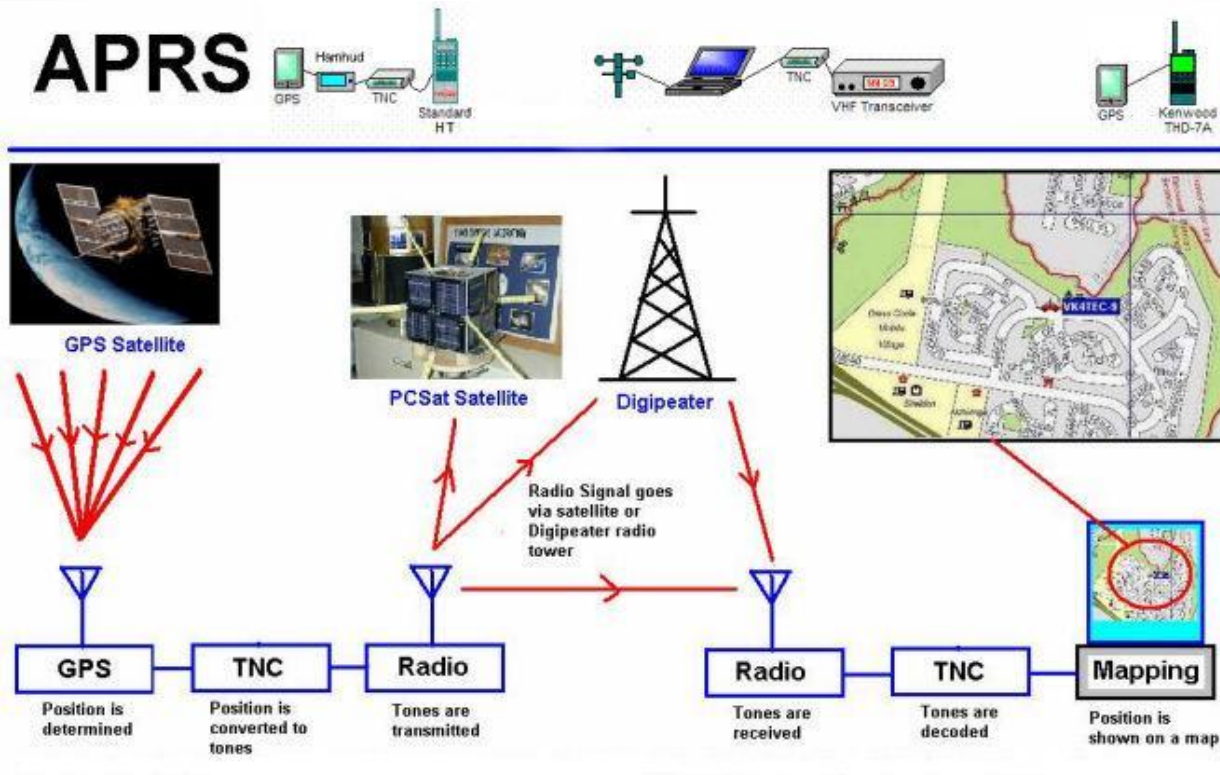


# APRS Station Tracking and Messaging



Prepared for Orange County RACES  
Presented by Mark Warrick

# Who Has Used APRS?



# What Is APRS?

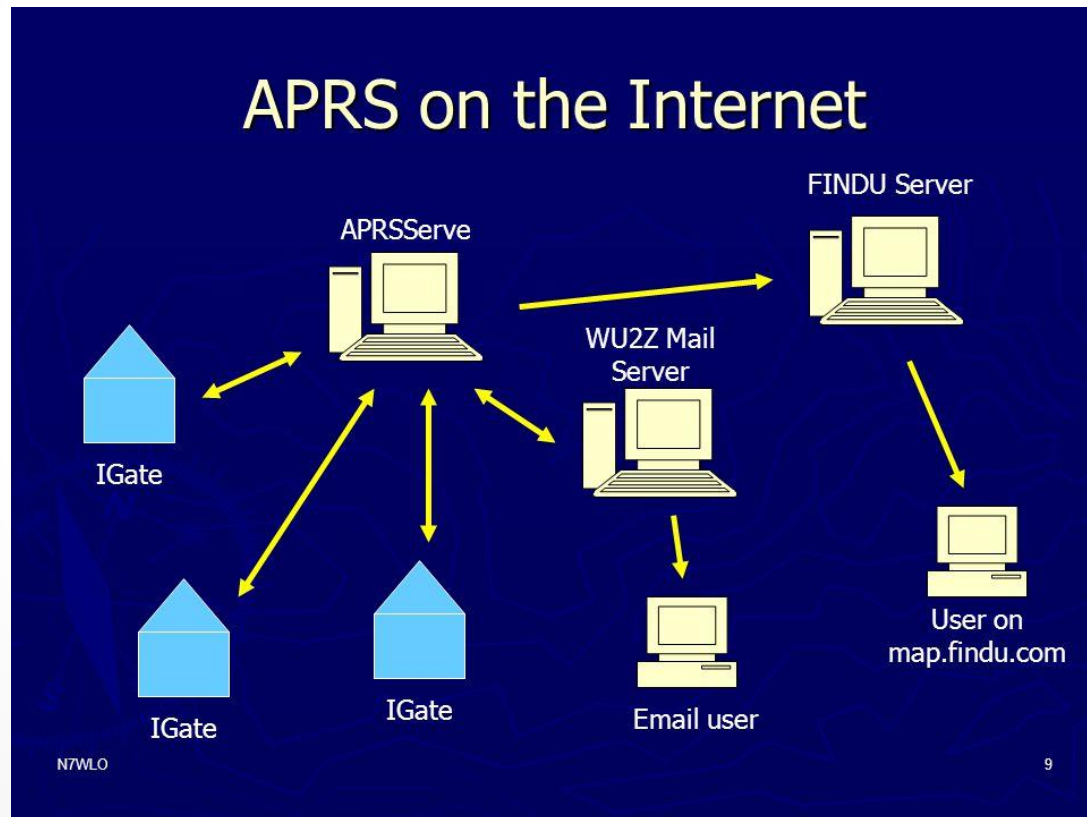
- [APRS](#): Automatic Packet Reporting System
- Developed by Robert Bruninga ([WB4APR](#)) in 1982
