



Maps – Mobiles - Users

Introduction to APRS!



Bob Bruninga, WB4APR
Updated by Greg Dolkas, KO6TH

APRS is a registered trademark Bob Bruninga, WB4APR



What is APRS?

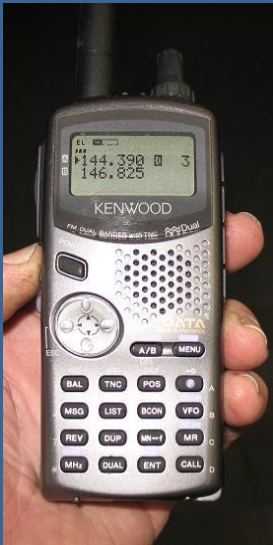
- **APRS** = Automatic **Packet** Reporting System
- **APRS** was developed in the late 1980's for local **tactical digital communications**, situational awareness and **TWO-WAY** information exchange
- Messages + maps for **OBJECTS** – everyone sees the same situation
- **Not just GPS Vehicle Tracking!**



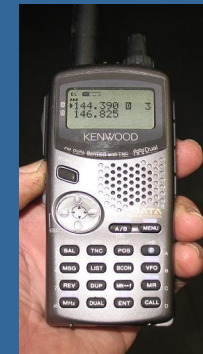
APRS Network Evolution



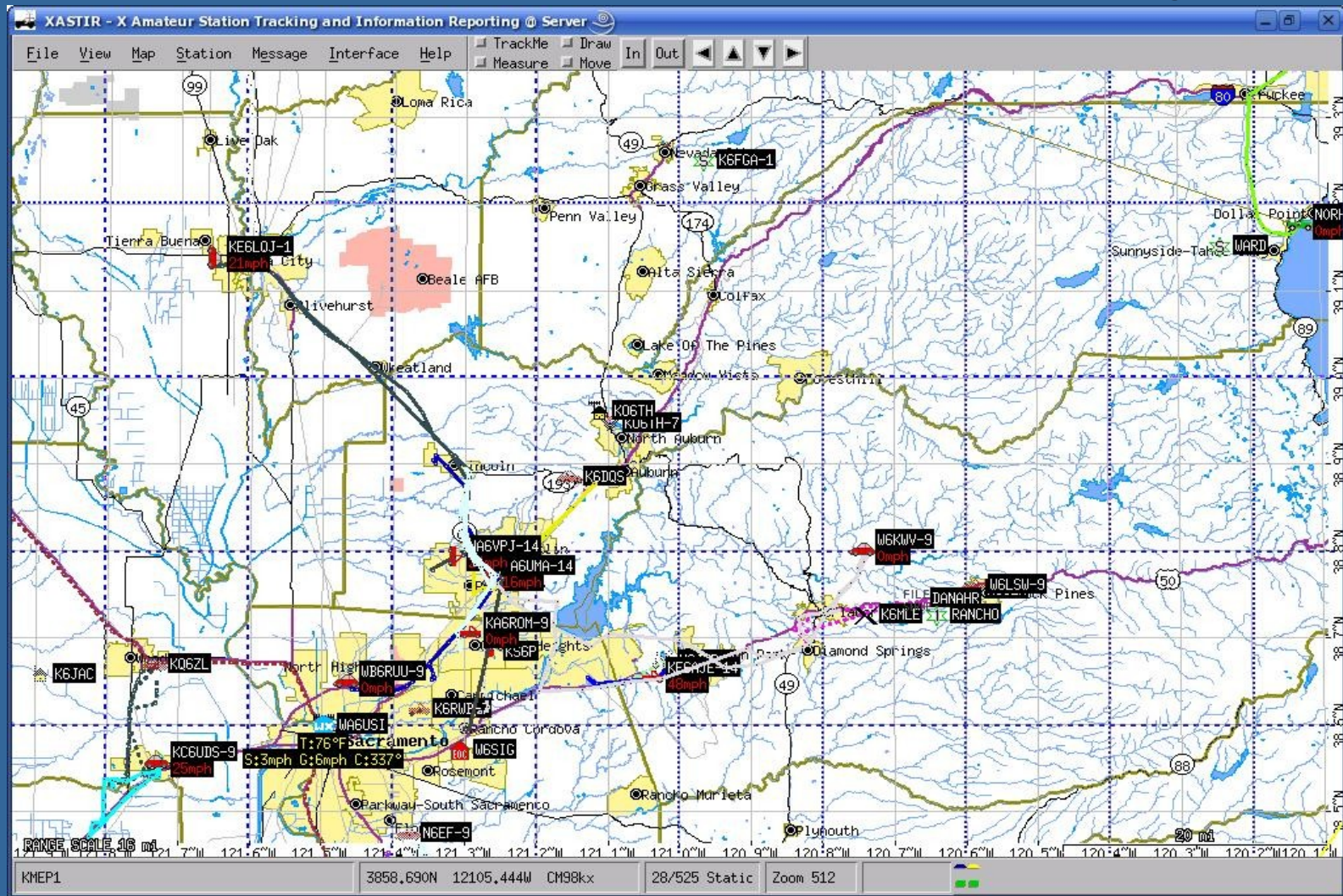
Digipeater



Clients



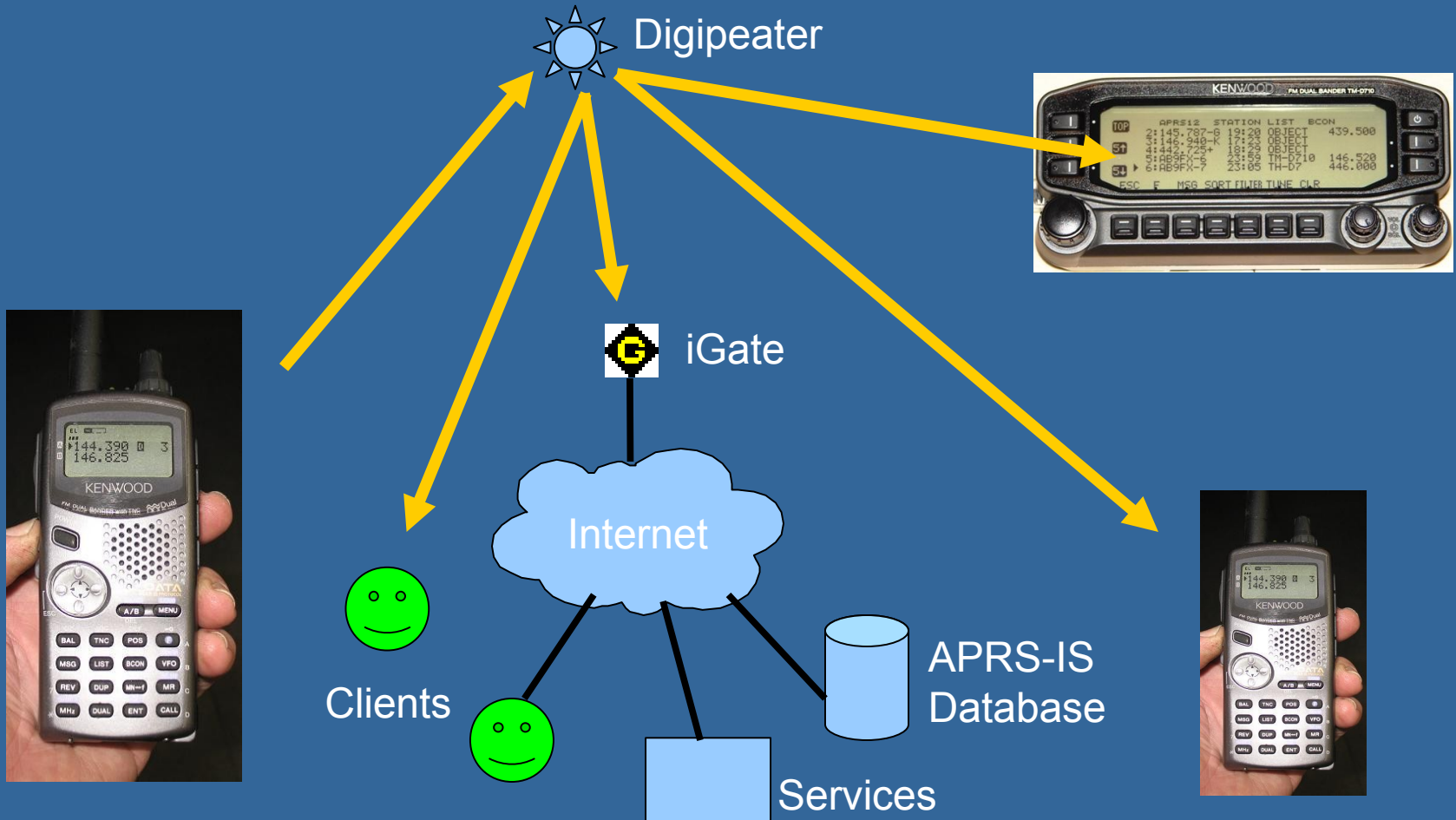
Client view: It's all about Objects



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APRS Network Evolution



APRS-Internet (www.aprs.fi)

The screenshot shows the Google Maps APRS interface. The browser address bar displays the URL: `http://aprs.fi/?lat=38.9587&lng=-121.1112&mt=m&z=11&timerange=21600`. The map shows the Sacramento Valley region with various towns and roads. A popup window for station **WA3ELA** is open, displaying the following information:

WA3ELA - info
2007-07-23 18:39:15z - 2009-09-14 01:02:13z
APRS/CWOP weather 2009-09-14 01:02:13z: [show weather charts]
Temperature **64.9°F** Humidity **47%** Pressure **1010.4 mbar**
Wind **168° 0.9 MPH** (Gusts **4.9 MPH**)
Rain **0.0 inches/1h 0.0 inches/24h 0.0 inches/since midnight**
[APRS via TCP/IP*,qAC,Core-2]
[start tracking]

The right sidebar contains the **aprs.fi** interface with a login field, a "Show last:" dropdown set to "6 hours", and a "Track callsign:" search field. Below this is an "Address, city or Locator:" search field. The "Other views:" section lists links for Station info, Raw packets, Status packets - Beacon packets, Messages - Bulletin board, Prefix browsing, Google Earth KML [?], and Preferences - My account. The "Information:" section lists various links including APRS stations currently moving, Blog, Linking to aprs.fi, AIS sites, Database statistics, FAQ, Technical details, Change log, Planned changes, Credits and thanks. At the bottom of the sidebar is an RSS feed for "What's up on aprs.fi" with a small cat icon and the text "Small changes (and a small cat) August 26, 2009".



APRS-Internet (www.aprs.fi)

Google Maps APRS - SeaMonkey

File Edit View Go Bookmarks Tools Window Help

http://aprs.fi/?lat=38.9587&lng=-121.1112&mt=m&z=11&timerange=21600

Home Bookmarks Newline Amsat Net RAIN Report AMSAT QRZ OSCAR Status Hotmail SF Radar Auburn Weather APRS Map

38°45'3" N 121°16'41" W, CM98IS

Map Satellite Terrain

aprs.fi · Login

Show last:
6 hours

Track callsign: [Clear / Show all]
Search [?]

Address, city or Locator: [Clear]
Search [?]

Wx: 67.0°F 46% 1011 mbar 1.9 MPH N

Other views:

- Station info
- Raw packets
- Status packets - Beacon packets
- Messages - Bulletin board
- Prefix browsing
- Google Earth KML [?]
- Preferences - My account

Information:

APRS stations currently moving · Blog · Linking to aprs.fi · AIS sites · Database statistics · FAQ · Technical details · Change log · Planned changes · Credits and thanks

idle: points updated 1, deleted 0

What's up on aprs.fi

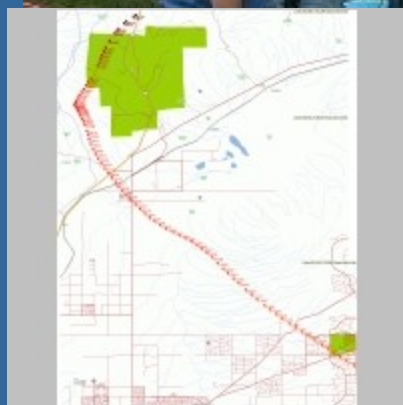
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APRS Balloons



