

## DashCommand Vehicle Settings

*For v2.5.0 – Document revision 1 – July 15, 2010*

DashCommand vehicle settings are used by the built-in PIDs to calculate values that may be of interest to you. Below, each setting is explained.

### **Fuel tank capacity** [l | gal (US) | gal (UK)]

The value can be found in the vehicle's owner's manual. Enter a value in liters (l), gallons (US), or gallons (UK).

CONST.FUEL\_TANK\_CAPACITY is the built-in PID that makes the setting available to the other calculations. It returns N/A when the setting is blank or an invalid entry is made.

When the fuel capacity setting is specified the following calculation PIDs will become functional.

CALC.FUEL\_LEVEL

CALC.DTE

CALC.TTE

CALC.FUEL\_PRICE

The following calculation PIDs are enhanced and made more accurate when the setting is provided.

CALC.ENGINE\_POWER – The weight of the fuel in the tank is accounted for in the calculation

CALC.ENGINE\_TORQUE – The weight of the fuel in the tank is accounted for in the calculation

### **Fuel type** {Gasoline | Diesel}

The fuel type setting defines the type of fuel consumed by the vehicle. It can be gasoline or diesel. When this setting is left blank the fuel type is assumed to be gasoline.

When the fuel type setting is specified the following calculation PIDs will become functional.

CONST.FUEL\_DENSITY – The fuel density is based solely on the fuel type.

CONST.STOICHIOMETRIC\_AIR\_FUEL\_RATIO – The value is solely based on the fuel type.

CONST.FUEL\_CO2\_CONTENT – The value is solely based on the fuel type.

The following calculation PIDs are enhanced and made more accurate when the setting is provided.

CALC.ENGINE\_POWER – The weight of the fuel in the tank is accounted for in the calculation

CALC.ENGINE\_TORQUE – The weight of the fuel in the tank is accounted for in the calculation

CONST.FUEL\_DENSITY and STOICHIOMETRIC\_AIR\_FUEL\_RATIO are used in all the fuel consumption calculations. Defining the wrong fuel type will adversely affect the fuel consumption calculations.

### **Curb weight** [kg | lb]

The curb weight is the weight (mass) of the vehicle when it is totally empty – no occupants, no cargo, and no fuel in the fuel tank.

When the curb weight setting is specified the following calculation PIDs will become functional.

CALC.ENGINE\_POWER  
CALC.ENGINE\_TORQUE

#### **Additional weight [kg | lb]**

This setting defines the weight (mass) of the occupants and the cargo in the vehicle. It is used to more accurately calculate engine power and engine torque. In the case where the SAE.FLI PID is not supported by the vehicle, this setting can also be used to account for the weight (mass) of the fuel in the fuel tank.

When the additional weight setting is specified the following calculation PIDs are enhanced and become more accurate.

CALC.ENGINE\_POWER<sup>[1]</sup>  
CALC.ENGINE\_TORQUE<sup>[1]</sup>

[1] Also requires the 'Curb weight' setting

#### **Drag coefficient**

Entering a drag coefficient allows the engine power and engine torque calculations to compensate for the power loss due the resistance of air. The frontal area setting must also be defined.

When the drag coefficient setting is specified, the following calculation PIDs are enhanced and become more accurate.

CALC.ENGINE\_POWER<sup>[1]</sup>  
CALC.ENGINE\_TORQUE<sup>[1]</sup>

[1] Also requires the 'Frontal area' setting to account for the power loss due to air resistance

#### **Frontal area [m<sup>2</sup> | ft<sup>2</sup>]**

Entering a frontal area allows the power and torque calculations to compensate for the power loss due to the resistance of passing through air. The drag coefficient setting must also be defined.

When the frontal area setting is specified, the following calculation PIDs are enhanced and become more accurate.

CALC.ENGINE\_POWER<sup>[1]</sup>  
CALC.ENGINE\_TORQUE<sup>[1]</sup>

[1] Also requires the 'Drag coefficient' setting account for the power loss due to air resistance

## **Tire rolling resistance coefficient**

Entering a tire rolling resistance coefficient allows the power and torque calculations to compensate for the power loss due to friction between the road surface and the tires.

Values range between 0.007 for ultra low rolling resistance tires to 0.014 for high rolling resistance tires. A good number for normal passenger vehicle tires is 0.012.

When the tire rolling resistance setting is specified, the following calculation PIDs become more accurate.

CALC.ENGINE\_POWER  
CALC.ENGINE\_TORQUE

## **MAF PID**

This setting tells DashCommand which MAF (mass air flow) PID to use for calculating fuel consumption. When this setting is left blank DashCommand will select the best MAF PID available. Specify a MAF PID when you want to force DashCommand to use a specific MAF PID such as one from an auxiliary sensor module.