- First used on a Commodore Vic-20 in 1984 for tracking horses in a 100-mile endurance run.
- Used world-wide on VHF frequencies (144.390 in US).
- Basic info: GPS location / preset status messages

# Who Has Used APRS-IS?



# What is APRS-IS?

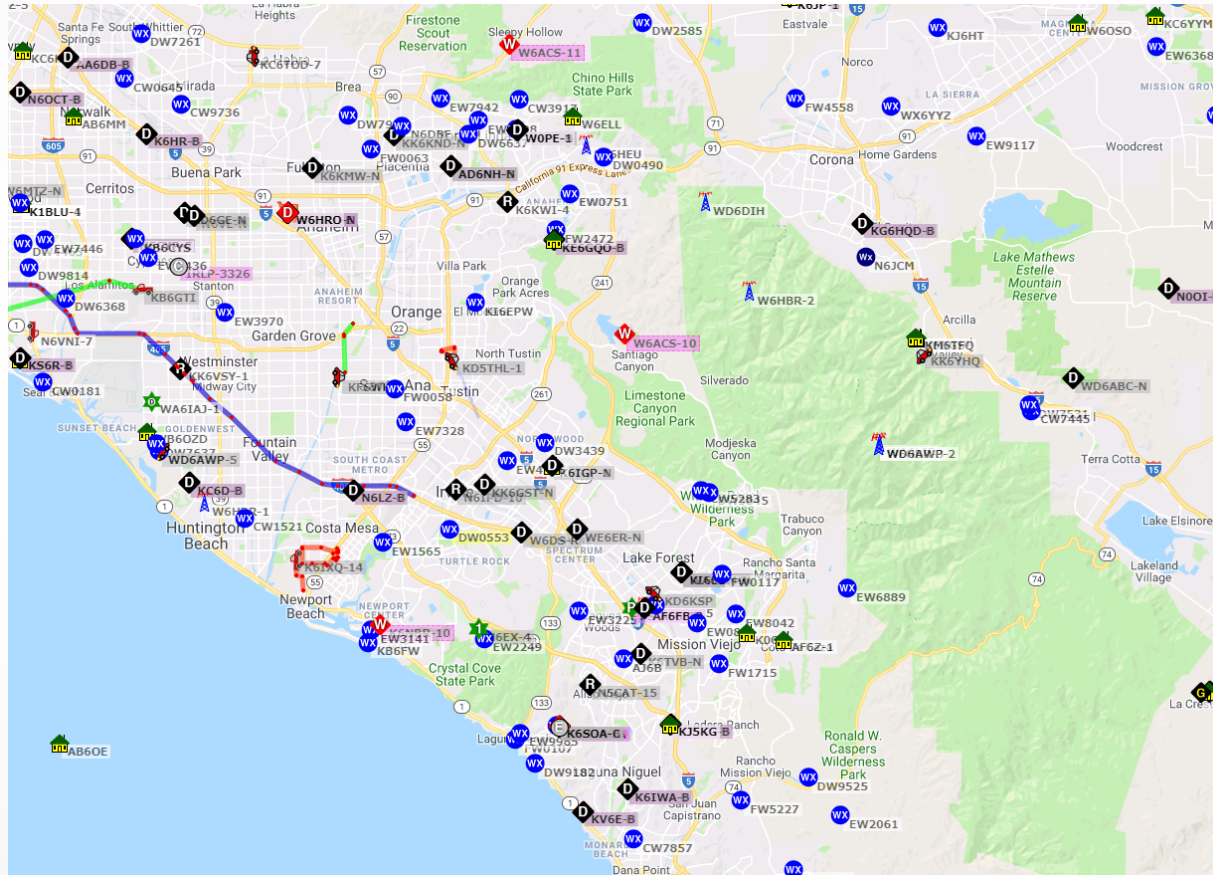
- It connects APRS digipeaters via Igates to Internet