Very Simple



APRS transmitter

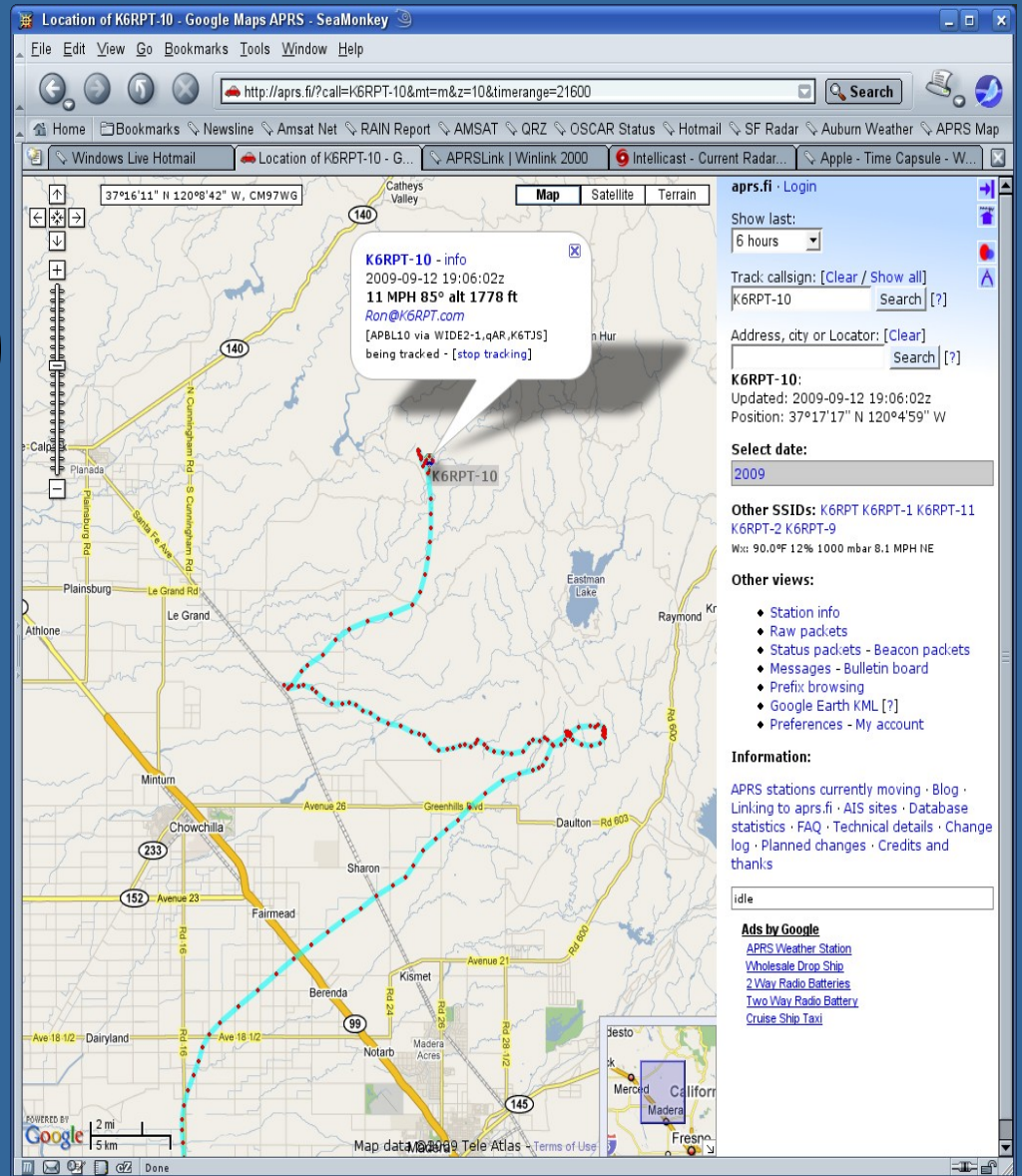
GPS

K6RPT-10 Balloon Flight Sept 12, 2009

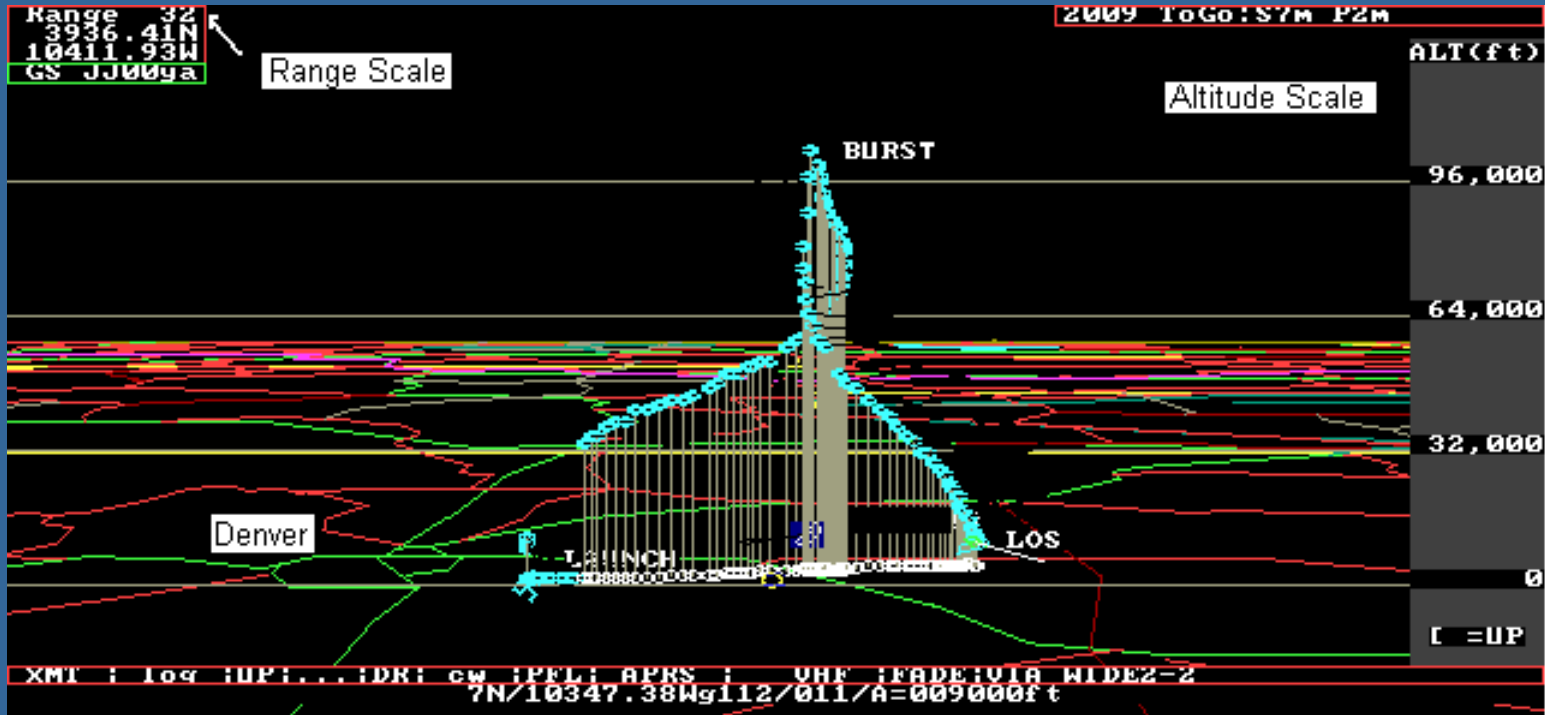
Real-time tracking available to anyone with an Internet connection.

Real-time telemetry (think Wx)

Beacon provided location information for recovery crew, without the need for wide-scale Direction Finding.



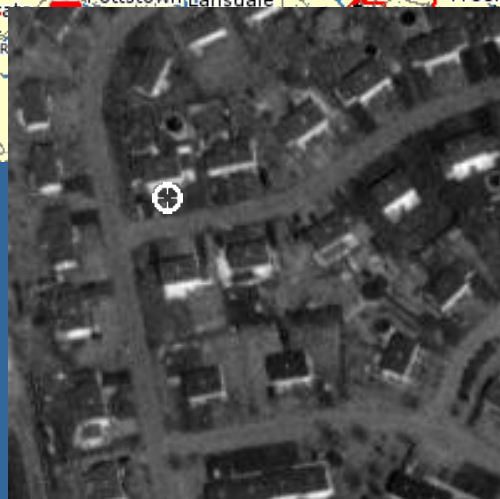
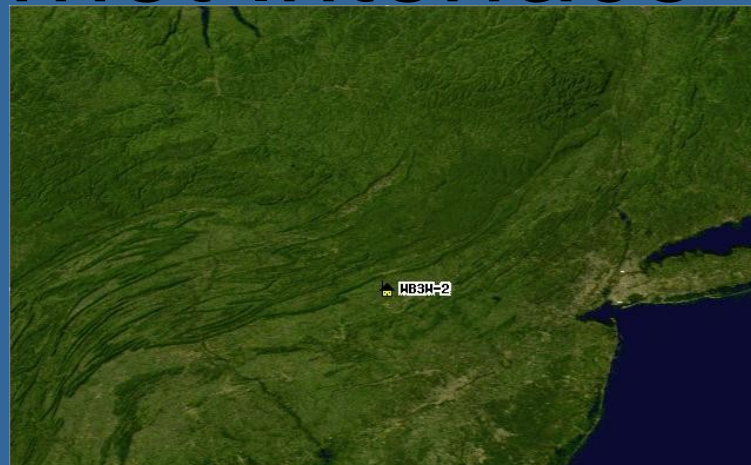
APRS 3D views for Balloon tracking



APRSdos has a 3D map display mode. The vertical scale can be separately set from the normal Range Scale depending on the altitude of objects. This is a typical APRS balloon track.

Findu.com Internet Interface

Internet tracking developed by
Steve Demise – K4HG



APRS-IS (FINDU – Near Range)

APRS Stations Near WB4APR-9 (last 240 hours)

Google™

findU links for WB4APR-9

- [Nearby APRS activity](#)
- [Raw APRS data](#)
- [Messages](#)
- [Nearest tide stations](#)
- [Metric units](#)
- [Nautical units](#)
- [Display track](#)
- [APRS Map Manager coverage](#)
- [NexRAD Radar](#)
- [Topographic map](#)
- [Aerial Photo](#)
- [APRSWorld map](#)
- [hide Google Maps](#)

External links for WB4APR-9

- [QRZ Lookup](#)
- [MSN map \(North America\)](#)
- [MSN map \(Europe\)](#)
- [MSN map \(world\)](#)
- [TopoZone](#)

