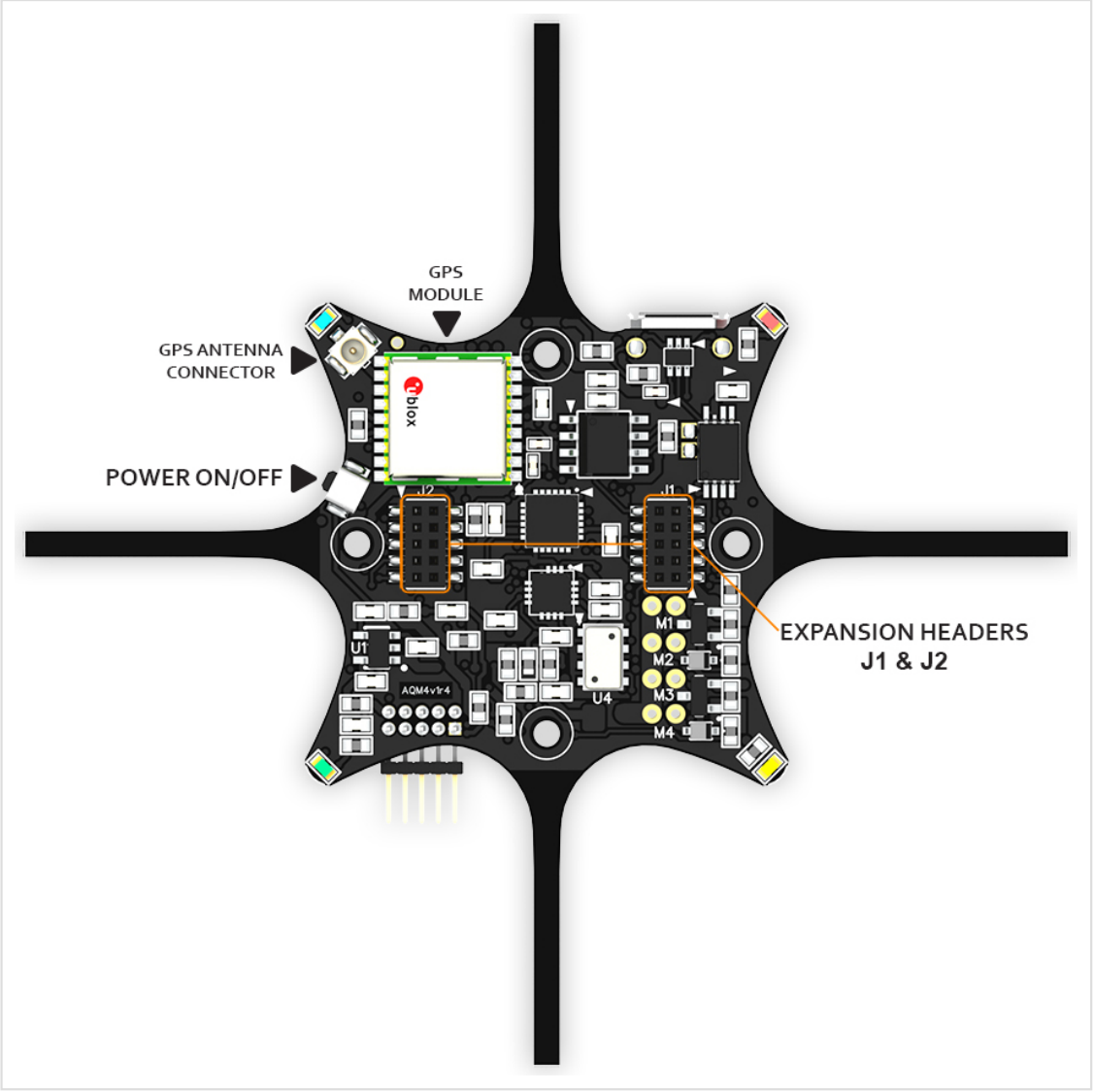
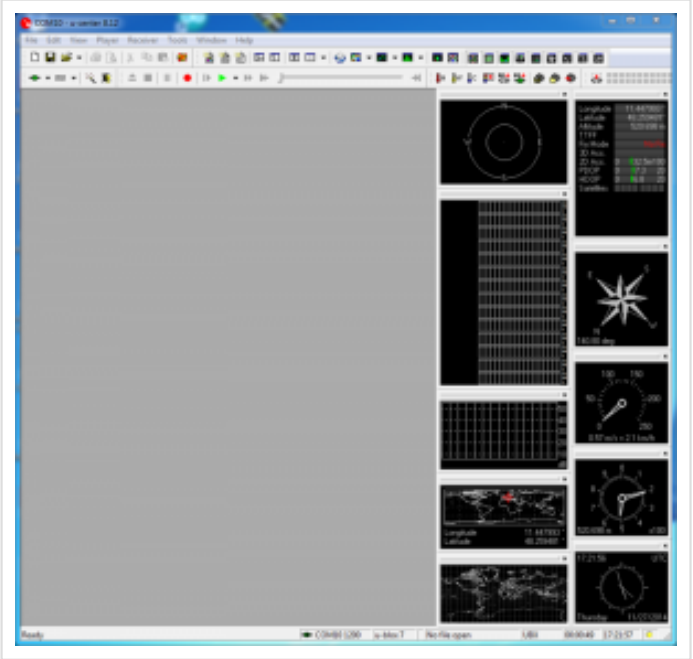
M4 GPS Antenna Options



