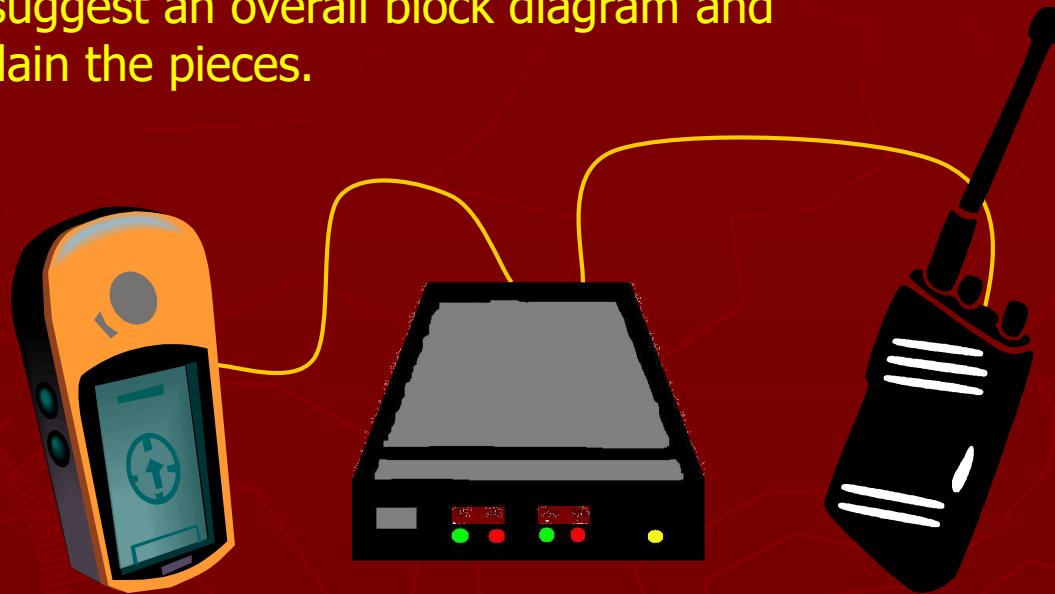# APRS
Automatic Position Reporting Syatem

I would suggest an overall block diagram and then explain the pieces.
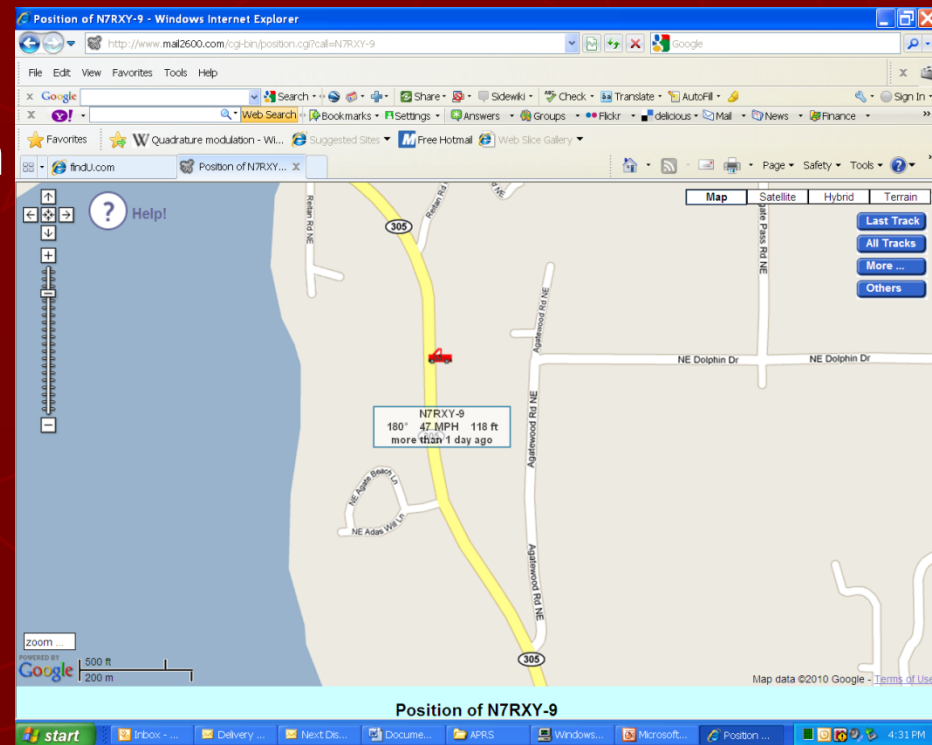
APRS System

What can it do?

With GPS accuracy transmit a specific longitude and latitude coordinates altitude and speed to an Amateur Radio gateway station that will then post the information on a public web site along with the originating stations name (Amateur Radio call sign)

What can it do?

Using free web sites anyone can search on a stations (or individuals) call sign and receive the coordinates, altitude and speed for a specific station.