Call	callbook	msg	wx	lat	lon	distance	direction	Last Position
WB4APR-9	**	**	.	39.00000	-76.50000	0.0		00:06:02:46
VA3ADG	**	.	.	38.99717	-76.50450	0.3	SW	05:22:10:17
WB4APR-1	**	**	.	38.99033	-76.49850	0.6	S	00:00:11:28
WE4APR-9	**	.	.	38.98667	-76.49283	0.9	SE	00:03:23:42
WB4APR-3	**	**	.	38.98500	-76.48550	1.3	SE	00:10:55:08
KB3KAK-9	**	.	.	39.02567	-76.50067	1.5	N	01:00:57:40
VA2JPN	**	.	.	38.97150	-76.49717	1.7	S	06:07:21:19
K3FOR-8	**	**	.	39.03200	-76.50267	1.9	N	00:08:58:06
WB1HAI-9	**	.	.	38.97067	-76.48400	2.0	SE	00:02:25:47
N3MNT-9	**	.	.	39.02117	-76.46400	2.5	NE	06:21:14:31
N3HU-9	**	.	.	39.01833	-76.44867	3.3	NE	00:02:18:02
N3KNP	**	**	.	38.97233	-76.55017	3.4	SW	04:01:37:14
W3AFE	**	**	.	39.03517	-76.45100	3.6	NE	00:02:14:24
K3TH-14	**	.	.	38.97383	-76.56283	4.1	SW	08:23:06:24
K3TH-3	**	.	.	38.97400	-76.56317	4.1	SW	00:00:14:52
N3HU	**	.	.	39.04017	-76.44183	4.2	NE	00:00:01:28

* Click to see all stations on map



APRS-IS (FINDU – Near Map)

40 miles

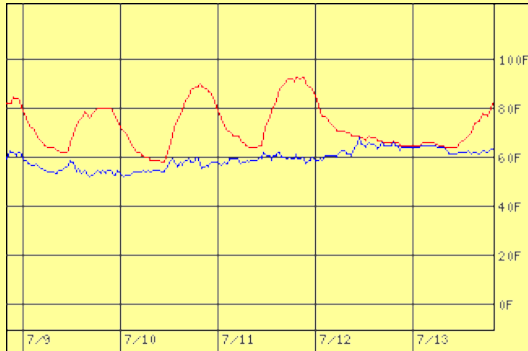


APRS-IS (FINDU - Messages)

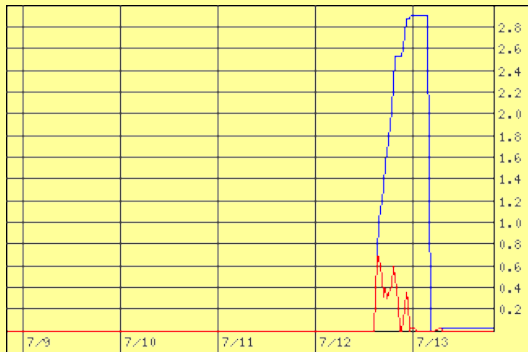
from	to	time	message
WB4APR-9	JA1RBY-4	10/25 00:07:04z	no msg list?{44
WB4APR-9		10/25 00:02:47z	qsl!{43
JA1RBY-9	WB4APR-9	10/24 23:59:59z	hello{15
N3HEV-1	WB4APR-9	10/14 14:09:06z	GM hve a grt day! 73! {0
WB4APR-9	ALL	10/14 13:53:03z	in d700... ignore that msg. It was 4 satellite. {42
WB4APR-9	ALL	10/14 13:50:24z	in d700 {41
WB4APR-9	ALL	10/14 13:49:07z	in d700 use ptt mode to TX while RXing{40
KE4NYV-15	WB4APR-9	09/30 21:55:30z	S1, if that{7
KE4NYV-15	WB4APR-9	09/30 21:51:01z	noisy{6
WB4APR-9	KE4NYV-15	09/30 21:50:32z	6.85?{38
KE4NYV-15	WB4APR-9	09/30 21:49:45z	noisy{5
N8PK	WB4APR-9	09/30 21:12:16z	Try again on 6.835 {003
WB4APR-9	KE4NYV-15	09/30 20:48:11z	52?{37
N1TI	WB4APR-9	09/29 02:47:14z	Good luck @ DCC{82
N3IDX-1	WB4APR-9	09/28 02:06:44z	Greetings from Huntingtown, Md{2b}
KD8ATF-2	WB4APR-9	09/28 01:55:17z	r u going to be on the next pass of go-32 bob?{26
WB4APR-9	ALL	09/28 01:51:40z	ck in!{35
N1TVZ	WB4APR-9	09/28 01:45:12z	%private line{M
WB4APR-9	ALL	09/28 01:43:14z	what is pl?{34
N8PK	WB4APR-9	09/28 01:40:41z	Gud 2 C U on the CARA last night! -Pat {000



