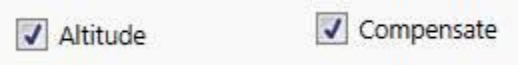
Altitude Sensor

Settings and Tuning



The ECU can compensate for altitude differences in pressure. It will adjust the fuel mixture and the timing in relation to altitude. Orion has an optional On-board 3 Bar MAP sensor which can be used for altitude. This is optional and has to be ordered separately. With Map/Alt Swop the 2 sensors can be swapped. Then the 3 Bar sensor on board is used as a Map sensor and an external 2.5 Bar sensor could be connected in the Map sensor's place for finer accuracy.

Select *Altitude* and click on *Compensate*. The Altitude sensor is pre-calibrated. You do however need a 2.5 Bar MAP sensor for external sensors unless the 3 bar sensor on board is used. The real time bar below will indicate the actual altitude pressure of your surroundings.

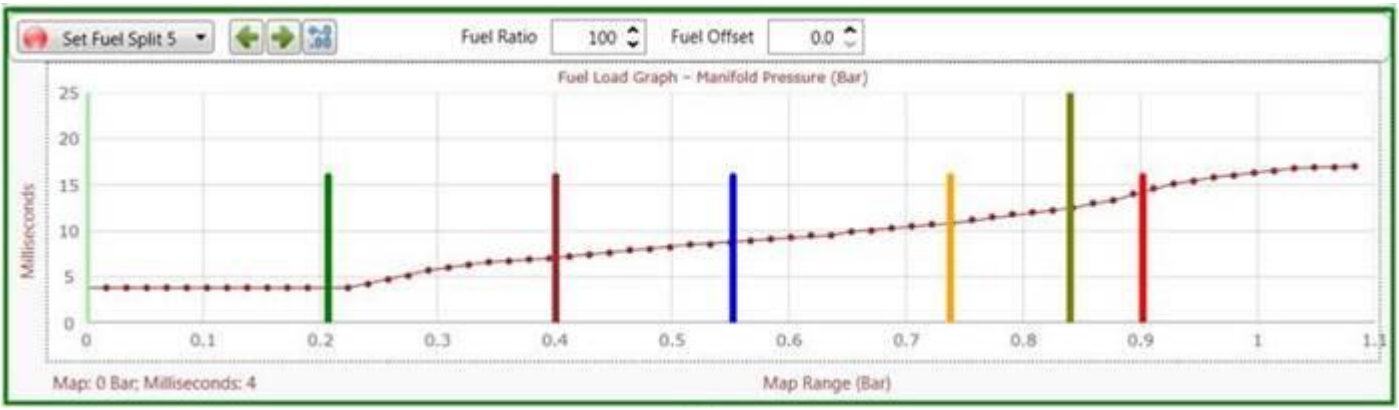
Fuel Compensation

This feature works differently for the different tuning methods. Below are descriptions of operation in each method.

Graph Map tuning – Normal Aspirated

This scaling feature is only for normal aspirated engines where the map range is set at 1.1 Bar. The ECU will calculate altitude in the background and rescale the MAP sensor value so that the map bar always reaches full scale at all altitudes. This is important because the normal MAP sensor will not reach the maximum scale on the tuning graph at high altitude. Put another way, full scale on the graph will always be compared to available altitude pressure outside.

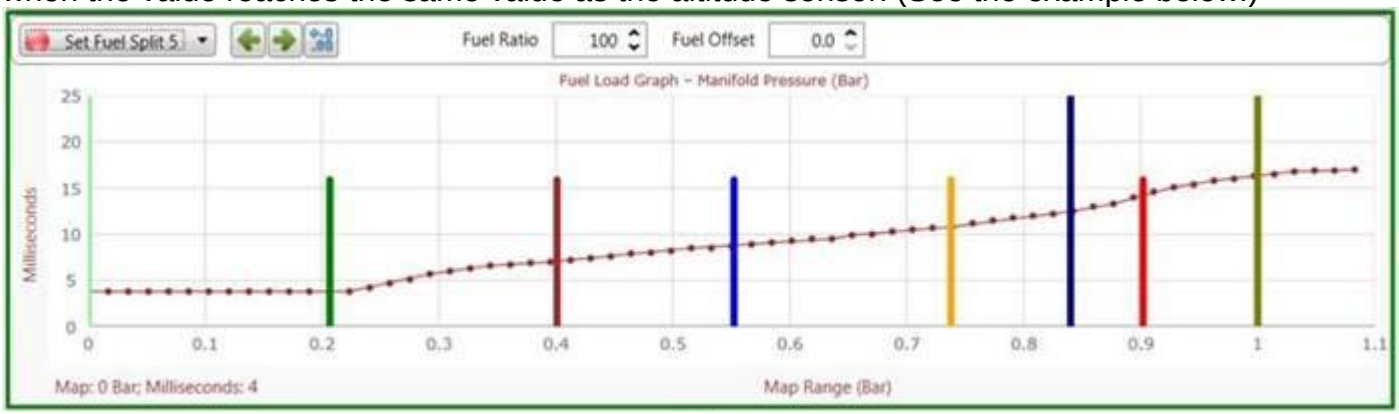
In a typical Fuel Load graph for example, an engine that was tuned at sea level where the MAP sensor reached 1 Bar, will only reach 0.83 Bar at around 2000 meters above sea level. The full load fuel compensation that was set to be richer above 0.9 bar will not be reached. The ECU will then not have the advantage of the full curve that was mapped out during tuning.