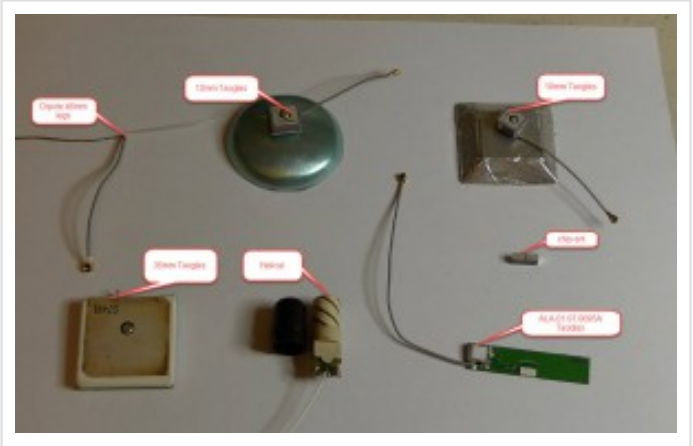
The M4v1 comes with an on-board UBlox 7 GPS module (M4v2 uses an M8Q module). All you need is an external antenna. There´s a variety of antennas being tested. Listed below*

A great tool to determin health and accuracy of your Ublox GPS modules and antennas is the Ublox
u-center GNSS evaluation software for Windows. You can download it here. Use a USB/UART connection at a baud rate of 1200 in the tool´s “Receiver” menu.



Download and install uBLOX uCENTER GNNS software.
Connect to the USB COM port at 1200 baud (tells the M4 that you want to speak directly to the GPS.) Turn on the NAV_SAT messages and you will get a graphic representation of satellites received, strengths and positions. GPS type is ublox8 for the M4r6 V2 production boards and uBlox7 for the BETA boards.

Note: a very first fix of a GPS module fresh from the factory can take 15 minutes and longer, depending on reception conditions. So just place your M4 with a fresh lipo in an open space and let it gather satellite data. On the M4v2 the GPS data will be buffered by a backup battery. Depending on the used antenna (active/passive, size etc.) you will be able to get a 3D fix and accurate coordinates in a very short time.



