

## AP510 / AVRT5 Documentation

Based upon firmware and configuration version(s) 20151031 (development build)

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Version: 20151031 1.1

### Quick Start:

#### Power Button Uses:

Firmware Update – Start with Unit “OFF”. Start firware upgrade process. PRESS AND HOLD UNTIL UPDATE COMPLETE.

Programming – Start with Unit “OFF”. Start Config program. Click “Read Config”. Press Power button until beep is heard.

- Should respond with “.....”

Power On – Press and hold 1.5seconds until beep.

Power OFF – Press and hold 3 seconds until fast beeping starts, then release.

Emergency Mode – When ON, Press and hold for > 10 seconds. Beacons Emergency Status Text and symbol. Each press of power button after that send emergency beacon. Power off to exit emergency mode. (Blue LED flashes very quickly in this mode)

### LED Functions:

Red: “ON” = External Power Applied - Charging      “OFF” = No External Power, or battery fully charged

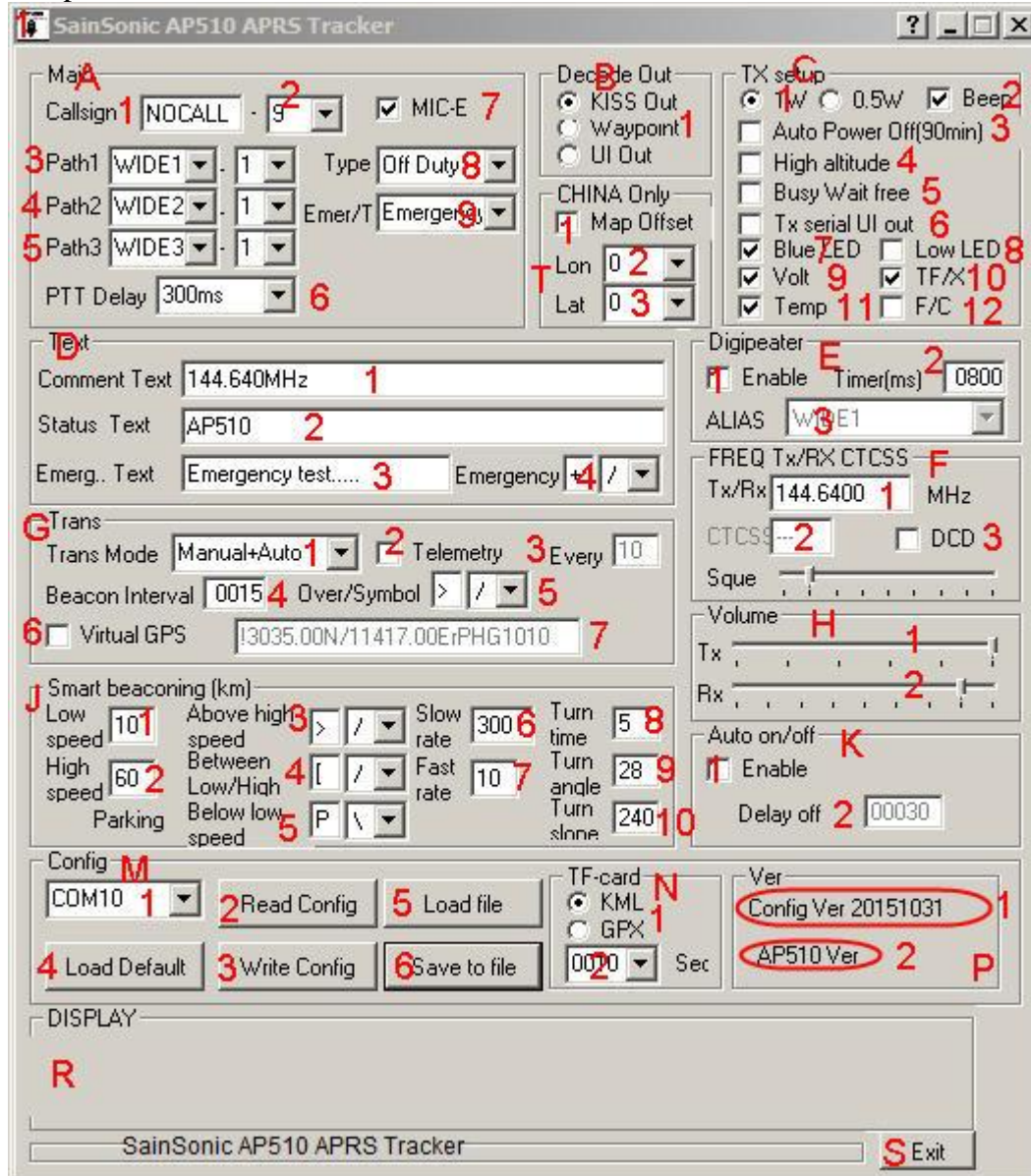
Blue: “OFF” = Unit OFF      “Steady ON” = GPS Lock      “Steady Blink” – NO GPS Lock      “Fast Blink” = TX or RX Detected

