

# Template:FMM640 Accelerometer Calibration

## Accelerometer Calibration

Accelerometer auto calibration functionality has one purpose - determine how FMC device is mounted in a vehicle. After the calibration process *eco driving* functionality becomes active and calibration data will be used to determine harsh acceleration, braking and cornering events.

There are two conditions when auto calibration takes place:

- If on device startup no calibration was detected;
- If the device receives an SMS/GPRS message with *auto\_calibrate:set* text.

After functionality has started FMB device periodically checks current appliance GNSS, ignition and movement source parameters and if the conditions match:

- position fix got;
- GNSS speed is zero;
- ignition is ON;
- first calibration vector was not saved yet;

Then first vector is taken. Saved vector will be considered as ground vector and it will be used at further calibration calculations.

*Note: When FMC device saves first ground vector vehicle must be parked on flat ground. Crooked vector may have an impact on further calculations.*

Afterwards first ground vector was taken, device analyses conditions:

- position fix got;
- GNSS speed is at least 20 km/h;
- ignition is ON;
- second vector was not saved yet;
- vehicle driving in the same direction with 5° tolerance;
- vehicle speed increase by 7km/h within 1 second.

For next vector. Second vector will be taken if all conditions match. Immediately after second vector is received, it will be multiplied by first (ground) vector, the result of these vectors is vector multiplication cross product which is the right side of a car. By using same vector multiplication method, device front, left side will be calculated. At this point calibration is successfully ended as indication device sends an SMS/GPRS message with *Device is calibrated, to recalibrate send:auto\_calibrate:set*.

*Note: SMS/GPRS message will be sent only if auto calibration functionality was triggered by SMS/GPRS message.*

For user convenience in case auto calibration functionality fails then notification message will be sent. For exact messages, check algorithm section.

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To get current calibration status *auto\_calibrate:get* SMS/GPRS command must be sent to the device. If device is calibrated it will respond with *Calibration state: calibrated* or otherwise *Calibration state: not calibrated*. Also this command returns saved Ground and Side vectors.

After every TRIP START event, device starts shadow calibration. This type of calibration is running in parallel with already saved vectors (this means that vectors does not reset until shadow calibration have both new vectors). After shadow calibration is done, device updates the vector values to the new ones. There are two conditions when shadow calibration does not run at TRIP start event:

- Normal calibration is still running.
- Shadow calibration is still running from previous TRIP event.

To take ground vector these conditions should be met:

- Ignition is ON
- Device got GPS FIX
- Vehicle speed = 0km/h

Device will check these conditions every 1sec until they will pass.

To take side vector these conditions should be met:

- Vehicle speed  $\geq$  20km/h
- Device got GPS FIX
- Ignition is ON
- Device angle does not change more than 5 degrees in past 1 sec
- Speed need to increase by 7km/h in 1s period. Device will check these conditions every 1 sec until they will pass.