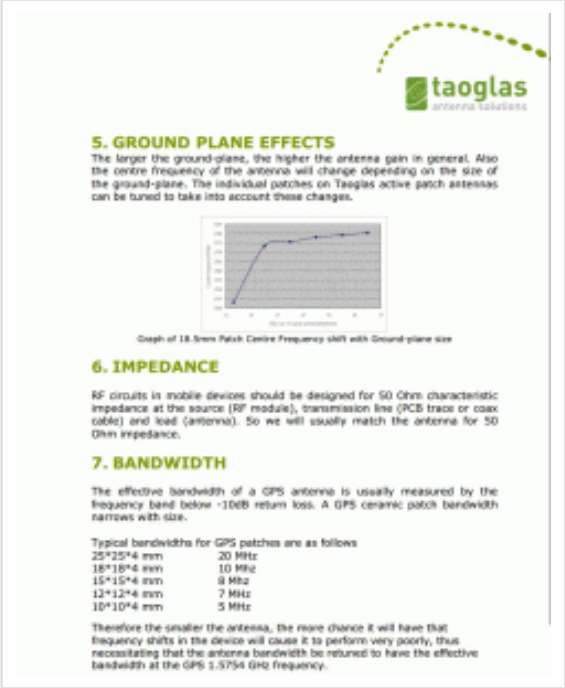
Enlarge the Groundplane of the GPS Antenna

— Examples for Groundplanes. Image by Astudillo. Reference: http://forum.autoquad.org/viewtopic.php?f=40&t=4253

Thickness does not matter. Basically any material with a conductive surface or inner conductive plane would work.

As for size: basically the more, the better. For a 10mm antenna use at least 30 mm diameter.

Distance from the FC itself is a factor too. So the higher you can lift the antenna up off the FC surface, the better.



taoglas

5. GROUND PLANE EFFECTS

The larger the ground-plane, the higher the antenna gain in general. Also the centre frequency of the antenna will change depending on the size of the ground-plane. The individual patches on Taoglas active patch antennas can be tuned to take into account these changes.

Graph of 18.5mm Patch Centre Frequency shift with Ground-plane size

6. IMPEDANCE

RF circuits in mobile devices should be designed for 50 Ohm characteristic impedance at the source (RF module), transmission line (PCB trace or coax cable) and load (antenna). So we will usually match the antenna for 50 Ohm impedance.

7. BANDWIDTH

The effective bandwidth of a GPS antenna is usually measured by the frequency band below -10dB return loss. A GPS ceramic patch bandwidth narrows with size.

Typical bandwidths for GPS patches are as follows

25*25*4 mm	20 MHz
18*18*4 mm	10 MHz
15*15*4 mm	8 MHz
12*12*4 mm	7 MHz
10*10*4 mm	5 MHz

Therefore the smaller the antenna, the more chance it will have that frequency shifts in the device will cause it to perform very poorly, thus necessitating that the antenna bandwidth be retuned to have the effective bandwidth at the GPS 1.5754 GHz frequency.

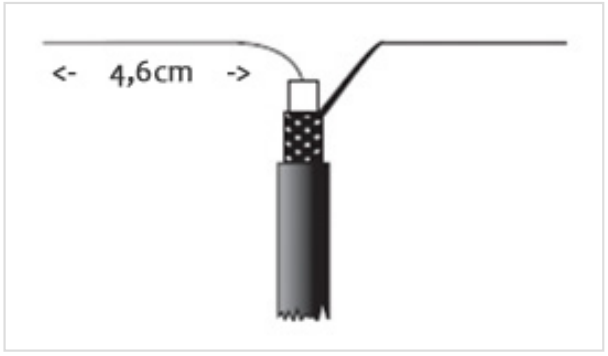
DIY Dipole GPS Antenna

Cheapest option is a simple DIY dipole antenna, derived from an antenna cable.

