



Where to place Frotcom's tracking device inside a vehicle



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Who should read this paper?

FLEET MANAGERS AND INSTALLERS

This paper explains where to place Frotcom's tracking device inside a vehicle, considering the different types of vehicles and the most frequent obstacles that block the satellite signals from GPS and other Global Navigation Satellite Systems (GNSS) used by Frotcom.

The purpose of this document is to help you find the most suitable location inside various types of vehicles to place the Frotcom tracking device.

But first, let me give you some basic notions:

About GPS and GNSS

The Global Positioning System (GPS) is a satellite-based radio navigation system developed and operated by the U.S. Department of Defense.

GPS permits land, sea, and airborne users to determine their position, velocity and the time 24 hours a day, in all weather, anywhere in the world.



GPS satellites circle the Earth twice a day in a very precise orbit and transmit signal information to Earth.

GPS receivers take this information and use triangulation to calculate the user's exact location.

Essentially, the GPS receiver compares the time a signal was transmitted by a satellite with the time it was received.

The time difference tells the GPS receiver how far away the satellite is.

Now, with distance measurements from a few more satellites, the receiver can determine the user's position in latitude and longitude coordinates, that can be displayed on an electronic map.

Today's GPS receivers are extremely accurate.

Generally, users will see accuracy within 5 to 10 meters under normal conditions.

A GPS receiver must be locked on to the signal of at least three satellites to calculate a 2D position (latitude and longitude) and track movement. With four or more satellites in view, the receiver can determine the user's 3D position (latitude, longitude and altitude).

GPS is not the only Global Navigation Satellite System (GNSS) used by Frotcom tracking devices. Some of our models can also use alternative GNSS constellations such as GLONASS, GALILEO, BEIDOU and QZSS.

Regardless of the GNSS used, the tracking device must be located in such a position in the vehicle that satellite signals are not being blocked constantly.

The ideal place, of course, would be on top of the vehicle's roof, but that is usually not an option.

Typical obstacles that block satellite signals

Although satellite signals can be affected by many different types of surfaces, the worst ones that typically exist in a vehicle are:

- **Metallic surfaces** – metals reflect electromagnetic signals. GNSS satellite signals are extremely weak and therefore will not be able to cross these metallic surfaces.
- **Windscreen (front window)** with a heat reflective shield embedded, also known as athermic windscreen – inside this type of windscreen a metallic film is placed to prevent sun radiation to get inside the vehicle. Unfortunately, it also prevents satellite signals to reach the tracking device.

Always avoid placing the unit directly under any of these surfaces, because they will most certainly degrade the tracking device's performance.

How do I know if the windscreen is heat reflective or not?

Usually the shop where the vehicle was purchased will be an ideal starting point. There is no rule about certain brands and models having a heat reflective windscreen or not.

Buyers can order most models with or without heat reflection. Moreover, in countries with more sun exposure the models with heat reflection usually prevail.

These heat reflective windscreens usually have a grey or black stripe around them, which is shown below. Usually this stripe is larger in the area of the rear view mirror.



Not sure yet? You can do an easy test

If you are not sure whether a vehicle has a heat reflective windscreen or not, an easy test is to compare the time it takes for the tracking device to establish its position outside of the vehicle and inside, directly under the windscreen.

Please follow the next steps.

1. Park the vehicle in a place without any obstacles nearby (buildings, tree, walls or any dense elements). In other words, there should be no obstacles between the car and the satellites.
2. Connect the device to the electric circuit of the vehicle according to the diagram provided by Frotcom. Watch the lights in the terminal and count how long it takes for the unit to get a position fix. Normally, this should take from 30 seconds to 5 minutes.

3. Now, disconnect the unit from power and place it inside the vehicle, directly under the windscreen. Close all doors and windows to make sure the satellite signals have to cross the windscreen and windows. Reconnect the unit again and watch the lights.
4. If you do not get a position fix within the previous time period, or a similar time period, the car most probably has a heat reflective windscreen. It may take a little longer than the time it took for the unit to get a position fix outside of the vehicle. That's normal. But not having a position fix within 5 minutes clearly demonstrates that you will have problems later on if you decide to install the unit under the windscreen.