Many of the free sites will show the station position superimposed on a Google map.
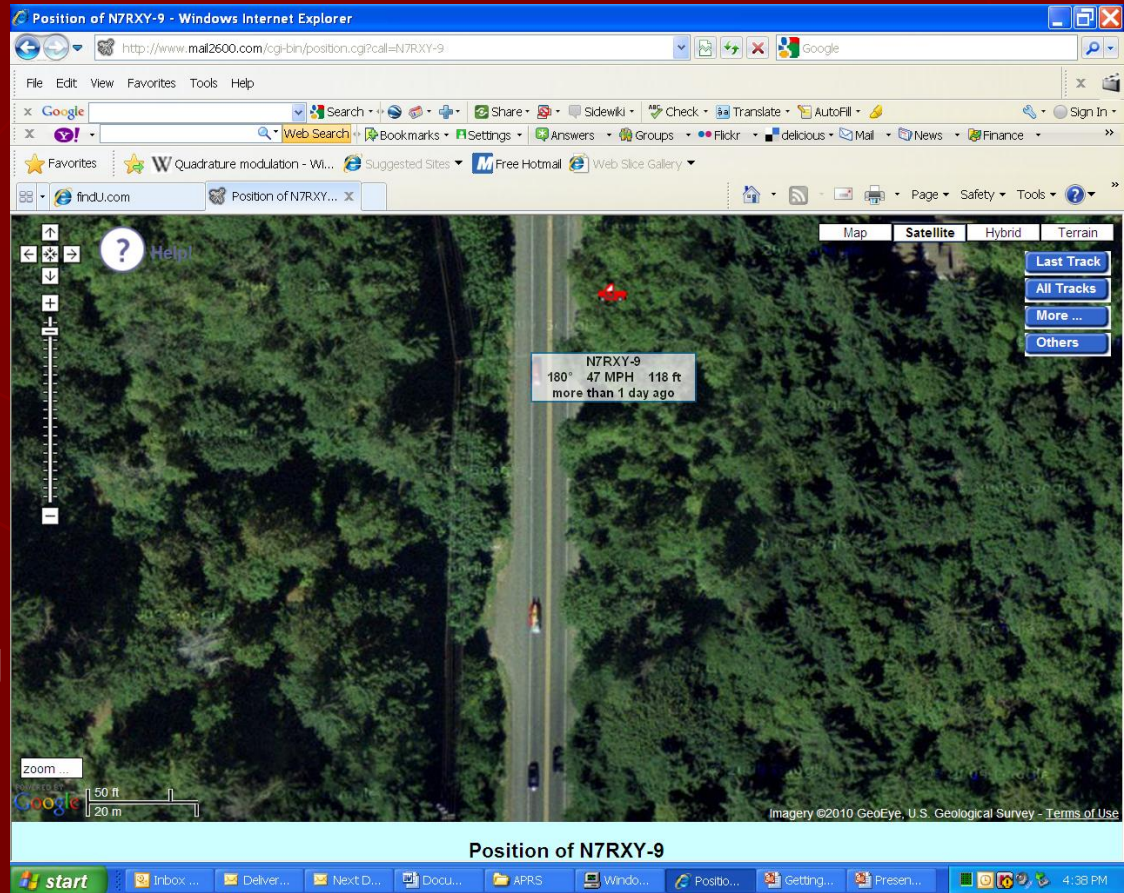
What can it do?

With GPS accuracy transmit a specific longitude and latitude coordinates altitude and speed to an Amateur Radio gateway station that will then post the information on a public web site along with the originating stations name (Amateur Radio call sign)

Using free web sites anyone can search on a stations (or individuals) call sign and receive the coordinates, altitude and speed for a specific station.

Many of the free sites will show the station position superimposed on a Google map.
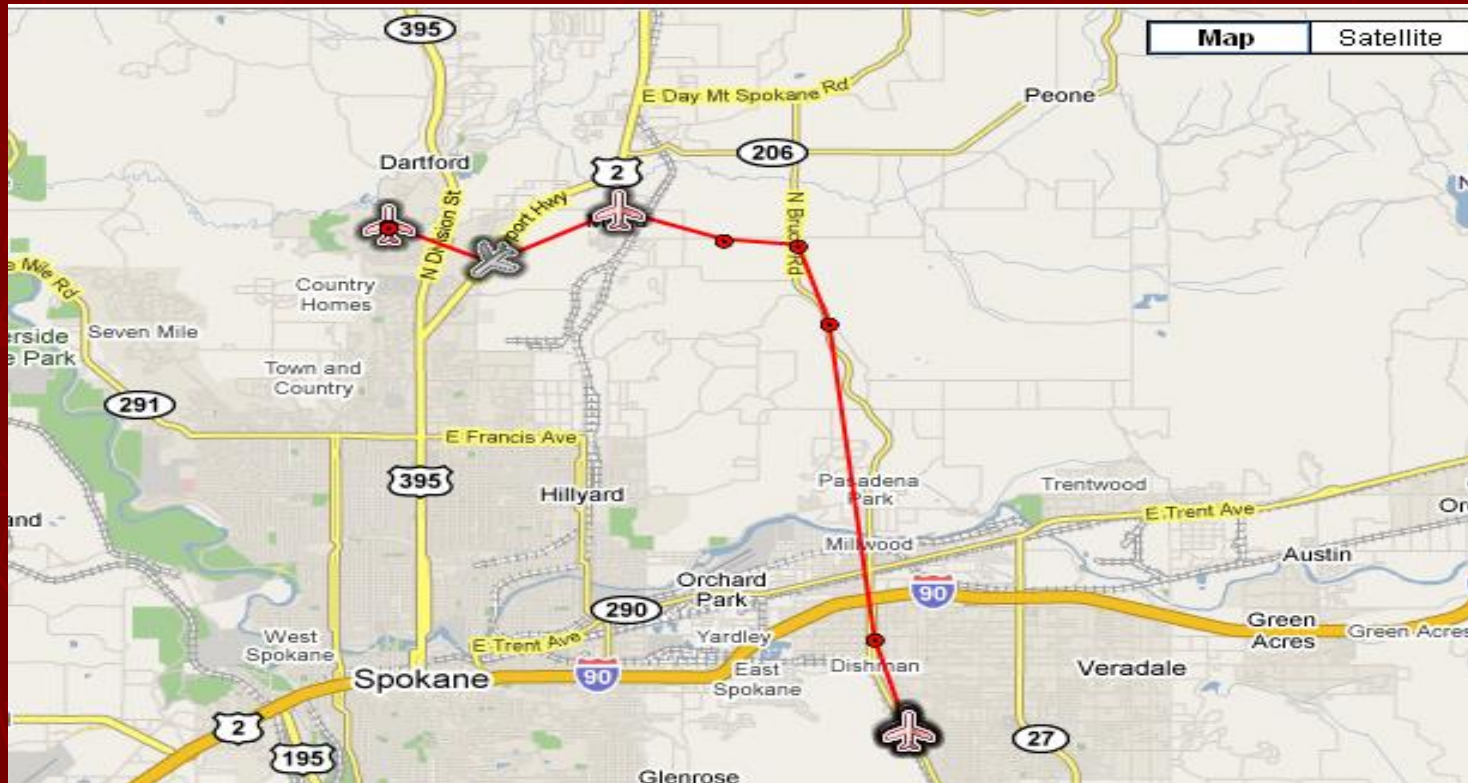
What can it do?