# APRS (RF) vs. APRS-IS (Internet)

- APRS (RF) Does not require Internet service.
- APRS (VHF) works anywhere in range of APRS stations and / or digipeaters.
- Fill-in digirepeaters can be added anywhere to extend ARPS range.
- Some radios have built-in digipeaters!
- Will work during a major power outage.
- ARPS-IS: Internet required!
- APRS-IS capable software runs on Android and iOS, Linux, Mac and Windows.
- APRS-IS connects digipeaters to lgates.
- Field Use: Works only where cell data signals are good.
- Might not work in major power outage.

# Orange County Stations





# Equipment for Sending APRS Beacons

- Self-contained ([PicoAPRS](#), [Byonics TinyTrack4](#))
- VHF Radio with APRS ([Kenwood TH-D72A](#))
- Laptop / tablet / phone Audio [AFSK](#) ([Direwolf](#))
- Laptop / tablet / phone using [APRS-IS](#)
- Laptop / tablet / phone using [TNC](#) (Modem)



# Other APRS Connections

- HF on 10.151 Mhz LSB
- Satellite: [ASTARS](#) (PCSat, ISS, ARISS, etc.)
- Outside the scope of this presentation

# Receiving APRS via PicoAPRS

- Extremely small screen, but packed with info.
- A bit expensive (about \$215 USD)



## Some screenshots from PicoAPRS:



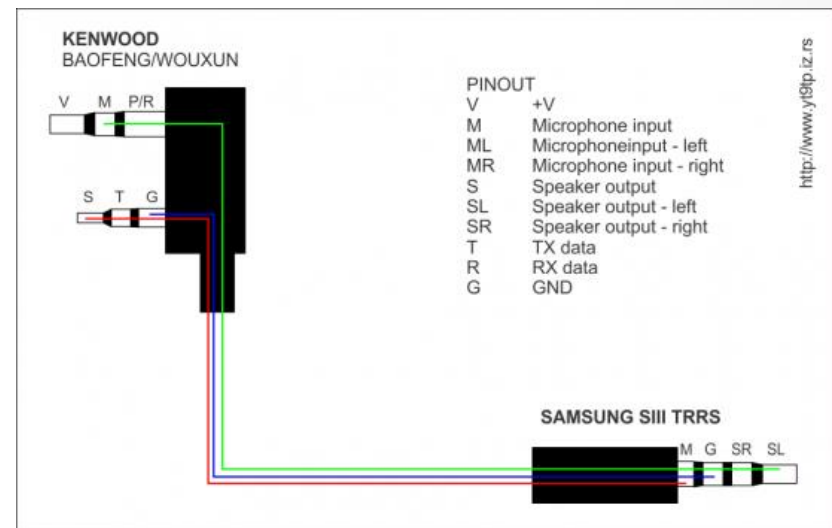
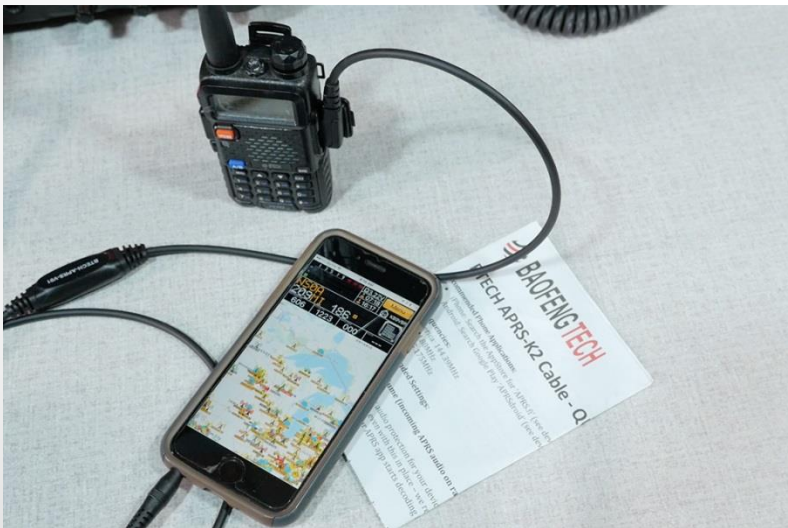
# Receiving APRS via Radio