The MAF PID setting is used for the following calculation PIDs.

CALC.MAF  
CALC.FUEL\_FLOW  
CALC.FC.AVERAGE  
CALC.FC.AFC  
CALC.FC.FUEL\_VOLUME  
CALC.FC.IFC  
CALC.DTE  
CALC.TTE

## **MAP PID**

This setting tells DashCommand which MAP (manifold absolute pressure) PID to use for calculating vacuum, boost and in some circumstances, fuel consumption related values. When this setting is left blank DashCommand will select the best MAP PID available. Specify a MAP PID when you want to force DashCommand to use a specific MAP PID such as one from an auxiliary sensor.

The MAP PID is used in the following calculation PIDs.

CALC.MAP  
CALC.BOOST  
CALC.VACUUM

## **Lambda (actual) PID**

This setting tells DashCommand which lambda PID to use for calculating the actual air/fuel ratio and to more accurately calculate fuel consumption. When this settings is left blank, DashCommand will select the first available lambda PID it discovers. DashCommand looks for a lambda PID matching SAE.WO2Sxy.LAMBDA or SAE.WO2Sxy\_B.LAMBDA where x is the sensor bank number and y is the sensor number (ex. SAE.WO2S11\_B.LAMBDA). Specify Lambda (actual) PID when you want to force DashCommand to use a particular lambda PID instead of the default one. This is useful when using an auxiliary wideband oxygen sensor.

This setting is used by the following calculation PIDs.

CALC.LAMBDA\_ACTUAL  
CALC.AFR\_ACTUAL  
CALC.FUEL\_FLOW  
CALC.FC.AVERAGE  
CALC.FC.AFC  
CALC.FC.FUEL\_VOLUME  
CALC.FC.IFC  
CALC.DTE  
CALC.TTE

#### **Lambda (commanded) PID**

This setting tells DashCommand which lambda PID to use for calculating the commanded air/fuel ratio. When this settings is left blank, DashCommand will select SAE.LAMBDA if it's available. Specify Lambda (commanded) PID when you want to force DashCommand to use a particular lambda PID instead of the default one.

The following calculation PIDs make use of this setting.

CONST.LAMBDA\_COMMANDED\_PID  
CALC.LAMBDA\_COMMANDED  
CALC.AFR\_COMMANDED

#### **Engine displacement [ml | l | cc | in<sup>3</sup>]**

The engine displacement setting tells DashCommand how much air can pass through the engine. This value is important and required to calculate fuel consumption when a MAF (mass air flow) PID is not provided by the vehicle. The value can also serve when a MAF PID is provided but a MAP (manifold absolute pressure) PID is not provided to calculate boost and vacuum. This setting maybe left blank if both SAE.MAF and SAE.MAP are provided by the vehicle.

When this setting is specified the following PIDs become operational.

CONST.ENGINE\_DISPLACEMENT  
CALC.MAF\_B  
CALC.MAP\_B

### Volumetric efficiency [%]

The volumetric efficiency setting is used in conjunction with the engine displacement value to tell DashCommand how much air can pass through the vehicle's engine. This value helps to more accurately calculate fuel consumption when a MAF (mass air flow) PID is not provided by the vehicle. The value can also serve when a MAF PID is provided but a MAP (manifold absolute pressure) PID is not provided to calculate boost and vacuum. This setting maybe left blank if both SAE.MAF and SAE.MAP are provided by the vehicle. A value of 75% is used by default when a calculation requires the setting but it is left blank.

When this setting is specified the following PIDs become operational.

CONST.VOLUMETRIC\_EFFICIENCY  
CALC.MAF\_B  
CALC.MAP\_B

### Final drive ratios

This setting is used to relate engine speed with vehicle speed. With the final drive ratio for each gear and a given engine speed and vehicle speed DashCommand can calculate which gear is currently engaged. It can also be used to suggest a more economical gear based on vehicle speed for vehicles with a manual transmission.

The setting is composed of a sequence of final drive ratios starting from 1<sup>st</sup> gear separated by semi-colons. For example, **13.56;7.65;5.08;3.80;3.12;2.60**.

To specify the final drive ratios you need the gear ratio for each gear and the drive ratio. These are traditionally found in the specifications section of the owner's manual or the manufacturer's web site. A final drive ratio (FDR) is the result of multiplying of the gear ratio (GR) and the drive ratio (DR), such as  $FDR = GR \times DR$ . Doing this simple calculation for each gear produces the series of final drive ratios.