Some sites can also show the station position on a satellite map (the satellite map is not real time, that is it can show your location in a parking lot, but the satellite Image is from an archive and may be months to years old.

What can it do?

In addition some sites will show your current track from start to finish (or current position) on the map

What are some applications?

1. Locating a person

2. Checking to see a stations progress to their eventual destination (my trip to Hamvention in Dayton Ohio).

3. Sending an exact position for:

- Reporting an incident (specific location on a foot race, bycicle race, triathlon, etc)

4. Tracking someone on a hike away from published routes.

What Does it take?

Amateur Radio **Automatic Position Reporting System**

1. A GPS receiver that determines your position coordinates (longitude and latitude), altitude and speed

2. A modem that converts the GPS receiver data into a standardized modulation format.

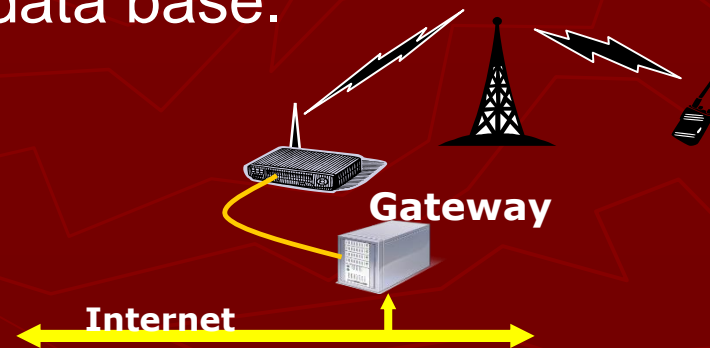3. A radio that can transmit a 144.39 MHz FM signal

What is APRS AYWAY? (c0ntinued)

• An amateur radio transmitter that transmits the data packet on 144.390 MHz.
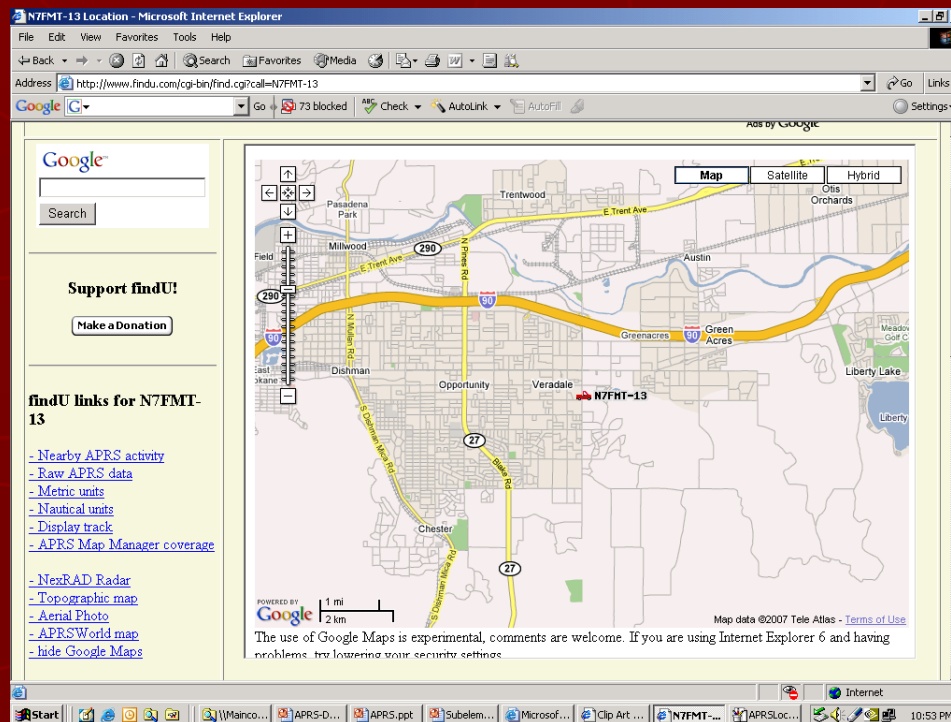
An APRS Gateway is a station that receives and decodes your 144.39 MHz packet signal and inserts your current position data with a time stamp into the internet on-line APRS data base.

