GSM Tracker

User Manual

November 2026

1 What the device does

The GSM tracker watches a parked car and reports by SMS if the car is moved. Unlike commercial trackers it respects your privacy: the GSM modem is *switched off* all the time while the car is being watched, so the device is not visible in the mobile network and cannot be located. The modem is powered only after a theft (or other movement of the car) has been detected.

The device is powered through a hidden switch. Switch it on when you leave the car, switch it off when you come back. There is no other way of disarming it.

In short:

1. You switch the device on and leave the car.
2. After two minutes it starts watching. GPS and motion sensors are checked continuously, GSM is off.
3. If the car is moved, lifted or towed, the GSM modem is switched on and an *alarm SMS* with the position is sent to your phone, then repeated every 15 minutes.
4. You can control the device by SMS replies (stop the reports, request the position, track more often, ...).
5. Everything is also recorded on the SD card.

2 Everyday use

2.1 Parking

1. Switch the device on by the hidden switch.
2. The **green** LED blinks slowly (1 s on, 1 s off): the device is *arming*. During the next 2 minutes it records the orientation of the car and, if GPS reception is available, its position. Close the doors and leave within this time; the car should not move or rock during arming.
3. Then the green LED changes to short flashes every 2 seconds: the device is *watching*.

GPS reception is not necessary for arming. In an underground garage the device watches with its motion sensors only and takes the GPS reference later, as soon as a good fix is obtained. The parking position is the average of many GPS fixes, which is refined while the car is standing still.

2.2 Coming back

Switch the device off *before* driving away. If you forget it, the device cannot know that it is you driving: you will receive an alarm SMS. Then simply switch it off, or reply `PWROFF` (or `REARM`, see below).

2.3 When an alarm SMS arrives

- Open the map link in the SMS to see where the car is.
- Reply `TRACK 30` to receive the position every minute for the next 30 minutes.
- Reply `POS` at any time for the current position, `STATUS` for details.

- If it was a false alarm, reply `REARM`: the modem is switched off and the device starts watching again from the current place.
- `STOP` only stops the periodic reports; the modem stays on so that the device still answers your commands. This costs battery and the radio of the modem may disturb the motion sensors, so do not leave the device stopped for a long time: after a false alarm prefer `REARM`, or `PWROFF` if you will switch the device off anyway.

3 Alarm detection

The device raises an alarm in any of these situations (the cause is written in the SMS):

Cause	Meaning
`GPS`	GPS shows the car moving faster than 2 m/s (7 km/h), or more than 200 m from the parking place, confirmed by 3 consecutive good GPS fixes.
`GPS+IMU`	Smaller GPS movement (more than 20 m from the parking place or faster than 1.5 m/s) together with motion felt by the sensors (tilt, rotation or acceleration above half of their limits) during the last minute.
`TILT`	The car is tilted by more than 4 ° for more than 10 s, e.g. lifted by a jack or a tow truck. Works without GPS.
`ROT`	The car is rotating (turning) faster than about 9 °/s for more than 2 s. Works without GPS.
`ACC`	The measured acceleration differs from the parked state by more than 0.5 m/s^2 for more than 2 s: the car is accelerating, braking, turning or tilted. Works without GPS.
`TURN`	The car has turned by more than 90 ° in total within about a minute, even in short turns. Works without GPS.
`VIBR`	Vibration (engine running, rolling) lasts for more than a minute. Works without GPS.
`TEST`	Test alarm started from the service console.

The motion sensors (marked IMU, inertial measurement unit) detect a theft even if GPS does not work: in an underground garage, or when a thief uses a GPS jammer. Towing or lifting the car is detected by `TILT` or `ACC`, driving away by `ROT`, `ACC`, `TURN` or `VIBR`.

People sitting in the car, closing doors, wind or a passing truck should not cause an alarm, because the motion must last for some time. With poor GPS reception (garage, reflections from buildings) the GPS position can wander by tens of metres while the car stands still. Therefore a large distance alone is required for a `GPS` alarm, and the distance limits are automatically increased to three times the position error estimated by the GPS receiver. Slow changes (cooling of the car, tyres settling) are followed automatically. All limits can be changed, see Section 7.