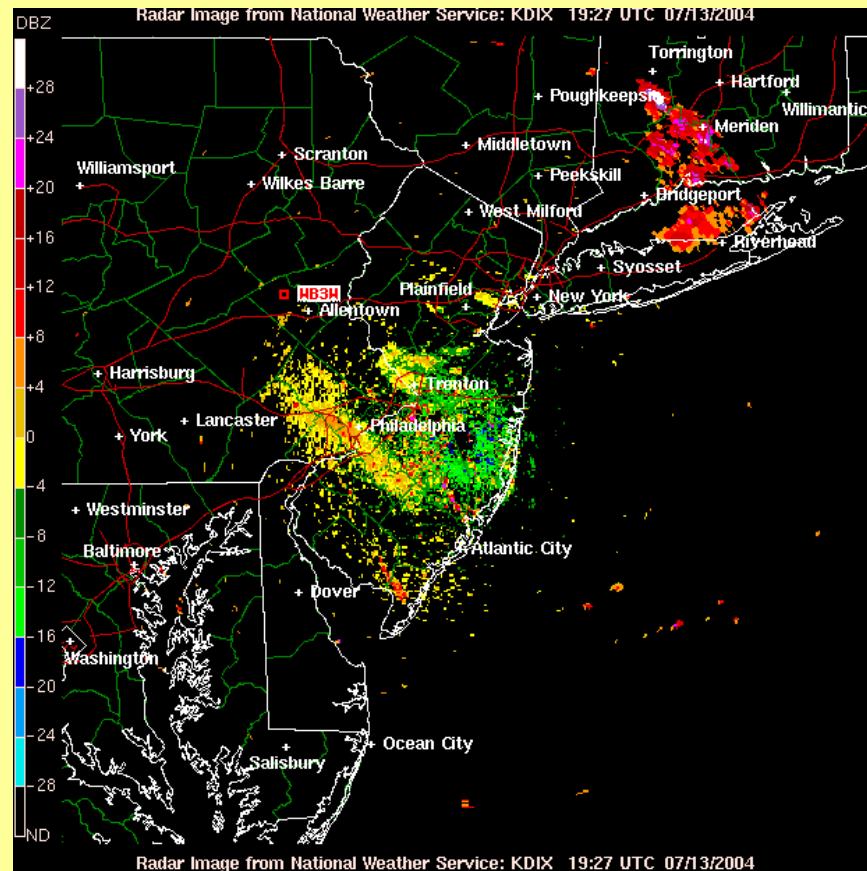
Findu.com Weather Data



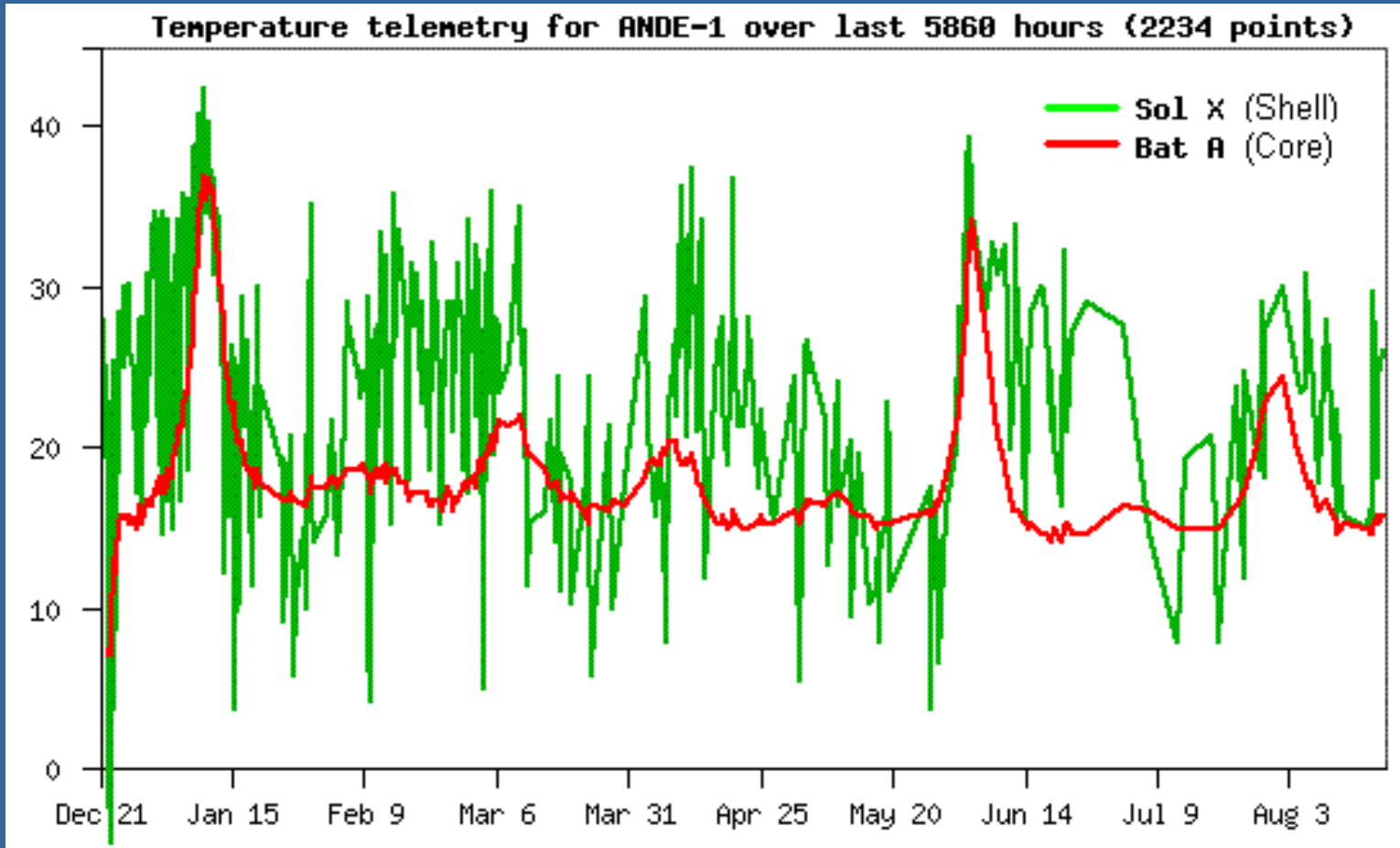
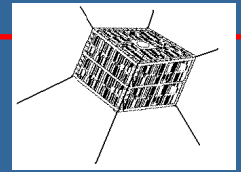
Temperature & Dew Point



Rainfall Rates



Findu.com Telemetry Plots



What is APRS all about?

(Humans communicating INFO with Humans)

Immediate local digital and graphical information exchange between all participants in a local area or event. This includes:

- Positions of all stations and objects
- Status of all stations
- Messages, Bulletins and Announcements
- Weather data and telemetry
- DF bearings and signal strengths for quick transmitter hunting
- RF Connectivity plots of all stations
- Local OBJECTS on a common map display for all users
- Local Freqs, IRLP, ECHOLink, Winlink, Nets, Meetings