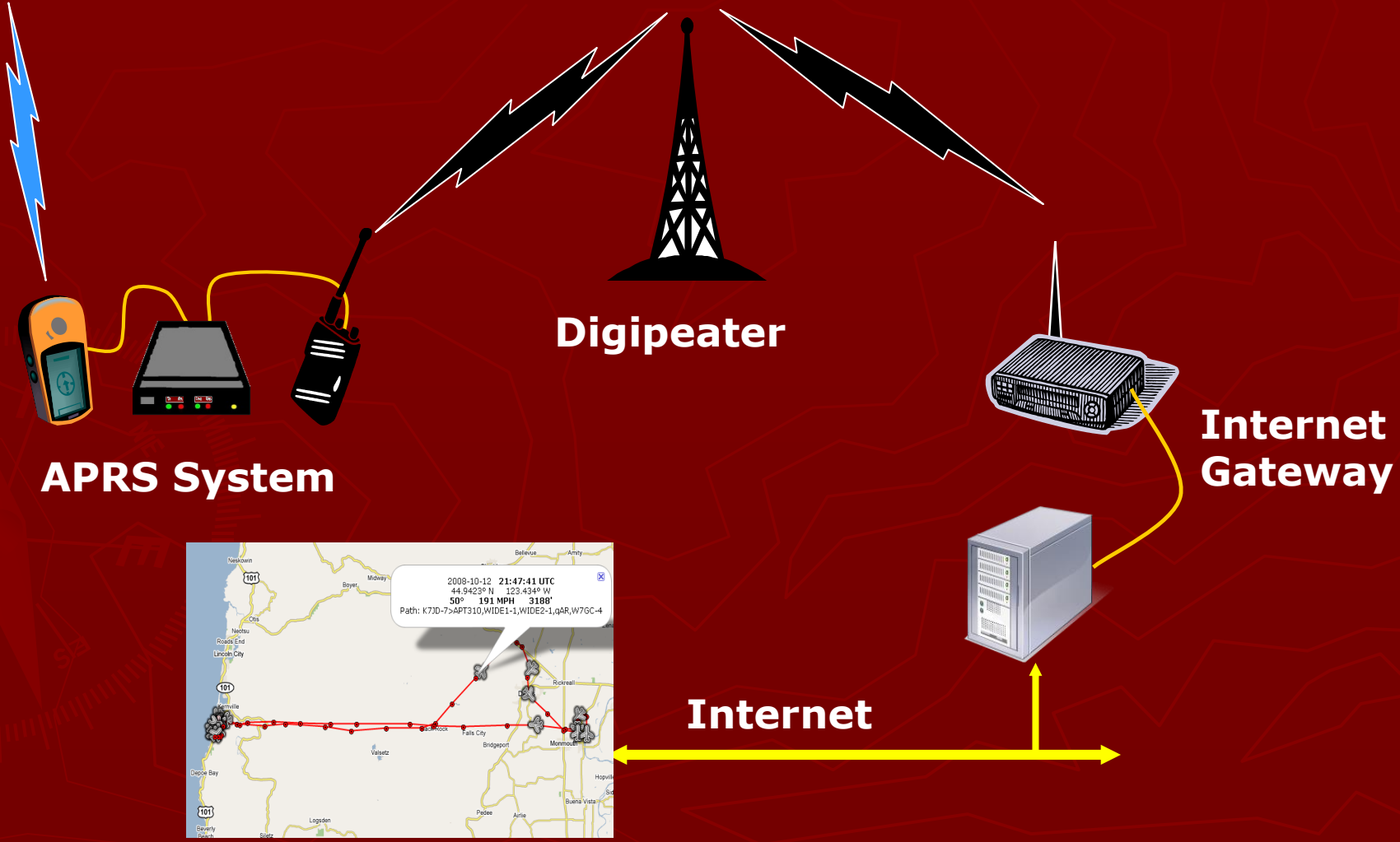**Gateway**

Internet

What is APRS AYWAY? (c0ntinued)

• An internet site that can access the data base and display your APRS location data on a map as a single point or a track.

The APRS Network

► APRS consists of a very large land based wireless network. Almost 30,000 users around the world.

► This network works via RELAYS every 20-30 miles called "digipeaters" and Globally via I- Gates to the internet.

► APRS is also used via some of the Amateur Satellites.

► APRS can also used to monitor telemetry values of weather stations for the National Weather Service (NWS)

How does the signal travel?

Digipeater

APRS System

Internet Gateway

Internet

2008-10-12 21:47:41 UTC
44.9423° N   123.434° W
50°   191 MPH   3188'
Path: K7JD-7>APT310,WIDE1-1,WIDE2-1,qAR,W7GC-4

What is needed for an APRS Station?