4 LED indication

LED	Meaning
green, long blinks (1 s on / 1 s off)	arming (first 2 minutes)
green, short flash every 2 s	watching
red, blinking twice a second	alarm, reports are being sent
red, short flash every 2 s	alarm stopped (`STOP`), modem on, waiting for commands
blue, short flash every 2 s	good GPS fix (in addition to the above)
blue, steady	SD card mode for a computer (Section 8)
all off	switched off by `PWROFF`, or no power

5 SMS reports

5.1 Alarm and position report

Example:

```
ALARM#1 GPS 54km/h 270deg alt312 sat9 hd1.1 age1s 12.4V 14:05Z
https://maps.google.com/?q=50.08702,14.42105
```

Item	Meaning
`ALARM#1 GPS`	alarm number since switching on, and its cause
`54km/h 270deg`	speed and direction of movement (0 = north, 90 = east)
`alt312`	altitude in metres
`sat9 hd1.1`	number of satellites and GPS accuracy (HDOP, lower is better, below 2 is good)
`age1s`	how old the position is (`s`econds, `m`inutes, `h`ours)
`12.4V`	car battery voltage
`14:05Z`	time (UTC); missing until the device has received time from GPS
link	the position on the map
`cell ...`	added if the position is older than 2 minutes: mobile network cell (operator, area and cell number), which can be looked up e.g. at opencellid.org
`NOFIX`	no GPS position since switching on; only the cell information is given

The first report is sent as soon as the modem has registered in the network (usually within a minute), then every 15 minutes, or every minute with `TRACK`.

5.2 STATUS reply

`STATUS` returns one line with the state (`WATCHING`, `ALARM`, `STOPPED`, ...), the alarm cause and number, report interval, tracking, number of sent/failed SMS, signal strength (`csq`, 0–31, above 10 is fine), mobile cell, battery voltage, GPS state, distance from the parking place, tilt, SD card and motion sensor state (`ok` or `ERR`), and time since switching on.

6 SMS commands

Send the command as an SMS to the tracker's phone number while it is in alarm (the modem is off while watching, so commands cannot be received then). Commands are not case sensitive. Each command is confirmed by a reply SMS.

- From the stored *alarm number* (your phone) just send the command, e.g. `POS`.
- From any other phone put the password first, separated by a space, e.g. `mypassword POS`. The password is case sensitive. SMS from other numbers without the password are ignored.

Command	Action
`POS`	send the current position report
`STATUS`	send the status line
`STOP`	stop the periodic reports; the modem stays on and commands still work (red LED short flashes)
`START`	resume the periodic reports after `STOP`
`TRACK` *n*	send the position every minute for the next *n* minutes (1–1440); `TRACK 0` ends tracking
`INT` *n*	set the normal report interval to *n* minutes (1–1440, default 15); stored permanently
`REARM`	switch the modem off and start watching again from the current place (false alarm, or car recovered)
`PWROFF`	switch everything off until the device is switched off and on again by the hidden switch
`NUM` *number*	change the alarm number, in international format, e.g. `NUM +420123456789`; the new number gets a notification
`PW` *password*	change the password (max. 16 characters, no spaces)
`SET` *name value*	change a setting, see Section 7

Notes.

- Do not use the underscore character _ (and preferably no national characters) in passwords and commands: they do not survive the SMS character set.
- SMS which were sent before the modem was switched on (more than 10 minutes earlier) are ignored, so that an old command (e.g. `PWROFF` sent during a previous alarm and delivered late) cannot act on a new alarm. All SMS are deleted from the SIM card after reading.
- Incoming calls are rejected automatically.

7 Settings

Settings are stored permanently in the device. They can be changed by SMS (`SET` *name value*) or from the service console (Section 9).

Name	Default	Meaning
`interval`	15	minutes between alarm reports (same as `INT`)
`arming`	120	seconds from switching on until watching starts
`tiltimu`	4	tilt in degrees for a `TILT` alarm
`tilttime`	10	seconds the tilt must last
`rotimu`	0.15	rotation in rad/s for a `ROT` alarm (0.15 is about 9 °/s)
`rottime`	2	seconds the rotation must last
`accimu`	0.5	acceleration deviation in m/s^2 for an `ACC` alarm
`acctime`	2	seconds the acceleration deviation must last
`turnangle`	90	degrees turned for a `TURN` alarm
`turnwindow`	60	seconds over which the turned angle is accumulated
`vibimu`	0.3	vibration (rms, m/s^2) for a `VIBR` alarm
`vibtime`	60	seconds the vibration must last
`tiltboth`	2	smaller tilt (degrees) counted as motion supporting GPS
`rotboth`	0.05	smaller rotation (rad/s) counted as motion supporting GPS
`distgps`	200	metres from the parking place for a `GPS` alarm
`speedgps`	2	speed in m/s for a `GPS` alarm
`distboth`	20	metres for a `GPS+IMU` alarm
`speedboth`	1.5	speed in m/s for a `GPS+IMU` alarm
`gpsnfix`	3	consecutive GPS fixes needed to confirm movement
`gpsminsat`	5	minimum number of satellites for a usable fix
`gpsmaxhdop`	3	maximum HDOP (inaccuracy) for a usable fix
`logperiod`	60	seconds between SD card records while watching
`errk`	3	distance limits are at least this multiple of the estimated GPS position error
`vcal`	0.0074	battery voltage calibration (only for service)

