Eco-Drive from Accelerometer

Introduction

Eco driving from accelerometer is available for all FM4th generation devices. Now, you can select Eco-Driving parameters source or choose automatic source detection. You can also have Eco-Driving without having FMS connection (FM-Eco4/4+, FM-Eco4 light/light+ and FM-Plug4 devices).

You can get the latest firmware and configurator from our documentation website: doc.ruptela.lt

Legal information

Document change log

Date	Version	Change details
2014-12-01	1.0	Initial draft
2016-01-12	1.1	Overall review, "Idling speed" added
2016-01-27	1.2	FM-Tco4 HCV label added
2016-04-16	1.3	Included description for *accinfo* command.
2017-06-06	1.4	Described "Enable IO" function, Updated Eco-Drive sources
2017-12-08	1.5	Described the new "Calculate data only when engine is ON" function in the configuration section.

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Eco-Drive from GPS parameters

Available parameters, when Eco-Drive data source is GPS:
- Overspeeding parameter is calculated from GPS speed.
- Harsh braking & extreme braking is calculated from GPS speed difference.
- Brake counter.
- Engine on timer.
- Harsh acceleration is calculated GPS speed difference.
- Cornering is calculated from GPS speed difference and change of angle.
- Idling delay (absolute idling time, idling event and idling timer) remains the same as in ACC mode.
- Idling speed is calculated from GPS speed.
- Max speed and normal speed distance parameters.

Not available parameters:
- Max RPM and RPM bands.
- Cruise control speed.
- Extended Eco-Drive parameters

Configuration

FM Device has to be configured properly for the Eco-Drive functionality to work. Configuration is split into two parts. First part described below:

1. Open FM Configurator and select your device.
2. Under **Eco-Drive** section put a tick in the **Enable** checkbox.
3. Click on the "Options" button on the right.
4. In the "Eco-Drive" popup window select a proper **Profile** for your vehicle. Profiles help to distinguish between different vehicles and their Eco-Drive parameter values. You can choose between *"Custom"*, *"Light vehicle"* and *"Truck"*.
5. Each profile comes with recommended Eco-Drive parameter values. However, you can easily modify them to achieve wanted results.
6. Different number of **Data sources** are available for different devices. To enable Eco-Drive from Accelerometer in the dropdown list choose "*ACC*". Some sources have fewer Eco-Drive parameters, more information on his matter can be found in <u>"Eco-Drive sources"</u> chapter below.
7. Check the "**Calculate data only when engine is ON**", this is necessary to avoid false eco drive data calculation because of various factors when the vehicle is standing with ignition off.
8. Check **Eco Driving panel connected** if you have Eco-Drive panel attached to the device. Connection schemes for different devices provided in <u>"Eco-Drive panel connection to FM-Tco4 HCV / FM-Tco4 LCV /FM-Pro4"</u> and <u>"Eco-Drive panel connection to FM-Eco4 / 4+ and FM-Eco4 light/light+"</u> chapters below.
9. You can also check **Automatic data source selection**. This effects how some of the Eco-Drive parameters are determined:
   a. Engine on – with "CAN" source selected, device uses CAN dada. If it is not available, then it uses ACC data.
   b. Overspeed limit - with "CAN" source selected, device uses CAN dada. If it is not available, then it uses GPS data.
   c. Distance parameters – data source for distance data is "Virtual odometer", but if data from "CAN" source is available, device takes it from there.