A GPS Receiver

☞ Must have standard NEMA output

☞ Does not require any display or control

☞ Many GPS Navigators already have compatible outputs available (you will need a cable)

☞ Simple GPS receivers are available for around $70
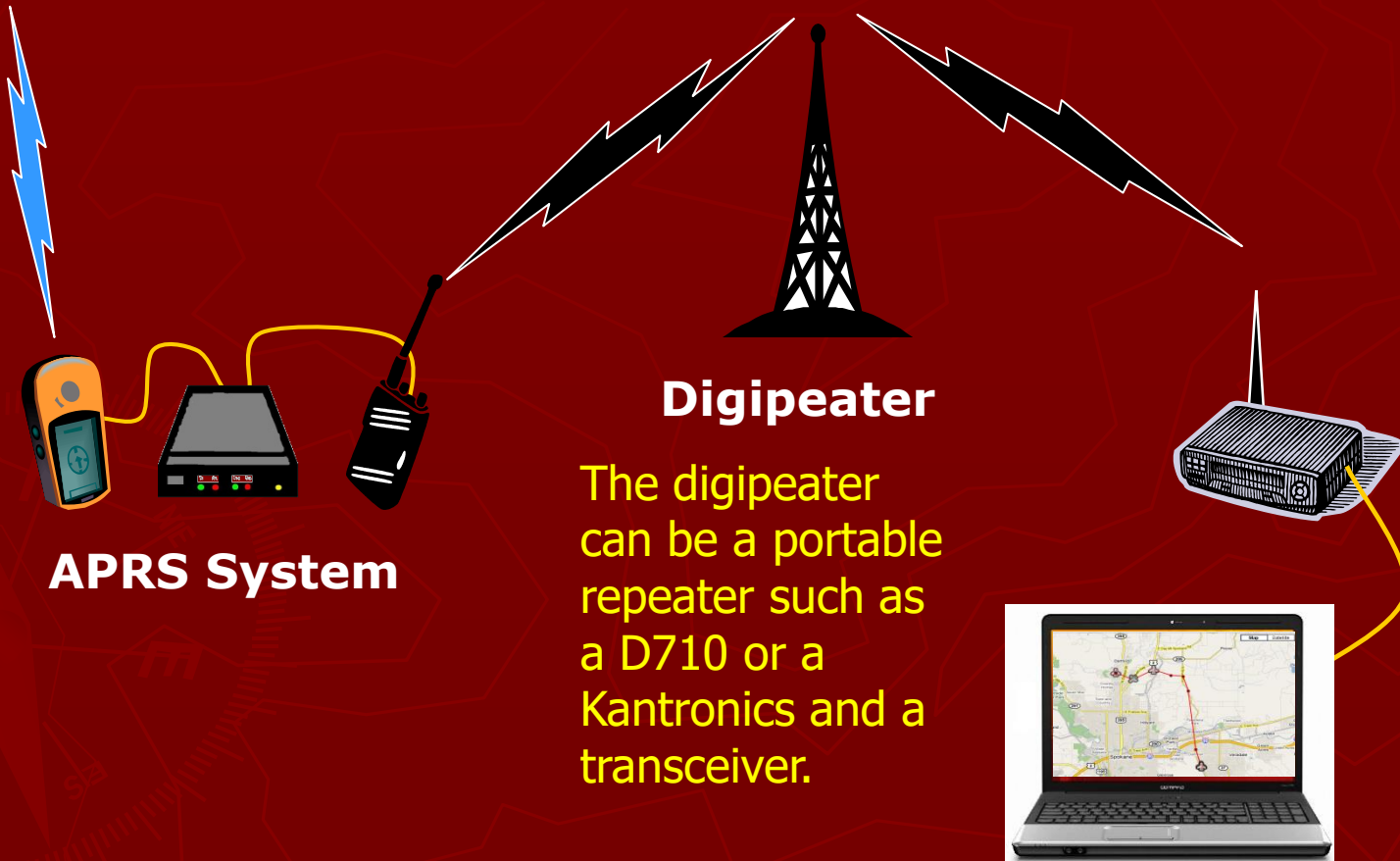
What is needed for an APRS Station?

A Modem

☞ Receives and formats the data from the GPS receiver into packets for transmission.

☞ Can be external device like the Byonics Tiny Track 3 or 4 or a Kantronics KPC3 (many others are compatible)

☞ A radio with an internal modem like the:

◇ Kenwood TM-D700A (includes front panel display)

◇ Kenwood TM-D710A (includes front panel display)

◇ Kenwood TH-D7A (includes front panel display)

◇ Alinco DR-135T MKII with EJ-41U TNC
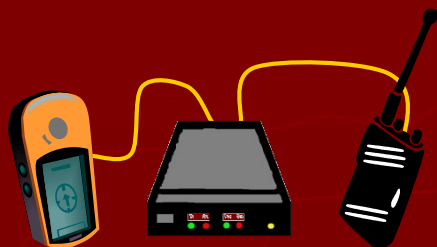
What is needed for an APRS Station?

A 2 meter or HF transceiver

☞ To listen for activity before transmitting.

☞ To transmit the formatted position data from the modem on one of the main US APRS frequencies:
   ◇ 144.390 MHz VHF (2 meters)
   ◇ 10.151 MHz LSB HF (30 Meters)

☞ Any 2 meter HT capable of transmitting on 144.390 will work for a simple position reporting station. You can find these at hamfests for low prices (they do not need to have tone capability).

☞ Some transceivers can be configured to function as a digipeater repeating and displaying information about the received station.