Higher values make the device less sensitive (fewer false alarms, later detection). The values of tilt, rotation, acceleration deviation, turned angle and vibration are written into the SD card log (Section 8) and shown by the service console command `D`; they help to choose the limits for a particular car and parking place.

8 SD card

The device writes a log file to the SD card, named after the date and time of switching on (e.g. `20261109_1630.log`; the time may be wrong if GPS time was not yet available). It contains a status line every minute while watching or stopped and every second during an alarm (time, state, GPS position and accuracy, distance from the parking place, tilt, rotation, acceleration deviation, turned angle, vibration, battery voltage, modem state), and all events: alarms, sent and received SMS (also failures to send, e.g. when the operator refuses), state changes. A new file is started at every switching on; `REARM` continues the same file.

To read the card without removing it, connect the device to a computer by USB and switch it on while holding the red button. The **blue** LED lights steadily and the card appears as a USB disk. To return to normal operation, switch the device off and on again.

8.1 Settings from the SD card

Settings can also be prepared on a computer: create a text file `config.txt` in the root directory of the card, with one command per line, using the same syntax as the SMS commands. Only `NUM`, `PW`, `INT` and `SET` are allowed. Everything after `#` on a line is a comment (so a password cannot contain `#`). Example:

```
NUM +420123456789 # my phone
PW mysecret
```

```
INT 15
SET distboth 30 # garage with poor GPS
```

At the next switching on the device applies the file, writes the results into the log, and renames it to `config.old` (with the password replaced by `***`), so that it is applied only once.

9 First setup and service console

The service console is available on the USB connector (virtual serial port) and on the USART1 connector (115200 baud). Type a command and press Enter. The most useful ones:

Command	Action
`N` *+420...*	set the alarm number (international format)
`P` *password*	set the password
`I` *minutes*	set the report interval
`K` *name value*	change a setting (names as in Section 7)
`D`	show all settings and the current state
`F`	factory defaults (`F1`: keep alarm number and password)
`A`	test alarm (modem on, alarm SMS with cause `TEST`)
`R`	re-arm (like the `REARM` SMS)
`X` *text*	process *text* as if it were an SMS from the alarm number, e.g. `X STATUS`
`t` / `T`*seconds*	show the clock / set it (Unix time, normally set automatically from GPS)

First setup. On the very first start (or after a firmware update that changes the settings) the device uses the default settings, has *no alarm number* and the publicly known default password `default_pwd`. Before using the device:

1. set your alarm number with `N`,
2. set your own password with `P` (max. 16 characters, no spaces, no underscore),
3. check both with `D`.

The default password contains an underscore, which cannot be transmitted by SMS, so it can never be used to control the device; commands from other phones work only after you have set your own password. Then make a test alarm with `A`, check that the SMS arrives, reply `STATUS`, and finish with `REARM`.

The SIM card must have the PIN request disabled. Keep some credit on a prepaid SIM, and remember that the modem uses the 2G (GSM) network.

10 Power consumption

While watching, the device takes about 50 mA from the car battery (about 1.2 Ah per day), which a healthy car battery tolerates for about two weeks. During an alarm the consumption is higher because the modem is on. After `PWROFF` the consumption is minimal, but the device does nothing until it is switched off and on again.

11 Troubleshooting

Problem	What to do
Alarm SMS when driving away	You forgot to switch the device off. Switch it off, or reply `PWROFF`.
False alarms while parked	Increase the limit or the time of the alarm cause given in the SMS (e.g. `accimu`/`acctime` for `ACC`); for GPS-caused alarms (poor reception) increase `distboth`, `errk` or `gpsnfix`.
`NOFIX` in the report	No GPS reception (garage, indoor). Use the cell information; the position will follow once the car is outside.
No reply to commands	Commands work only during an alarm. Check that you send from the alarm number or put the password first.
`imuERR` in `STATUS`	The motion sensor does not respond; only GPS detection works. Have the device checked.