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10. If **Beeper Enabled** is checked, Eco-Drive panel will beep on exceeded value (e.g. if over speeding).
11. The user can click the "Enable IO" button. This will enable seven standard Eco driving IO parameters, thus reducing the amount of IO parameters that need to be enabled in the next part of the configuration.
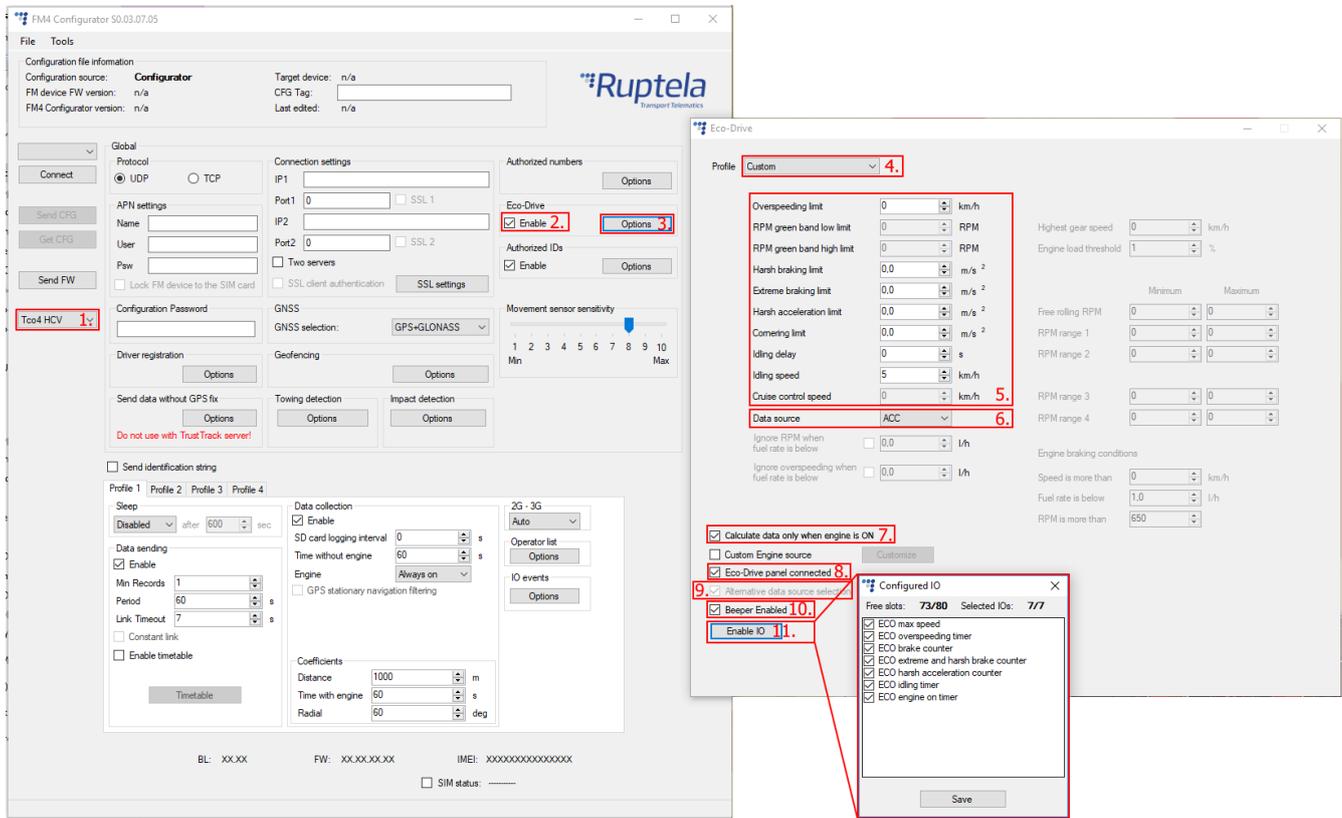
Second configuration part deals with IO events. In order to see parameters in the reports you have to select proper IO parameters in the **IO settings**. Remember that Eco-Drive parameter availability depend on selected data source. More information on his matter can be found in "Eco-Drive sources" chapter.