Will only send “Status Text” until GPS Lock!

Format of Status Text:

“Status Text” Altitude Volts Temp X AVRT5 (version)

Setup software:



Configuration Description by Section: (Main, Decode Out, CHINA Only, TX setup, Text, Digipeater, Trans, Freq Tx/RX CTCSS, Volume, Smart beaconing (km), Auto on/off, Config, TF-Card, Ver.)  
 (Defaults show in {text box} [check box] |drop down| <radio button> )

**A Main:**

- 1 Callsign – {NOCALL} -
- 2 SSID – {9} – Available options 0-14 0=NO SSID. \*Bug 15 not available!
- 3 Path1 – |Wide1| - Available Options: Non, Wide1, Wide2, Temp1
- |1| - Available Options: 0-9
- 4 Path2 – |Wide2| - Available Options: Non, Wide2
- |1| - Available Options: 0-9

- 5 Path3 - |Wide3| - Available Options: Non, Wide3  
- |1| - Available Options: 0-9
- 6 PTT Delay - |300ms| - Available Options: 60ms, 120ms, 180ms, 300ms, 480ms, 600ms, 1000ms
- 7 Mic-E - [X] - Enable/Disable Mic-E compressed packets
- 8 Type - |Off Duty| - Available Options: Off Duty, En Route, In Service, Returning, Committed, Special, Priority, Emergency
- 9 Emer/T - |Emergency| - Available Options: Off Duty, En Route, In Service, Returning, Committed, Special, Priority, Emergency

- B** Decode Out: (Serial port output when in normal run mode)
- < x > KISS Out (selected)
  - < > Waypoint
  - < > UI Out NOTE: Modification available in “TX setup: TX serial UI out” – Includes own packets

**T** CHINA Only

- 1 [ ] Map Offset
- 2 Lon |0| - Available options: -45 to +45 in steps of 1
- 3 Lat |0| - Available options: -45 to +45 in steps of 1

**C** TX setup:

- 1 < x > 1W < > 0.5W (Transmitter power out)
- 2 [X] Beep – Beep Enabled
- 3 [ ] Auto Power Off (Turns unit OFF after 90 minutes from last manual PTT, Battery or plugged in)
- 4 [ ] High altitude NOTE: On models built before 2014.09 hardware mod required. See pictures below.
- 5 [ ] Busy Wait free (Waits for no sq or dcd before PTT)
- 6 [ ] Tx serial out - Transmits own packet in “Decode Out: UI Out” mode
- 7 [X] Blue LED – On by default – If off the Blue LED Goes OFF when the GPS is locked  
- Note: Normal mode is 1hz blink – no gps lock, solid blue – gps lock. Blink on TX or RX
- 8 [ ] Low LED – Dims red and blue LED’s
- 9 [X] Volt – Status packet includes system voltage x.xxV
- 10 [X] TF/X – Status packet with X means TF-Card missing or write error to TF-Card (See TF-Card section **N**)
- 11 [X] Temp – Status packet includes system temperature xx.xC (or xx.xF if modified by F/C **C12**)
- 12 [ ] F/C – Status packet Temp in F instead of C