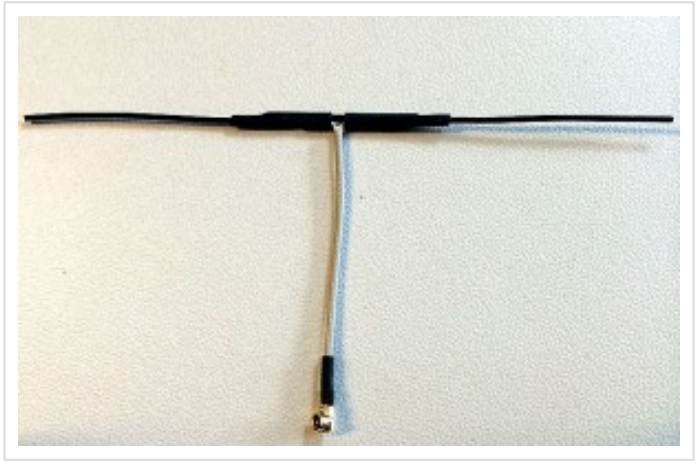
> Dipole antennas or small ceramic patch antennas will never be able to achieve the same performance as a 35mm active antenna. Please keep that in mind when trying autonomous functions with mini sized Quads.To get the best reception you should mount the antenna as far away from the FC as possible. A bigger ground plane will also help with the small active ceramic patch antennas.

You can order a cable with connectors from Viacopter

Shorten the cable to your needs and dismantle the outer isolator. Cut the wires to 4,6cm length and put some short pieces of heat shrink over both ends.

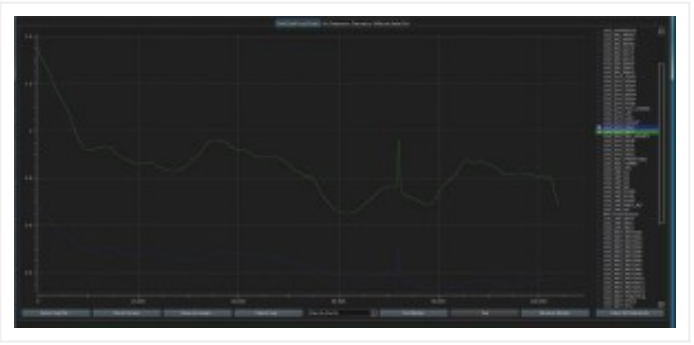


To strenghten the dipole you can use some plastic rods or similar to keep the T shape.



We´ve been testing these with good results: a 3D GPS fix can be achieved in around 30-40secs.
However you can´t expect solid GPS reception at any conditions.

The longer you wait the more precise the navigation will be since it takes a while until you get an HAcc (horizontal accuracy) of less than 1m. A 2D fix will start at an HAcc <4m, a 3D fix will start at <3m. An HAcc of less than 2m is good enough to fly missions and get a good position hold.



— UBlox M8Q results with active GPS antenna

— UBlox M8Q results with DIY Dipole antenna

Note: Without a 3D fix the M4 will perform an Altitude Hold, based on pressure sensor and accelerometer fusion.

List of possible Antennas suitable for M4 & other AQ boards

Ceramic patch antennas

10mm ceramic patch antenna, circa 1,5grams

25db ; 931-1148-ND ; AP.10F.07.0039B,
15db ; 931-1147-ND ; AP.10E.07.0039B

12mm patch antenna

25db ; 931-1227-ND ; AP.12F.07.0045A

17mm ceramic patch antenna

25db : 931-1226-ND ; AP.17F.07.0064A,
15db : 931-1151-ND ; AP.17E.07.0064A

35mm ceramic patch antenna, 27 grams – recommended v6 antenna

15db ; 931-1004-ND ; AP.35A.07.0054A (recommended antenna for V6 boards), circa 27 grams

PCB/Ceramic antennas, Omnidirectional

45*10*2.3mm; 931-1014-ND; ALA.01.07.0095A, (omnidirectional, 1.35 grams)

«« M4 V2 Power Supply & Voltage Monitoring | M4 Telemetry Connection »»

This page was created on **5-Aug-14** by ***kinderkram***. Last modified on **17-Feb-15** by ***kinderkram***.