- Limited screen space
- Limited range (due to antenna)
- Complicated filtering (**very difficult in the field**)
- Replying is like text messaging with a 25 year old phone



# Receiving APRS via Audio (AFSK) & App

- Connect laptop, tablet or phone via audio
- Software-based TNC Demodulates Audio to Text
- Cheap solution – [Baofeng](#), [Audio Cable](#), [App](#)
- Messaging that you're used to using!



# Receiving APRS via Direwolf

- Use ANY radio and corresponding audio cable.
- Use a USB dongle to protect laptop and separate the channels between mic / speaker.
- Software controls PTT.
- Acts as a virtual network TNC that can be used by multiple computers.
- Useful info window helps tune radio dial.
- Hard to configure, but reliable once setup.
- Works with Baofengs! CHEAP!





# Direwolf Receiving via Baofeng

**PinPoint v2.0 build 190521**

File Map Tools View Lat: 34° 42' 3.52" N Lon: 120° 17' 1.73" W Zoom: 8 Distance: 152.17 miles at 295°

**Map Call Signs:** KB6CAG-11, K6ERN, WA6ZSN, K1MIX-8, N6LXX-4, N7W, KG6HCU-3, WA6MHA-15, N6BXE, KF6IRK-4, KM6TSH-7, W6MF-1, NG6B-1, KD6DCN-5.

**Last Heard**

- Radio reports
- Position reports (24)
- KM6TSH-7
- K6IXQ-14
- KG6HCU-3
- WA6MHA-15
- K6ERN
- KF6IRK-4
- NG6B-1
- KB6CAG-11
- KD6KSP
- N6BXE
- W6MIN
- KD6DCN-5

**Communications Monitor**

Show GPS Data Clear Data

WA6MHA-15>APOTU0,N6EX-4\*>: CHG STN ON  
WA6MHA-15>APOTU0,N6EX-4\*:I3411.20N/11813.02W\_12.6V 84F  
N6EX-1>UIDIGI:UIDIGI 1.9  
K6IXQ-14>S3TPWW-1,N6EX-4\*,WIDE2-1:~\$jn>Qk/"43]TourdeOC.org Win-System  
K6IXQ-14>S3TPWW-1,N6EX-1\*,WIDE2-1:~\$jn>Qk/"43]TourdeOC.org Win-System  
KG6HCU-3>S4QQR,W6SCE-10\*,N6EX-1:~CDI##>/"6x|&D%z'z|lwo0| 3  
K6IXQ-14>S3TPXT-1,N6EX-4\*,WIDE2-1:~\$Nnpnk/"40]TourdeOC.org Win-System  
K6IXQ-14>S3TPXT-1,N6EX-1\*,WIDE2-1:~\$Nnpnk/"40]TourdeOC.org Win-System  
KM6TSH-7>S3TSVR,N6EX-4\*,WIDE2-1:~L !|/"4%}\_#

**C:\Users\mark\Downloads\direwolf\direwolf-1.5-win\direwolf.exe**

Digipeater N6EX-1 audio level = 88<22/40> [SINGLE] :::  
[0.1] K6IXQ-14>S3TPXT-1,N6EX-1\*,WIDE2-1:~\$Nnpnk/"40]TourdeOC.org Win-S  
MIC-E, truck, Unknown manufacturer, In Service  
N 33 40.8400, W 117 55.5000, 32 MPH, course 82, alt 82 ft  
TourdeOC.org Win-System