**D** Text:

- 1 {144.640MHz} Comment Text – Sent at the end of packet, also includes x.xxV xx.xC TFStatus (if last three selected)
- 2 {AP510} Status Text – Sent at power on, or if TX before GPS lock! Also includes x.xxV xx.xC TFStatus AVRT5 BuildVersion
- 3 {Emergency test.....} Emer. Text – Sent each time power button is pressed after put into emergency mode. Press and hold power switch for  
greater than 10 seconds to enter emergency mode. Power off to exit. Also sends  
Emergency Symbol.
- 4 Emergency - {+} Symbol and Table used when sending “Emergency” packets (hold ptt for > 10 seconds)

Table: |/| - Available Options: / \

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### E Digipeater:

- 1 [ ] Enable
  - 2 {0800} Timer(ms)
  - 3 |WIDE1| - Alias – Available Options: WIDE1, WIDE2, WIDE3, WIDE1+WIDE2, WIDE1+WIDE2+WIDE3
- 

### G Trans:

- 1 |Manual+Auto| Trans Mode – Available Options: Manual, Auto, Manual+Auto, Smart, Smart+Manual
  - 2 [ ] Telemetry (Enable sending telemetry packets)
  - 3 {10} Every – Send Telemetry Packets every x position Packets. 01-99
  - 4 {0015} Beacon Interval – How many seconds between packets if set to “AUTO” or “Manual+Auto” – Fixed rate beacons.
  - 5 Over/Symbol - {>} - Symbol and Table used when sending “Auto” packets  
Table: |/| - Available Options: / \
  - 6 [ ] Virtual GPS – Fixed location packet (Does not use GPS!)
  - 7 {!3035.00N/11417.00ErPHG1010} Virtual GPS ( Manual packet construct)
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### F FREQ Tx/Rx CTCSS:

- 1 {144.6400} MHz Tx/Rx Frequency – NOTE: Must be padded to the right with zeros!
  - 2 {---} CTCSS Frequency (Not enabled yet)
  - 3 [ ] DCD (Data Carrier Detect) – 0-Blue LED displays squelch, 1-Blue LED displays software DCD
  - 4 Sque slider ( 0-8 ) 0 = disabled, default 1
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### H Volume:

- 1 Tx slider ( 1-6 ) default 6
  - 2 Rx slider ( 1-9 ) default 8
- 

### J Smart beaconing (km):

**NOTE:** All settings are in time (seconds) and Kilometers!

- 1 {10} Low Speed km/h – 1-999km/h
- 2 {60} High speed km/h – 1-999km/h (Speed when Fixed **rate** beacons begin)
- 3 {[ ]/} Symbol used when High Speed is exceeded. (Normally set to same as 4 )
- 4 {[ ]/} Symbol used when Smart Beaconing (Between low and high speeds)
- 5 Parking {[ ]/} Symbol used when speed is below Low speed.
- 6 {300} Slow rate (seconds) – 1-9999
- 7 {10} Fast rate (seconds)
- 8 {5} Turn Time (seconds) – Time between beacons if turning (corner pegging) 1-999s
- 9 {28} Turn angle – 1-999 – Angle deviation from last beacon. If exceed slow speed and heading change > last beacon heading.
- 10{240} Turn slope – 1-999 – Modifies deviation angle as speeds get slower. (“1” eliminates slope, 999 maximum)

NOTE: Low Speed should be as low a possible – GPS typically show low “speeds” when stationary. Smart Beaconing should be thought of as a “distance between beacons” with “corner pegging”.

The high speed setting should be greater than the maximum speed the “vehicle” will travel. High speed rate is the maximum rate the tracker will send packet. To calculate the “distance between packets” (straight line) the following formula is used:

HighRate \* 3600 / HighSpeed = Kilometers between packets.

Corner Pegging is a much more complex setting. <http://info.aprs.net/index.php?title=CornerPegging>

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**K** Auto on/off: NOTE: Requires hardware modification below!!!

**1** [ ] Enable – **NOTE: DO NOT** enable unless hardware mod has been done below!!! Will cause random power off condition!

**2** {00030} Delay off -

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**M** Config:

**1** |COMx| - Drop down that shows all available com ports

**2** Read Config (Reads config, also puts tracker into programming mode!) – **Always performed first!**  
Note: Click “Read Config”, then very quickly press and hold power button until AP510 beeps, then release.

**3** Write Config – Writes any changes made to the tracker.

**4** Load Default – Loads a default config – Should be done first after new install of firmware, then write, then modify, then write.