1. In the **IO events** section click on "Options" button. It opens up a new "IO settings" window.
2. You have many slots for parameters (40 for Eco4/4+/light/light+, Plug4 devices and 80 for Pro4, Tco4 HCV, Tco4 LCV devices). Select a slot that you want to enable (**If enable IO was selected in the previous part of the configuration, 7 IOs will already be enabled in the list**).
3. In the **IO properties** section tick the **Enable** check box, otherwise the slot will remain empty.
4. **ID** contains the parameters list. Choose an Eco-Drive parameter that you want to enable for the selected slot.
5. Repeat steps 1 to 4 until you enable all Eco-Drive parameters. A list of all 11 parameters for the Eco-Drive from Accelerometer functionality can be seen in the picture below.
6. Once all parameters are enabled, close the "IO settings" window and send configuration to the device.
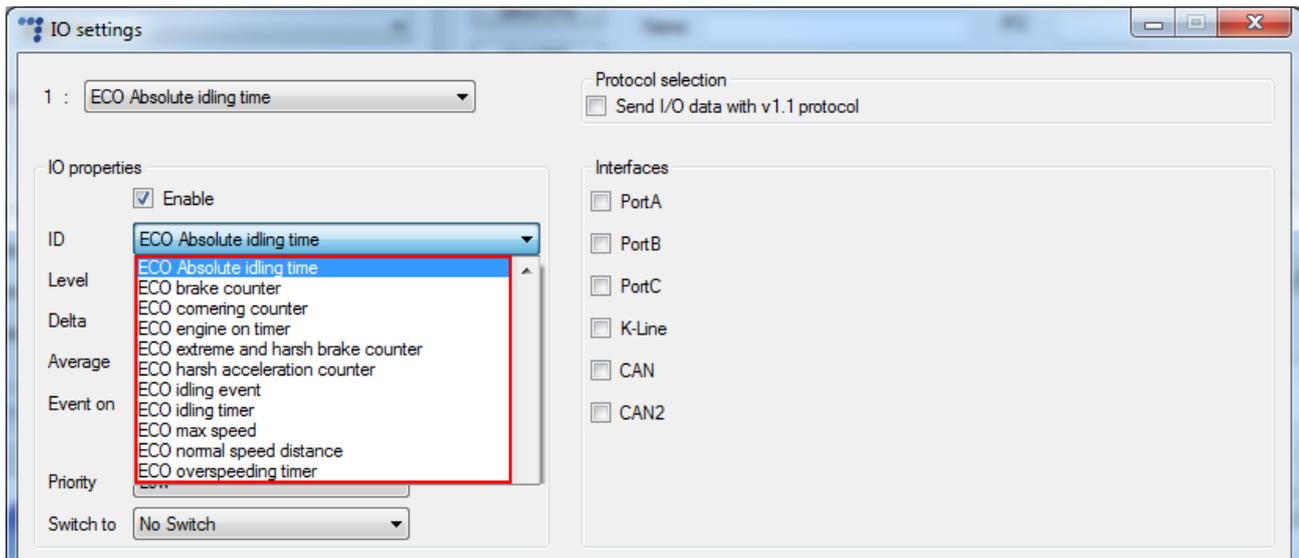
Note

It is very important to enable at least one Eco-Drive parameter in the IO list. If you fail to do so, the ECO-Drive will not function.

Eco-Drive sources

You can manually select an Eco-Drive parameters source or choose to enable an automatic source detection. Different devices can have different Eco-Drive sources.

FM Device side	Eco-Drive source
FM-Eco4/4+/light	ACC, GPS
FM-Plug4	ACC, OBD, OBD+ACC, GPS, GPS+OBD[1]
FM-Pro4	ACC, CAN, CAN+ACC, GPS, GPS+CAN[1]
FM-Tco4 LCV	ACC, CAN[2], CAN[2]+ACC, OBD, OBD+ACC, GPS, GPS+OBD[1], GPS+CAN[1]
FM-Tco4 HCV	ACC, CAN, CAN+ACC, OBD, OBD+ACC, GPS, GPS+OBD[1], GPS+CAN[1]

[1]Check change logs to see when this new data source was included in standard firmwares.
[2]Only for LCV source.