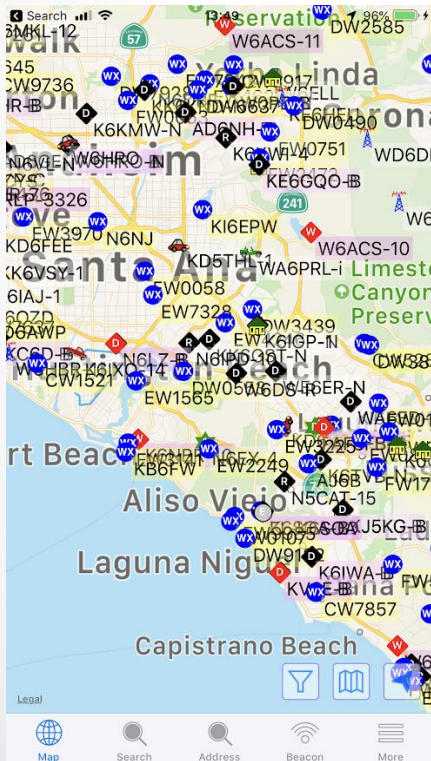
Digipeater N6EX-4 audio level = 120<34/59> [NONE] ::::  
Audio input level is too high. Reduce so most stations are around 50.  
[0.2] KM6TSH-7>S3TSVR,N6EX-4\*,WIDE2-1:~\$L<0xif>1 !|/"4%}\_#<0x0d>  
MIC-E, Human, Yaesu VX-8G, In Service  
N 33 43.6200, W 117 48.0300, 0 MPH, course 5, alt 46 ft  
TourdeOC.org Win-System

Digipeater N6EX-4 audio level = 127<32/60> [NONE] ::::  
Audio input level is too high. Reduce so most stations are around 50.  
[0.1] W7BF-3>APN391,N6LXX-4,N6EX-4\*:f3436.00NS11540.92VWPHG6930A-005400  
Amboy Pk.<0x0d>  
Position: OVERLAY DIGI (green star) w/overlay S, Kantronics KPC-3 rom v  
36 W height=5120 3dBi omni  
N 34 36.0000, W 115 40.9200  
A=005400 Bristol Amboy Pk.

# Receiving APRS-IS via Cell Phone

[APRS.fi](http://APRS.fi)

iOS



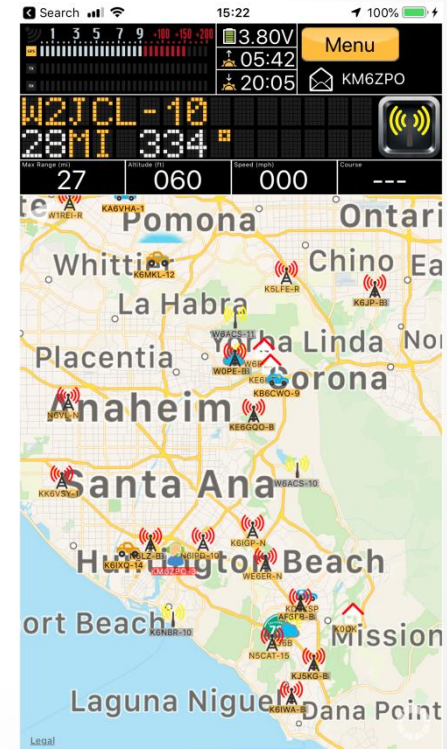
[APRSDroid](http://APRSDroid)

Android



[APRS Pro Ultimate](http://APRS Pro Ultimate)

iOS





# Receiving APRS via Hardware TNC

- Radio with built-in TNC ([Kenwood TH-D72A](#))
- Ext. TNC ([Mobilinkd](#), [Kantronics](#), [Signalink](#))
- Hardware-based TNC, requires software
- Signals sent / received via VHF 144.390
- Not dependent upon Internet ([APRS-IS](#))
- Power only required for devices



# PinPoint APRS

PinPoint v2.0 build 190521

File Map Tools View

Lat: 33° 58' 39.11" N Lon: 118° 22' 34.72" W Zoom: 10 Distance: 36.35 miles at 306°

Map showing various locations including Inglewood, Westmont, South Gate, Norwalk, La Habra, Brea, Yorba Linda, Fullerton, Anaheim, Orange, Villa Park, Garden Grove, North, W6BVB-9, K6IXQ-14, KD6KSP, K9AOG-7, N6EX-5, K6IRK-4, K6HQC-9, KK6YHQ, K6TS, K7JAJ-1, K9AOG-7, K6DAC-1, K6KSP, K6HQC-9, K6PCW-9, K6YHQ, K6AUL-9, N6CY-9, N6EX-1, N6EX-3, N6EX-5, N6LXX-4, N6MKW-7, N6VUY-15.