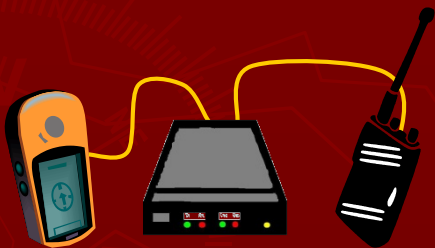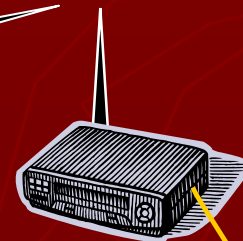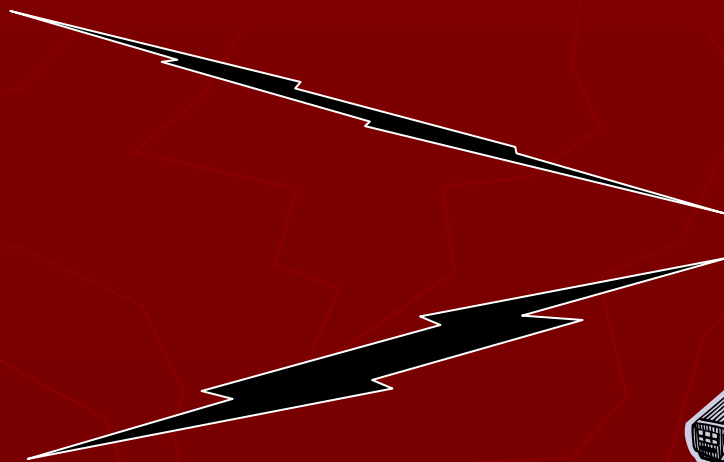# Can be a local event network with out internet connectivity

Digipeater

APRS System

The digipeater can be a portable repeater such as a D710 or a Kantronics and a transceiver.

Can be a local event network with out a digipeater

APRS System

APRS System

Lets assemble
a simple low cost APRS Station

For our station we will use the integrated Bionics GPS2 GPS receiver and the Tiny Track 3+ from the Byonics web site at:

http://www.byonics.com/tinytrak/

Ordering:	TinyTrak3Plus Built and Tested with **Case** - For those not interested in soldering together the kit.
Without a GPS	$47 TinyTrak3Plus Built
Combo with Byonics GPS2 - Includes a Byonics GPS2 with the SiRFstar III chipset.	$112 TinyTrak3Plus Built and GPS2 Combo

This information is from the bionics web site. Go there for current pricing and to order. If you have a compatible GPS simply buy the tiny track 3+, instead of the GPS Tiny Track 3+ combo (you will need to construct or buy the cable from your GPS unit to the Tiny Track 3+).

Lets assemble
a simple low cost APRS Station (continued)

For a portable station you will likely want to use an HT (Your own or one you find at a Hamfest). Radios like the Radio Shack HTX 202, ICOM 2GAT, Yaesu FT50, FT60 or similar HT's are ideal. Any radio capable of 144.390 MHz simplex will do the job.

If you bought the combo package you already have the cable for the GPS to the Tiny Track 3+. If you did not you will need to purchase or construct a cable to connect the GPS to the Tiny Track 3+ and supply the proper voltage to the GPS receiver (may require configuring a jumper inside the Tiny Track 3+).

Lets assemble
a simple low cost APRS Station (continued)

You will need a cable to connect The Tiny track 3+ to your radio Microphone input jack.   These are available from Byonics for many of the current production radios.

HT (handheld) Cables

HT1 - For Yaseu, ADI, and Radio Shack handheld radios with a 1/8" mono earphone jack and a 3/32" mono mic jack.

HT2 - For Icom handheld radios with a 1/8" stereo earphone jack and a 3/32" stereo mic jack.

HT4 - For Yaesu handheld radios with a single four-conductor 1/8" earphone / mic jack.

HTK - For Kenwood handheld radios with a 3/32" mono earphone jack and a 1/8" stereo mic jack.

Lets assemble
a simple low cost APRS Station (continued)

Mobile Rig Cables with Modular Rectangular Microphone Jacks

M2 - For Kenwood mobile radios with an 8-pin RJ-45 modular mic jack with squelched audio out.

M4 - For Kenwood mobile radios with an 8-pin RJ-45 modular mic jack and an 1/8" speaker jack.

M5 - For Yaesu mobile radios with an 6-pin RJ-11 modular mic jack and an 1/8" speaker jack.

M6 - For Icom mobile radios with an 8-pin RJ-45 modular mic jack and an 1/8" speaker jack.

M7 - For Radio Shack mobile radios with an 8-pin RJ-45 modular mic jack and an 1/8" speaker jack.

M8 - For Yaesu mobile radios with an 8-pin RJ-45 modular mic jack and an 1/8" speaker jack.

Lets assemble
a simple low cost APRS Station _(continued)

<u>Mobile Rig Cables with Round Microphone Jacks</u>

<u>R1</u> - For Kenwood and Alinco mobile radios with an 8-pin round mic jack jack and a 1/8" speaker jack.

<u>R2</u> - For Yaesu mobile radios with an 8-pin round mic jack jack and a 1/8" speaker jack.

<u>R3</u> - For Icom mobile radios with an 8-pin round mic jack jack and a 1/8" speaker jack.