Example:

Gear	Gear Ratio	Drive Ratio	Final Gear Ratio (Gear Ratio * Drive Ratio)
1	4.148	3.329	13.809
2	2.370	3.329	7.890
3	1.555	3.329	5.177
4	1.154	3.329	3.842
5	0.859	3.329	2.860
6	0.685	3.329	2.280

In DashCommand, enter the final drive ratios as a series separated by sem-colons. For example:  
**13.809;7.890;5.177;3.842;2.860;2.280.**

The values are entered from gear 1 to the last high gear. Any number of gears can be specified.

In the above example, the drive ratio is the same for each gear. In some vehicles the drive ratio can be different for a few gears.

Do not enter the reverse gear.

Final drive ratios for automatic transmissions (AT) and manual transmissions (MT) can be specified. Some vehicles are equipped with continuously variable transmissions (CVT) and inherently do not have gear ratios. If your vehicle has a CVT leave the final drive ratios setting blank.

When final drive ratios are specified the following extended PIDs will become available and operational.

CALC.GEAR.CURRENT<sup>[1]</sup>

CALC.GEAR.SUGGESTED<sup>[1][2]</sup>

CALC.GEAR.SHIFT\_INDICATOR<sup>[1][2]</sup>

[1] Also requires that either the 'Wheel circumference' setting or the 'Tire size specification' setting be specified.

[2] Also requires that the 'Minimum engine speed' setting be specified.

### **Vehicle speed correction factor**

This setting is used to correct the vehicle's speedometer reading to compensate for using a different tire size than what is originally specified for the vehicle. There are a few of ways of determining the correction factor.

- 1) Measuring the actual vehicle speed (SP\_A) with a GPS device and noting the speedometer reading (SP\_O). Divide SP\_A by SP\_O to calculate the correction factor ( $CF = SP\_A/SP\_O$ ).
- 2) Measuring both the original wheel circumference (WC\_O) and the new wheel circumference (WC\_N). Use the following formula to calculate the correction factor (CF):  $CF = WC\_O/WC\_N$ .

When a vehicle speed correction factor is specified, CALC.VSS\_C will output the corrected vehicle speed. When no correction factor is specified the correction factor is assumed to be 1 which represents no correction.

Valid correction factors are close usually close to 1.00.

### **Wheel circumference [mm | in | r/km | r/mile]**

The wheel circumference setting is used in conjunction with the final drive ratio setting to enable the gear calculations.

The value can be measured with a tailor's measuring tape or often times the tire manufacturer will provide the value as part of the tire's specifications.

Values may be entered as mm, inches, revs/km, or revs/mile.

As an alternative, the 'Tire size specification' setting can be used to specify a wheel circumference but this method is less accurate but usually good enough for the purposes of the gear calculations. The advantage is that it can be read directly from the tire.

When a wheel circumference is specified the following calculation PIDs will become available and operational.

CALC.GEAR.CURRENT<sup>[1]</sup>

CALC.GEAR.SUGGESTED<sup>[1][2]</sup>

CALC.GEAR.SHIFT\_INDICATOR<sup>[1][2]</sup>

[1] Also requires that the 'Final drive ratios' setting be specified.

[2] Also requires that the 'Minimum engine speed' setting be specified.

### **Tire size specification**

The tire size specification is used to calculate an approximate wheel circumference which is then used by the gear calculations.

Enter the size specification as it appears on the side wall of the tire, for example, P215/45R18. Other acceptable input formats are 215/45/18 or 215/45-18 and a few others.

If the 'Wheel circumference' setting is specified the value of the 'Tire size specification' setting is not used and can remain blank.

When a tire size is specified the following calculation PIDs will become available and operational.

CALC.GEAR.CURRENT<sup>[1]</sup>

CALC.GEAR.SUGGESTED<sup>[1][2]</sup>

CALC.GEAR.SHIFT\_INDICATOR<sup>[1][2]</sup>

[1] Also requires that the 'Final drive ratios' setting be specified.

[2] Also requires that the 'Minimum engine speed' setting be specified.

### **Minimum engine speed [r/min]**

The minimum engine speed setting is used by the gear calculations to determine a suggested gear based on current vehicle speed. Specifically, it is used to calculate the minimum sustainable vehicle speed for each gear. It is primarily useful for manual transmission vehicles where a suggested gear and a shift indicator can serve as useful reminders to shift to a more economical gear.

When minimum engine speed is specified the following calculation PIDs will become available and operational.

CALC.GEAR.SUGGESTED<sup>[1]</sup>

CALC.GEAR.SHIFT\_INDICATOR<sup>[1]</sup>

[1] Also requires that the 'Final drive ratios' setting be specified.

#### **Maximum engine speed [r/min]**

The maximum engine speed is used to calculate the maximum speed attainable in each gear.

#### **Shift point [r/min]**

The shift point engine speed is used to calculate the shift point speed in each gear. This setting is only useful for vehicles with a manual transmission.