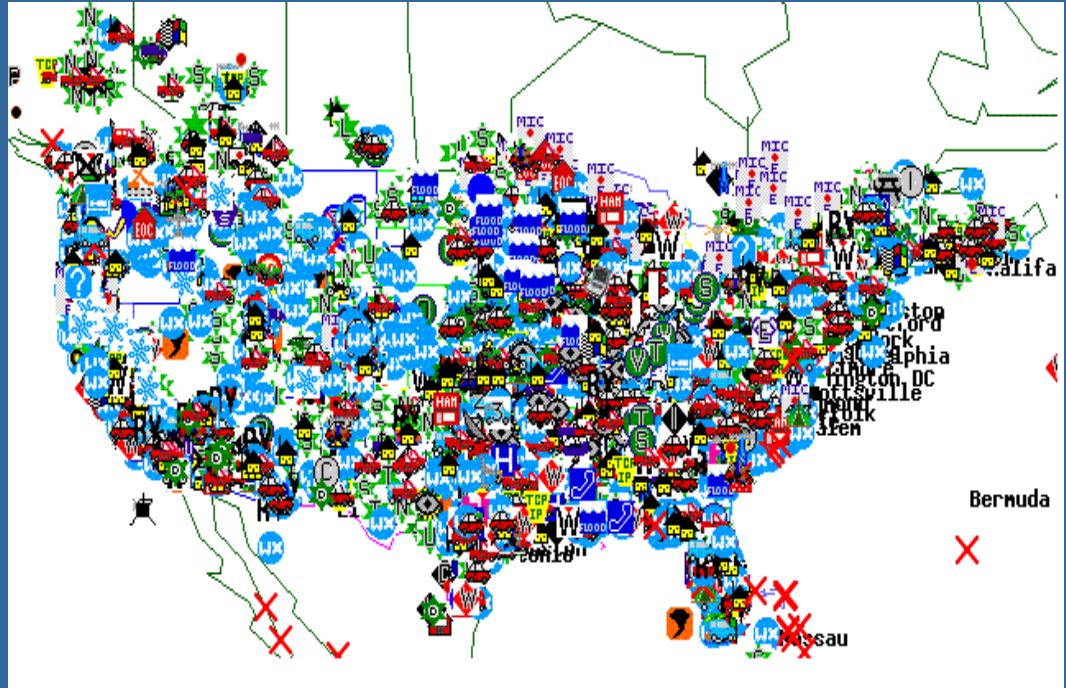
Typical applications are:

- Routine local awareness of all ham radio events and assets around you
- Marathons, races, events and public service
- Search and rescue
- Family communications and tracking and one-line emails
- Mobile-to-mobile global text messaging
- Weather data exchange and display
- Efficient multi-user Satellite communications



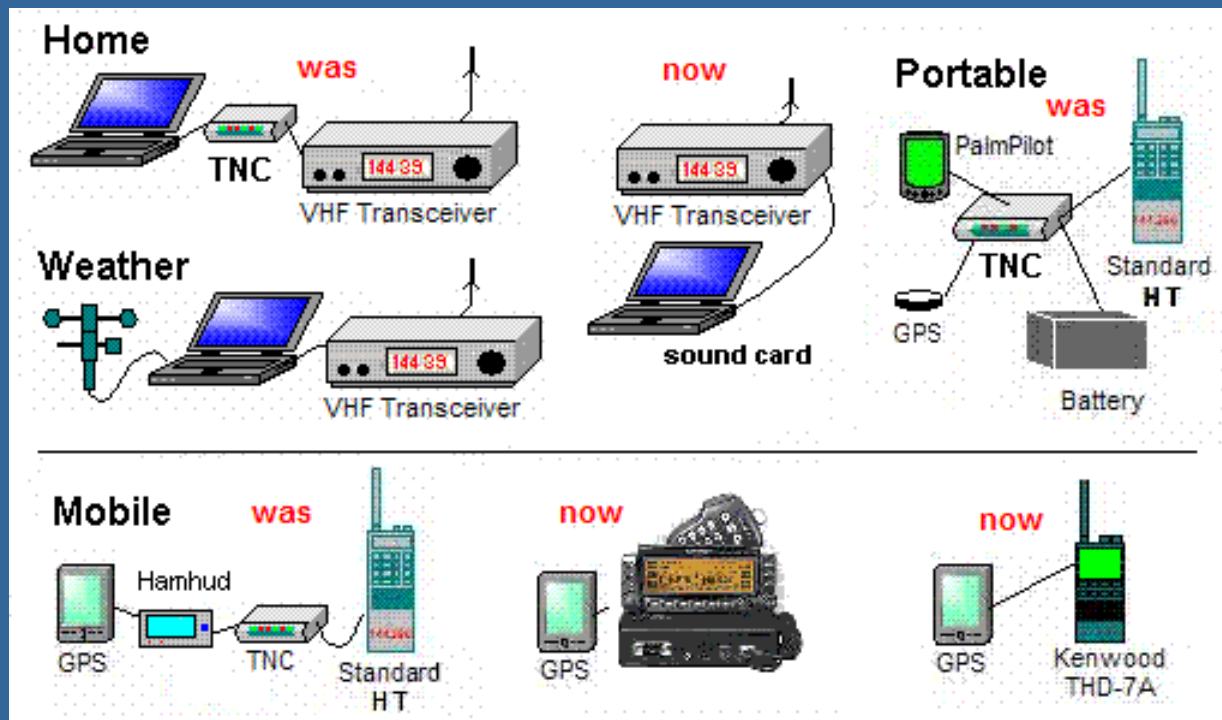
Scope of APRS

- Over 30,000 users worldwide.
- RELAYS every 20-30 mi called “digipeaters.”
- All linked by home station I-gates
- Global links by Amateur Satellites
- Thousands of Weather stations
- Telemetry and data everywhere



But, only 2% of local ham radio users...
(a side show)...