<u>R4</u> - For Radio Shack mobile radios with an 8-pin round mic jack jack and a 1/8" speaker jack.

Lets assemble
a simple low cost APRS Station (continued)

Mobile Rig Cables with 6-Pin Mini DIN Data Jacks

M1 - For mobile radios with a 6 pin mini DIN data jack. Uses the Carrier detect line of that connector.

M3 - For mobile radios with a 6 pin mini DIN data jack and an 1/8" speaker jack.

M12 - For mobile radios with a 6 pin mini DIN data jack. TinyTrak4 Only.

M96 - For mobile radios with a 6 pin mini DIN data jack. TinyTrak4 Only.

If you can't find your cable here or you want to save the money you can buy the connectors and build your own interface/power cable.

Lets assemble
a simple low cost APRS Station (continued)

Now that you have your hardware it is time to connect them together and apply power.

Caution- if you did not buy the combo make sure the voltage supplied by the Tiny Track 3+ is correct for your GPS receiver if power is being supplied from the Tiny Track 3+. Twelve volts applied to a 5 volt GPS receiver will destroy it!

Connect the serial port side of the tiny Track 3+ to the serial port of your PC through a null modem adapter or cable.
Install and run the Bionics programming software
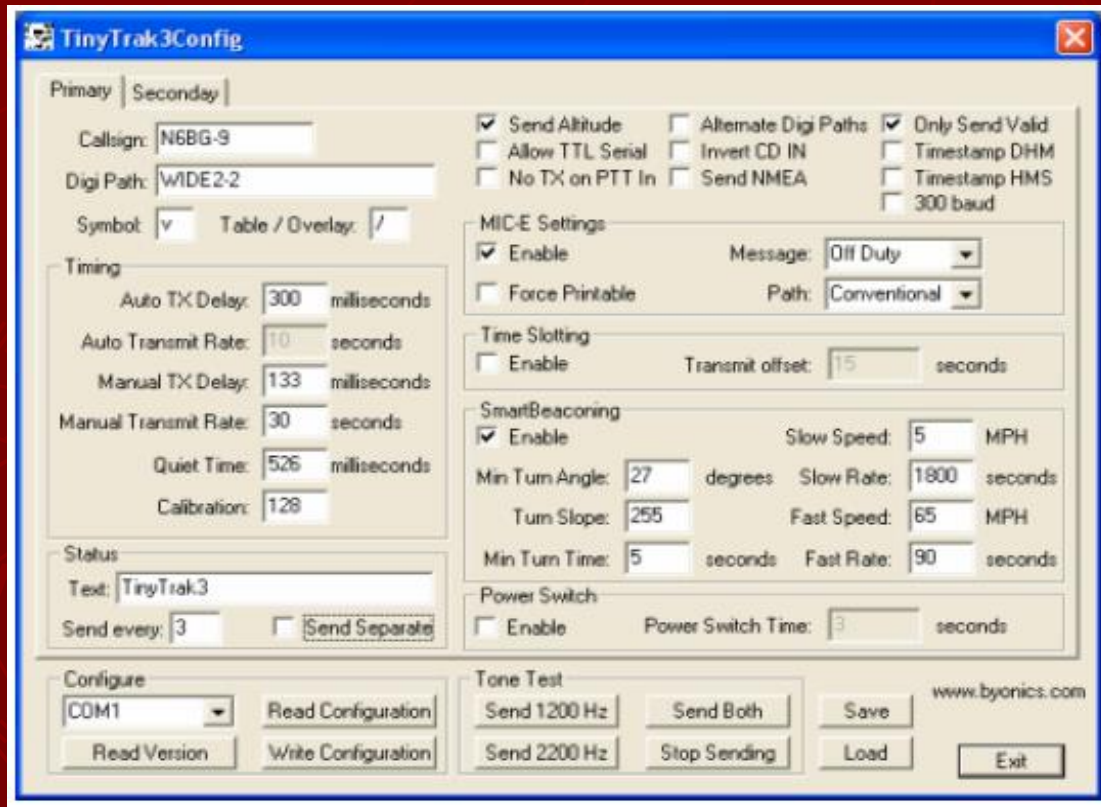
Female To Female Null Modem Adapter - $6.

Female To Female Null Modem Cable - $8.

Configuring your APRS Station

If things are working properly you should see the following configuration screen on your PC when you run the software.
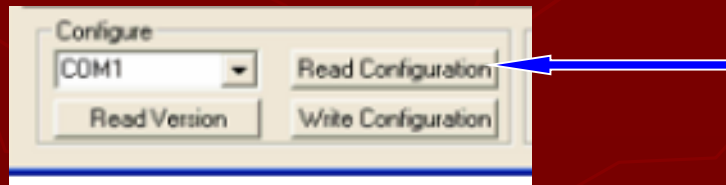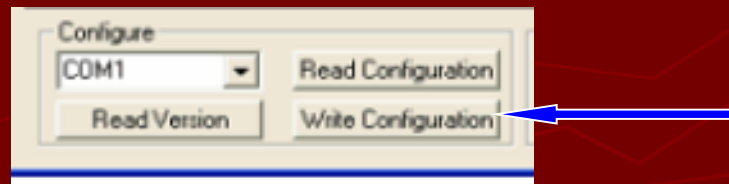
Configuring your APRS Station

Select the com port to be used.

