report will be marked with thelastthreelettersofthestationthat is currently uplinking that position to the net.

A neat feature of APRS is that any station that has more current information on the location of that object can update its position by hooking, moving the cursor, and then hitting the insert key. Now this new station begins uplinking the new posit, and all stations, will update their P-list entry for that object INCLUDING THE ORIGINAL UPLINK STATION! The new position overwrites the old one so that the original station will now no longer uplink it.

This cameinhandy during hurricane tracking. Who ever had information on the latest NWS EMILY position, uplinked it and everyone then always saw the latest storm track without anyone in the net being dependent on any one station for updates!

Once objects are transmitted on to other station map screens, they will remain there until that operator deletes them. Even if the original station stops sending the object position, it will remain there forever. Once the object or station has not been heard from for 2 hours, it will fade to gray so that you know it is an old contact. In version 4.0 1 a feature was added so that you can suppress the callsigns of old contacts. Just press the J command, and select LATEST instead of selecting any specific object type.

The result will be to redraw the map showing ALL symbols, but only the calls of the recent ACTIVE stations less than 2 hours old. Another feature added recently is the KILL function. This permits the uplinker of an OBJECT to KILL it from all displays on the net. His station will continue to uplink the object, but tagged with a special KILL flag to suppress its display on all screens. It remains in everyone's P-lists, though, so they can refer back to it if needed. They must still manually DELete it from their P-list as needed.

## Load Sharing

Since any station can take over reporting of any objects, one approach is to let only one station hook every symbol that comes in and then he becomes the reporting responsibil-

ity. The original station that uplinked the report in the first place will fall silent when it sees the report coming from the designated Net Control station. This way all positions are reported by only one station on frequency, although all other stations can still update the positions as needed. Remember that the last station to report the position of an object will be the one that continues to report it!

## Propagation Statistics

A secondary benefit of the redundant beacons is that it operates like a poor-man's chirp-sounder. Since APRS keeps statistics on the number of packets heard from each station over the last 24 hours, this display can be used to verify HF connectivity between stations throughout the day. It's like a free-bee radio check every 15 minutes everywhere! After watching APRS statistics for just a day, or so, the daily variations in propagation conditions to all stations is visible at a glance. Further improvements in connectivity is possible by changing frequency bands during the solar day. By saving statistics on each band in a different file, the APRS user can use this data to optimize his connectivity at any time of day or location.

## Weather Reporting

All stations on the net can be apprised of unusual weather conditions by any station placing a weather symbol on the map. Just like stations, weather symbols will be dead reckoned between reports. In this way APRS is ideal for reporting the movements of hurricanes and tropical storms. There are over a dozen different weather symbols for this type of weather reporting. Secondly, APRS has an optional interface routine for automatically reporting the wind speed, direction, temperature and rainfall from the ALTIMETER-II home weather station. All stations with this interface show up on the maps as a large blue DOT with a line indicating the wind direction and speed. Their position report also includes the temperature and the rainfall. Similarly, any station can select to use the Weather station symbol for his station, and can manually enter his wind speed and direction for display on the net.

## Waterway Net Operations

It is recommended that all Waterway Net participants that are HF packet capable begin reporting their positions on the HF APRS nets. No changes to the existing voice net on 7068 are required! Since APRS will be operating continuously, 24 hours a day, it will provide a reliable and continuous background reporting of most stations. This will free up the voice net for passing of more voice traffic, and for position reports from non packet stations. One APRS station should volunteer daily to uplink the voice position reports into the network from his display by placing them on his screen as OBJECTS. Once these reports are being uplinked into the APRS net, any other APRS station can assume reporting responsibility for that OBJECT (station) simply by uplinking a later report. If the original station uplinking an OBJECT hears a later report, it will update its screen with the new report and will no longer report on that OBJECT since another station has taken reporting responsibility for that OBJECT. This enables stations to pass off APRS reporting responsibilities and keeps the network from being dependent on specific full time stations.

## Differential Correction

Tom Clark (W3IWI) has installed a Differential GPS transmitter in the Washington DC area transmitting 30 second DGPS data on the APRS frequency. APRS GPS mobiles can now obtain accuracies to 5 meters or so. We are pleased to report that the RTCM- 104 format works perfectly well with APRS and with TNC's.

Although this is an excellent demonstration. and there are surely HAM applications that can take advantage of the DGPS accuracy, APRS is probably not one of them. First, APRS is not concerned with NAVIGATION accuracy, because a) no maps are that accurate (with DGPS you can make 'em so!), and b) the purpose of APRS is to inform others of mobile locations over a wide VHF area, NOT to the nearest 15 feet. (APRS formats do maintain positions to 60 foot precision ) Secondly, A mature APRS net involved in a special event. or activity, can probably NOT handle the QRM from 30 second RTCM transmissions.

In the long term, the DGPS data should probably be transmitted MORE OFTEN and on another frequency, OR be remotely controlled such that it can be requested by a mobile user on demand, but silenced most of the time. Transmitting less often is meaningless due to latency of the data The only application of DGPS that I can think of is to keep track of golfcarts at a hamfest, and be able to see who's booth they are at. I will probably incorporate a ?RTCM? format in APRS to permit stations to request DGPS data.