



---

**PlaneGadget - Radar - V2.0  
USB ADS-B Receiver**

---

**Advanced User Guide**

17/3/10

---

This product has been tested and complies to the relevant standards for CE marking in the European Union



## **Safety Guidance – Please Read**

### **Pointy end of antenna!**

Although the antenna has a round end, please take care not to poke yourself with it! It's easy to place it on the window sill, then gaze out the window at the majestic aircraft sweeping by, the antenna below your chin and out of focus, out of sight, out of mind... A finger in the eye is not nice, so a slim antenna however blunt the end would be a bit worse I would imagine.

**Take care where you use the receiver that you are doing so legally in the country and place of use. When you open the package you are asked to agree that you will not use the receiver in any way that is illegal within the country of use**

Although most countries are very happy for aircraft enthusiasts to use equipment that relates to your hobby, in some countries you will be seen as breaking the law and may be arrested, especially if you are using your equipment in a sensitive place such as near an airport. This is not specifically about ADS-B virtual radar, but the use of air band receivers and even taking photos in the wrong place in the wrong country can land you in prison.

Recently we have seen aircraft enthusiasts get arrested in Greece for photographing aircraft and in India for listening on an air band radio to communications between the pilot and air traffic control.

So take care to ensure that your use of this equipment and other equipment you use is accepted and legal within the country and place of use.

**Please read the Installation Guide first.**

## **Section 1: Data format**

The PlaneGadget-Radar communicates via a USB virtual serial port.

This means you can talk to the receiver using simple serial coms.

The serial over USB is what is known as CDC, and this USB standard is supported by Microsoft Windows using the usbser.sys driver that is included in the operating system. You still need to install the PlaneGadget .inf files to install the driver however.

The CDC system is built on the Microchip CDC USB framework which has been demonstrated on Linux systems etc. However RadarGadgets have not tested on any other system than Microsoft Windows and do not warrant the operation of this USB CDC functionality on other systems.

To turn on data from the receiver send G+ in ASCII to the receiver

To turn off data from the receiver send G- in ASCII to the receiver

When data is active a packets received are sent over the serial channel.

This is raw packet data. It is not decoded positions and IDs etc as with other receivers. This means you can write your own software to decode the packets. It also means that you can use the receiver to decode packets that are not covered by other receivers on the market.

The raw packet data is sent in 14byte units, as non-ASCII data. Each packet has a start flag of 0xFF.

So a packet stream may look like this (with bytes numbered)

FF000102030405060708090A0B0C0DFF000102.... but this is an ASCII hex representation of the data which is transmitted as bytes, so when you see say 02 above it means the byte with the value 02.

You need to synchronise with the packet stream before you can start decoding, and as 0xFF can appear in a packet you cannot just look for 0xFF to start a packet. The correct way to handle this is to look for 0xFF then count 14bytes of data, then check the following byte is FF. If it is you are synchronised, if not then you need to try synchronising again.

Some packets in the transmissions are 7 bytes and some 14 bytes, however the receiver ALWAYS SENDS 14bytes even when the packet is 7 bytes. When you read the 1<sup>st</sup> few bytes of the header and confirmed a packet is 7 bytes you need to read by ignore the latter half 7 bytes.

All packets with the correct Mode-S/ADS-B pre-amble are decoded. This is a pre-amble which starts with a 0.5uS pulse at time 0, one at 1uS in, one at 3.5uS in and one at 4.5uS in, with data starting at 8uS in.

To decode these packets the reference is ICAO Annex 10 in all its parts. Though there are of course many other references on the internet. It is beyond the scope of this guide to cover packet contents and decoding.