



Product Bulletin

CE367 ECU Altitude Limitation

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April 22, 2019



I. PROBLEM

The CE367 ECU from Currawong Engineering is based on the mature Autronic SM4 automotive fuel injection computer. This fuel injection system has a “baro limp home” barometric pressure limit of 50 kPa. Anytime the measured barometric pressure is less than 50 kPa the system assumes the measurement is erroneous and replaces the pressure with the limp home value of 100 kPa.

This change in barometric pressure affects fueling through three separate fuel multipliers: the pressure compensation fuel multiplier, the charge temperature fuel multiplier, and the injector pressure fuel multiplier. When the limp home mode is activated the net effect of these multipliers is to lean the engine. The exact amount of leaning is a function of the engine calibration, but in most cases will be more than 20%; likely causing the engine to stop.

II. WORKAROUND 1: ALTITUDE LIMITATION

In order to avoid the baro limp home mode the pressure measured by the barometric pressure sensor must be higher than 50 kPa. The pressure sensor is subject to some amount of error, such that even if the true pressure is more than 50 kPa the measured pressure may be less, triggering the limp home mode. The sensor is rated for a maximum error of 1.725 kPa. We assume in the worst case that the sensor could be in error by 2.5 kPa, resulting in a do-not-go-below barometric pressure of 52.5 kPa.

According to the US standard atmosphere 52.5 kPa atmospheric pressure is equivalent to 17,117 ft (5217 m), *on a standard day*. It is vital to understand that the actual altitude for 52.5 kPa pressure on any given day may be different than the standard atmosphere. On a day which is hotter, or lower pressure, than the standard day the altitude that violates the 52.5 kPa pressure is lower. To account for this variation, consider a worst case altimeter setting of 97 kPa (28.64 in Hg). With that altimeter setting the true altitude that results in 52.5 kPa pressure is 16,045 ft (4891 m).

In total, to avoid the limp home mode:

Do not fly at altitudes above 16,000 ft (4880 m).

III. WORKAROUND 2: CALIBRATION FILE ADJUSTMENT

For customers that must fly above 16,000 ft it is possible to adjust the calibration file of the ECU to mitigate the effects of the limp home. This adjustment affects the barometric pressure sensor calibration, the charge temperature table, and an auxiliary fuel table. The net effect of the adjustments is to produce the correct injector pulse widths even as the ambient pressure goes below the limp home threshold. P4F has verified this process using simulated crank sense, temperature inputs, and a vacuum chamber down to a pressure of 36 kPa (26,000 ft). The calibration file adjustments are subtle and should not be attempted by the customer.

To fly higher than 16,000 feet:

Work with P4F or Currawong Engineering to adjust your calibration for use at altitudes above 16,000 ft (4889 m).



IV. SUMMARY

- 1) If your current and future operations do not require flights above 16,000 ft (4880 m) then no action is required.
- 2) **No CE 367 ECU should be flown above 16,000 ft (4880 m) unless it has been modified to do so** by making the proper calibration file adjustments.
- 3) To obtain the proper calibration file adjustments to enable your CE 367 ECUs for operation above 16,000 ft (4880 m) please contact Power4Flight or Currawong Engineering directly.
- 4) For a detailed technical description of the Baro limp home issue which includes the fuel model validation, details on the specific changes implemented as well as the test results and data used to validate the changes request the technical report "CE367 Altitude Testing".
- 5) For further information contact:

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