Communications Monitor

Show GPS Data Clear Data

KG6HQD-9>SS5PSU,N6EX-1\*,N6EX-4:-<\m6\*k/"7/\_%  
WA6MHA-11>APOTW1,N6LXX-10\*,WIDE1,N6EX-4:13410.50N/11828.90W\_135/003g004t068P000h52b10157V1240TW1  
WA6MHA-15>APOTU0,N6EX-4\*:13411.20N/11813.02W\_12.7V 62F  
WA6MHA-15>APOTU0,N6EX-4\*:13411.20N/11813.02W\_074/003g004t060p009h002T2WX  
K1GR-9>SRSYSP,K6DAC-1\*,WIDE1,N6EX-4:WCI >/"Sh  
W6MAF>APTW01,W6SCE-10\*,N6EX-4:\_06210855c225s018g016t059r000p000P000h85b10105tU2k  
KF6ILA-10>GPSHW,N6EX-4\*:211223z3321.78N/11650.18W\_082/021g029t059r000p000P000h17b10124.DsVP  
KG6HCU-3>S4QQUR,N6LXX-10\*,WIDE1,N6EX-4:CDI#>/"6s|"u%3'h|lw[?|3  
N6VUY-15>S4QVSQ,W6SCE-10\*,N6EX-4:/&2m54>/"40)=  
K6TS>3TUUXY,N6LXX-4\*,WIDE1,N6EX-4:-Tvl Q|/>:"q=  
AD6TG-13>APK102,N6LXX-10\*,WIDE1,N6EX-4:=3430.28N/11809.93W\_263/006g010t056r p P000h87b KU2k  
W6BVB-9>SS4TRR,N6EX-4\*,WIDE2-1:-MDnq&|/"4@)=  
K6IXQ-14>S3TPUQ-1,N6EX-4\*,WIDE2-1:-S"l!\*"k/"4,}TourdeOC.org Win-System  
K6IXQ-14>S3TPUQ-1,N6EX-1\*,WIDE2-1:-S"l!\*"k/"4,}TourdeOC.org Win-System  
N6EX-4>UIDIGI:UIDIGI 1.9  
KD6KSP>S3SWUX,N6EX-4\*,WIDE2-1:-E3I|5>/"5F|"%"5'b|lw-F|3  
KISS TNC send>> KM6ZPO-12>APIN20,WIDE1-1,WIDE2-1:13340.13N/11751.84W/htp://km6zpo.com via PinPoint v2

Radio reports

Miscellaneous reports (6)

Position reports (32)

- AD6TG-13
- K1GR-9
- K6IXQ-14
- K6TS
- K7JAJ-1
- K9AOG-7
- K6DAC-1
- KC70-9
- KD6KSP
- KF4LVZ-1
- KF6ILA-10
- KF6IRK-4
- KG6HCU-3
- KG6HQC-9
- KJ6PCW-9
- KK6YHQ
- KR6AUL-9
- N6CY-9
- N6EX-1
- N6EX-3
- N6EX-5
- N6LXX-4
- N6MKW-7
- N6VUY-15

# PinPoint APRS Benefits

- No internet required!
- Works with external GPS receiver
- Greatly enhanced with internet (APRS-IS)
- Very simple interface
- Maps can be cached
- Simple chat-like messaging
- Minimal laptop specs needed