Devices can measure angular momentum (harsh cornering or aggressive turning), which is detected by the accelerometer. It is not available, when CAN or OBD is used as a data source. Therefore additional data sources can be selected:

● CAN+ACC: here Eco-Drive parameters are calculated from CAN data and cornering detection is done by the accelerometer.
● OBD+ACC: here Eco-Drive parameters are calculated from OBD data and cornering detection is done by the accelerometer.

Note

Cornering events do not work on TrustTrack system.

Some data sources has fewer Eco-Drive parameters than others. Unavailable parameters will be greyed out in the "Eco-Drive" window. For example RPM bands and Cruise control speed for the GPS source. Availability of parameters according to the Eco-Drive source is shown in table below:

IO ID Parameter	Data source			
	CAN	Accelerometer	OBD	GPS
ECO absolute idling time	+	+	+	+
ECO brake counter	+	+	+	+
ECO cornering counter	CAN+ACC GPS+CAN[1]	+	OBD+ACC GPS+OBD[1]	+
ECO cruise control distance	+	Not available	Not available	Not available
ECO cruise control timer	+	Not available	Not available	Not available
ECO engine on timer	+	+	+	+
ECO extreme and harsh brake counter	+	+	+	+
ECO harsh acceleration counter	+	+	+	+
ECO idling event	+	+	+	+
ECO idling timer	+	+	+	+
ECO max RPM	+	Not available	+	Not available
ECO max speed	+	+	+	+
ECO normal speed distance	+	+	+	+
ECO overspeeding timer	+	+	+	+
ECO RPM in green band distance	+	Not available	+	Not available
ECO RPM in red band timer	+	Not available	+	Not available
ECO braking value[2]	+	CAN+ACC	+	+
ECO acceleration value[2]	+	CAN+ACC	+	+
ECO cornering value[2]	CAN+ACC GPS+CAN[1]	CAN+ACC	OBD+ACC GPS+OBD[1]	+

[1]Check change logs to see when this new data source was included in standard firmwares.
[2]Only for LCV source.
[3]Parameters are only available in 4th generation (FM4) devices, also v1.1 Protocol version has to be used.

Note
Extended Eco-Drive parameters can be used only with FM-Tco4 HCV/LCV and FM-Pro4 devices.

Eco-Drive panel connection to FM-Tco4 HCV, Tco4 LCV and FM-Pro4

FM-Tco4 HCV / FM-Tco4 LCV / FM-Pro4 Pinout

Wire colors (FM Device side)	Wire colors (Eco-Drive panel side)
Red - 1W +5V (in 14 pin connector)	Red
Black - GND (Chassis)	Black
Purple - DOUT1	Purple
Orange - DOUT2	Orange
	Green - To other device (if DOUT1 is needed)
	White - To other device (if DOUT2 is needed)

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FM Device wires

Eco-Drive panel wires
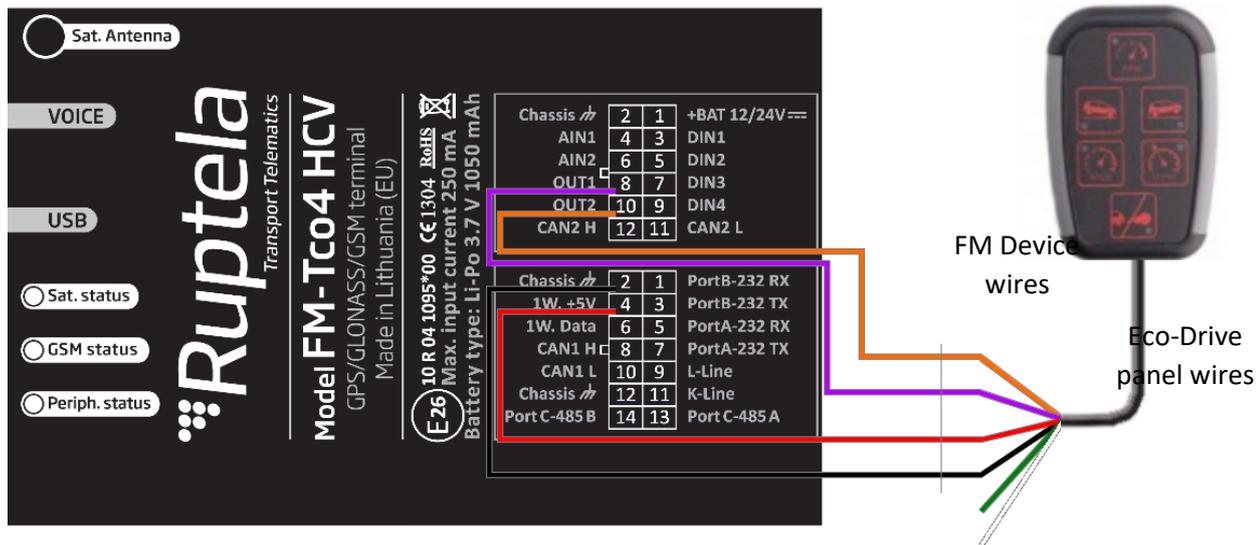
Eco-Drive panel connection to FM-Eco4 / 4+ and FM-Eco4 light/light+