Click the read configuration button to up load the current configuration of the Tiny Track 3+ onto your computer screen.

Edit or enter your configuration information (see next slide) and click the write configuration button to down load the new configuration into your Tiny Track 3+.

Configuring your APRS Station

Enter your call sign and SSID

Enter path

Choose your symbol

Click write configuration

TinyTrak3Config

Primary | Secondary

Callsign: N6BG-9
Digi Path: WIDE2-2
Symbol: v   Table / Overlay: /

☑ Send Altitude ☐ Alternate Digi Paths ☑ Only Send Valid
☐ Allow TTL Serial ☐ Invert CD IN ☐ Timestamp DHM
☐ No TX on PTT In ☐ Send NMEA ☐ Timestamp HMS
                                  ☐ 300 baud

MIC-E Settings
☑ Enable   Message: Off Duty ▼
☐ Force Printable   Path: Conventional ▼

Timing
Auto TX Delay: 300 milliseconds
Auto Transmit Rate: 10 seconds
Manual TX Delay: 133 milliseconds
Manual Transmit Rate: 30 seconds
Quiet Time: 526 milliseconds
Calibration: 128

Time Slotting
☐ Enable   Transmit offset: 15 seconds

SmartBeaconing
☑ Enable   Slow Speed: 5 MPH
Min Turn Angle: 27 degrees   Slow Rate: 1800 seconds
Turn Slope: 255   Fast Speed: 65 MPH
Min Turn Time: 5 seconds   Fast Rate: 90 seconds

Status
Text: TinyTrak3
Send every: 3   ☐ Send Separate

Power Switch
☐ Enable   Power Switch Time: 3 seconds

Configure
COM1 ▼   Read Configuration
Read Version   Write Configuration

Tone Test
Send 1200 Hz   Send Both
Send 2200 Hz   Stop Sending

www.byonics.com

Save
Load
Exit

Common SSID Usage

No SSID = Your primary home station
-1 = Home station running a Fill-In Digi, Weather station
-2 = OK for any use

-3 = OK for any use
-4 = OK for any use
-5 = OK for any use

-6 = OK for any use
-7 = Assigned to Kenwood D7, D700, D710

-8 = Secondary mobile station
-9 = Primary mobile station
-10 = Primary WIDE digipeater
-11 = Balloons, Secondary wide digipeater
-12 = Tertiary Mobile and wide digitipeater

-13 = OK for any use

-14 = OK for any use, Trucks

-15 = Primary TCPIP connection only, no radio connected

Paths

► Setting up the correct path is VERY important. The wrong path can clog up the system with unneeded packets.

►

Home Path Settings

► WIDE2-2

- Provides two hops via the RF network.

► WIDE1-1,WIDE2-1

- Use in you are in an area where digipeaters are needed to cover areas that are shadowed from the main digitpeaters receiver.
- This will provide two hops via the RF network. WIDE1-1 will activate fill-in digipeaters.

► Transmit periodicity

- Once every 30 minutes.
- If a weather station, once every 15 minutes.

Mobile Station Settings

► WIDE1-1,WIDE2-1

- Use in you are in an area where digipeaters are needed to cover areas that are shadowed from the main digitpeaters receiver.

- This will provide two hops via the RF network. WIDE1-1 will activate fill-in digipeaters.

► Transmit periodicity

- Once every two minutes is acceptable.

Configuring your APRS Station

- Disconnect your computer and connect the radio cable.

- Place the GPS Receiver antenna so it sees sky and apply power to the tiny track 3 and you are ready to go.

- Go to a tracking web site and enter in your call and SSID and your location should be shown on the map. If this is the first time you power it up , allow a minute or two for the GPS receiver to locate where you are in the world.

APRS Tracking web sites

http://www.wulfden.org/APRSQuery.shtml

http://aprs.fi/

http://www.mail2600.com/cgi-bin/everyone.cgi (K7JD private web site)

Alternative APRS Station configurations

Byonics Micro Track AIO (all in one)~$250

• Includes everything except 8 AA batteries.

• Built in GPS and and GPS antenna.

• Built in 10 watt transmitter (no receive capability) with 2 meter antenna, programmable to any 2 meter frequency. Powel is adjustable from <1W to 10W

• Transmissions do not listen for a clear channel. Your transmission may collide with another and not get through.

• The AIO comes pre-configured, you send them desired callsign/SSID and any other operating parameters different from the defaults.

• The Micro-Trak AIO default settings can run nearly 8 days when used with typical AA alkaline batteries transmitting at two minute intervals.

Alternative APRS Station configurations

Configuration with Kenwood transceivers that are APRS compatible

GPS integrated
receiver

Bionics
GPS2 $69

$+$

GPS interface cable
and 5V regulated
supply

Bionics
GPAP - $25

$+$

APRS Compatible
Radio

Kenwood TM-D700A

Kenwood TM-D710A

Kenwood TH-D7A

Alternative APRS Station configurations

Top of the line configuration

Geosat5 GPS - $650

+

APRS Compatible Radio:

    Kenwood TM-D700A

    Kenwood TM-D710A

    Kenwood TH-D7A

Demo time

- Track of folks coming to meeting

- Tiny Track 3 programming

- AD7FO's Kenwood D7 with bionics GPS2 GPS receiver

- AD7F0's portable APRS Station

- AD7KV's mobile TM700 + Geostat APRS station

Happy
    tracking
        to
            you