**5** Load file – Loads a config file stored previously. (Can be used AFTER a Read, then can Write)

**6** Save to file – Saves current config to a file.

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**N** TF-card:

**1** <X> KML (Google Earth KML format)

< > GPX (Garmin GPX format)

**2** |0010| Seconds – Available Options: 0005, 0010, 0015, 0020, 0030, 0060, 0120, 0180, 0300, 0600, 1000 TF Card write intervals. Can write in 0-9999 seconds.

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**P** Ver:

**1** Config Version of software

**2** Firmware loaded in tracker (available once a “Read Config” has been performed)

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**R** Display:

Displays help and allowable settings for each field when hover over field.

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**S** Exit – Exits programming mode, Exits program. Should be used instead of “X” in top right corner to close program!

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Important references:

AP510 Main Website: <http://www.y027.com>

English Yahoo Group: AP510 <https://groups.yahoo.com/neo/groups/AP510/info>

APRS 101 : <http://www.aprs.org/doc/APRS101.PDF>

Symbol Table: [http://wa8lmf.net/miscinfo/APRS\\_Symbol\\_Chart\\_Rev-H.pdf](http://wa8lmf.net/miscinfo/APRS_Symbol_Chart_Rev-H.pdf)

SmartBeaconing™ Information: <http://www.hamhud.net/hh2/smartbeacon.html>

SmartBeaconing™ Wiki: <http://info.aprs.net/index.php?title=SmartBeaconing>

CornerPegging: <http://info.aprs.net/index.php?title=CornerPegging>

VHF APRS Frequencies: [http://info.aprs.net/index.php?title=Frequencies#Primary\\_VHF\\_Networks](http://info.aprs.net/index.php?title=Frequencies#Primary_VHF_Networks)