FM-Eco4 / 4+ and FM-Eco4 light/light+ Pinout

Wire colors (FM Device side)	Wire colors (Eco-Drive panel side)
Red-White - 1W +5V (in 12 pin connector)	Red
Black - GND (Chassis)	Black
Purple - DOUT1	Purple
Orange - DOUT2	Orange
	Green - To other device (if DOUT1 is needed)
	White - To other device (if DOUT2 is needed)

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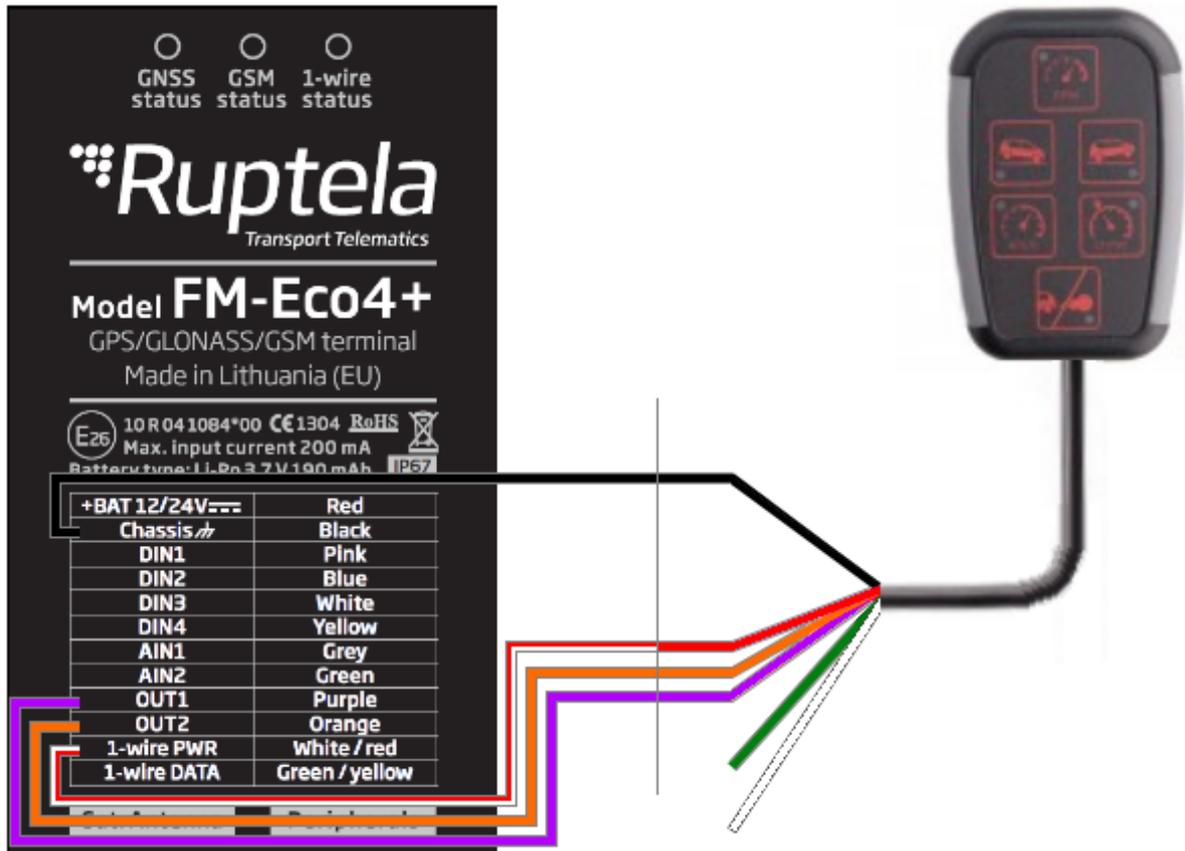
Calibration process