Various APRS Stations (two-way)



APRS is a Network intended for real-time Tactical INFORMATION exchange. This means TWO-WAY.

Mobile/Portable APRS Terminals

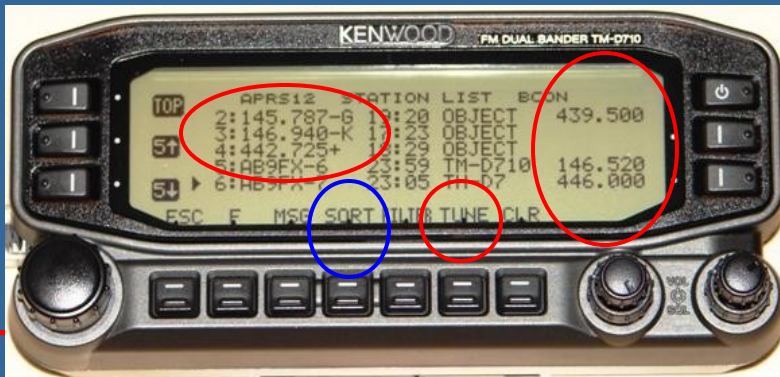
Kenwood TM-D700A

- Dual band 144/440 MHz 50/35 Watts
- Built-in 1200/9600 bps TNC including digipeater
- Built-in screen display of other APRS stations and front-panel send/receive messaging.
- Other APRS station locations are sent to the attached GPS map for display.

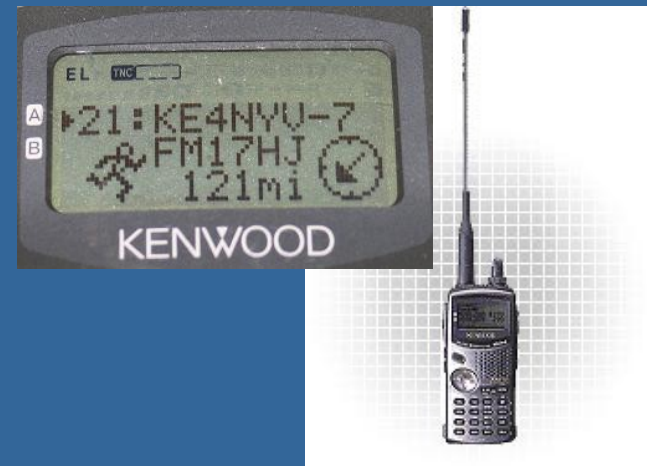


TM-D710

- Adds operation Freq to every posit !
- Auto tunes to others with Freq!
- Shows local Voice Repeaters !

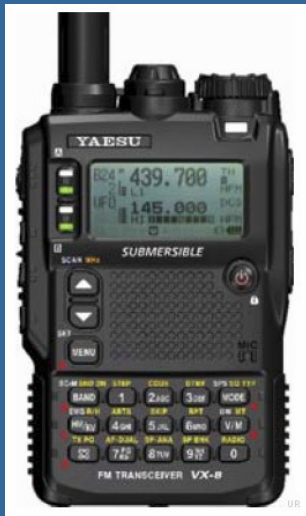


Kenwood TH-D7A(G)



Other APRS radios

- Alinco DR-135T/EJ-41U
- 2 M Radio with optional TNC.
- N1VG Scott makes an OT tracker module
- No messaging/data display
- But OT adds GPS map display



- VX8R announced at Dayton 08. Should work “like the D7”

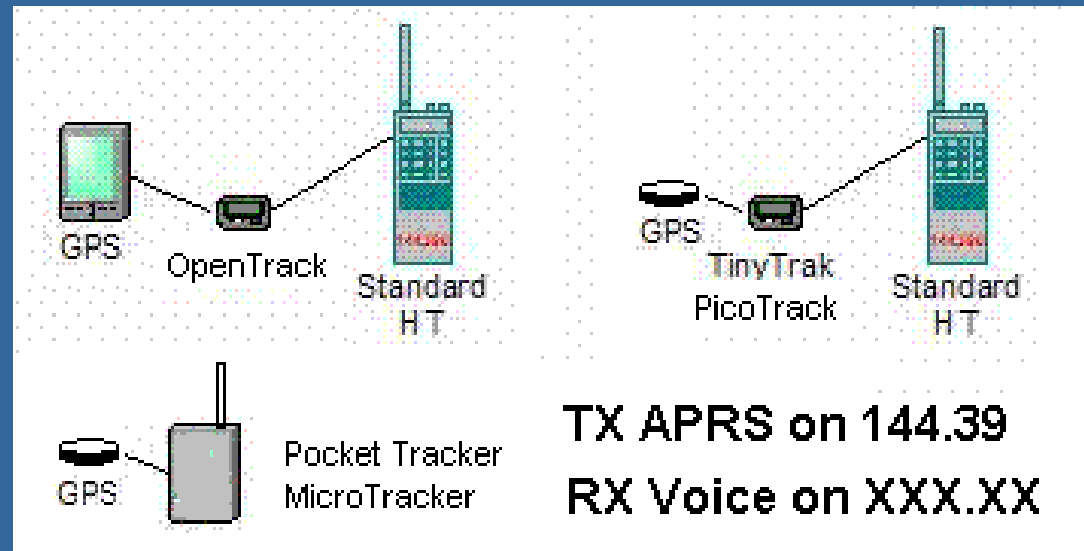
- Or HAMHUD on any radio!



TRACKERS (should be two-way)

One-way APRS is not normally recommended. APRS is a Network. We want good 2-way communications among all participants for maximum utility.

Trackers have no APRS data display. So the receiver should be tuned to a beamed Voice frequency so the operator can be involved in the Net!



One-way trackers are good for non-manned assets at large movement events.. Not as the only APRS asset for a ham.

Trackers may be his 2nd, 3rd or 4th unit for APRS support... not his 1st!

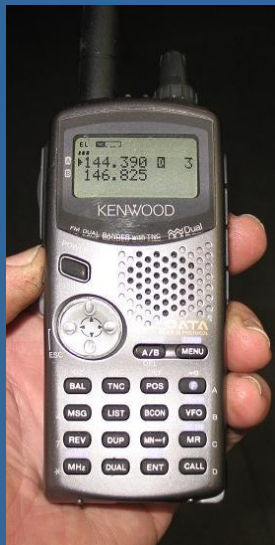
APRS MisConceptions!

