

<APRSdec>TM - The G3NRW APRS Packet Decoder

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4 July 2000

Abstract

This paper describes the principal features of the <APRSdec> program.. The program fully decodes raw APRS packets, producing reports in plain English. It has proved to be an extremely useful APRS diagnostic and learning tool. <APRSdec> is written in Perl, and runs under native DOS, Windows, Unix and Linux. It is available from <http://www.tapr.org/~g3nm>

Introduction

<APRSdec> started life towards the end of 1999, when I was working on the APRS Protocol Specification. I needed a simple tool to decode the many different types of APRS packet seen on air, to help me verify that I understood all the formats. Later, in the spring and early summer of 2000, the program unexpectedly came into its own as a diagnostic tool, when floods of badly corrupted packets appeared on the APRS network (arising from a combination of broken APRS client software and broken IGate server software). <APRSdec> was invaluable in reporting the errors and providing clues towards identifying the culprits.

<APRSdec> is a particularly useful tool for:

- APRS software development and testing.
- PIC development and testing.
- Network fault-finding and diagnostics.
- Learning about the APRS protocol.

<APRSdec> Features

Runs under native DOS, Windows 95/98 and LinuxAJnix. (It will almost certainly run under Windows NT and Windows 2000 as well, but this has not been tested).

Accepts raw input in TNC/IGate terminal output format.

Accepts raw input in UI-View two-line log format, and decodes the 15-digit UI-View timestamp.

Performs rigorous format checking, with detailed error reporting.

Understands position ambiguity, reporting the bounding box in which the station is located.

Compares lat/long position against a prefix/country database - if the station's position appears to be outside the country, <APRSdec> reports a possible anomaly.

Reports data values in imperial, nautical and metric units.

Fully decodes Mic-E and compressed position formats.

Recognizes data from Kenwood TH-D7 and DM-700 radios, and changes the incorrect DM-700 APRS Data Type Identifier to "Current Mic-E Data".

Provides detailed weather station reports, including the calculation of windchill and dew point.

Decodes storm data.

Decodes bearing and range data.

Decodes DX Cluster reports, showing the data as it will appear on TH-1~7 and DM-700 screens.

Some Examples of <APRSdec> Output

A simple lat/long report:

```
-----  
Record #170  
KC4SQT>APRS, W1NHV- 9, W1DE~, W1DE/2: ~270700z3408.76N/07924~60W John in Marion, SC-793-  
APRS Data Type= Posit w/ time. With APRS  
Day= 27 Time= 07 hours 00 mins UTC  
Lat= 34 deg 08.76 min N Long= 79 deg 24.60 min W  
Icon= House QTH VHF Overlay= (none)  
-w-w-  
-----
```

A Mic-E report. CAPRSdew recognizes this comes from a Kenwood TM-D700 radio and automatically corrects the APRS Data Type to "Current Mic-E data":

```
-----  
Record #8051  
KC7EQL>VE7VAN- 3~~>W1DE3-1>T8PWPW '37]1Ie- /]-SS-Mark at Home awaits Sunsat  
APRS Data Type= Current Mic-E data  
Radio= Kenwood TM D700  
Message Type= /M2/In Service  
Lat= 48 deg 07.07 min N Long= 123 deg 27.65 min W  
Icon= House QTH VHF Overlay= (none)  
Course= 173 deg Speed= 4 knots (4.6 mph 7.4 kph 2.1 m/s)  
Altitude= 397 feet (121 meters)  
-----
```

A compressed lat/long position, within an APRS Object report:

```
-----  
Record #1763  
N9IDH>APRK11, AE9A- 10~~, W1DE3- 2:; A016 , 111826z\%H+!3vA!Sk~!R=05280/437.051/13Khz/APRStk  
APRS Data Type= Object  
Object Name= 'A016 ' Object Status= Killed  
Day= 11 Time= 18 hours 26 mins UTC  
Lat= 81 deg 14.20 min N Long= 14 deg 04.30 min W  
CPS Fix= Old (last) NMEA Source= Other Compression Origin= Compressed  
Course= 296 deg Speed= 1018 knots (1171.5 mph 1885.3 kph 523.7 m/s)  
Icon= Satellite/PAC Overlay= (none)  
e--w-  
-----
```

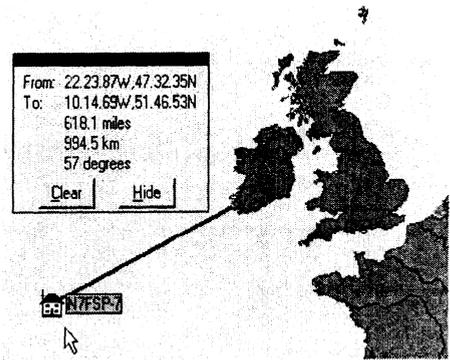
A Long Way from Home

This UI-View report (complete with the decoded UI-View timestamp) shows APRS Working Group Chairman John Ackermann, N8UR, jogging towards G3NRW's home at over 72mph -- he was on a train at the time! cAPRSdec> recognizes that John is outside the contiguous 48 states, so it questions the reported location:

```
-----  
Record #622  
N8UR- 7"->RELAY>W1DE>W1DE>W1DE2- 2>UIUVXX (UI):'vSf"> [ />"58)  
UI-View Timestamp= 27 May 2000 12 hrs 58 mins 32 sets (PC clocktime)  
APRS Data Type= Current Mic-E data  
Radio= Kenwood TH-D7  
Message Type= /M2/In Service  
Lat= 51 deg 56.88 min N Long= 0 deg 29.74 min W  
;h0QUESTION: Is this lat/long position reasonable?  
It seems a long way from home for this call sign.  
Icon= Jogger Overlay= (none)  
Course= 1 deg Speed= 63 knots (72.5 mph 116.7 kph 32.4 m/s)  
Altitude= 407 feet (124 meters)  
-----
```

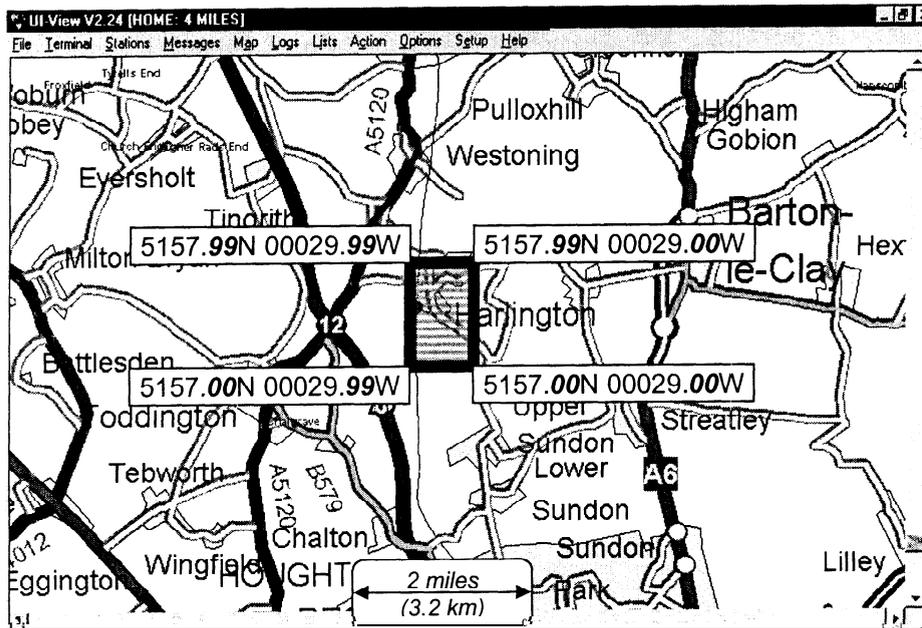
The next report is an example of how data was corrupted somewhere in the APRS network - the leading longitude digit was somehow changed from 1 to 0, making N7FSP-7 appear in the Atlantic Ocean, 600 miles off the southwest coast of Ireland:

```
Record #646
N7FSP-7>APK101,N70EP-10~~,WDE3-2:@111816z4732.21N/02222.65W
000/000/Mc-E/MD/Off duty>
APRS Data Type= Posit w/ time. With APRS
Day= 11 Time= 18 hours 16 mins UTC
Lat= 47 deg 32.21 min N Long= 22 deg 22.65 min W
%*QUESTION: Is this lat/long position reasonable?
It seems a long way from home for this callsign.
Icon= House QTH VHF Overlay= (none)
Course= (Indeterminate) deg Speed= 000 knots (0.0 mph
0.0 kph 0.0 m/s)
```