## Configuration File mapping below:

```
[AVRT5] - NOTE All Defaults Shown!

01=NOCALL9 - Call+SSID
02=4 - PTT Delay 1=60ms 2=120ms 3=180ms 4=300ms 5=480ms 6=600ms 7=1000ms
03=1 - Decode Out 1=KISS Out, 2=Waypoint, 3=UI Out
04=1 - MicE enable/disable - 1=Enable 0=Disabled
06=>/ - Fixed Rate (Auto) symbol and table
07=3 - Trans Mode - 1=Manual 2=Auto 3=Manual+Auto 4=Smart 5=Smart+Auto
08=0015 - Trans Delay Time(s) - 0000-9999 (Auto Beacon mode - Beacon interval in
seconds)
09=AP510 - Status Text Field (Max Length?)
10=144.640MHZ - Comment Text Field (Max Length?)
12=01 - Digi 01=Disabled, 11=Enabled Alias WIDE1, 12=Enabled Alias=WIDE2, 13=Enabled
Alias=WIDE3
- , 14=Enabled Alias=WIDE1+WIDE2, 15=Enabled Alias=WIDE1+WIDE2+WIDE3
13=0 - APO (Automatic Power Off) 0=disabled 1=Enabled (Radio will turn off after 90
minutes)
14=0PP - CHINA Only - First digit 0=disabled 1=Enable PP is a hex value for 00 offset
15=013035.00N/11417.00ErPHG10102 (NOTE: Config Program writes a "00" hex where the last ascii 2, now
"32" hex is!)
16=144.6400 - Tx/Rx Frequency - NOTE trailing Zero's required!
17=1 - Beep - 0=Disabled 1=Enabled
18=0100300060010240028005 - (See bytemap below)
19=0 - High Altitude (for balloons) 0=Disabled 1=Enabled
20=0 - Busy wait free 0=Disabled 1=Enabled
21=6 - TX Volume - 1-6
22=8 - RX Volume - 1-9
23=1 - Transmitter Power 0=.5watts 1=1watt
24=0 - Tx serial UI out 0=Disabled 1=Enabled (Modifies Decode OUT if UI Out to
include own packets)
25=WIDE1 1 - Path 1 - 0=None, Wide1 Wide2 Temp1 0-9
26=WIDE2 1 - Path 2 - 0=None, Wide2 0-9
27=WIDE1 1 - Path 3 - 0=None, Wide3 0-9
28=711111010001010 - (See detail below - bytemapped)
29=000030+[/>/P\0 - (See bytemap Below)
30=Emergency test..... - Emergency Text Field (Max Length?)
31=001008000 - First Four Digits - TFCard Write Times 0000-9999 Seconds, Middle 4 Digits -
Digipeater Timer(ms)(0000-9999), Last digit 0/1 Status text temperature C/F
<end>

18=(010)0300060010240028005 - SmartBeaconing Low Speed - 001-999 km/h
18=010(0300)060010240028005 - SmartBeaconing Slow Rate - 0001-9999 Seconds
18=0100300(060)010240028005 - SmartBeaconing Hight(sic) Speed - 001-999km/h
18=0100300060(010)240028005 - SmartBeaconing Fast Rate - 001-999 Seconds
18=0100300060010(240)028005 - SmartBeaconing Turn slope - 001-999
18=0100300060010240(028)005 - SmartBeaconing Turn angle - 001-999
18=0100300060010240028(005) - SmartBeaconing Turn time - 001-999

28 (7)11111010001010 - Type (MIC-E) Message Bit - 0=Emergency 1=Priority 2=Special 3=Committed
4=Returning 5=In Service 6=EnRoute 7=Off Duty
28 7(1)1111010001010 - Volt - 1=Enable, 0=Disabled (Transmit Voltage in Comment Field)
28 71(1)1111010001010 - Temp - 1=Enable, 0=Disabled (Transmit Temperature in Comment Field)
28 711(1)11010001010 - TF/X - 1=Enable, 0=Disabled (Transmit "X" if TF-Card not inserted or not writing
28 7111(1)1010001010 - Squelch 0=Disabled 1-8
28 71111(1)010001010 - Blue LED - 1=Enable 0=Disabled (Actually changes GPS State indication from ON to
OFF)
28 711111(0)10001010 - Trans Telemetry - 0=Disabled 1=Enabled
28 7111110(10)001010 - Trans Telemetry every x packets - 00-99
28 711111010(0)01010 - ( Timeslot Setting ?)
28 7111110100(0)1010 - ( Timeslot Setting ?)
28 71111101000(1)010 - ( Timeslot Setting ?)
28 711111010001(0)10 - DCD - 1=Enable 0=Disabled
28 7111110100010(1)0 - TF-Card 1=GPX Format 0=KML format
28 71111101000101(0) - Low LED - 1=Enable (Low intensity), 0=Disabled (normal brightness)

29 (0) 00030+[/>/P\0 - Auto on/off 0=Disable 1=Enable
29 0 (00030) +[/>/P\0 - Auto on/off Delay off - 00000-99999
29 000030 (+) [/>/P\0 - Emergency (NON-MicE) Overlay and table
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```

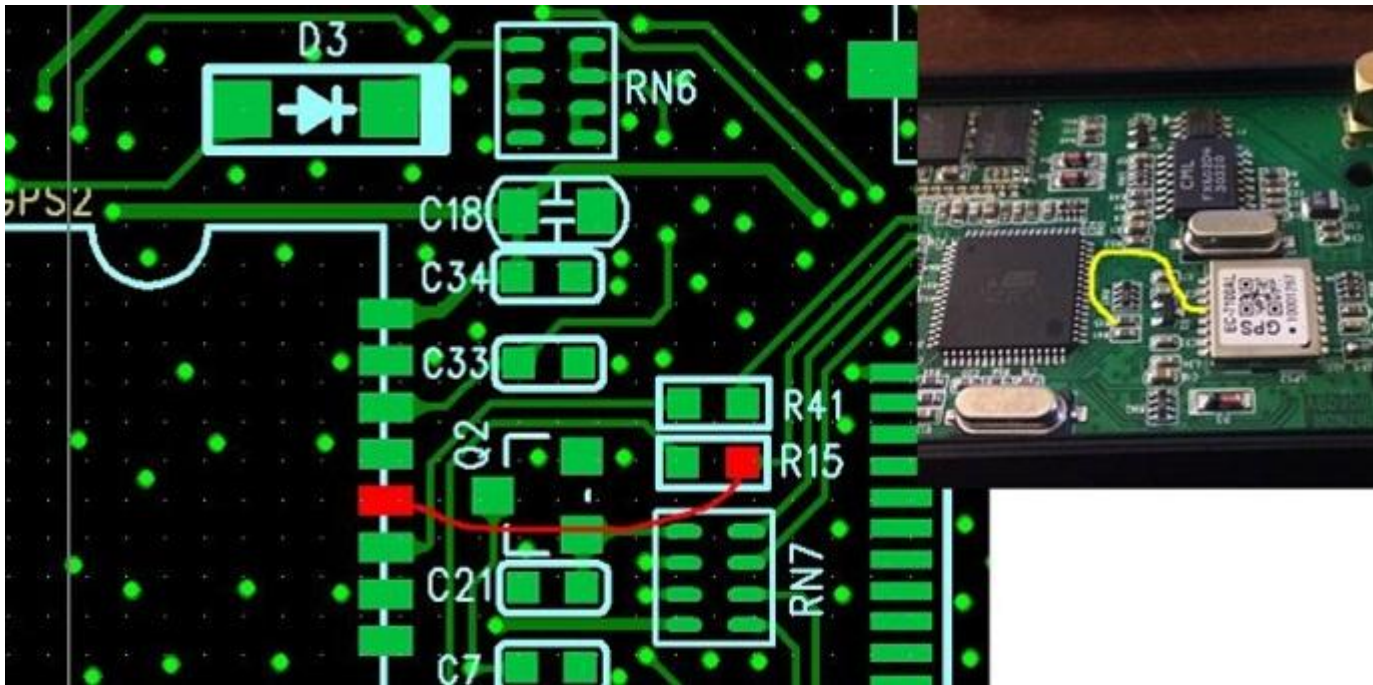
29 000030+/([/] >/P\0 - Smart Beaconsing Overlay and table used if High Speed is exceeded.
29 000030+/[/ (>/) P\0 - Smart Beaconsing Overlay and table if between the slow speed and high speed.
29 000030+[/>/ (P\ ) 0 - Smart Beaconsing Overlay and table if below slow speed.
29 000030+[/>/P\ (0) - Emergency (MIC-E) Message Bit 0=Emergency 1=Priority 2=Special 3=Committed
4=Returning
- 5=In Service 6=EnRoute 7=Off Duty