See [APRS-tactical.html](#)

- That APRS is just Vehicle Tracking instead of a **Real-Time Information Distribution System**.
- That APRS is dependent on GPS for its value (**GPS is not needed. See Objects**).
- Failure to use the APRS built-in **Mile-Marks** for tracking all other non-APRS mobiles.
- Using APRS clients that only do maps and ignored **too many of the APRS fundamentals**.
- Ignored the fundamental **Decay Algorithm** to accelerate new data, and decay old data!
- Failure to understand the importance of OBJECTS: . See **Objects 101** and **Operations**
- Failure to use real-time messaging: . See **Messages 101** and **Message Operations**
- Failure to implement the original APRS Centralized **Common Bulletin Board** concept.
- Not understanding the APRS operator's role as a **Data Input** (Objects, Bulletins and Messages)
- Not using the D7 and D700 as **data entry and clipboard display units** at field events.
- Too much focus on **Large Screen** Displays **-vs-** **Individual Operator** displays for events.
- Failure to display APRS **symbols with all their attributes** and colors without clicking them
- Failure to manage the network by **adjusting the local digipeater** for the situation at hand.
- Not realizing the importance of **Voice Operating frequencies** in APRS.



Global APRS Email!



To: EMAIL

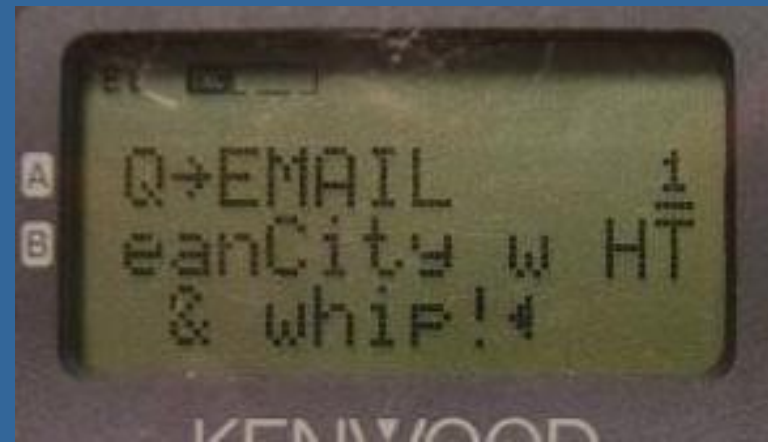
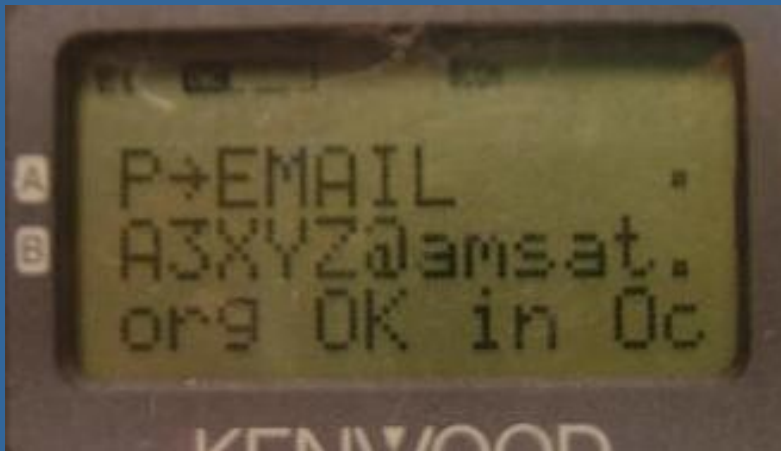
MSG: wb4apr@amsat.org ET call home!



- APRS Global **Text Messaging** since 1993; from HT's since 1998!
- Send Email from any APRS radio anywhere to anyone on the planet, anywhere LIVE.
- WU2Z Email Engine on the APRS-IS gates it to Internet
- **Great Demos.** Send an Email to a Blackberry in the audience.

APRS Msgs/Email

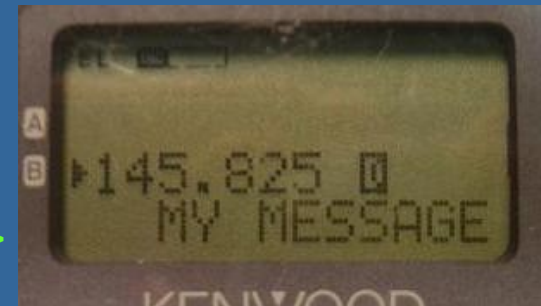
MSG
menu



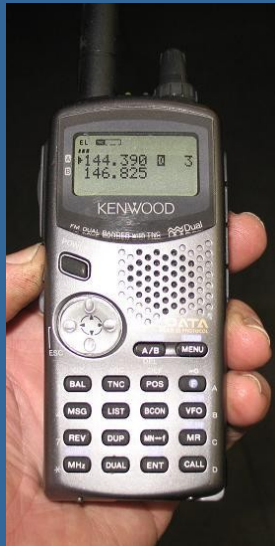
Send/Receive messages or email

Anywhere on the planet via APRS satellite

Confirmation of Relay =>



Global APRS Email Services



Several to choose from!



EMAIL: RF->email only, single line messages.

EMAIL-2: RF->email only, single line messages; supports aliases

- See: <http://www.aprs-is.net/Email.aspx>

WLNK-1: Send/Receive, multiple lines. Need Winlink account

- See <http://www.winlink.org/aprslink>

APRSMail: Email->RF only, single line messages. Need account.

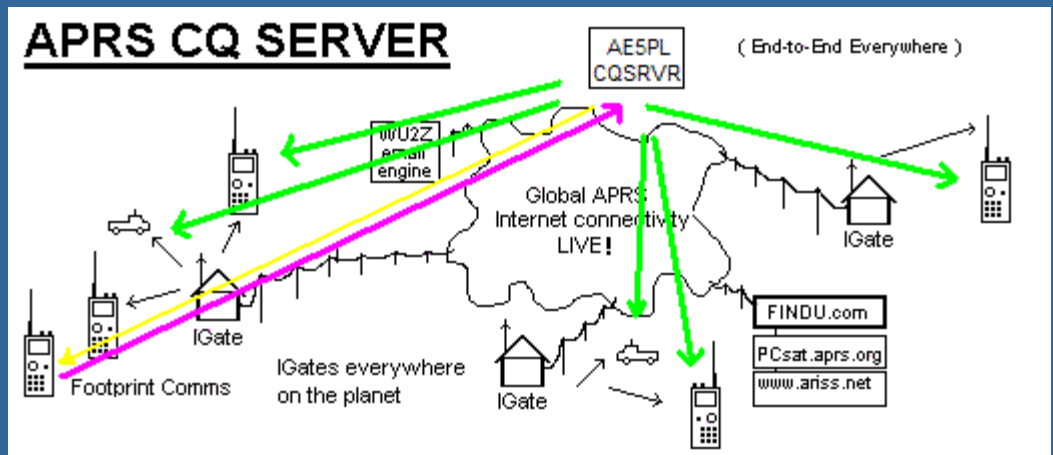
- See <http://www.aprsmail.org>



APRS Global

CQ's

www.aprs.org/cqsrvr.html



- We needed a CQ System for **SCOUTS, JOTA, SATERN, IOTA, SCR** and **Field Day!**
- **AE5PL** responded with **CQSRVR**
- Allows anyone to send a global message to everyone involved in an **XXXXX** activity
- Just send a message to **CQSRVR** starting with **CQ XXXX CQ XXXX** message
- **Everyone** who has sent a similar **CQ XXXX** message to CQSRVR **will get your CQ**

- From then on, once you see **callsigns**, you message normally **point-to-point**
- To limit load, only one CQSRVR message per 30 minutes is forwarded.

- Can also be used any day, any time, anywhere! **CQ CQ CQ CQ anyone around?**
- Can also be used for **global GROUP comms** if 30 minute timer is changed.

APRS Voice Alert! *

(For all mobiles!)



Voice Alert is effectively 3rd Radio channel for the D7 and D700 APRS radios

By setting the APRS Band, A, to CTSS-100, but keeping the volume turned up:

You wont hear any packets on 144.39 *

But you will hear a voice call using PL-100 on 144.39

And you will hear* an occasional Ping packet if another D700 comes in line-of-site to you, like a proximity radar alerting you to local presence.