If **ACC** or **Automatic data source** selection is used, accelerometer needs to be calibrated. This procedure must be completed at least once, only then Eco-Drive from Accelerometer will work properly.

Requirements:
● GPS fix for speeding/braking.
● FM device is installed tightly, cannot move, shake or get loose. This is VERY important.

Calibration Sequence:
1. Steady (zero) position. Send SMS command *accreset* or use terminal command *?reset acc calib* to begin the calibration. Wait, until the device detects steady position:
   a. Device is installed according to the requirements. Please do not open or close vehicle doors, avoid causing strong vibrations in the vehicle.
   b. Vehicle is located on a plain, flat surface (inclination should not exceed 5 degrees).
   c. Start the engine.
   d. Wait 1 - 5 minutes. There shouldn't be any movement for 1024 samples (in a row). Sample rate: 1 sample every 10 ms. No movement Period = 1024 * 0,01 s = 10,24 s.

Movement is caused by an increased acceleration in any direction or when GPS speed is noticeable. Zero position can be calibrated in a garage or some similar location, because GPS fix not necessary for this calibration step.

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2. Acceleration (GPS needed). Drive forward to calibrate front movement and positive acceleration.
   a. Start driving. Speed must be rapidly increased, accelerate at full power.
   b. Calibration starts, when GPS speed is over 15 km/h.
   c. Speeding (positive/forward acceleration) must be continued for at least for 3 seconds.
   d. Complete steps a, b, c at least **2 times**.

For a successful calibration you need two acceleration measurements. Device compares two acceleration values and calibrates accelerometer accordingly. This is why two acceleration actions must be completed. To check, if calibration was successful please use SMS commands (*see below*).

Important!
If you calibrated device and then removed it from vehicle or reinstalled it in a different location, you must recalibrate your device. Old calibration can be reset using SMS command. *(see SMS commands below)*

SMS Commands

SMS message to get all calibrated parameters from the device:
- accinfo

  SMS answer format is:

  AXL state: 11; XYZo:-0.024,-0.999,-0.215; N:0.271; ABC:0.229,0.025,-0.142.

  AXL state shows calibration process:
  - 0–3indicates zero position. If you get AXL state 3, steady position is calibrated. Usually you will get some values on XYZo and "nan" on ABC.
  - 3–6 indicates acceleration calibration is progress.
  - Other states show internal processes (e.g. calculating acceleration data).
  - State 11 means calibration is finished. If you get some values at XYZo and ABC parameters – calibration successful. If you get 'nan' - calibration failed.

SMS message to reset calibrated accelerometer parameters:
- accreset – Command resets calibrated parameter values. After this SMS message was sent, start calibration from the beginning.

SMS answer format is "ACC reset OK/FAILED".

Terminal command

Terminal command to reset calibrated accelerometer parameters:
- ?reset acc calib - Command resets calibrated parameter values. After this command was entered, start calibration from the beginning.

If you get a lot false breaking/acceleration events, please review your configuration settings. If configuration review does not reveal any mistakes, recalibrate your device. Calibration is tricky procedure, but once it is done correctly device will function as it should.

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