Engine tuned at sea level up to 1 bar only reach 0.83 bar at 2000 meter. **Note**: The bar will not pass the red bar and take advantage of the WOT rom compensation graph or the extra hump in the full load graph above 0.9 bar.

In the above example the injector time was 11.9 milliseconds.

When compensation is checked by the ECU will it compare the available air pressure in the air cleaner with the actual pressure in the intake manifold. It will then scale the MAP sensor to read 1 bar when the value reaches the same value as the altitude sensor. (See the example below.)



The dark blue bar is the altitude value and the olive bar is the map value. Note how the MAP sensor is now reading 1 bar at 2000 meter.

Notice the difference in fuel due to the hump on the right hand side. Now the ECU still has the advantage of the graph profile even at high altitude.

Matrix Map – Normal Aspirated

The same system applies for the Matrix Map tuning as Matrix Graph tuning. They both operate the same way except that it is a matrix. Read the above section for explaining purposes.

Graph Map tuning – Boosted Engines

In this tuning method altitude compensation is disabled. The reason is that you are already using a MAP sensor and measuring the manifold pressure. Fuel and time is set accordingly and does not require additional altitude compensation.

TPS Matrix tuning

This is for normal aspirated racing engines where TPS versus RPM fueling is used. The altitude sensor becomes very important as RPM versus TPS cannot compensate for altitude pressure differences. The ECU will adjust calculated fuel in ratio with altitude pressure differences to ensure a more accurate fuel mixture. For example, 10% less altitude pressure will result in 10% less fuel. The TPS versus RPM tuning is normally for engines with throttles or poor vacuum signal due to overlap camshafts. You need to activate the compensation values before tuning an engine. Even if you are inland at high altitude. The ECU will be tuned with the reduced fuel, so that when you decent to sea level, the fuel will be added.

Graph MAP with TPS Matrix tuning

This is for boosted racing engines where TPS versus RPM fueling is used with a boost pressure graph. The altitude sensor becomes very important as RPM versus TPS cannot compensate for altitude pressure differences. The ECU will adjust calculated fuel in ratio with altitude pressure

differences to ensure a more accurate fuel mixture. For example, 10% less altitude pressure will result in 10% less fuel. This altitude compensation is done on the TPS matrix and then is compensated with the boost graph. The TPS matrix and boost graph tuning is normally for turbo engines with poor vacuum signal due to overlap camshafts. You need to activate the compensation values before tuning an engine. Even if you are inland at high altitude. The ECU will tune with the reduced fuel so that when you decent to sea level, the fuel will be added. For detailed explanation see the ***Graph MAP and Matrix TPS Tuning*** section.

Timing Compensation

This feature is available and operates the same in all the tuning modes. If you don't want it to affect your timing, make the value 0.

Under Timing Settings set the Altitude Comp to 3 degrees per 1000 meter.

With timing compensation, the ECU will gradually add timing with increased altitude. The tuner can select the number of degrees' advance per 1000-meter increase in altitude. In this example we used 3 degrees which results in 1 degree for every 333 meters. **Note**: This will advance the calculated timing in total. There are no extra graphs to tune.
You need to activate the compensation values before tuning an engine. Even if you are inland at high altitude. The ECU will tune with the added degrees so that when you decent to sea level, the timing will be retarded.

Sensors Description

The altitude pressure sensor provides instantaneous altitude pressure information to the Orion ECU. It will allow the Orion2 to calculate air density, which in turn determines the required fuel compensation for optimum combustion. It also adjusts ignition timing with altitude changes. Orion2 uses an optional built in internal 3 Bar map sensor or an external 2.5 Bar map sensor. You may swop the map and altitude sensors around to take advantage of the 3 Bar sensor onboard for normal MAP sensor operation.