

## **Application Note: AT100 GPS Quality Parameters**

### **Overview**

The AT100 uses the Global Positioning System (GPS) to determine location, speed, heading, acceleration and altitude. In most cases, the data provided by the GPS receiver is very precise. However, when signal quality is reduced, the accuracy of the resulting data can suffer quite significantly. The main cause of poor signal quality is obstructions between the GPS antenna and the sky, either from the vehicle itself (e.g. when the antenna is beneath the dashboard or in the windscreen) or from surrounding tall buildings etc. The former issue can be eradicated by use of a panel mounting roof antenna.

### **How Can We Tell When a Fix is Reliable?**

Good question! The answer is unfortunately not that simple, but there are a number of useful indicators that we can use to make the decision about the quality of any given GPS fix. These indicators include the following:

- Horizontal Dilution of Precision
- Vertical Dilution of Precision
- Figure of Merit
- Altitude Aiding
- Number of Satellite Vehicles in View

The above can be used to define what is required for a fix to be considered acceptable by the AT100.

### **Configuration of Acceptable GPS Quality**

The AT100 has parameters which can be used to define when a GPS fix is acceptable. However, if the acceptable values are set too strictly, the GPS availability may be reduced. On the other hand, if the acceptable values are opened up too wide, then unreliable and potentially inaccurate data may be used. The optimum trade-off between GPS availability and reliability may differ from one application to the next, hence the acceptable levels are configurable in the AT100. There are two different sets of parameters, as used by older and newer AT100. Both techniques are described on the following pages.

**Hardware Rev E (IMEI 01100900.....), firmware ver 1.60 and later**

**Hardware Rev H (IMEI 35944900.....), firmware ver 2.28 and later**

### **GPSL – GPS Maximum Estimated Location Error**

The estimated location error is based on a combination of all available fix quality/reliability data, to give the best available indication of the position error of the GPS fix.

### **GPSS – GPS Maximum Estimated Speed Error**

The estimated speed error is based on a combination of all available fix quality/reliability data, to give the best available indication of the speed error of the GPS fix.

### **Guidance on Setting GPSL & GPSS**

The following data was gathered from typical vehicle installations, one with a roof mount antenna and one with dashboard mounted antenna, to give some indication of the typical range of the above error estimates.

#### **1. Roof Mount Antenna**

	<b>best</b>	<b>average</b>	<b>worst</b>
<b>GPSL</b>	36	176	515
<b>GPSS</b>	3	5	11

#### **2. Dashboard Mount Antenna**

	<b>best</b>	<b>average</b>	<b>worst</b>
<b>GPSL</b>	140	1059	6681
<b>GPSS</b>	4	309	4567

The default values for GPSL and GPSS have been set to suit installation of the antenna in an appropriate position beneath the vehicle dashboard, as this is the most common method of installation. Please refer to the relevant application note for guidance on antenna installation. The default values are:

Default GPSL        3000

Default GPSS        1500

### **How to Set These Parameters?**

The above parameters can be set by the user like any other parameter, either using a NMEA command via the AT100 serial port or remotely by SMS or TCP.

Example 1 – setting by NMEA command:

```
$PARAM,GPSS,3000
```

Example 2 – setting GPSL and GPSS by SMS:

```
*GPSL=2500#*GPSS=300#
```

**Hardware Rev E (IMEI 01100900.....), firmware up to ver 1.59**

**Hardware Rev H (IMEI 35944900.....), firmware up to ver 2.27**

**GPSM – GPS Maximum Figure of Merit**

The GPSM parameter defines the maximum acceptable Figure of Merit in metres. The maximum value is 25000 (poorest quality) and the minimum is 1 (best quality). The default value for GPSM is 5000. Filtering of fixes based on the Figure of Merit can be disabled (i.e. accept any valid fix), by setting GPSM to zero.

**GPSD – GPS Maximum Dilution of Precision**

The GPSD parameter defines the maximum acceptable horizontal dilution of precision. The maximum value is 65535 (poorest quality) and the minimum is 1 (best quality). The default value for GPSD is 25000. Filtering of fixes based on the Dilution of Precision can be disabled (i.e. accept any valid fix), by setting GPSD to zero.

**GPSA – GPS Altitude Aiding Enable**

The GPSA parameter is used to define whether fixes with altitude aiding (i.e. 2D fixes) are acceptable. A value of 1 for GPSA will enable altitude aiding and zero will disable it. The default value for GPSA is zero (altitude aiding disabled).

**How to Set These Parameters?**

The above parameters can be set by the user like any other parameter, either using a NMEA command via the AT100 serial port or remotely by SMS or TCP.

Example 1 – setting by NMEA command:

```
$PARM,GPSM,100
```

Example 2 – setting GPSD and GPSA by SMS:

```
*GPSD=5000#*GPSA=1#
```