# GPS and GNSS Antenna's

Many of our products, use a GPS or GNSS antenna. Here are answers to the questions we get asked about GPS antennas.

What's the difference between GPS and GNSS?

GPS is the USA's global positioning system and GNSS stands for Global Navigation Satellite System. GNSS covers all the difference systems in use worldwide, such as GPS, GLONASS, Galileo, Beidou etc.

A GNSS antenna needs a slightly wider bandwidth as the GLONASS system operates on slightly different frequencies to GPS.

So while a GPS antenna may pick up GLONASS signals, it isn't recommended.

What GPS Antenna is the best one to use?

The best type of antenna is an active type operating from 3-5 VDC. These antennas have 24 to 36 dB of gain and are powered by feeding DC up the inner wire of the coaxial lead.

Precision Test Systems supplies two types of antenna's:

- A small GPS antenna which is only 40 mm square and has a magnetic mount on it. This allows it to be easily mounted to a steel structure. The operating voltage is anywhere from 3 to 5 volts. The advantage of this wider operating voltage range is that any slight loss of voltage in the coaxial cable will not affect the antenna's operation. This antenna has 24 dB of gain.
- A higher quality GPS / GNSS antenna with 36 dB of gain and built in lightening protection. The part number is GPS150.

Where should it be positioned?

The GPS / GNSS antenna should be placed on the roof of the building with a full 360-degree view of the sky. This is the perfect location. If a 360-degree view is not available, that the antenna should be positioned for the best view possible.

Some experimentation should be carried out if a full view is not available. Often good results can be obtained on one side of a pitched roof.

The GPS / GNSS receivers in our products are very sensitive and it is possible to get some type of satellite reception from a windows edge. But

it is likely the GPS / GNSS receiver will flag errors and so this is not recommended.

How much loss can be tolerated in the antenna cable?

24 dB gain antenna and the GPS10RBN

The gain of the antenna plus any amplifier or splitter used, plus any cable loss should be in the range 18 to 36 dB.

The antenna supplied by Precision Test Systems has a gain of 24 dB. This takes into account the five meters of RG174 that is supplied with the antenna.

Therefore, the maximum loss in any extra cable can only be 6 dB (24-6 = 18 dB).

36 dB gain antenna and the GPS10eR

The GPS10eR has a very sensitive GNSS receiver and can tolerate much more loss in the cable. However, cable loss should be kept to < 15 dB if possible.

What is the best cable to use?

Many people use RG58 but this should not be used since it is only rated to 1 GHz. GPS frequencies operate at 1575.42 MHz, so any cable used must be designed for this frequency.

We recommend the following cables:

- HDF200. Diameter 5 mm. Loss 0.45 dB / m.
- 7808A. Diameter 6.1 mm. Loss 0.32 dB / m.
- HDF400. Diameter 10 mm. Loss 0.185 dB/m.

Should I use an antenna amplifier?

As already mentioned above, only 6 dB loss can be tolerated in the antenna cable for the GPS10RBN. If longer cable lengths are needed, then an inline amplifier should be used.

Precision Test Systems manufacture the GPS35 antenna amplifier. This gives a minimum 38 dB of gain and is very easy to use. Simply connect between the antenna and the GPS receiver. The GPS35 is powered by the GPS receiver inside the unit. 5V DC is fed up the inner wire of the coaxial cable. This powers the GPS35. The GPS35 then feeds the same voltage to the active antenna. The amplifier should be positioned at the antenna end of the installation.

The GPS35 has filters that only allow the GPS or GNSS frequencies through. Therefore, signals outside these bands are rejected. This improves overall performance of the system.

What is the longest cable lengths that can be used for the 24 dB gain antenna?

Taking into account all that's been said above, the maximum cable lengths that can be used between the antenna and the GPS receiver are:

- Using HDF200 cable. 13 m without an amplifier. 86 m with an inline GPS35 amplifier.
- Using 7808A cable. 18 m without an amplifier. 122 m with an inline GPS35 amplifier.
- Using HDF400 cable. 32 m without an amplifier. 210 m with an inline GPS35 amplifier.

What if I need longer cables lengths than mentioned above?

If longer cable lengths are needed two amplifiers could be used. However, it will probably be cheaper and easier to use a fiber optic connection.

We supply a fiber optic antenna connection as an option to our products. The standard antenna is connected to an optical transmitter. Then thin fiber optic cable is used to connect the optical transmitter to the optical receiver. So the optical transmitter is at the antenna end and the optical receiver is at the GPS receiver end.

Fiber cable lengths of well over 1 km can be used with minimal loss of signal.


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