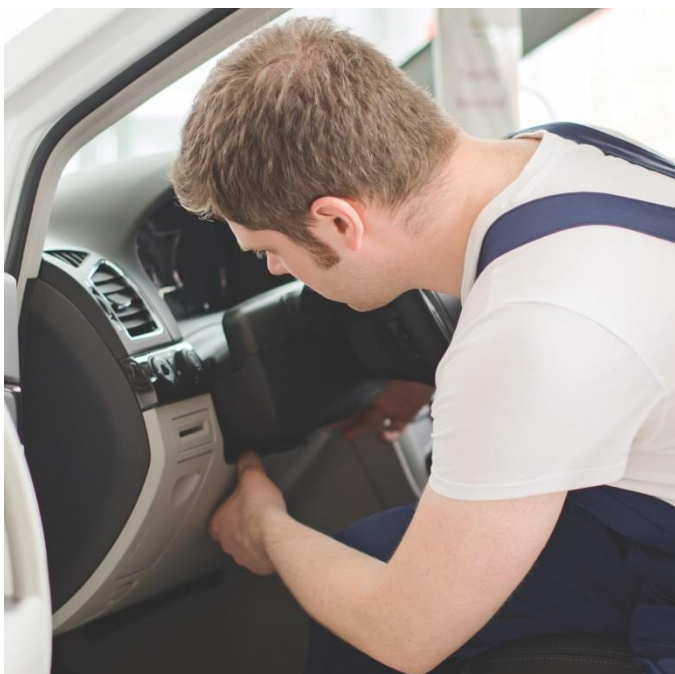
So where to place the unit?

Well, if you found out that the windscreen is not heat reflective, it will be a lot easier. You can put the unit in most places, even below the dashboard. Keep in mind that you should avoid placing it directly under any metallic surface.



Typical precautions are:

- Always make sure that wherever you install the unit you will get a position fix in 5 minutes or less. The quickest you get a position fix, the better.



But what if the windscreen is heat reflective?

If the windscreen is, however, heat reflective, avoid locating the unit in the front part of the vehicle, except directly in the unprotected zone behind the rear view mirror. The heat reflective metallic film that causes the signals to bounce back is absent there.

Alternatively, prefer placing the unit in the trunk (in the case of light vehicles) or other positions far away from the windscreen.

If you find no convenient way to place the device, please contact us. We can provide or recommend external antennas that you can place outside of the vehicle or in the unprotected area behind the rear view mirror, in order to get a good satellite signal.

For some vehicles you may find out this is the only way to get around the heat reflective windscreen.



- Possible places, depending on the vehicle:
 - Below the dashboard, hidden;
 - Inside the fuse box, if there is enough room and if it is safe;
 - In the trunk of the vehicle (light vehicles) in such a way that it does not hurt its current use;
 - In some vehicles, directly below plastic parts such as the aileron or the area where the windscreen brushes are located. Be aware that most tracking devices cannot withstand dust or water, so make sure they are protected adequately.
 - In some cases, the glove compartment (attention, satellite signals can be too weak there).
- Places that are not usually recommended:
 - Under the seats; satellite signals are usually blocked.
- Do not install the terminal in a way that it will obstruct the visibility of the driver.
- Do not install the terminal in a way that it may affect the airbags.
- Install cables and wires in such a way that they will not disturb the driver.
- Check whether the installation method complies with local traffic laws and regulations before installing and operating the unit.

About the author: Renato Ferreira is CTO at Frotcom International, a global provider of vehicle tracking systems for fleet management. Renato has been working in vehicle tracking since 1998. Frotcom International is a privately held company based in Portugal, providing fleet management solutions for clients around the world. Clients span from small companies with just a couple of vehicles, to cross-border road transportation companies with thousands of vehicles.