# PinPoint APRS Deficiencies

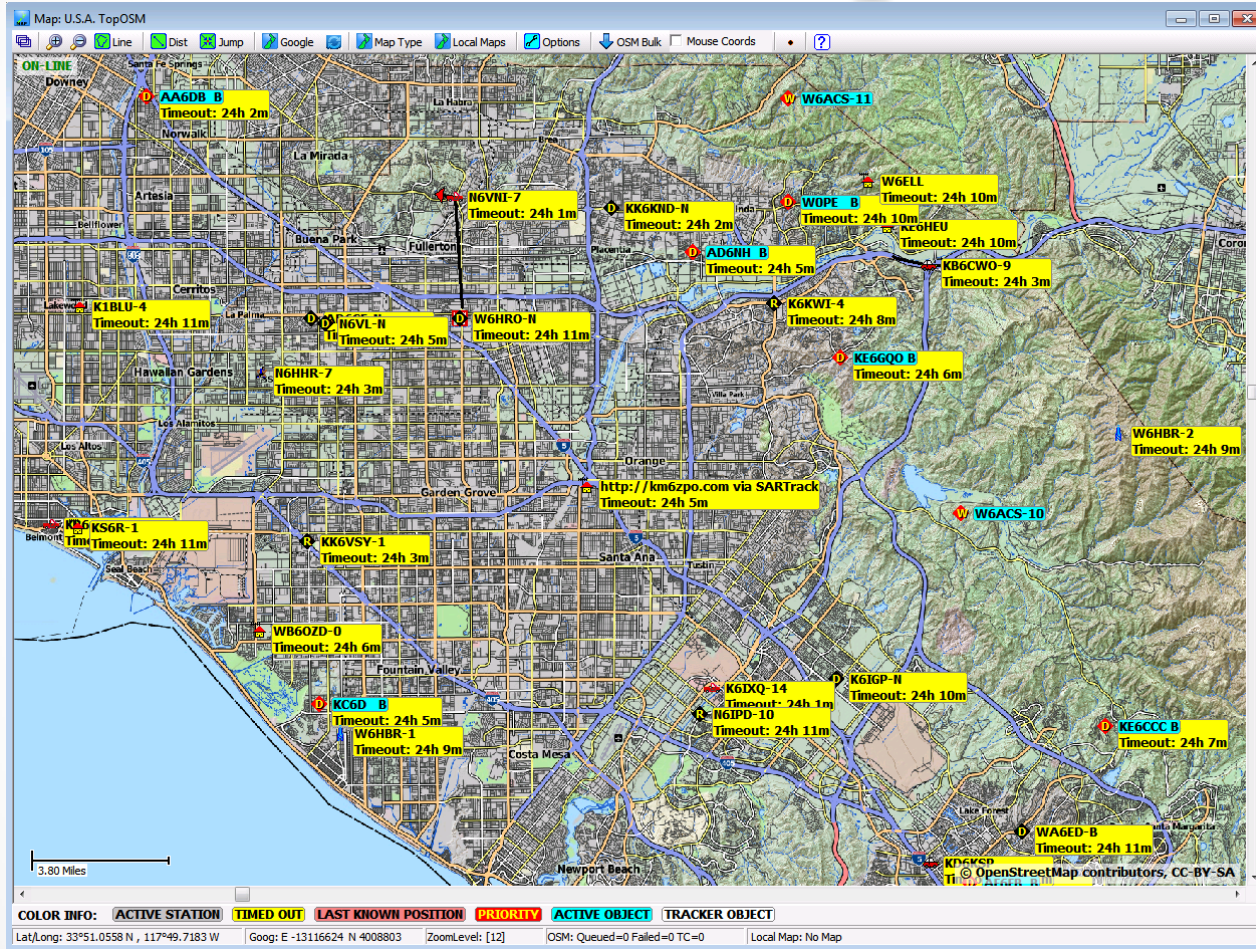
- Station info is lost after closing last heard window
- No group messaging feature
- Cannot mass cache maps for offline use
- BETA product with limited resources
- No documentation



# SARTrack – Designed for Professionals



# SARTrack Map View





# SARTrack Stations View

The screenshot displays the SARTrack Stations View window. The main window shows a list of stations with columns: Call, Tactical, Min's Ago, Latitude, Longitude, Speed, Course, Altitude, and Information. A modal window titled "KI6AZQ-5" is open, showing detailed information for that station.

**Stations List (Visible Rows):**

Call	Tactical	Min's Ago	Latitude	Longitude	Speed	Course	Altitude	Information
KM6ZPO-13	http://km6zpo.com vi...	0:02:02	33°46.6500 N	117°52.8600 W			98 ft	
K6NAZ-5		24:04:17	34°8.4900 N	118°35.3800 W				MMDVM DVMega 431.0750/431.0750 CC1
KI6AZQ-5		24:04:17	33°13.4400 N	117°15.8000 W	37.98 mph	334°T	217 ft	https://aprsdroid.org/
W6HRO		24:04:20	33°50.7000 N	117°56.5300 W				Ham Radio Outlet, Anaheim
KJ0SHL		24:04:23	34°11.9918 N	118°36.7983 W			823 ft	Mobile Micro-Trak RTG
N5CAT-11		24:04:26	33°25.0100 N	117°36.1800 W				San Clemente iGate
AF6TT		24:04:26	34°5.1400 N	117°40.9300 W				231/004g...t078r...p...P000h57b10128L....DsIP
N0XFD-14		24:04:28	34°14.1400 N	118°31.7700 W			853 ft	

**KI6AZQ-5 - Detailed View:**

Call sign	KI6AZQ-5	Latitude	33°13.4400 N
Tactical		Longitude	117°15.8000 W
Mins's ago	24:04:1	Altitude	66 Meter
Timeout	YES	Speed	61.12 km/h
RX Packets	1	Course	334°T
Radio Range	0	Waypoints	9
Information	https://aprsdroid.org/		
Icon	PHONE / \$		
TrackColor	0		
Rig			
Voice Freq			
Last Data	=3313.44N/11715.80W\$334/033/A=000216		
Path			