```

Modifications: High Altitude - This is a software and hardware change. Software enable "High Altitude".

NOTE: With software enabled you will see an "E" if the hardware mod is needed. A "K" in the status packet means all is working!  
/000/A=000495NSL-40 K 4.26V 28.5C TF

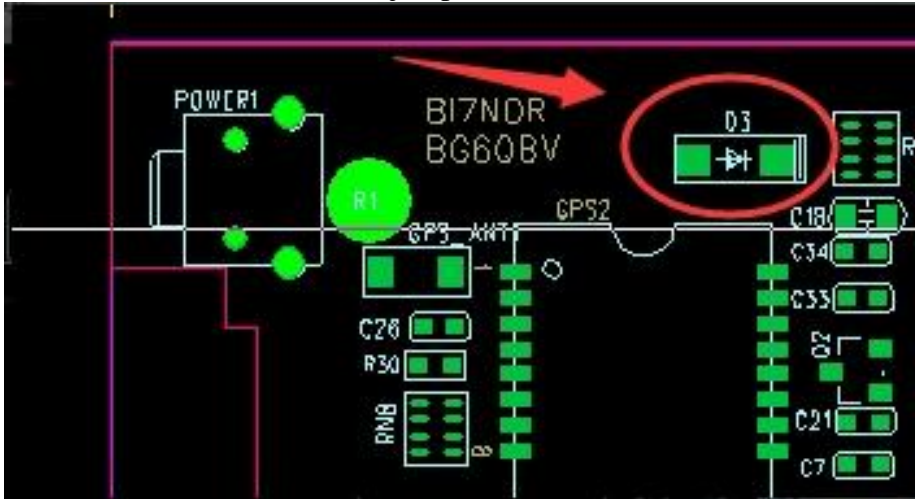
NOTE: In place of "TF" you will see an "X" if TF/X is enabled and there is no TF-Card or there is a write error!



