



Starting up the RPM-8000 revolution counter (Version 4)

1. The **new version 4 has an input voltage range of 12–42V DC**. If you are using the battery terminals on a motorbike, for example, as the connection to the vehicle electrical distribution system instead of the cigarette-lighter socket, always make sure the polarity of the connection cable is correct. If you have contact problems with some makes of cigarette lighters you should use an adapter cable (from a different connector type to a standard socket) to avoid inadvertently reversing the connection terminals. **Due to its signal acquisition technology, the RPM-8000 is not equipped with overvoltage and reverse voltage protection. A polarity mismatch will inevitably cause damage to the device and is not subject to the general warranty!**
2. To improve the signal-to-noise ratio, additional resistive loads such as rear window heater and lights (not gas discharge lamps) should be switched on. All inductive loads such as air conditioning system, air blower, light dimmer, sliding roof and door opener should remain turned off! This process increases the accuracy of the output signal in every case.
3. Start the vehicle motor, connect the spiral cable to the "Board Net" socket and plug the other end into the cigarette-lighter socket in the vehicle. Make sure that the red "Power" LED on the RPM-8000 is illuminated.
4. After a short delay the device will detect the motor speed signal. Successful synchronization is signalled by the green "O.K." LED on the RPM-8000. The device is now in the ready state and all measuring signals are available at the output. If synchronization has not taken place after a few seconds, this means that strong noise signals from vehicle loads have been superimposed on the residual ripple from the vehicle electrical distribution system. In which case briefly press the accelerator and synchronization will be achieved after returning to no-load speed.
5. You can now carry out the first tests by increasing and reducing the motor speed in the idling state and by monitoring the voltage at the analog output with a multimeter or pointer-type instrument. If the voltage tracks the motor speed synchronously, the device is properly functioning on your vehicle. The revolution counter on the dash panel may show values with small differences to those of the RPM-8000. This is due to inaccuracies in the vehicle instrument and you can ignore them!
6. Should problems occur during the test phase, please observe the following:
 - The use of cigarette-lighter sockets in the rear seating area or in the car boot in some vehicles can cause additional interference noise to be injected into the long line routes. You should therefore repeat the test at the socket on the dashboard or on the driver's console.
 - A loss of synchronization may occur when the motor speed drops. In this case the vehicle electrical supply briefly switches to battery-backup mode, as the high Faraday capacity of the battery is not able to decay quickly enough. To eliminate this effect, switch on additional resistive loads (light, window heater).
 - Some Diesel vehicles of upper class cars are equipped with overrunning alternators. This may cause in cases of extremely high negative accelerations a short-time rotational speed difference between engine and alternator. This is important to know, because the RPM-8000 measures indeed the revolutions per minute of the alternator.
 - If the device is operated from the vehicle electrical distribution system while the motor is at a standstill and the ignition is switched on, the RPM-8000 may synchronize with arbitrary noise signals from the vehicle electrical distribution system, as the reference signal from the residual ripple is not available. In this case the green "O.K." LED is energized before the motor is started, and the system must be "reset" by removing the connector from the cigarette-lighter socket for a short period. The same applies if the motor is stopped and the green "O.K." LED does not go out.
 - Should none of the above measures prove successful, please contact us at the above e-mail address.

Calibrating the RPM-8000 revolution counter (Version 2)

1. For calibrating the device with an analog reference sensor measure simultaneously the output voltage from the reference sensor and the RPM-8000. Using the supplied screwdriver change the gain with the potentiometer on the RPM-8000 labelled "Analog Cal." until both signals are equal.
2. For calibrating the device with a digital reference sensor simultaneously record both the reference signal and the output frequency of the RPM-8000. This signal always corresponds with the actual residual ripple frequency and is not influenced by the position of the potentiometer! Therefore determine a correction factor from the relationship between both signal values. You can integrate this factor into your digital data acquisition system as a multiplier.
3. If you calibrate with technical parameters without a reference sensor, proceed as follows:
 - a) Determine the generator pole number. This is an even number that you will find in the generator data sheet or which you can obtain from the manufacturer.
 - b) Determine the transmission ratio between crankshaft and generator. This ratio is obtained from the relationship of the effective diameters of both pulleys.
 - c) Calculate the digital frequency correction factor or the analog output voltage to be set with the following formulas:

$$\text{Digital: } n = f * \frac{60}{3 * p * g}$$

$$\text{Analog: } v_{\text{Cal}} = \frac{v_{\text{Ref}} * f_{\text{Cal}}}{n_{\text{Ref}} * 3 * p * g}$$

The meaning of the symbols:

- g ... Transmission ratio between crankshaft and generator pulleys
(Petrol cars 2 – 3, Diesel cars ≈ 3, Trucks ≈ 5)
- p ... Pole number of generator (usually 12, sometimes 16)
- 3 ... Factor, arising from the 3 phases of the three-phase generator
- 60 ... Conversion factor for Hz to min⁻¹ (1Hz = 60min⁻¹)
- f ... RPM-8000 output frequency (Hz)
- f_{Cal} ... Internally generated RPM-8000 reference frequency during calibration (4000Hz)
- n ... Motor speed (min⁻¹)
- n_{Ref} ... Reference rotational speed (1000min⁻¹ = 16.667Hz)
- v_{Ref} ... Reference voltage (1V)
- v_{Cal} ... Analog output voltage of RPM-8000 to be set in calibration mode

- Notes:
- I) n_{Ref} and v_{Ref} are examples for an equivalence of 1V = 1000min⁻¹.
 - II) For devices with the value-8 frequency divider option the numerator of the digital formula has to be 60 * 8 = 480 instead of 60.

Example: A transmission ratio of 2.14 and a pole number of 12 gives a frequency correction factor of 0.779 (1000 Hz output frequency corresponds to a speed of 779min⁻¹) and an analog output voltage of 3.115V to be set in calibration mode (1V during measurement then corresponds to 1000min⁻¹).

- d) If the frequency output is used, the calculated correction factor must be taken into account during digital data acquisition. To adjust the RPM-8000 by analog means, switch to calibration mode by actuating the test contact "Analog Cal." on the RPM-8000 with the supplied hexagon key. Activation is signalled by the flashing green "O.K." LED. To eliminate external noise calibration should be carried out with the ignition switched on for powering and the motor switched off.
- e) In this mode the digital output generates a quartz-stable frequency of 4000Hz that also serves as input signal to the analog stage to be calibrated. Now, using the screwdriver supplied, set the calculated voltage (for example 3.115V) at the analog output at the potentiometer "Analog Cal."
- f) Deactivate the calibration mode by pressing the "Analog Cal." pushbutton again. The green "O.K." LED must go out and the device is ready for measurement.