**Stations List (Continued):**

W6HRO		24:04:20	33°50.7000 N	117°56.5300 W				Ham Radio Outlet, Anaheim
KJ0SHL		24:04:23	34°11.9918 N	118°36.7983 W			823 ft	Mobile Micro-Trak RTG
N5CAT-11		24:04:26	33°25.0100 N	117°36.1800 W				San Clemente iGate
AF6TT		24:04:26	34°5.1400 N	117°40.9300 W				231/004g...t078r...p...P000h57b10128L....DsIP
N0XFD-14		24:04:28	34°14.1400 N	118°31.7700 W			853 ft	
KF6IRK-4							89 ft	
KE6MTF-1								Kirk
K6JP-7								DMR ID: 3115939
KD0GG								APRS-IS
N6VNI-7							210 ft	GEORGE&KRIS ARE ON THE ROAD AGAIN
K6GHSQ-2								BPQ32 iGate V 6.0.16.9
N5CAT-15								Laguna iGate
K6MKL-12							387 ft	
W6MHA-15								CHG STN ON
W0PE-B								440 Voice 431.02500MHz +0.0000MHz
AD6NH-B							10 ft	RNG0001 440 Voice 431.01250MHz +0.0000MHz
AJ6B								262/000g005t065r000p000P000b.....h64L145eMB37
K6IX-14							20 ft	ourdeOC.org Win-Syst
KD6KSP							397 ft	
N6UTC-5								6UTC-5/R WOLVES/D N6UTC-3/G N6UTC-1/B
KM6HRD-N								440 MMDVM Voice 446.30000MHz +0.0000MHz, KM6HRD...
KE6MTF-2								Kirk
AF6FB-1								Michael Base
KK6DA-9							200 ft	
W6IAJ-1								11111111,Remote Site Telemetry
AA6RA-B								440 Voice 439.05000MHz +0.0000MHz
AA6DB-B								440 Voice 446.50000MHz +0.0000MHz
KM6VAK-B								440 Voice 433.10000MHz +0.0000MHz
N6DAN-2								WX3in1Plus2.0 SatGate 145.825 Elk 5 element antenna
N6EX-3								/LA iGate/A=1350/sceara@ham-radio.com
N6EX-5								/W1 for South Bay/WLA
W4APK-B								440 Voice 436.20000MHz +0.0000MHz
KK6KND-N								440 MMDVM Voice 441.02500MHz +0.0000MHz, KK6KND...
AI6YR-7							151 ft	
W6MHA-11								182/008g012t082P000h36b10148V1440TW1



# SARTrack Messaging View

The screenshot displays the SARTrack Messaging View interface. The main window is titled "Chat with KM6ZPO" and shows a chat log with the following messages:

- test 20190620 1115 11:15
- what's your qth 11:16
- 11:15 received
- 11:17 Near SNA

Below the chat log, there is a section for "Messages" with a table of message history:

From	Addressee	I/O	Message	Time	Port
KM6ZPO	KM6ZPO-14	IN	test 20190620 1115	11:15 20-06	Radio
Mark <KM6ZPO-14>	KM6ZPO	OUT	received	11:15 20-06	All Ports
KM6ZPO	KM6ZPO-14	IN	what's your qth	11:16 20-06	Radio
Mark <KM6ZPO-14>	KM6ZPO	OUT	Near SNA	11:17 20-06	All Ports

At the bottom, there is a "Send Messages" section with fields for "Addressee" (EMAIL-2), "TO: Email" (mark@warrick.net), and "TO: Mobile TXT". There are also buttons for "Ping", "Query", "Send", and "Close".

The interface also includes a map of the Pacific Ocean with a scale bar of 10 Kilometers. The status bar at the bottom shows "COLOR INFO: ACTIVE STATION", "TIMED OUT STATION", "LAST KNOWN POSITION", "PRIORITY", "ACTIVE OBJECT", and "TRACKER OBJECT". The coordinates are Lat/Long: 60°50.6946 N, 185°58.5936 W. The zoom level is [2] 27990.3mpp. The status bar also indicates "DOWNLOAD FINISHED" and "Spare3".

# SARTrack Benefits

- Manage information for the entire operation
- Extremely detailed information
- Group station tracking and messaging
- APRS send / receive SMS
- Database server for multiple SAR stations
- Multi-mode connections (TNC, APRS-IS, AGWPE, Direwolf, Icom, Motorola, Hytera – and Satellite!)
- Works with external GPS receiver
- Extensive documentation

# SARTrack Deficiencies

- Steep learning curve – especially in SAR mode
- **Memory and video card intensive**
- Not easy to cache maps
- Map quality not as good as PinPoint APRS
- Cheap TNCs (like Mobilinkd) not supported

# Software Demo

# Questions?

# Thank you!

- Please visit <http://km6zpo.com> for more information.
- Or email: [mark@km6zpo.com](mailto:mark@km6zpo.com)
- Or call: 949-870-9493
- Call Sign: KM6ZPO