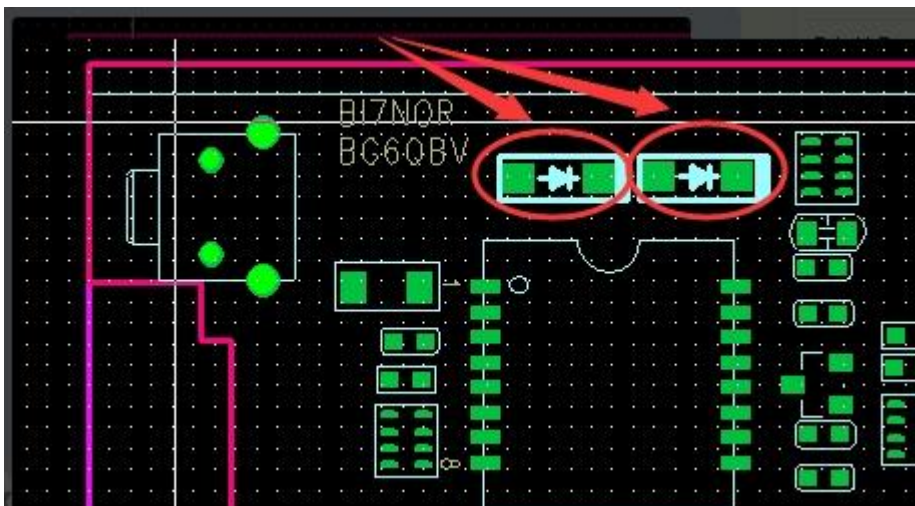
Hardware versions:

There was a hardware change related to high altitude use.

Before 2014.09 (Need to add jumper mod above)