Great for long haul traveling and meeting other APRS users.

APRS – IS - Local Info!

Last 100 stations!



Direction & Distance

Frequency and Tone

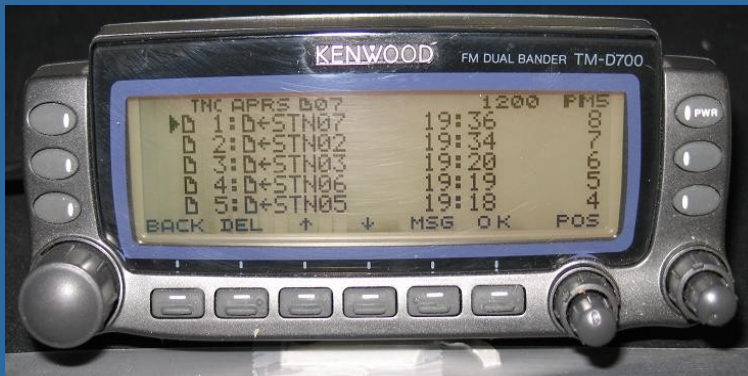
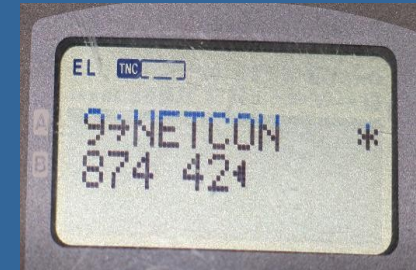
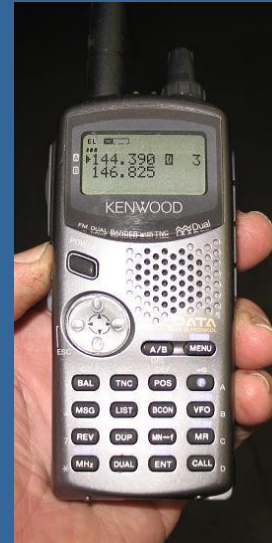
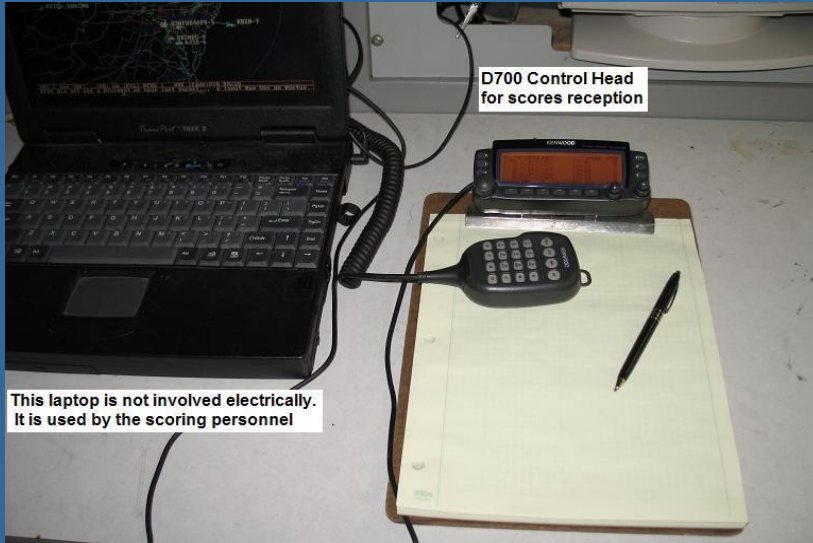


APRS for Special Uses

- Bicycle rallies, races
- Walk-a-thons, Parades
- Skywarn
- Weather Nets
- Crime prevention patrols
- Damage assessment
- Direction Finding – Foxhunts
- Voice for communications, APRS for visual mapping
- Now integrating into APRN (Automatic Picture Relay Network)

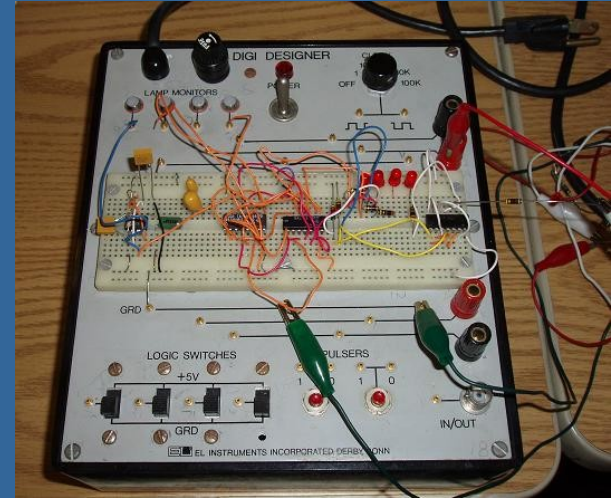
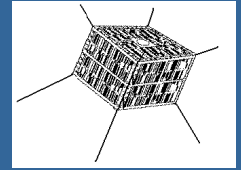


APRS Event Data Entry



Score Data Received

Sensor Buoy Prototype



- **Naval Academy Student Project** •
- * If free-floating, do not disturb.
- * If aground, move to deep water and advise bruninga@usna.edu
- * If later than 30 Nov 2006, recover and advise above.

See Buoy Location and Telemetry at

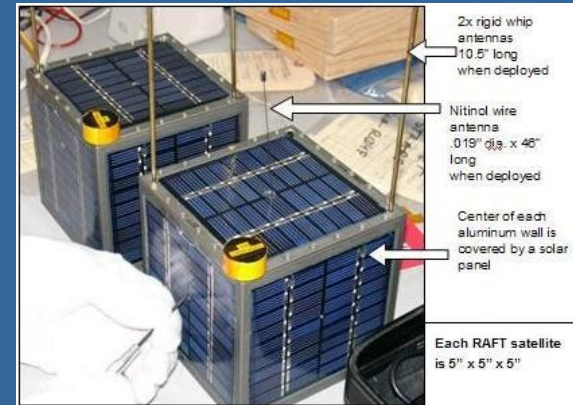
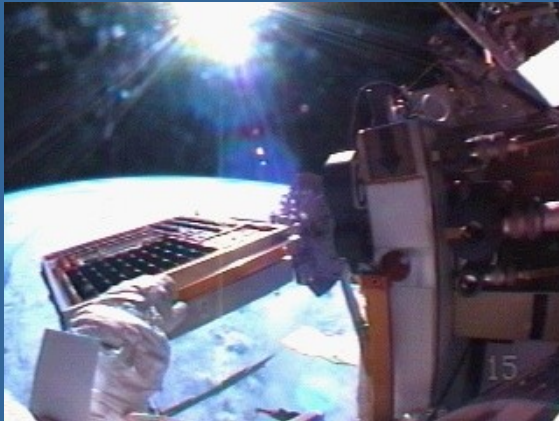
<http://www.ew.unsa.edu/~bruninga/buoy.html>

APRS is a registered trademark Bob Bruninga, WB4APR



APRS in Space

- 2001 PCSAT-1 Prototype Comms.
- 2006 PCSAT2 on ISS
- 2007 ANDE
- 2008 RAFT



- APRS space frequency is published as 145.825

See live downlink on <http://pcsat.aprs.org>

Anybody can participate

In the Shack: XASTIR, UIView, several others

- Radio+TNC+PC (Win, DOS, Linux, Mac, Palm, etc.)
- Internet connection, optional

At home, work, or the odd Internet Cafe

- Aim your browser to www.aprs.fi

On the Road

- Kenwood, Yaesu handhelds, mobile rigs
- Radio parameters:
 - Tune to 144.390 simplex; PL 100 optional
 - 1200 BPS AX.25 packet radio
 - Use “via” of “wide1-1,wide2-1”, not “relay,wide”
 - Packet routing method changed in 2005 to fix congestion

More info: www.aprs.org (Bob's main site, with lots of resource links!)

- The original (uncut) version of this presentation is at the link on this page.