Position Ambiguity

Position ambiguity allows a station to specify its approximate rather than absolute position. One way to do this is to replace coordinate digits with spaces. For example, G3NRW's home to the nearest minute of latitude and longitude could be specified as 5157.,N and 00029.,W (where . represents a space). This means that the latitude may be anywhere between 51° 57.00' and 51° 57.99' N and the longitude may be anywhere between 000° 29.00' and 000° 29.99' W. In other words, G3NRW is located somewhere inside the bounding box shown below: --



<APRSdec> understands this position ambiguity, and reports the coordinates of opposite corners of the box:

```
Record #1
C3NRW>APRS: !5157. N/00029. W
APRS Data Type= Posit w/o time. No APRS
Ambiguous position. Opposite corners of bounding box:
NW Corner: Lat= 51 deg 57.99 min N Long= 0 deg 29.99 min W
SE Corner: Lat= 51 deg 57.00 min N Long= 0 deg 29.00 min W
Icon= House QTH VHF Overlay= (none)
```

<APRSdec> similarly reports a bounding box for a Maidenhead grid locator:

```
-----
Record #459
CTIDBH-1>ID: [IM58IS]
APRS Data Type= Maidenhead Grid Square
Maidenhead locator bounding box:
NW Corner: Lat= 38 deg 47.50 min N Long= 9 deg 20 min W
SE Corner: Lat= 38 deg 45.00 min N Long= 9 deg 15 min W
*'''NOTE: This Maidenhead format with square brackets is obsolete.
-----
```

Here is a full WX station report, with computed windchill and dewpoint:

```
-----
Record #S034
-----
APRS Data Type= Posit w/ time. With APRS
Day= 11 Time= 19 hours 55 mins UTC
Lat= 44 deg 47.06 min N Long= 93 deg 29.48 min W
Icon= WK station Overlay= (none)
Wind Direction= 125 deg Speed= 008 knots (9.2 mph 14.8 kph 4.1 m/s)
Gust Speed= 9 mph (14.5 kph 4.0 m/s 7.8 knots)
Temp= 79 degF (26.1 degC) Windchill= 76.5 degF (24.7 degC)
Rain: Last hour= 0 in (0.0 mm) Last 24 hrs= 0.03 in (0.8 mm)
Since midnight= (Indeterminate)
Humidity= 41 percent Dew Point= 53.2 degF (11.8 degC)
Barometric Pressure= 1019 nbar/hP
-----
      s-m
-----
```

Finally, here is an example of a DX Cluster report, showing how the data appears on Kenwood radio displays:

```
-----
Record #3852
NA4V-3>RESORC, AB4KN-2: kWDE3-2: DX de NA4V-3 >F029@1509 F020@1503 SATS
DX Cluster Information:

```

TH-D7 Screen 1	TH-D7 Screen 2	TM-D700
1 Dx: F020@1503	1 Dx: F020@1503 ;	1 1: F020@1503 F029@1509 SATSI
1 F029@1509 I I		
SATS I 1		

```
-----
```

Input Files

cAPRSdec> understands input data in regular TNC/Igate terminal format: e.g.

```
W0ZCU>APRS46, WA4WHD-3+~, WDE/V: =2559. N/08010. WPHC6560/Carl's Castle!
```

and in two-line UI-View log format: e.g.

```
36673.5168518519-MDTA>MB7UPG>GIYFF~^>T-CE3-1>APRS [UI]:
=5143.43N\00035.88EUMDTA Bob on Danbury Hill. Email address: mldta@yahoo.com
```

To obtain raw data from an IGate, you can telnet to it; e.g. telnet www.aprs.net. However, many APRS report lines are much longer than the 80-character line limit of most telnet clients. These lines will be split, so that some reports may occupy 2 (or even 3) separate lines. It is possible to join them up again using a text editor, but that is a long, tedious process!

Much better is to use a telnet client that can read long lines without wrapping or truncating. By far the best I have seen is [~era~erm~~, frOmhttp://hp.vector.co.jp/authors/VA002416/teraterm.html](http://hp.vector.co.jp/authors/VA002416/teraterm.html).