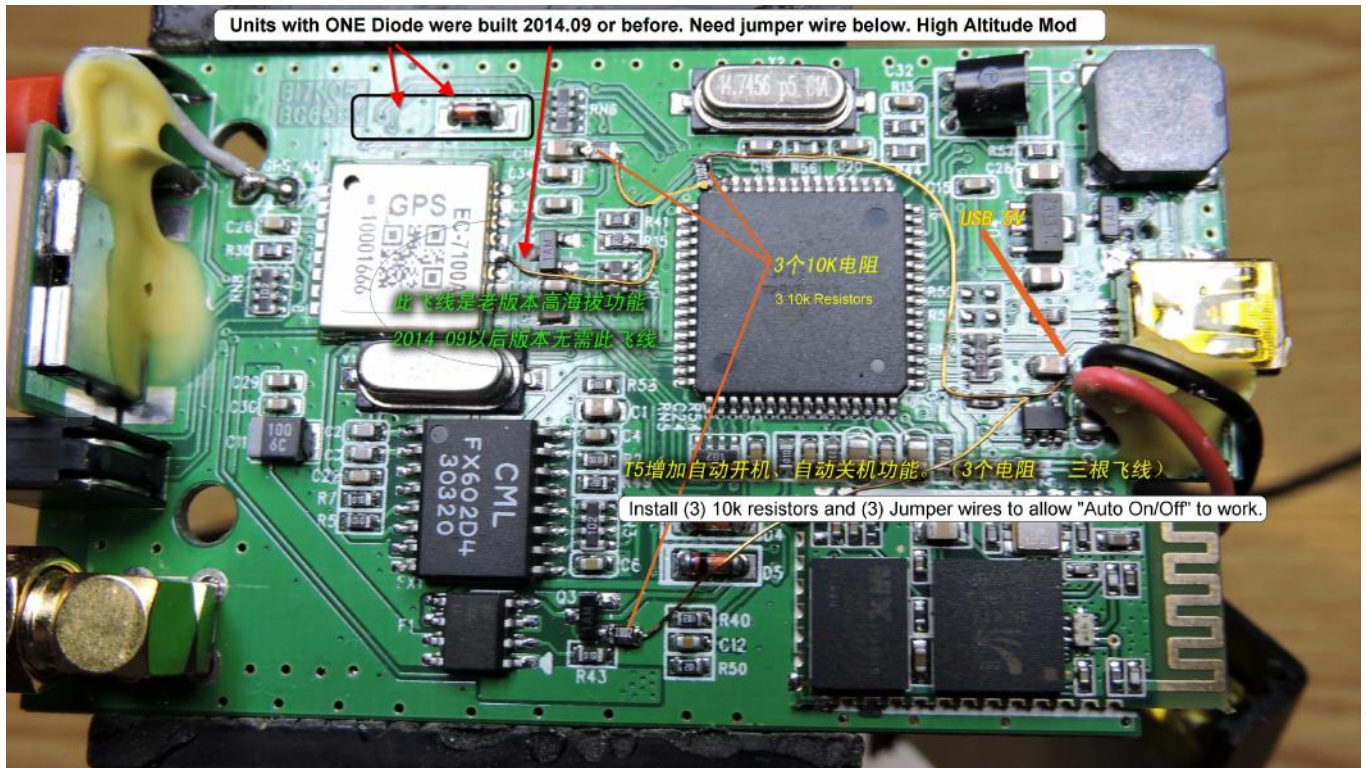


After 2014.09





## Auto On/Off:



(3) 10k resistors and (3) jumper wires must be added to the radio to allow Auto ON/OFF to work.

When power is applied to USB connector, radio will turn ON.

When power is removed from USB connector "off" timer will begin.

Author (KC5EVE) suggested path and smartbeaconing settings for various purposes:

NOTE: MIC-E improves the chances of a low power packet being decoded since the transmit time is shorter!

- **Enable MIC-E !**

- This also goes for "Status Text and TF/X, Volts, Temp" You will improve your decode rate by NOT using status text and not using TF/X, Volts, Temp unless needed!

Trans Mode: **Smart+Manual**

Bicycle: Low speed is borderline slow, may cause some extra beacons when stationary.

Path1: Wide1 1

Path2: Wide2 1 (A remote area may need Wide2 2 or Wide3 3)

SmartBeacon settings:

Low Speed: 8 (5mph)

Low Rate: 900 (15 minutes)

High Speed: 145 (90 mph) (used with high rate to compute distance between packets!)

High Rate: 40 (Used with high speed to compute distance between packets!)

This will result in a packet every 1.6km (1 mile) when moving over 8kph (5mph).

Turn Time: 5

Turn Angle: 28

Turn Slope: 100 (More aggressive than faster vehicles)

Symbol sets:

Above High Speed: b /

Between Low/High Speed: b /

Parking: b /

Emergency: ! \

Car/Motorcycle:

Path1: Wide1 1

Path2: Wide2 1 (A remote area may need Wide2 2 or Wide3 3)

SmartBeacon settings:

Low Speed: 16 (10mph)

Low Rate: 900 (15 minutes)

High Speed: 240 (150 mph) (used with high rate to compute distance between packets!)

High Rate: 50 (Used with high speed to compute distance between packets!)

This will result in a packet every 3.4km (2 miles) when moving over 16kph (10mph).

Turn Time: 5

Turn Angle: 28

Turn Slope: 240

Symbol sets:

See symbol table in URL since many types of trucks, cars, RV, etc.....

[http://wa8lmf.net/miscinfo/APRS\\_Symbol\\_Chart\\_Rev-H.pdf](http://wa8lmf.net/miscinfo/APRS_Symbol_Chart_Rev-H.pdf)

Emergency: ! \

Balloon/Airplane:

Path1: NONE (Remote or low altitude flights (below 1000ft AGL should use Wide2 1)

SmartBeacon settings:

Low Speed: 16 (10mph)

Low Rate: 900 (15 minutes)

Airplane High Speed: 400 (250 mph) (used with high rate to compute distance between packets!)

Airplane High Rate: 72 (Used with high speed to computer distance between packets!)

This will result in a packet every 8km (5 miles) when moving over 8kph (5mph).

Balloon High Speed: 240

Balloon High Rate: 50

This will result in a packet every 3.4km (2 miles) when moving over 16kph (10mph).

Turn Time: 5

Turn Angle: 28

Turn Slope: 240

Symbol sets:

Airplane:

Above High Speed: ‘ /

Between Low/High Speed: ‘ /

Parking: ‘ /

Emergency: ‘ \

Balloon:

Above High Speed: O /

Between Low/High Speed: O /

Parking: O /

Emergency: ! \

Frequencies:

